

**Government of the People's Republic of Bangladesh
Ministry of Shipping**

**Bangladesh Regional Inland Water
Transport Project 1
(Chittagong-Dhaka-Ashuganj Corridor)**



**ENVIRONMENTAL AND SOCIAL ASSESSMENT
And Resettlement Policy Framework**

EXECUTIVE SUMMARY



Bangladesh Inland Water Transport Authority (BIWTA)

May 2016

Contents

List of Acronyms	iii
1. Introduction.....	1
SECTION A: PROJECT CONTEXT.....	2
2. Background.....	2
2.1. The Proposed Project.....	3
2.2. The Environmental and Social Assessment.....	4
2.3. Composition of Study Team	5
3. Policy, Legal and Administrative Framework	7
3.1. Applicable Legislation and Policies in Bangladesh	7
3.2. Environmental Procedures	11
3.3. World Bank Safeguard Policies	11
3.4. Compliance Status with Bangladesh Legislation and World Bank Policies	13
4. Project Description	15
4.1. Project Objective	15
4.2. Program Components and Locations	15
4.3. Construction Material and Sources.....	18
4.4. Project Implementation Schedule	19
4.5. Project Cost.....	19
5. Project Alternatives	21
5.1. No Project alternative	21
5.2. Alternatives to the IWT	21
5.3. Alternative Means of Maintaining the Navigation Routes	22
5.4. Alternative Methods of Dredging	22
5.5. Alternatives to Dredged Material Management.....	22
5.6. Alternative Contracting Approaches	23
5.7. Alternative Locations and Design Aspects of Terminals and Landing Stations	23
SECTION B –Environmental Assessment and Management.....	24
6. Description of Environment	24
6.1. Physical Environment.....	24
6.2. Chemical Environment	26
6.3. Biological Environment.....	27
7. Climate Change Considerations	32
8. Potential Environmental Impacts and Mitigation Measures.....	34
8.1. General	34
8.2. Impact Assessment Methodology.....	34
8.3. Summary of Assessed Impacts	35
8.4. Environmental Impacts from Dredging Works in Component 1	36
8.5. Environmental Impacts from Construction of Component 2 Works	38
8.6. Impacts from during Operation and Maintenance for both Component 1 and 2	40
9. Cumulative and Induced Impact Assessment.....	43
9.1. Objective	43
9.2. CIIA in Context of the Proposed Project	43
9.3. Aquatic Biodiversity	43

9.4. Dolphin.....	43
9.5. Hilsa.....	44
9.6. Mitigation Measures	44
10. Environmental Management Plan.....	45
10.1. General.....	45
10.2. Institutional Arrangements.....	45
10.3. Environmental Management.....	47
10.4. Monitoring Plan	48
10.5. Capacity Building	51
10.6. External Monitoring	52
10.7. Reporting	52
SECTION C – Social Assessment and Resettlement Policy Framework.....	53
11. Social Assessment	53
11.1. Brief Socio-Economic Baseline.....	53
11.2. Social impacts from Construction Activities	54
11.3. Grievance Redress Mechanism.....	58
11.4. Institutional Arrangements.....	58
11.5. Monitoring and Reporting	59
SECTION D – Consultation and Budget.....	60
12. Stakeholder Consultations and Disclosure	60
12.1. Overview	60
12.2. Consultations Feedback.....	60
12.3. Cost of Environmental and Social Management	62
12.4. Disclosure	63

Annex 1: Entitlement Matrix

List of Tables and Figures

Table 1: Classification of IWT River Routes in Bangladesh	2
Table 2: Compliance of Project with GoB Legislation and World Bank Safeguard Policies	13
Table 3: Location of IWT Routes in Component 1 and Estimated Dredging.....	16
Table 4: Locations of Vessel Shelters in Component 1.....	17
Table 5: Locations of River Terminals and Landing Stations in Component 2	17
Table 6: Cost Estimate of the Project-I	19
Table 7: Significance of Impact Criteria	34
Table 8: Potential impacts and their significance	35
Table 9: Effects Monitoring Plan.....	49
Table 10: Number of Persons Covered in Various Consultation Meetings.....	60
Table 11: Key Issues Raised and Plans to Address the Issues	60
Table 12: Cost Estimates for Environmental Management and Monitoring of the Project	63
Figure 1: Location of Project Interventions.....	7
Figure 2: Hilsa Sanctuaries and Spawning Areas Declared by the Government.....	29
Figure 3: Proposed Institutional Structure for Implementation of the Project.....	46

List of Acronyms

ARAP	Abbreviated Resettlement Action Plan		
BDL	Below Detectable Limit		
BDT	Bangladesh Taka		
BIWTA	Bangladesh Inland Water Transport Authority		
BOD	Biological Oxygen Demand		
BLPA	Bangladesh Land Port Authority		
BP	Best Practice		
CNG	Compressed Natural Gas		
DEPTC	Deck and Engine Personnel Training Centre		
DO	Dissolved Oxygen		
DoE	Department of Environment		
DoF	Department of Fisheries		
DSC	Dredging Supervision ConsultantEA	Environmental Assessment	
ECA	Environmental Conservation Act; Ecologically Critical Areas		
ECC	Environmental Clearance Certificate		
ECoP	Environmental Code of Practice		
ECR	Environment Conservation Rules		
EHS	Environmental Health and Safety		
EIA	Environmental Impact Assessment		
EMF	Environmental Management Framework		
EMP	Environmental Management Plan		
ESIA	Environmental and Social Impact Assessment		
E&S	Environmental and Social		
GoB	Government of Bangladesh		
GRM	Grievance Redress Mechanism		
HH	Household		
IEE	Initial Environmental Examination		
IUCN	International Union for Conservation of Nature		
IWM	Institute of Water Modeling		
IWT	Inland Water Transport		
MOEF	Ministry of Environment and Forest		
MARPOL	International Convention for the Prevention of Pollution from Ships		
Mg/L	milligram per liter		
MoS	Ministry of Shipping		
NGO	Nongovernmental Organization		
NLTA	Non-lending Technical Assistance		
OP	Operational Policy		
O&M	Operation and Management		
OSPAR	Oslo/Paris convention (for the Protection of the Marine Environment of the North-East Atlantic)		
PCR	Physical Cultural Resources		
PM	Particulate Matter		
PIU	Project Implementation Unit		
RAP	Resettlement Action Plan		
RPF	Resettlement Policy Framework		
t	Metric ton or tonne		
TCAF	Transformative Carbon Asset Facility		
TDS	Total Dissolved Solids		
TSS	Total Suspended Solids		
USD	US Dollars		
VEC	Valued Environmental Component		
VOC	Volatile Organic Compounds		
WB	World Bank		
WBG	World	Bank	Group

1. Introduction

The Bangladesh Regional Inland Water Transport Project 1 (Chittagong-Dhaka-Ashuganj Corridor) is the proposed 'Project' by the Government of Bangladesh (GoB) to develop Inland Water Transport (IWT) sector and related infrastructure between Dhaka-Chittagong and Dhaka-Ashuganj river corridors. The Project has three major components. The Component 1 will include dredging and maintenance of the river corridors and ferry routes in the Project area through a performance contract over a period of seven years; and construction and maintenance of six vessel storm shelters. The Component 2 includes construction and upgrading of six inland river ports (terminals) and rehabilitation/upgrading of fourteen landing stations (launch ghats) along these river corridors. Component 3 includes institutional capacity development measures including civil works for retrofitting an existing training institution and small scale pilot river training works. A comprehensive Environmental and Social Impact Assessment (ESIA) has been prepared for the Component 1; and an Environmental Management Framework (EMF) for Component 2 and 3 works. A Resettlement Policy Framework (RPF) has been prepared the overall Project. This Executive Summary presents a summary of the potential environmental and social impacts of the overall Project as described in ESIA, EMF and RPF documents. Mitigation measures are described and included in relevant environmental and social management plans to address potential impacts as well as to enhance the environmental and social benefits of the Project.

The report is organized accordingly:

Section A – Project Context

Section B – Environmental Assessment and Mitigation Plans

Section C – Social Assessment and Mitigation Plan.

Section D – Consultations and Budget.

Annex 1 – Entitlement Matrix

SECTION A: PROJECT CONTEXT

2. Background

IWT Sector in Bangladesh: Bangladesh has a large and vibrant Inland Water Transport sector. In total it carries over 50% of all Bangladesh's cargo traffic and one quarter of all passenger traffic. IWT is now playing an increasingly important role in the social and economic development of the country by maintaining communication between various remote parts of the country which are inaccessible by other modes of transport; particularly during the periods of peak monsoon. It is also a reliable means of transport for importing and exporting cargo. The length of all of Bangladesh's rivers is approximately 24,000 km. Of this, approximately 5,923km are currently navigable during the monsoon (wet) period, shrinking to about 3,865km in the dry periods (October to May). The rivers are mainly classed (Table 1) according to the maximum draft limitations – which is the maximum depth a vessels hull may be immersed at certain places on the river. Class One routes include those between the country's main seaports of Chittagong and Mongla to Dhaka and Narayanganj, extending as far as Ashuganj on the Surma-Meghna river system. Class Three and Four routes are mainly located close to Dhaka and North of Ashuganj.

Table 1: Classification of IWT River Routes in Bangladesh

Class	Max Vessel Draft (& Min Advertised River Depths)	Minimum Channel Width	Minimum Vertical Clearance	River Length	% of total IWT km
I	3.65 m (3.96m)	76.22 m	18.30 m	683 km	11%
II	2.13 m (2.43m)	76.22 m	12.20 m	1,000 km	17%
III	1.52 m (1.82m)	30.46 m	7.62m	1,886 km	32%
IV	<1.52 m	20.00m	5.00m	2,400 km	40%

Need for Improvement of Navigability of Rivers in Bangladesh: Bangladesh lies predominately within the Bengal basin, the world's largest delta formed by the Ganges, Brahmaputra and Meghna river systems. Navigation is complicated by the braided nature of the rivers, which are characterized by high sediment delivery and - due to extremely low gradients - very low sediment throughput. This makes the rivers extremely sensitive to flooding with rapid geometry (boundary and channel) changes. Further, river systems in Bangladesh exhibits high seasonality over a year i.e. abundant of water during monsoon and scarcity of water during dry season from December to May. Navigability becomes very critical during dry season in many river routes and ferry crossing. Problems of navigation are compounded by the growth of inland water vessel size and the IWT fleet now comprises dry and liquid bulk ships of up-to 3,000 deadweight tons, mainly trading on the class 1 river routes. Moreover, the size of the IWT fleet is growing and currently there are over 22,300 registered vessels which carry over 50% of all freight traffic and one quarter of all passenger traffic. In addition, there are some 750,000 country (traditional) boats, a substantial part of which have been mechanized. Approximately 65% of these are passenger boats, where demand is predominantly generated by rural communities, a substantial proportion of which only have access to river transport.

Need for Improvement of Dhaka – Chittagong – Ashuganj IWT Corridor: The GoB has identified 65 main river navigation routes that are essential to passenger and freight transport within Bangladesh. Of these, river corridors between Dhaka and Chittagong; and between Dhaka and Ashuganj (with extensions to Narayanganj and Barisal) are identified as high priority

routes for domestic trade and bilateral trade with India. About 80% of country's IWT transport is routed through these corridors and daily about 200,000 passengers use these routes. Inland river terminals at Dhaka, Narayanganj, Chandpur and Barisal along these routes play very important role in transporting and handling passenger and cargo. Food grains, fertilizers and consumer goods are the main commodities which are transported by cargo vessels and cargo-cum-passenger launches. The cargo terminal at Ashuganj is a key terminal for Bangladesh – India trade and it is connected by road to the north eastern states of India.

Cargo transport is heavily orientated towards imports and in volume terms, most is trafficked on the Class 1 river routes, primarily between Chittagong, Narayanganj and Dhaka. Cargo is mainly: dry bulks (including clinker, fertilizers, food grains, coal, salt, gypsum and fly ash); liquid bulks (petroleum products); and, general dry cargo (bagged cargo, machinery and steel). The main dry and liquid bulks are typically offloaded at private jetties or terminals, most of which are equipped with dedicated bulk handling equipment. Some break bulks and other smaller general cargoes are handled at limited number common user facilities or directly over the riverbanks by manual labour. There is some cross-border traffic on protocol routes between Bangladesh and India, however bilateral trade volumes are very small, accounting for just 3% of total IWT freight traffic in Bangladesh. Most of this consists of fly ash (and some wheat), mostly collected from India on Bangladesh registered vessels. Improved maintenance of advertised depths along the protocol route waterways will ideally spur increased trade.

Need for Improvement of Inland River Ports and Landing Stations: Inland river terminals at Dhaka, Narayanganj, Chandpur and Barisal along the Project routes play very important role in transporting and handling passenger and cargo. These four river ports together transport annually about 53 million tonnes of cargo and 22 million passengers (in 2013-2014). The facilities built at these terminals are not sufficient to meet the growing demand of IWT as they lack in adequate facilities for berthing, parking and storage areas, and passenger comfort. The port facilities at Sadharghat terminal at Dhaka and surrounding areas are highly congested with commercial and residential development leading to traffic congestion and inefficient use of port facilities, and also there is no space around the current terminal for further expansion. The GoB would like to augment the facilities at Sadarghat terminal in Dhaka by building a new passenger terminal at Shasanghat (2.5 km downstream), develop a cargo terminal at Pangaon, and augment and modernize the existing facilities at Ashuganj, Narayanganj, Chandpur and Barisal river terminals.

In addition to river terminals, there are a number of landing stations along the Project corridor which are very important for people living in the rural and remote areas. The landing stations (also known as launch ghats) are berthing points of high importance for the local communities that they serve, yet lack proper infrastructure and other essential facilities such as toilets and drinking water, as well as basic safety features for users, and many are in a highly dilapidated state. They usually consist of one pontoon with shore connection for embark and debark passenger and cargo. They play an important role in the lives of the rural people, as without them vessels would not berth and they would not receive much needed food, medicines, fuel and other consumer essentials.

2.1. The Proposed Project

The Ministry of Shipping (MoS) of GoB through the Bangladesh Inland Water Transport Authority (BIWTA) is preparing the Project to improve the IWT sector along with related infrastructure. BIWTA has approached the World Bank for financing the Project.

Location: The location map of the Project interventions is shown in Figure 1.

Proposed works: The main civil works that are proposed under the Project are as follows:

- Component 1
 - dredging/river maintenance and provision of visual aids between Dhaka and Chittagong Corridor, including branches to Ashuganj, Narayanganj and Barisal;
 - construction and maintenance of six vessel storm shelters along the above routes; and
 - maintenance dredging of the main river ferry crossing routes (Chandpur and Shariatpur; Lakshmiapor and Bhola; and Beduria and Laharhat).
- Component 2
 - Construction of a new passenger terminal at Shasanghat near Dhaka; rehabilitation/upgradation of two existing passenger terminals at Narayanganj and Barisal; and reconstruction or new construction of an existing terminal at Chandpur
 - Construction of a new cargo terminal at Pangaon and rehabilitation/upgradation of an existing cargo terminal at Ashuganj;
 - Rehabilitation and upgradation of fourteen landing stations (launch ghats)

In addition, a third project Component includes various other activities aimed at institutional capacity development, continuous sector improvement, market development and policy framework development. Among these activities, a few may have environmental and social implications, namely: (i) minor civil works to retrofit existing buildings at the IWT Deck and Engine Personnel Training Centre (DEPTC) in Sonakanda, Narayanganj; (ii) various activities related to environmental and social sustainability of the IWT sector, including development of a water hyacinth to livestock feed and biogas pilot scheme, small-scale piloting of different river training technologies to minimize the need for continuous dredging, studies and pilot programs related to “greening” the vessel fleet, and development of a Gender Action Plan for IWT; and (iii) project preparation studies for a potential follow-on investment project on additional priority waterways, as well as studies related to climate change mitigation and adaptation opportunities in the IWT sector.

Implementation period: Dredging for improvement of IWT routes will be carried out through one or more performance based contracts over a period of seven years. The infrastructure facilities such as vessel shelters, river terminals and landing stations will be designed during the first year of implementation and the facilities will be built over a period of next two to three years. Other activities under Component 3 will likewise be designed/planned in the first years of the project and implemented in subsequent years.

2.2. The Environmental and Social Assessment

Studies and documentation: This ESA executive summary has been prepared by the BIWTA and submitted to the World Bank for the Project. This report is prepared is based on field studies and data collected during August to December 2015 by various consultant teams hired by BIWTA and MoS. These studies have been documented in three volumes, (i) Environmental and Social Impact Assessment (ESIA) for Component 1, (ii) Environmental Management Framework (EMF) for the rest of the project (primarily Component 2 works), and (iii) Resettlement Policy Framework (RPF) for the overall project. All these documents are available under separate covers and have been disclosed on the BIWTA website, on the World Bank Infoshop, and have been disclosed locally in hard copy at locations accessible to project affected people.

Contents of the present document: After a description of the Bangladesh legal and administrative framework and the applicable World Bank policies in chapter 2, a project description is presented in chapter 3, followed by a discussion of project alternatives in chapter

4. A description of the physical, biological and socio-economic environment is given in chapter 5. Climate change aspects are discussed in Chapter 6. Potential adverse effects of the project are described in chapter 7 and potential cumulative impacts and concerns associated with other river related projects are presented in chapter 8. Possible mitigating measures to offset, reduce or compensate potential negative impacts of the project are included in the EMP that is summarized in chapter 9. Finally, chapter 10 provides an overview of all stakeholder consultations and activities for disclosure and access to the information.

2.3. Composition of Study Team

ESA consultants: The ESA study has been carried out by BIWTA and the reports have been prepared by BIWTA and submitted to the World Bank for the Project. BIWTA has contracted Institute of Water Modeling (IWM) to prepare the ESIA for Component 1. MoS has hired two independent consultants Dr. Venkata Nukala (Environmental Specialist) and Dr. B.K.D. Raja (Social Specialist) to review and provide guidance on the work of the IWM team as they carry out their work, as well as to prepare EMF and RPF for Components 2 and 3 and this executive summary.

Environmental study team: The environmental team comprised of Zahirul Haque Khan (Team Leader), Dr. Sheikh Muhammad Abdur Rashid (River Ecologist), Mohammed Anisuzzaman Khan (Terrestrial Ecologist), Md. Mehedi Hasan Emon (Environmental Engineer), Rubayat Alam (River Hydrologist), Mohammad Abdus Salam Sikder (Coastal Hydrologist), Mohammad Ziaur Rahman (Sediment Dispersion Modeller), Md. Zahidul Islam (Agriculture Expert) Farhan Md. Zahir (Junior Water Resource Professional), Muhammad Ghulam Rasul (Junior Agriculture Professional), Afroza Mahzabeen Anannya (Junior Terrestrial Ecologist), Md. Shamsuddin (Junior River Ecologist), Md. Zahid Hasan Siddiquee (GIS Expert) and Syed Monowar Hussain (Survey Specialist/Navigation Specialist).

Social study team: The social team consisted of Khairul Matin (Sr. Socio-Development Specialist), Md. Rafiqul Islam (Media and Communications Specialist), G.M. Manzurul Mazid (Junior Socio-Development specialist), Sukhendra Narayan Chowdhury (Junior Socio-Development specialist) Md. Mustafizur Rahman ((Junior Socio-Development specialist) and M.Hamidul Islam (English-Bangla report translator).

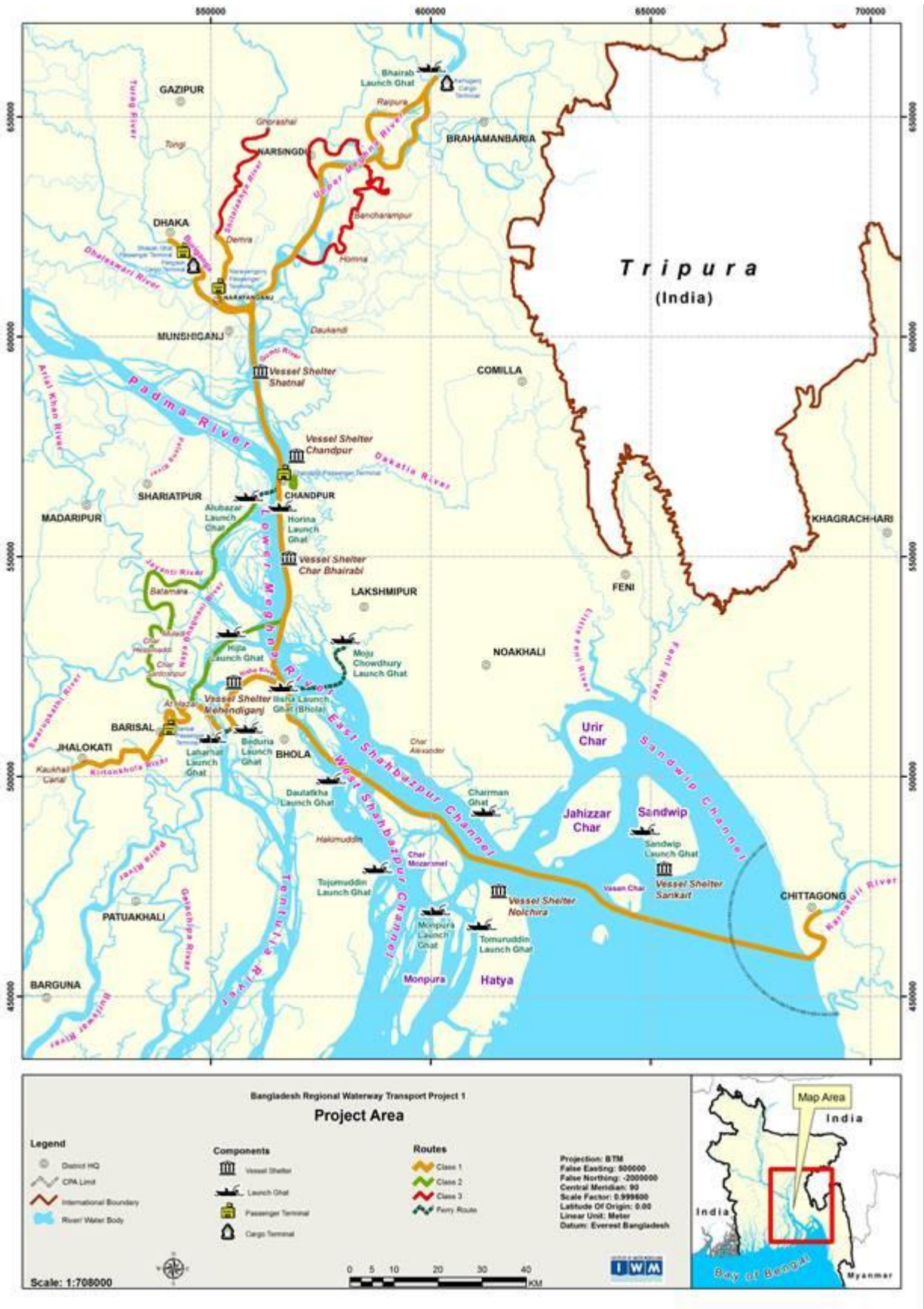


Figure 1: Location of Project Interventions

3. Policy, Legal and Administrative Framework

3.1. Applicable Legislation and Policies in Bangladesh

Bangladesh Environmental Conservation Act, 1995 and amended in 2010: The Environmental Conservation Act (ECA) of 1995 is the main legislative framework related to environmental protection in Bangladesh. This umbrella Act includes laws for conservation of the environment, improvement of environmental standards, and control and mitigation of environmental pollution. This Act has established the Department of Environment (DoE), and empowers its Director General to take measures as he considers necessary which includes conducting inquiries, preventing probable accidents, advising the Government, coordinating with other authorities or agencies, and collecting and publishing information about environmental pollution. According to this act (Section 12), no industrial unit or project shall be established or undertaken without obtaining, in a manner prescribed by the accompanying Rules, an Environmental Clearance Certificate (ECC) from the Director General of DoE. In accordance with this Act, the Project will need to be cleared by DoE before commencing the project following procedures given in the Environment Conservation Rules (ECR) 1997 (discussed below).

The Acquisition and Requisition of Immovable Property Ordinance, 1982: The principal legal instrument governing land acquisition in Bangladesh is the Acquisition and Requisition of Immovable Property Ordinance, 1982 (Ordinance II of 1982 with amendments up to 1994) and other land laws and administrative manuals relevant to land administration in Bangladesh. According to the Ordinance, whenever it appears to the Government of Bangladesh that any property in any locality is needed or is likely to be needed for any public purpose or in the public interest, the Government can acquire the land provided that no property used by the public for the purpose of religious worship, graveyard and cremation ground. The law specifies methods for calculation of market value of property based on recorded prices obtained from relevant Government departments such as Registrar (land), Public Works Department (structures), Department of Forest (trees), Department of Agriculture (crops) and Department of Fisheries (fish stock). Given that people devalue land during title transfer to minimize tax payment, compensation for land paid by DC including premium largely remains less than the actual market price.

Other Relevant Acts, Laws and Rules in Bangladesh: Other legislation relevant to the proposed project are listed below.

- Bangladesh Environment Conservation Rules (ECR), 1997 empowers the GoB to declare ecologically critical areas, classification of industries and projects into various categories, procedures for issuing the environmental clearance certificate, and determination of environmental standards. According to the Rule 7 (1) of the Environmental Conservation Rules 1997; for the purpose of issuance of Environmental Clearance Certificate (ECC), every industrial units or projects, in consideration of their site and impact on the environment, will be classified into the four categories and they are: Category I (green), Category II (Orange-A), Category III (Orange B) and Category IV (Red). The works in Component 1 and terminals in Component will fall in to 'Red' category, while improvement of landing stations and other civil works in Component 3 will fall in to 'Orange B' category.;
- Water Act 2013 is based on the National Water Policy, and designed for integrated development, management, extraction, distribution, usage, protection and conservation of water resources in Bangladesh. The project activities will influence

the water quality. Mitigation measures to address water quality impacts are covered in ESIA and EMF;

- Bangladesh Environment Court Act, 2010 has been enacted to resolve the disputes and establishing justice over environmental and social damage raised due to any development activities. According to this act, government can take legal actions if any environmental problem occurs due to project interventions; Bangladesh Wildlife (Preservation) Order (1973) and Act (1974) regulates the hunting, killing, capture, trade and export of wild life and wild life 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. Mitigation measures to address impacts on wildlife are covered in ESIA and EMF;
- Protection and Conservation of Fish Act (1950) provides power to the government to: make and apply rules to protect fisheries; prohibit or regulate erection and use of fixed engines; and construction of temporary or permanent weirs, dams, bunds, embankments and other structures. The Act prohibits destruction of fish by explosives, guns, and bows in inland or coastal areas; and destruction of fish by poisoning, pollution, or effluents. The Act prescribes the seasons during which fishing is allowed, prohibits fishing during spawning periods, and specifies officials having authority to detect breaches of this Act. There are hilsa sanctuaries in the project area and mitigation measures to avoid impacts on the sanctuaries are covered in the ESIA and EMF;
- The Forest Act of 1927 as amended in 1989 grants the government several basic powers, largely for conservation and protection of government forests, and limited powers for private forests. The 1927 version of the act was amended in 1989 for extending authority over "any [Government-owned] land suitable for afforestation". Mitigation measures to address impacts on plantations are included in ESIA and EMF;
- Embankment and Drainage Act, 1952 consolidates the laws relating to embankments and drainage providing provision for the construction, maintenance, management, removal and control of embankments and water courses for the better drainage of lands and for their protection from floods, erosion or other damage by water. Mitigation measures to address impacts associated with disposal of dredged material are included in the ESIA and EMF;
- The Bangladesh Labor Act, 2006 provides the guidance of employer's extent of responsibility and workmen's extent of right to get compensation in case of injury by accident while working. Mitigation measures to address workers' health and safety are included in the EMF;
- Inland Shipping Ordinance 1976 and Inland Shipping (Amendment) Act 1990 deals with the administration, registration, competency and pollution control, etc., of inland water transport. Mitigation measures to address ship pollution are included in the ESIA and EMF;
- Draft Rules for Inland Ship Safety 1994 control impacts from all inland water transport, ports, ship-related facilities, and ship related activities for the protection of inland water in regard to air emissions, handling and storage of harmful materials, solid and liquid waste discharges, dredging, and disposal of dredged sediments. Mitigation measures to address ship pollution are included in the ESIA and EMF;
- The Bangladesh National Building Code sets out the constructional responsibilities according to which the relevant authority of a particular construction site shall adopt some precautionary measures to ensure the safety of the workmen.

Relevant National Policies and Plans: The national policies relevant to the proposed project and its environmental and social assessment are briefly described below.

- Bangladesh National Environmental Policy 1992 sets out the basic framework for environmental action, together with a set of broad sector action guidelines. The proposed interventions are required to comply with all the policy directives emphasizing particularly on reducing adverse environmental impacts;
- Inland Water Transport Policy (IWTP), 2009 for overall improvement of IWT sector including dredging navigation routes, provision of inland port facilities and navigation aids, conducting hydrographic survey, vessel development, etc. The proposed project interventions are in line with this policy.
- Dredging and Dredged Material Management Policy 2013. Salient features of the policy with respect to dredging are: Project has to be formulated after identifying location of dredging and location for projecting/dumping of dredged materials; in dry season, in no way dredged material shall be projected into flowing water. However, in south and southeast region, where tidal influence is very strong, material can be thrown into the river based upon recommendations from proper study; and in rainy season, material might be disposed into river flow based upon recommendations from proper study with hydro-morphological considerations. With respect to dredged material management, the policy says no agricultural land is hampered/damaged, might be dumped plan-wise in shallow places in river upon technical considerations, connection khals (channels) are not disconnected etc.; and best way of management to fill-in up low land (following Conservation Act 2000) or pile in government owned khas (waste land);
- National Water Policy (1999) aims to provide guidance to the major players in water sector for ensuring optimal development and management of water. A number of clauses of this policy are applicable to the project as the dredging operation will affect water quality including change in aquatic habitats. The proposed interventions are designed and implemented with due consideration of the relevant clauses of the policy.;
- National Water Management Plan, 2001 (Approved in 2004) envisions to establish an integrated development, use and management plan for water resources in Bangladesh over a period of 25 years. Some of the programs of this policy (main river, environment and aquatic resources) are applicable to the Project;
- The National Land Use Policy, enacted in 2001, aims at managing land use effectively to support trends in accelerated urbanization, industrialization and diversification of development activities. The policy is applicable to the projects that could change the land use;
- National Agriculture Policy, 1999 aims to make the nation self-sufficient in food through increasing production of all crops including cereals and ensure a dependable and secure food system for all. The policy particularly stresses on research and development of 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 water-logging and salinity and provide irrigation facilities for crop production;
- Coastal Zone Policy, 2005 provides general guidance so that the coastal population can pursue their livelihoods under secured conditions in a sustainable manner

without impairing the integrity of the natural environment. Mitigation measures are included to address impacts on benthic habitat and water quality in ESIA and EMF;

- National Fisheries Policy, 1996 focuses on aquaculture and marine fisheries development and includes the following mandates: (i) Maintaining biodiversity in all natural water bodies and in marine environment, (ii) Ensuring that chemicals harmful to the environment will not be used in fish shrimp farms; (iii) Using environment friendly fish shrimp culture technology; (iv) Expanding fisheries areas and integrating rice, fish and shrimp cultivation; (v) Undertaking control measures against activities that have a negative impact on fisheries resources and vice-versa; and (v) Formulating laws to ban the disposal of any untreated industrial effluents into the water bodies.

International Treaties signed by Bangladesh: Bangladesh is a signatory to a number of international environment-related treaties, conventions, declarations and protocols. The following are the relevant international treaties and conventions to which Bangladesh is a party:

- London Convention on the Prevention of Marine Pollution by Dumping of Waste and other Matters, 1972 (London Convention). The main objective of the Convention is to take all practical steps to prevent pollution of the sea by dumping of waste and other matter (oil, noxious liquid, harmful substances, sewage, garbage, air) that is liable to create hazards to human health, to harm living resources and marine life, to damage amenities to intervene with other legitimate users of sea.
- International Convention for the Prevention of Pollution from Ships (MARPOL) 1973/1978. The main objectives of the Convention are to prevent the pollution of the marine environment by the operational discharges of oil and other harmful substances and the minimization of accidental discharges of such substances. Convention on Biological Diversity, Rio de Janeiro (1992);
- United Nations Framework Convention on Climate Change, Rio de Janeiro (1992). The convention is broadly applicable due to project construction and operation activities. Mitigation measures to address greenhouse gases emissions are covered in the ESIA and EMF;
- Vienna Convention for the Protection of the Ozone Layer, Montreal (1987). Mitigation measures to address greenhouse gases emissions are covered in the ESIA and EMF;
- Convention on Wetlands of International importance especially as Waterfowl Habitat, Ramsar (1971) and its amending protocol, Paris (1982). Migratory birds visit the project areas and mitigation measures to address impacts on migratory birds are included in the ESIA and EMF;
- Convention on Conservation of Migratory Species of Wild Animals (1979). Migratory birds visit the project areas and mitigation measures to address impacts on migratory birds are included in the ESIA and EMF;
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington (1973). This is not directly relevant to the project since the project does not involve in any international trade of endangered species of wild fauna and flora. General restrictions have however been included in the Environmental Code of Practice;
- Convention concerning the Protection of World Culture and Natural Heritage (World Heritage Convention) (1972). Though directly not applicable to the project since there are no known such sites are located in the project area – measures to address chance finds are included in the EMF; and

- Kyoto Protocol (1997) and Copenhagen Accord (2009) on climate change. Mitigation measures to address greenhouse gases emissions from the project activities are included in the EMF

3.2. Environmental Procedures

Environmental Impact Assessment: In accordance with the Bangladesh Environmental Conservation Rules, the maintenance dredging is designated as red category and hence an EIA is to be prepared. Construction of river ports and landing stations are not included in any of these categories. However, considering the scope of works involved in the subprojects in Component 2, it can be considered that the subcomponent on improvement of terminals will fall in to 'Red' category and other subcomponent on improvement of landing stations will fall in to 'Orange B' category. Small scale pilot projects on river training works and water hyacinth biogas project in Component 3 are also expected to fall in to 'Orange B' category; this will be confirmed during project implementation when these components are more fully identified.

EIA Approval: The ECR'97 describes the procedures for obtaining Environmental Clearance Certificates (ECC) from the Department of Environment for different types of proposed units or projects. Any person or organization wishing to establish an industrial unit or project must obtain ECC from the Director General. The certificate is issued on the basis of the EIA for Red Category projects, and on the basis of IEE for Orange B category projects, along with payment of applicable fees and completion of prescribed forms. The validity of such certificate is one year for both red and orange category, and compulsory requirement for renewal of certificate at least 30 days before expiry of its validity.

3.3. World Bank Safeguard Policies

The World Bank's environmental and social safeguard policies relevant to the project include the following:

Environmental Assessment (OP 4.01): The Project has been classified as Category A, since some of the potential impacts associated with dredging and instream construction activities are likely to be significant and diverse. The World Bank requires an environmental and social assessment for all "Category A" projects proposed for Bank financing, in order to ensure that these projects are environmentally and socially sound and sustainable. In accordance with the requirements of Operational Policy (OP) 4.01, a full ESIA has been carried out for Component 1 Works. Similarly, for Component 2 works, a full ESIA will be carried out during project implementation in accordance with the EMF and RPF documents. For Component 3, any physical activities to be carried out through the project will undergo environmental and social screening, to identify the appropriate and necessary assessment, stakeholder consultation, and management requirements as per this policy.

Natural Habitat (OP 4.04): The Meghna river system and its floodplain provides habitat to a wealth of aquatic and terrestrial biodiversity. While no net loss or permanent degradation of critical natural habitat is expected to result from the project, the proposed activities will have impacts on some areas of natural riverine and floodplain habitat, including legally designated protected areas; hence, this policy is triggered. A comprehensive Biodiversity Management Plan will be implemented to ensure compliance with this policy. Under the plan, habitat restoration and enhancement measures as well as ongoing ecological monitoring will be included in the project to mitigate and/or compensate for any adverse impacts in accordance with this policy. Dredge spoils deposit locations will also be restricted to non-critically sensitive areas, and other rules for dredging and impact management detailed in the plan will be enforced to ensure that the mitigation hierarchy is appropriately applied for all potential impacts to natural habitats.

Physical Cultural Resources (OP 4.11): As part of the environmental and social assessment studies for the project, a full baseline assessment has been carried out, including consultations, to identify any physical cultural resources (PCR) in the project influence area. Though there are no identified PCRs located in the subproject sites which would likely be directly affected or displaced by proposed works, the development of ports at Shasanghat and Pangaon will affect the access to a Muslim graveyard and a Hindu ashes immersion point. Alternative access will need to be provided to these locations. In addition, 'chance find' procedures will be included in the EMPs for all works activities.

Involuntary Resettlement (OP 4.12): The Project requires land acquisition as well as displacement of residences and businesses for construction of vessel shelters, river terminals and landing stations. A Resettlement Action Plan (RAP) will be prepared during implementation in accordance with the RPF.

Forestry (OP 4.36): The policy is triggered since some mangrove and social forestry plantation are located close to the project influence area; though the proposed project will not directly affect any of these forests. Dredging and dredged material placement will not be carried out at these locations.

International Waterways (OP 7.50): This policy is triggered since the project interventions will take place in the Ganges-Brahmaputra-Meghna river system on international waterways that flow from India. As Bangladesh is the downstream riparian, the proposed project is not expected to change the quality or quantity of water flow and adversely impact India. Nonetheless, a riparian notification has been issued to India consistent with this policy.

Access to Information: This policy sets out the Bank's requirements for disclosing and sharing information. The policy reaffirms the Bank's commitment to transparency and accountability in its activities for promoting development effectiveness and poverty reduction. The ESIA, EMF and RPF and this Executive Summary have disclosed at BIWTA website in addition to sharing them with the stakeholders including the local communities. These reports have also been disclosed in the World Bank InfoShop. This Executive Summary will also be translated Bangla language and made available in at BIWTA website and locally with BIWTA offices at the existing terminals.

Environmental Health and Safety Guidelines: The World Bank Group (WBG) Environment, Health, and Safety (EHS) General Guidelines (2007) contain performance levels and measures for development of industrial projects that are considered to be achievable within the new facilities at reasonable costs by current existing technology. These guidelines apply to the project, particularly with respect to air emissions, ambient air and noise quality standards, waste water quality, hazardous material and waste management, and occupational and community health and safety management. The EHS Guidelines for Ports, Harbors, and Terminals, and EHS Guidelines for Shipping are applicable to the Project.

Environmental and social policies of the World Bank that are not applicable to the project include:

Pest Management (OP 4.09): This policy is not triggered since none of the Project subcomponents will procure any pesticides, nor will they induce an increased use of pesticides. Placement of dredged material placement sites on land may attract mosquitoes in some locations. However, as per existing experience in the project area with dredge materials management, the scale of the impact is minor and temporary, and pesticides are not required.

Indigenous People (OP 4.10): There are no indigenous communities residing in the project influence area and therefore this OP is not triggered.

Safety of Dams (OP 4.37): The dam safety Policy is not triggered since no dams are involved under the project, nor will the proposed IWT improvement and river terminals depend on existing dams.

Projects in Disputed Areas (OP 7.60): This policy is not applicable, since the project is not located in or near any disputed territory.

3.4. Compliance Status with Bangladesh Legislation and World Bank Policies

The present compliance status of the project with Bangladesh legislation and World Bank safeguard policies is indicated in Table 2.

Table 2: Compliance of Project with GoB Legislation and World Bank Safeguard Policies

	Legislation/Policy	Actions Taken to Comply
GoB requirements	Environmental Conservation Act	BIWTA will submit the ESIA report of Component 1 and future ESIA reports to be prepared for Component 2 and 3 works to DOE for environmental clearance
	International treaties	Verification of protected sites, Red List and protection of vulnerable habitats in all environmental screenings and assessments under the project. Inclusion of relevant mitigation measures in each EMP for each subproject/activity.
	Public information and disclosure	The draft ESIA, EMF and RPF reports have been disclosed on BIWTA's website. Public consultations meetings were held in Dhaka, Ashuganj and Barisal to disclose the project information and ESIA and to solicit stakeholder feedback.
World Bank requirements	Early screening and Scoping	Scoping consultations were held at Dhaka on 14 October 2015 through a national consultation workshop; and in the project area in September, 2015.
	Participatory approach	Key informant interviews, participatory rural appraisals, consultation meetings and focus group discussions were held between September 2015 and January 2016.
	Integrate environmental and social assessment	Natural environment, public health, and social aspects are integrated in planning documents.
	Natural Habitats	Verification of protected sites and ecosystems, Red List and endangered flora and fauna has been done for all proposed Component 1 and 2 activities. A Biodiversity Management Plan has been prepared as part of the ESIA. The EMF also addresses natural habitats issues for Components 2 and 3 subprojects.
	Risk assessment	Health and safety risks for population and workers are identified in the ESIA and EMF, and management measures will be included in tender documents. BIWTA's capacity will also be strengthened on health and safety risk management.
	Climate Change and floods	Impact of climate change effects are assessed and design of infrastructure facilities (river terminals, landing stations, vessel shelters) will consider climate change adaptation in the designs
	Cumulative Impacts	Cumulative impact assessment has been conducted as part of the ESIA to cover the impacts from all components of the Project and other related developments in the Project area.
	Alternatives	Alternatives considered included: "without project" case; alternatives to the Project; alternative techniques for channel maintenance; alternatives to dredging methods and dredged material placement. ESIA studies for

	Legislation/Policy	Actions Taken to Comply
		terminals and landing stations will also evaluate alternatives
	Pollution	Baseline survey of environmental quality has been carried out. Environmental standards of GoB and World Bank will be complied. Environmental Code of Practices (ECoPs) will be included in contractors' bidding documents of all subprojects (including building of training centers in Component 3).
	Physical Cultural Resources	No physical cultural resources which warrant special treatment under the World Bank OP 4.11 were identified in the project impact area. the development of ports at Shasanghat and Pangaon will affect the access to a Muslim graveyard and a Hindu ashes immersion point. Alternative access will need to be provided to these locations. Chance find procedures will be included in bidding documents.
	Social impacts	For negative social impacts on land/assets/livelihood/access to resources etc. mitigation plans will be prepared in keeping with the Bank's Operational policies triggered.
	Gender	Gender consultations, including women only consultation meetings, were carried out during social assessment. Female friendly aspects will be incorporated into designs for river terminals and landings.
	Public Health	Public health aspects were studied and public health impacts are covered in ESIA and EMF
	Consultation and access to information	The ESIA, EMF and RPF have been disclosed in country (on BIWTA website and hard copies will be made available in locally accessible locations in the project area, including BIWTA offices at the existing terminals) and also sent to WB InfoShop. Public consultations were held in Ashuganj and Barisal on 17th and 18th November 2015, and scoping consultations in Dhaka and in the project area in September-October. Further planned public consultations include a second national level workshop, as well as a workshop in Chandpur in late February 2016.

4. Project Description

4.1. Project Objective

The overall Project development objective is to enhance inland water transport services along the Dhaka – Chittagong – Ashuganj Regional IWT Corridor. The Dhaka – Chittagong and Dhaka Ashuganj routes are not only needed for passenger transport, the Bangladesh cargo that need to be moved between Dhaka and Chittagong for domestic consumption and international export, but they are the topmost priority routes for Bangladesh-Indian bilateral trade, and for Indian transit goods to move between Kolkata Port and landlocked states of Northeast India. Improvement of bilateral protocol routes would also support Bhutan's trade with Indian and Bangladesh by transporting traded goods, especially bulk goods, and export of boulders to Bangladesh.

4.2. Program Components and Locations

Component 1: Improved Inland Waterway Navigation (USD 235 million). This component shall include work to guarantee advertised depths and widths of navigation channels on select river routes. The work also includes provision of aids to navigation. The work is to be done on an Output- and Performance-based Contracting method designed to increase the efficiency and effectiveness of river asset management and maintenance. It is designed to ensure that the physical condition of the rivers under contract are adequate for the need of river users, over the entire period of the contract which is six to seven years. This type of contract significantly expands the role of the private sector, from the simple execution of works to the management and conservation of river assets. This is a departure from the traditional river maintenance contracts used in Bangladesh which have been less-than-optimal. Even where works have been carried out according to plan, the nature of the rivers has meant that advertised depths, aids to navigation and other river infrastructure do not last as long as they should because of deficiencies in the original design, aggravated by inadequate maintenance. The beneficiaries of the new concept are expected to be the river users. In a wider sense, future generations will be able to benefit from a better maintenance of past investments. River users will be able to know the Service Level they can expect in return for the payments they make for the use of the infrastructure (tolls, tariffs, user fees, taxes, etc.). The River Administration shall also benefit by obtaining better overall river conditions with reduced levels of expenditure.

Also included in Component 1 is work to provide safe harbors (storm shelters) whereby users can seek shelter from stress of weather in the Meghna Delta area during tropical cyclones. The Bay of Bengal is responsible for the formation of some of the strongest and most destructive tropical cyclones in the world. Adverse wave conditions, heavy rainfall and associated storm surges from these cyclones are a major cause of loss of life and infrastructure damage in the maritime delta area. With projected climate change, these effects are likely to intensify in coming decades. It is intended that the storm shelters shall be constructed under the same Output and Performance-based Contractor, using dredged material as a resource. Among others, this component will finance the following activities: (i) bathymetric and other surveys to determine the extent and types of dredging required, river training, environmental protection or other works; (ii) visual aids for day and night navigation such as light buoys, radar beacons, leading lines and other aids; (iii) limited and selected performance-based dredging to guarantee Least Advertised Depth; and (iv) development of six vessel shelters within cyclone prone areas along project routes equipped with mooring buoys to ensure safety for the vessels.

Locations of IWT routes and ferry crossing routes to be improved under Component 1 are shown in Figure 1 and details are given in Table 3. According to bathymetric surveys carried out during 2015, it is estimated that about 6 million m³ of dredging will be required at some locations along

these routes during the dry season (months of October to May). Locations of dredging and depth of dredging are also given in Table 3. The depth to be maintained at these locations varies from 2.1 to 4.3m and minimum channel width to be maintained varies from 30.46 m (for Class III routes) to 76.22 m (for Class I and II routes). Locations of dredging might change every year due to dynamic nature of the river and shifting of the channels, sand bars and shoals; and exact locations of dredging will be identified by the Contractor every year prior to the dry season, and throughout the year as needed, through bathymetric surveys. As indicated in Table 3, it is envisioned that the works related to maintenance of IWT channels and navigational aids, ferry crossings and vessel shelters will be split between two performance based contractors (PBCs) by geographic area.

The dredged material will be managed by placing them in the rivers. Several locations (Figure 3.5 of ESIA) in the Upper Meghna and Lower Meghna have been identified for placement of dredged material, and most of these locations have been experiencing severe erosion over the years forming deep scour holes along the shorelines. Excess dredged material will be disposed in the river in areas below Ashuganj where tidal influences are high, through submerged discharge according to national dredging policy/guidelines. Both dredging and dredged material locations will avoid sensitive areas such as fish spawning areas and habitats of important or threatened species. Contaminated dredged materials, where encountered, will be disposed on the land in confined disposal facilities.

Locations of vessel storm shelters are given in Table 4. These shelters will be designed during project implementation and constructed by the performance based river maintenance contractor. The typical facilities at the vessel shelters include a harbor basin with break waters and berthing facilities to accommodate about five vessels during cyclones and other emergencies.

Table 3: Location of IWT Routes in Component 1 and Estimated Dredging

Route No.	Priority	Route Class	Channel width m (no slope)	Dredging depth m	Base Line Dredge Volume	Potential Annual Volume with 50% re-sediment rate	Potential Contractor Split (By Geographical Area)
1 & 2	A	1	76	-4.3	37,500	56,250	PBC-1
2 (South of Chandpur)	A	1	76	-4.3	597,400	896,100	PBC-2
3 & 4	A	1	76	-4.3	22,600	33,900	PBC-1
5	A	1	76	-4.3	236,000	354,000	PBC-1
6	A	1	76	-4.3	-	-	PBC-1
14	A	1	76	-4.3	432,900	649,350	PBC-2
18	A	2	76	-2.8	1,000	1,500	PBC-2
19	A	2	76	-2.8	25,100	37,650	PBC-1
20	A	2	76	-2.8	387,000	580,500	PBC-2
21	A	2	76	-2.8	392,300	588,450	PBC-2
22	A	2	76	-2.8	396,500	594,750	PBC-2
<i>Sub-Total</i>					2,528,300	3,792,450	
7&8	B	2	76	-2.8	370,000	555,000	PBC-1
12	B	2	76	-2.8	152,800	229,200	PBC-1
13	B	2	76	-2.8	76,400	114,600	PBC-2

13a	B	2	76	-2.8	1,000	1,500	PBC-2
<i>Sub-Total</i>					600,200	900,300	
9	C	3	30	-2.1	126,800	190,200	PBC-1
10	C	3	30	-2.1	33,274	49,911	PBC-1
15 & 16	C	3	30	-2.1	607,500	911,250	PBC-2
17	C	3	30	-2.1	500	750	PBC-2
<i>Sub-Total</i>					768,074	1,152,111	
TOTAL					3,896,574	5,844,861	

Table 4: Locations of Vessel Shelters in Component 1

S.No	Location of Vessel Shelter	Latitude	Longitude
1	Shatnal	23°27'46.54"N	90°35'30.61"E
2	Amirabad	23°22'02.60"N	90°36'42.93"E
3	Chandpur	23°13'44.73"N	90°38'20.89"E
4	Mehendiganj	22°47'48.57"N	90°32'19.01"E
5	Sandwip (Sarikait)	22°24'18.84"N	91°28'46.51"E
6	Nolchira	22°22'15.59"N	91°07'08.55"E

Component 2: Improved Services at Priority Inland Waterway Terminals and Landing Ghats/Stations (US\$75 million). This component supports the development of two cargo terminals, four passenger terminals and 14 landing ghats. The development of passenger and cargo terminals are within existing inland waterway port areas under the jurisdiction of BIWTA. It includes the modernization and extension of existing facilities to cater for increased demand. Terminals and landing stations are part of the network of about 448 river terminals, 374 landing stations, 23 coastal terminals and 25 pilot stations already provided by BIWTA. The passenger terminals and landing stations will specifically incorporate the needs of women users and less abled users, and all investments will address safety-related issues for all users. Locations of the terminals and landing stations are shown in Figure 1 and details are given in Table 5.

Table 5: Locations of River Terminals and Landing Stations in Component 2

Item	Name	Position	
		Latitude	Longitude
1 Passenger Terminals			
1.1	Shasanghat	23°41'24.55"N	90°25'34.72"E
1.2	Narayanganj	23°36'58.86"N	90°30'20.53"E
1.3	Chandpur	23°13'59.61"N	90°38'54.65"E
2 General Cargo Terminals			
2.1	Ashuganj	24°02'34.42"N	91°00'04.58"E
2.2	Pangaon	23°39'30.79"N	90°27'14.68"E
2.3	Barisal		
3 Launch Ghats (Landing Stations)			
3.1	Bhairab	24°02'35.76"N	90°59'20.62"E
3.2	Alubazar	23°10'58.57"N	90°34'50.32"E
3.3	Horina	23°09'51.20"N	90°38'32.33"E
3.4	Hijla	22°54'18.07"N	90°31'48.32"E
3.5	Moju Chowdhury	22°52'23.10"N	90°46'56.25"E
3.6	Ilisha (Bhola)	22°47'31.72"N	90°38'33.30"E

Item	Name	Position	
		Latitude	Longitude
3.7	Beduria	22°42'17.22"N	90°33'52.70"E
3.8	Laharhat	22°41'18.11"N	90°29'22.62"E
3.9	Boddarhat	22°39'16.72"N	90°53'57.36"E
3.10	Daulatkha	22°36'11.99"N	90°45'06.14"E
3.11	ChairmanGhat (CharBata)	22°31'19.37"N	91°05'22.23"E
3.12	Sandwip	22°29'03.26"N	91°26'01.06"E
3.13	Tojumuddin	22°24'31.93"N	90°51'36.21"E
3.14	Monpura	22°19'35.89"N	90°58'28.40"E

Specifically, this component will finance the following:

- The cargo terminals include: (i) extension of the existing Pangaon Container Terminal with new general cargo vessel berths and land access infrastructure on the Buriganga river; and, (ii) rehabilitation and modernization of the existing general cargo terminal at Ashuganj including river bank erosion prevention, the replacement of pontoons, gangways and other dilapidated marine structures, the extension of berthing space
- The passenger terminals include: (i) construction of a new passenger terminal at Shashanghat, downstream of the existing terminal at Sadarghat where landside congestion preclude the development of additional berths; (ii) rehabilitation works for the passenger terminal at Narayanganj; (iii) rehabilitation of works for the passenger terminal at Chandpur; and, (iv) extension of the existing passenger terminal at Barisal
- Rehabilitation works or new construction of 14 landing stations or launch ghats under this Project are designed to provide access for rural communities, some of which in the lower Meghna delta have no alternative means of transport.

Component 3: Institutional Capacity Development and Sustainability (US\$50 million).

A series of activities are proposed that will support BIWTA's overall enhancement of its management systems and human resources capacity for modern, efficient, and high quality management of the IWT sector in line with international standards, and to help BIWTA achieve long-term operational and financial sustainability. Activities to be supported include: (i) the development of River Information Systems to help BIWTA improve data collection for the planning, maintenance and development of IWT, as well as enhance climate resiliency of the IWT sector in Bangladesh by creating a more systematized baseline understanding of river hydrology and navigational implications, and provision of a Traffic Monitoring System for passengers and cargo; (ii) improvement of Human Resources capacity for better management of the IWT sector through upgrading and modernizing the IWT Deck and Engine Personnel Training Centre (DEPTC) into a regional IWT Training Center with open access to all users in the Region and the world; (iii) commissioning of a study to propose an institutional structure and reforms needed to develop an effective Search and Rescue organization; (iv) a project preparation facility to finance feasibility, surveys, design and safeguards studies for continuous sector development; and, (v) support for the Project Management Unit including the hiring of key staff and procurement of selected systems needed for implementation of the Project.

4.3. Construction Material and Sources

The construction materials required for vessel shelters, terminals and landing stations will include earth, cement, concrete aggregates, brick chips, bitumen, steel for concrete reinforcement, and building material for housing. Some of these materials will be obtained from within the project influence area: sand and fill material from the river. Other materials such as

cement, steel, and brick chips will be procured from local/national markets, whereas some of the materials such as concrete aggregates and asphalt may have to be imported.

Construction of terminals, landing stations and vessel shelters and other administrative buildings such as training centers are labour intensive while the dredging activities for river and ferry maintenance require less labour (a crew of 10 to 15 per each dredger). The estimated average labour requirement during construction of civil works at terminal site will be 50 to 100 persons per day, and for landing stations will be about 10 workers per day. These will include engineers, technicians, supervisors, surveyors, mechanics, foremen, machinery operators, drivers and skilled and unskilled labor. Unskilled workers will be mainly hired locally and include women. Construction camps for each construction site are to be established by the contractor. The contractor will select the location of the camp through consultation with the local communities and BIWTA, and based on the recommendations of the comprehensive ESIA for these facilities to be completed during project implementation.

4.4. Project Implementation Schedule

The overall implementation period of the Project is seven years. The river and ferry crossing maintenance works will be carried out over a period of seven years under a performance based contract. The engineering designs and ESIA studies for the Component 2 works will be carried out during the first year of implementation of the Project and civil works will be carried out over a period of four years after completion of the engineering designs. Vessel shelters will be designed in detail during year one of the project, with construction civil works following; they will subsequently be maintained by the performance based contractors for river and ferry crossing maintenance for the remaining duration of the project. At each individual river terminal and landing site, construction lengths will vary, from an initial estimated 12 to 48 months depending on the size of the subproject and the extent and complexity of civil works required. BIWTA will procure consulting firms for preparation of detailed engineering designs and to carry out environmental and social assessment of the proposed Component 2 works. The ESIA consultants will be independent of Engineering Design Consultants but both consultants will coordinate with each other while planning and design of the facilities. For the various Component 3 activities, preparatory studies and detailed planning will get underway in year one of project implementation, with execution of the institutional capacity development and continuous sector improvement related initiatives and pilots being implemented in subsequent years of the project period.

4.5. Project Cost

The overall cost of the Project is estimated to be USD 360 million (see Table 6).

Table 6: Cost Estimate of the Project-I

Description	Amount in USD, million
Component 1: Improved Inland Waterway Navigation	235

A. PBC contracts for year-round maintenance of Least Available Depth and Navigational Aids including for Night-time Navigation	205
Independent Performance Monitor	7
Unallocated but for activities associated with PBC contract	3
B. Six shelters-safe harbors for vessels in adverse weather conditions	10
C. Establishment of a Search and Rescue Organization	10
Component 2: Improved Services at Priority Inland Waterway Terminals and Landing Stations	75
A. Development of a new common user general cargo terminal with access infrastructure on the Buriganga River adjacent to the existing Pangaon container terminal	20
B. Rehabilitation and modernization of the existing general cargo terminals at Ashuganj	6
C. Development of a new passenger terminal at Shasanghat	10
D. Upgrade of existing passenger terminals at Narayanganj, Chandpur, and Barisal	10
E. Upgrade of 14 Existing Landing Stations/ Launch Ghats	14
F. Design, Supervision, Safeguards Services As Needed, and Other Unanticipated Activities relating to River Port Terminals	5
Component 3: Institutional Capacity Development and Sustainability	50
TOTAL	360

5. Project Alternatives

5.1. No Project alternative

Though IWT in Bangladesh is a cheaper and environmental friendly mode of transport, the sector is not fully developed particularly for the following reasons:

- **Dry season navigability:** Due to low water levels during dry season and siltation, the navigability of the rivers is shrinking. Currently during dry season, the vessels had to wait for high tide, run in half-load or under load condition to avoid groundings or take a detour that increase transportation time and cost and turnaround time of vessels as well. All these aspects make IWT mode unattractive and create lack of confidence among the users.
- **Current practices of dredging:** Currently the dredging, by BIWTA, mainly being carried out along the traditional navigation routes, not always along the existing channels due to non availability of update bathymetric survey data. This causes dredging of more volumes than required and more disturbance to benthic and aquatic habitat. There are also no dredge material management practices are being followed and most of the dredged material is is openly discharged in the river causing more sediment generation at the disposal location. There are also no environmental standards are being followed during dredging.
- **Lack of aids to navigation:** Inappropriate aids to navigation along the routes create problem combined with dry season navigability. Equipment of aids to navigation installed by BIWTA are considered by navigators not sufficient according to requirement, resulting in slower travel times on the IWT routes, and higher accident rates for vessels. Additional vessel accidents also increase the likelihood of spills of hazardous materials into the waterways.
- **Inadequate facilities at Inland Ports and Landing Stations:** Inland river ports in Bangladesh are characterized with marginal facilities that do not provide safe embarkation and disembarkation of passengers and goods. Due to lack of mechanization, head-load still remains the main means of loading/ unloading of cargo. The facilities available at the river ports are inefficient and not sufficient to meet the growing demand of IWT as they lack in adequate facilities for berthing, parking and storage areas, and passenger comfort. They also lack facilities for women, are not accessible for people with disabilities, and do not address waste management issues for ships.
- **Lack of storm shelters:** Cyclones and other natural calamities have become more frequent in Bangladesh. Lack of storm shelters along the accident prone routes means vessels must face the threat of capsizes, with the potential loss of the lives of thousands.

Without the Project, and if the navigational routes are not maintained with adequate infrastructure, the IWT along these routes will continue to deteriorate.

5.2. Alternatives to the IWT

Common alternatives for IWT are road and rail. Since 1970s, after independence, the GoB has mainly concentrated on the improvement of road and rail sectors in Bangladesh. The investments in IWT sector have been decreasing continuously from last few decades. The IWT sector has considerable advantage over the road and rail sectors in terms of economy, social and environmental issues. The unit cost of transporting one tonne of goods for a length of one

kilometer will cost only 0.99 BDT for IWT compared to road (4.50 BDT) and road (2.74 BDT)¹. The improvement of IWT reduces traffic congestion and accidents on the roads. Environmentally the IWT require lesser fuel consumption and hence generates lesser greenhouse gas emissions. Transport distances for one tonne of goods for the same amount of fuel are 100 km for trucks, 300 km for trains and 370 km for vessels².

5.3. Alternative Means of Maintaining the Navigation Routes

The general means of maintaining the navigation routes are dredging and systematic river training works such as revetments, spurs and groins on both sides of the river. Such infrastructure will help in developing the navigation channels away from the banks. Revetments along the river banks will also help in developing channels close to the river banks. However, experience in Bangladesh shows that these channels also require further improvement through annual dredging. These type of river training structures may be useful for smaller rivers, but for mighty braided and multi-channel rivers like the Lower Meghna where the river width varies from 5 to 12 km, the river training structures are not useful in isolation. Further they are very expensive (about 3000 to 6000 USD per running meter) and also create lot of morphological impacts on the river regime such as erosion of river bank between two river training structures. The river bank erosion will lead to erosion of floodplain agricultural land and terrestrial habitats, and resettlement of floodplain dwellers. Maintenance by dredging is presumed to be necessary for waterways included in the Project. However, to minimize the dredging and other maintenance needs through application of river training schemes will be studied in Component 2 and some pilot projects (USD 0.75 million) will be developed.

5.4. Alternative Methods of Dredging

General types of dredging suitable for the Project IWT routes are mechanical and hydraulic dredgers. Key environmental issues to be considered while selecting type of dredgers are: (i) low risk of sediment dispersal during excavation (most of the sediment excavated should be captured by the dredger to minimize sedimentation); (ii) low risk of sediment releases from lifting (most of the sediment captured should be lifted efficiently to minimize the re-suspension of sediments); and (iii) low risk of leakage from transportation. The Impact Assessment includes a full discussion of the various dredging techniques and compares their relative performance on environmental management aspects. The final decision on dredging equipment will be left to the contractor to decide.

5.5. Alternatives to Dredged Material Management

Various options have been considered for dredged material management. These options can be primarily grouped in to two categories: (i) placement in the river in the deep scourholes and along eroding river banks; and (ii) placement on the land for beneficial use where in river disposal is not feasible and where there is a demand and material is suitable . The options for land required for on land disposal include existing stack yards of the sand traders, encumbrance free government owned land, or leasing land from private people or community. The beneficial uses for dredged material (if suitable, environmentally acceptable and there is a demand) for on land use is engineering fill (foundation basis for construction, earth fill); construction (reclamation of new land, aggregate, roads); and for aquatic use is construction (dikes and bunds), coastal defense (filling of scours, beach creation and nourishment, mud-shore profile engineering); and habitat development (aquatic habitats, intertidal mudflats). Placement of the material in the deep scour holes in the river or in the estuary is considered as a preferred option in this project since

¹ World Bank. 2007. Bangladesh - Revival of inland water transport : options and strategies.

² International Navigation Association, 2003. Guidelines for Sustainable Inland Waterways and Navigation

removal of sediment, by dredging, from its natural path or cycle, may have damaging environmental consequences (in the estuaries, the balance between erosion and accretion will be disturbed by dredging, and furthermore the salinity of sediments in the estuary makes them environmentally unsuitable for on-land disposal). Therefore, it can be beneficial to return the material into the originating system, rather than removing it to a separated site.. The placement of dredged material on the land has not been considered as the preferred option since all the land along the river are either densely populated or intensively cultivated. However, along some parts of the narrow river routes (in the freshwater branch/loop rivers in Upper Meghna where the river widths are less than 100 m), placement of dredged material on the land is considered as the preferred option.

5.6. Alternative Contracting Approaches

Traditionally the BIWTA is following 'bill of quantities' based contracting approaches, where the contractors will be paid based on the volume of the dredging. Performance Based Contracting (PBC) is recommended in this Project due to the following advantages: (i) Contractor discretion to adjust the detailed alignment of the route (and correspondingly move the aids to navigation) to follow changing riverbed morphology, and (ii) Payment based primarily on depth maintained rather than volume dredged – meaning that no detailed dredging plan is provided ex-ante to the contractor, and instead it is up to the contractor to conduct continuous surveying, determine appropriate dredging equipment needs, and maintain the channel (while conforming to environmental and social requirements such as staying under threshold turbidity / other water quality levels, avoiding sensitive habitats during specified seasons, disposing of spoils in pre-authorized locations, etc.), while being subjected to continuous third party monitoring to verify compliance.

5.7. Alternative Locations and Design Aspects of Terminals and Landing Stations

The alternate locations for siting of terminals and landing stations and also their alternative design aspects will be analyzed as part of the detailed ESIA for these components during project implementation.

SECTION B – Environmental Assessment and Management

6. Description of Environment

6.1. Physical Environment

Definition of the study area or project influence area: The influence area of the overall Project is defined as areas that are likely to be directly or indirectly affected by the proposed dredging and construction activities. This includes but is not limited to what extent the project would impact floodplain areas, hydrology, morphology, and the project footprints. The influence area covers the entire river reach between the Project routes and extending one kilometer on each side of the river bank. In the estuarine areas, a wider influence area of up to 7 km has been considered due to large tidal zone.

Physiography: The physiography in this area is dominated by characteristics of the Ganges, Brahmaputra, Upper Meghna and Lower Meghna rivers and their tributaries with braided and meandering channels, chars (shoals), mud flats and alluvial floodplains. Brahmaputra joins the Ganges at Goalandhat, the combined flow of Ganges and Brahmaputra is known as Padma river; and Meghna joins the Padma further downstream at Chandpur. From this point downwards, the combined flow of the Padma and Upper Meghna is known as the Lower Meghna, becoming one of the broadest rivers (with width varying from 5 km to 12 km) and largest estuaries in the world. It flows into the Bay of Bengal through the Shadbazpur and Hatia channels in the Mouths of the Lower Meghna river, which are encumbered by numerous shoals and bars. The Lower Meghna carries annually approximately one billion tonnes of sediment feeding the Bengal Fan, the largest depositional system in the world. The eastern active part of the delta is characterized by opposing influences of fluvial and marine processes. The fluvial processes are driven by the high sedimentation (and seasonal change), while the marine processes are a semidiurnal tide with strong fortnightly variation. Fluvial influences are most pronounced between the Bishkhali and Tetulia estuaries, and marine influences in the Hatia and Sandwip channels where strong tidal currents are the principal cause of morphologic change. The Shahbazpur channel (and Bhola Island) is influenced by both fluvial and tidal dynamics, which can lead to a complex morphologic processes. Land use in the floodplain of sub-districts of project influence area (other than rivers) is covered 71.2 percent by agriculture, 28.1 percent by settlements, 0.56 percent of water bodies, 0.01 percent by fallow land (government owned waste land) and 0.13 percent by other uses.

Climate: The climate of Bangladesh is sub-tropical with three seasons; namely summer from March to May, monsoon from June to October, and winter season from November to February. The maximum temperature at Dhaka varies from 21.8°C to 42.3°C and in Sandwip from 23.3°C to 39.3°C. Maximum temperature occurs in the month of April and minimum temperature in January. Mean annual rainfall in this region is about 2,100mm at Dhaka and 3,480mm at Sandwip. About 75 to 80 percent of annual rainfall occurs during June to October. The wind regime in the Lower Meghna shows seasonal variation between the dry season (November to May) and the monsoon season (June to October). During the dry season the prevailing winds are calm. In the monsoon season the prevailing winds are from South-Southeast direction with an average speed of about 3-7.6 knot in the Meghna estuary. The maximum wind speed can be in the range of 32-99 knot.

Hydrology: River systems under Dhaka-Chittagong Corridor can be mainly divided in four sections: (i) Main Dhaka-Chittagong Route consists of Buriganga, Dhaleshwari, Lower Meghna and Meghna Estuary; (ii) Narayanganj Extension Route consists of Shitalakhya and Upper Meghna; (iii) Ashuganj Extension Route consists of Upper Meghna; and (iv) Barisal Extension Route consists of Lower Meghna, Meghna Estuary, Arial Khan, Naya Bhagnani, Tentulia, Maskata, and Kirtonkhola. The monthly mean discharge of the Lower Meghna varies from 5800m³/s in the month of February to 72,000m³/s in August.

Tide: The entire project area is subject to at least some tidal influence, although the effects in the northern reaches is minor, with Ashuganj experiencing a tidal range of 0.2m. Tides in the Bay of Bengal are semi-diurnal in nature, exhibiting two high waters and two low waters per day. In the western part of the coastal area of Bangladesh the average tidal range is approximately 1.5 m. In the coastal area around Sandwip, the tidal range is about 6.6 m. The tidal range is less than 1 m near Chandpur.

Wave: The influence of the wind induced waves in the Lower Meghna estuary is limited to the shallow nearshore zone and inter tidal area. Wave climate in the Meghna estuary is rather mild due to limited depth. Wave model indicates that under the South-southeast wind, the average significant wave height varies between 0.6-1.5m in the nearshore zone to 0.1-0.6m in the landward part. In the dry season the wave is generally less than 0.6m with peak wave period of 3-4seconds. During monsoon season wave heights exceed greater 2m with periods more than 6 seconds.

Cyclones: Cyclones pose a threat to IWT, lives and property in low-lying coastal regions in Bangladesh. Cyclonic storms, occasionally of severe intensity, can occur in the months of March-May and October-November, accompanied by storm surges, high winds and intense rainfall. While the loss of life during these cyclones is being progressively reduced by means of improved storm warnings and continuing construction of cyclone shelters, the damages to property, livestock, crops and livelihoods continue to take their toll, and existing cyclone shelter infrastructure to date do not include any such shelters for vessels along the waterways. Major tropical cyclonic disasters in 1970 and 1991 were estimated to have killed an estimated 300,000 and 140,000 people respectively. The other major cyclones were recorded in May 1985, November 1988, and April 1991 in May 1997, November, 2007 and in May, 2009. During cyclones about 1.5 to 9 m height of storm surges were noticed.

Geology: The geology is dominated by quaternary sediments deposited by the Ganges and its numerous tributaries and distributaries. The area is underlain by Tertiary and Quaternary sediments and recent alluvial deposits originating in the foothills of the Himalaya. The stratification of the sediments is generally composed of non-cohesive materials of sand and silt with patches of cohesive deposit of clay. The surface soils are usually grey silt loams and silty clay loams.

Seismicity: According to Bangladesh National Building Code, the Project area is located in Zone 3 or below (Zone 2 or 1), which corresponds to a maximum earthquake of 6.5 g magnitude (for 2500 years return period) and an intensity of VII to VIII on the Modified Mercalli Scale. According to this code, all the buildings in this zone are to be designed for a 4.3 g magnitude earthquake (2/3 of maximum earth quake).

Groundwater: On the floodplains, groundwater is found at shallow depths (1.1 to 4.2 m) and used extensively for drinking purposes. At some places, groundwater is also being used for irrigation.

6.2. Chemical Environment

Sampling and analysis: Sampling and analysis of surface water and river bed sediments were carried out at 12 locations during high flow season of September and October 2015. The sampling locations are (1) Harinaghat, Chandpur, (2) Gozaria, Munshiganj, (3) Boktabali Ferryghat, Narayanganj, (4) Araihasar, Narayanganj, (5) Ashuganj, (6) Sadarghat, Dhaka, (7) Near Vasana Char, Chukhalighat, Sandwip, (8) near Chairman Ghat, Noakhali, (9) near Beduria Launch Ghat, Barisal, (10) near Hizla, Mehendiganj, Kaliganj, (11) near Ilisha Ghat, Tulatali Bazar, Bhola, and (12) near Dawlatkhan Launchghat. The samples were analyzed for all major ions, metals, and pollutants. Similar sampling and analysis is being carried out during low flow season of February 2016. Groundwater sampling from floodplains was also carried out near these locations. Air and noise quality was measured at six locations, (i) Ashuganj, Brahmanbaria, (ii) Sadarghat Launch Terminal, Dhaka, (iii) Char Shreepur, Barisal, (iv) Dhunia, Bhola, (v) Chandpur Launch Terminal, and (vi) Gozaria Launch Terminal, Munshiganj.

Surface water quality: The total dissolved solids (TDS) in all project rivers in high flow season generally vary from 50 to 140 mg/l, except close to the coastal area of Sandwip (646 mg/l). In low flow season, the TDS in the rivers of Upper Meghna Basin, except in Buriganga and Shitalakya, have shown concentrations from 64 to 191 mg/l; and the maximum concentration recorded in coastal area is 14,738 mg/l near Sandwip. Turbidity in Lower Meghna varies from 337 to 970 NTU during high flow season. Total suspended solids (TSS) concentration ranges from 20 mg/l in Buriganga at Sadharghat to 953 mg/l in Lower Meghna near Sandwip; at Chandpur the TSS concentration is 391 mg/l. The TSS concentrations in low flow season vary from 40 to 177mg/l. The Buriganga River near Dhaka, which was subjected to historic pollution from Dhaka city, showed a TDS of 90 mg/l, dissolved oxygen of 3.66 mg/l and biological oxygen demand of 7.65 mg/l in high flow season; while the recorded concentrations in low flow season are: TDS of 537 mg/l, dissolved oxygen of 2.40 mg/l and biological oxygen demand of 15.7 mg/l. According to a secondary data on water quality of Buriganga during dry season (March and April) of 2004 showed BOD levels of 30 to 50 mg/l. The water quality in Lower Meghna exhibits seasonality due to tidal fluctuations and the salinity, in terms of TDS, has been documented to vary from 100 to 4,000 mg/l. The surface water quality in most of the lower Meghna is suitable for both fisheries and irrigation according to Bangladesh standards (pH: 6.5 to 8.5: DO: 5 mg/l and above; BOD: 6 mg/l and below). In the upper Meghna, results show that project waterways, while generally supportive to aquatic life and suitable for irrigation during high flow seasons, are under varying degrees of stress from urban, industrial and agricultural sources of pollution which lead to poor water quality in many locations especially during low-flow season.

Riverbed Materials: Riverbed materials were analyzed at twelve locations and compared with OSPAR guidelines (Oslo/Paris convention for the Protection of the Marine Environment of the North-East Atlantic). The test results have shown all twelve samples from the high flow season are within the acceptable limit of OSPAR guidelines; however higher values of lead are noticed in Buriganga river in low flow season. No pollutants such as PCBs, POPs and hydrocarbons were detected in the sediments. The arsenic concentration in the sediment varies from 0.3 to 1.65 ppm in high flow season and from 1.3 to 9.7 ppm in low flow season (the standard is 30 to 80 ppm), cadmium varies from 0.11 to 0.24 ppm in high flow season and up to 0.054 in low flow season (the standard is 1 to 2 ppm), the chromium varies from 7 to 32 ppm in high flow season and from 18 to 66 ppm in low flow season (the standard is 150 to 200 ppm) and the zinc varies from 6 to 72 ppm in high flow season and 35 to 112 ppm in low flow season except in Buriganga (the standard is 250 to 500 ppm). In Buriganga river near Dhaka, the lead concentrations recorded in high flow season is 14 ppm and in low flow season is 204 ppm (the standard is 100 to 120 ppm); and the zinc concentration in high flow season is 39 mg/l and low flow season is 251 mg/l (the standard is 250 to 500 ppm).

Groundwater: In general, the groundwater is suitable for drinking purposes with TDS ranging from 198 to 841 mg/l. At one location near Chairman Ghat, Noakhali high TDS concentration of 3,398 mg/l is recorded, in high flow season, probably due to presence of localized brackish aquifers; and in low flow season the concentration recorded at this location is 2905 mg/l. It is also noticed that iron (ranges from 0.3 to 3.24 mg/l) and manganese (ranges from 0.07 to 2.60 mg/L) have exceeded national and WHO standards in most samples (0.3 mg/l for iron and 0.4 mg/l for manganese).

Air quality: Ambient air quality in the influence area has shown exceedances in particulate matter when compared to the World Bank EHS standards of ambient air quality. Concentrations of PM₁₀ are particularly high (ranging from 49.67 to 127.18 µg/m³ during monsoon; and from 91 to 144 µg/m³ during monsoon exceeding ambient air quality standards of the WBG EHS (50 µg/m³).

Noise quality: Noise levels are generally exceeded the national as well as WBG EHS standards. The day time noise levels were found in the range of 53 to 65 dB (national and WBG standards for residential areas are 45 and 55 dBA respectively).

6.3. Biological Environment

General Biodiversity: About 17% of all the species recorded in Bangladesh occur in the project area. These include 367 species of flora, 25 species of mammals, 255 species of birds, 36 species of reptiles, 15 species of amphibians and 156 species of fish. Within the flagship animal species, Ganges River Dolphin (*Platanista gangetica*) Crowned River Turtle, Northern River terrapin (*Batagur baska*), Three-striped Turtle (*Batagur dhongoka*) are the nationally endangered species located in the Project area. In addition, Fishing Cat (*Prionailurus viverrinus*) and Jungle Cat (*Felis chaus*) are nationally endangered mammals; and Yellow Monitor (*Varanus flavescens*) and Binocellate Cobra (*Naja naja*) are the two nationally endangered reptiles that are rarely seen in the project area. Gangetic Dolphin, fishing cat, Northern River Terrapin, Olive Ridley, Green turtle and Hawksbill turtle are globally endangered species, and peacock softshell turtle is globally vulnerable species. Of the fish species, 89 are commercially important and 53 are nationally threatened.

The Upper Meghna Flood Plain (see Figure 5.40: Bio-ecological zones of Bangladesh of ESIA) is a dominant freshwater environment inhabited by freshwater plant and animal species. The floodplain comprises a nutrient rich freshwater ecosystem supporting high fish production, and many aquatic species some of which are now endangered. Native waterfowl and migratory birds, freshwater turtles and other reptiles and amphibians depend on this system, and the area was rich in biodiversity. The pressure from the increasing human population on the natural resources (e.g. agriculture) has affected the ecosystem. However the water quality is still favourable for many of the aquatic species like the smooth-coated otters (*Lutrogale perspicillata*), Gangetic dolphins (*Platanista gangetica*), Peacock Softshell turtle (*Nilssonina hurum*), Crowned River turtle (*Hardella thurjii*), etc.

The Lower Meghna River supports both the Gangetic Dolphin and Irrawady Dolphin. However their distribution is marked by the salinity depending on seasonal freshwater discharge with Gangetic dolphin prefer the fresh water and Irrawady dolphin prefer salt water. Among the reptiles, Gangetic softshell turtle present in this area.

The Meghna estuary along with Hatiya and Sandwip channels lies within the globally important migratory bird flyway which acts as staging, feeding and wintering ground of species belonging to East-Asia Australasian and Central Asian Flyways. The coastal ecosystem of the project area is also important habitat for globally endangered Irrawaddy dolphin, Olive Ridley turtle, Green turtle and Hawksbill turtle.

Protected and sensitive areas: Locations of known environmentally sensitive areas, including reed lands (which are habitats of migratory birds), mangrove forests, and hilsa sanctuaries and spawning grounds are shown in Figure 2. The locations of expected dredging locations (based on 2015 hydrographic surveys undertaken by BIWTA) and pre-identified appropriate dredge material placement locations are also shown in Figure 2. In addition, the river banks and chars will also act as breeding areas for several aquatic species including fish and turtles, as well as birds. During months of March and April, no hilsa fishing is to be carried out in the sanctuaries. Further, all types of fishing are banned in these sanctuaries during the Bangla month of Ashwin (usually occurs between October and November). Buriganga and Sitalakhya rivers are declared as ecologically critical area by the DOE to minimize development of unplanned industrial activities around the river; and allow only DOE cleared projects along these rivers. DOE has signaled that proposed project activities on these two rivers will be permissible, subject to implementation of strict mitigation measures and compliance monitoring.

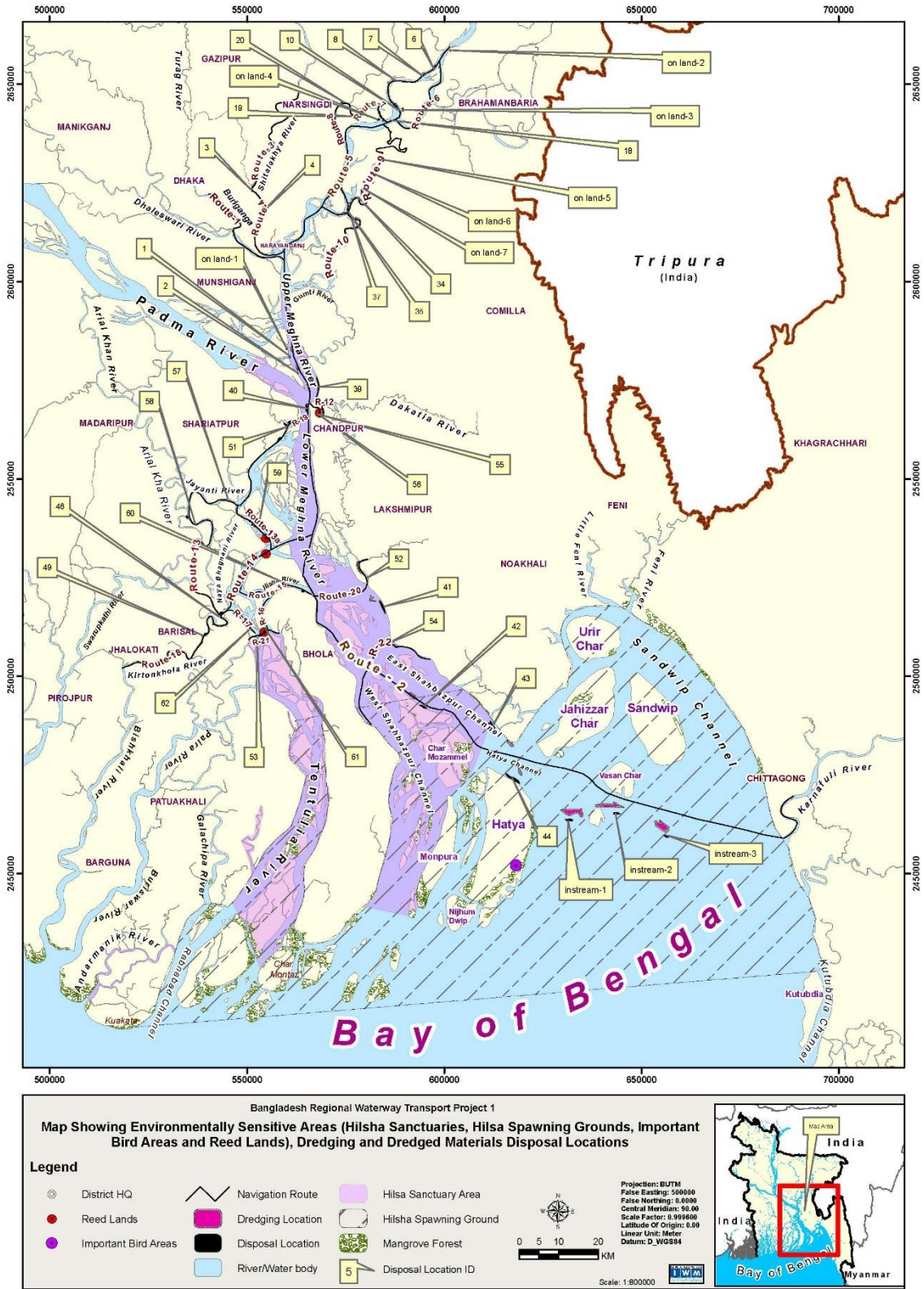


Figure 2: Sensitive Environmental Locations in the Project Area and the Proposed Dredging and Dredged Material Placement Locations

Terrestrial ecosystems: The terrestrial ecosystem in the project influence area is dynamic and is heavily influenced by the water flow of the system. It is dominated by agricultural landscape and homestead areas, but there are also large areas of chars that are mostly covered by sun grass, reeds and other natural vegetation. The terrestrial ecosystem supports about 25 mammal species including nationally threatened species such as Golden Jackal, Jungle Cat and Fishing Cat. The habitat range of floodplain mammal species has been decreasing due to ongoing bank erosion. Trees around the agricultural fields and homesteads are dominated by indigenous species with some exotic species such as Eucalyptus and Acacia.

River and Floodplain Wetland Ecosystems: The Meghna and its tributaries provide habitat for numerous species of vertebrates and invertebrates. Most of those species are found also in other rivers and floodplain systems in the country; for them the project influence area is not a critical biotope. The fresh water aquatic ecosystem of Meghna River and its tributaries are the lifeline of the endangered Gangetic dolphin and freshwater turtles. The chars act as nesting habitat of turtles. Connection between river and floodplain wetland are corridors for migratory fish (to and from breeding and nursing grounds). The Meghna River is also a corridor for migratory birds.

River and Charland Ecosystem: The young, vegetated charlands form a major habitat for the vertebrate fauna: mammals, birds, reptiles and amphibians. These areas are relatively free from noise and other disturbances, while the mixed vegetation and the large number of water bodies support a rich hunting, feeding and roosting habitat. A range of waterfowl, both local and migratory, are directly or ecologically dependent on charland ecosystems. Chars, especially their submerged extensions, act as reproduction area for many riverine fish and crustacean species. Aquatic reptiles (including endangered turtles) lay their eggs in the sandy beaches on the chars. Given the shortage of land in Bangladesh, stabilized charlands are quickly occupied by farmers and fishermen, profiting from the natural richness of these new and fertile lands.

Bird Migration: Huge congregations of migratory winter birds can be seen during November-March in the Meghna estuary. Winter birds from the Himalayas, Central Asian highlands and faraway places like Siberia move to relatively warm coastal mudflats in Bangladesh including the project influence area to escape the freezing cold, and feed on various animal and plant food that are abundant in the mudflats, sandflats, rice fields and other areas. Usually, migratory water birds fly in the north-south direction. Birds start arriving from early November and stay till March-April. An estimated 500,000 birds of about 150 species (mainly ducks, waders and warblers) travel to Bangladesh each winter. The common migratory birds noticed were Ruddy Shelduck (*Tadorna ferruginea*), Northern Pintail (*Anas acuta*), Gadwall (*Anas strepera*), Common Sandpiper (*Actitis hypoleucos*), Wood Sandpiper (*Tringa glareola*), and Little Stint (*Calidris minuta*). Critically endangered migratory birds recorded include Spoonbill Sandpiper (*Calidris pygmaea*), Asian Dowitcher (*Limnodromus semipalmatus*), Nordmann's Greenshank (*Tringa guttifer*). Greater Spotted Eagle (*Aquila clanga*) and Painted Stork (*Mycteria leucocephala*) are vulnerable species and Eurasian Curlew (*Numenius arquata*) is near threatened species recorded in the project area. The major threats to migratory birds are habitat degradation, hunting, and human disturbances. Due to continued human population growth, these threats are very prominent.

Fisheries: Both capture and culture fisheries practices exist in the project area. The river contributes the largest share of this production followed by floodplains, beels and khals. Fish production from khals is insignificant as most of those are either dried up during the peak dry season or remain closed by flood control structures. In recent years, however, capture fish production has declined to about 50%, with a negative trend of 1.24 % per year. In spite of these in 2013-14, Bangladesh has produced 3.5 million tonnes of fish of which 83.22% and 16.78%

comes from inland and marine fisheries respectively. Fishing is one of the few available livelihood opportunities for most of the landless people of the project area.

7. Climate Change Considerations

Climate change and IWT: Climate change may result in increased rainfall intensities, rise of future sea levels, higher temperatures and higher wind speeds. These changes may consequently result in changes in flood regimes due to changes in precipitation pattern, changes in sediment load, and changes river water levels, which are all factors that may affect the river navigation. Though climate change projections for Bangladesh were available through studies carried out at regional scale, there are a lot of uncertainties associated with these projections. Nonetheless, the key predictions associated with the worst case climate projections scenario are summarized below and have been taken into consideration when planning the project.

Rainfall projections: In accordance with the projection on precipitation the rainfall in the dry season will be decreased. It implies that the water flow/discharge is very likely to be decreased in the river during dry season causing decrease of navigation depth. In the monsoon, it is expected that the precipitation will increase. The increase of precipitation will increase the river flow during monsoon, which may lead river bank erosion in the navigation routes. A World Bank study on Bangladesh Coastal Embankment Project has projected, based on a climate change modeling analysis, the following percentage changes in monthly rainfall by year 2050: January (-14.53%), February (3.24%), March (-0.4%), April (-10.7%), May (6.46%), June (3.55%), July (16.71%), August (19.6%), September (26.99%), October (16.09%), November (-11.53%), and December (-16.97%).

Future sea level rise: Sea level rise in the Bay of Bengal is the combined effect of global sea level rise, local changes in sea level due to ocean density and circulation changes and possible subsidence or uplift of the delta and sedimentation. The changes in the sea level are evident from the trends noticed in the river water levels in the estuarine areas. A trend analysis of the annual average and minimum of available water level data for tidal water level stations at Hironpoint in Pussur River, Khepupara in the Tentulia River and Rangadia in the Meghna estuary has been carried out from 1977 to 2013 find the change in relative sea level rise. The trends in average water level rise at these stations are found to be 6.88 mm/year, 3.7 mm/year and 4 mm/year respectively.

Wind forces: Cyclone intensities may increase by 10 to 20% by 2050. Which will cause higher cyclone induced storm surge height and wave run-up. This may have the effect on ship movement, causing travel delays for few days.

Impact on Climate Change: The IWT generate greenhouse gases such as carbon dioxide from ship and terminal operations and related hinterland transport, contributing to global climate change. However, the fuel efficiency per ton-km hauled for typical IWT vessels is lower than that of typical trucks and other vehicles on the roads. The project's improvements to the waterways will also further enable larger vessels to consistently ply the routes, which will result in further fuel efficiency gains from greater economies of scale in cargo transport. Therefore, the additional IWT-related GHG emissions due to increased overall IWT traffic still represent a net reduction in GHG emissions over what would otherwise be expected through equivalent growth of road-based traffic.

Climate change mitigation and adaptation: A Climate Change Unit will be established in the BIWTA for mainstreaming the climate change issues in the project planning and implementation. The following mitigation and adaptation measures will be pursued during implementation of the Project.

The project will develop a strategy and action plan for “greening the waterways”, and will pilot select activities under the plan, to test approaches and generate lessons learned to enable scaling up in a future operation. This study will include a large focus on identifying mitigation

measures to reduce carbon dioxide and other greenhouse gases emissions from ships, cargo handling equipment and related hinterland transport. Possible such activities to be included in the action plan are:

- Preparing GHG emissions inventory (from the current operations) and setting goals to reduce emissions. Also periodic reporting.
- Exploring the introduction of cleaner fuels such as CNG (comparatively less emissions) in the vessels owned by the ministry to set a good example for others to follow.
- Developing an incentive scheme to encourage vessel owners to upgrade vessel engines, such as conversion to CNG or installation of emissions control measures.
- Educational campaigns for users of the waterways to tackle behavioral aspects of reducing emissions and other forms of pollution.
- Improving efficiency within the logistic chains by streamlining the movement of cargo, truck traffic and inland navigation access
- Reduce energy dependence with in the ports by developing and using renewable energy sources

On the adaptation front, the project will foremost ensure that river terminals and landings are designed in consideration of maximum flood levels expected with climate change, as well as potential decreases in minimum flows during dry season.

In addition, the project will support a detailed climate change vulnerability assessment and development of an adaptation/resilience strategy for the IWT sector as a whole. Potential adaptation measures to be explored at the sector level include:

- Climate change modeling and developing forecasts for river water levels and changing sedimentation patterns
- long term planning and design for new infrastructure in consideration of climate vulnerabilities
- Identify the vulnerabilities in the IWT sector and proactive actions
- Design of new wider vessels that could accommodate low drafts
- Planning for future upgrading / modification of additional BIWTA-owned facilities to account for future flood levels expected from climate change

8. Potential Environmental Impacts and Mitigation Measures

8.1. General

The IWT is an environmentally friendly mode of transport compared to road and rail in terms of energy consumption and greenhouse gases emission. The negative impacts associated with the Project are mostly related to dredging activities for maintenance of navigation routes. However, the extent of dredging to be carried out under the navigation maintenance (5 to 6 million m³ of dredging annually) is very limited compared to the annual sediment load of one billion tonnes carried out by the Lower Meghna. Similarly, the 76.22 m width of channel to be dredged is also very less compared to the width of the Lower Meghna which varies from 5 to 12 km. The impacts of dredging and its placement on the aquatic and terrestrial habitat can be minimized by adapting mitigation measures presented in this chapter. The other significant negative impacts of the Project will mostly result from the construction and operation of river terminals, and construction of vessel shelters and landing stations, training institute, pilot river training works. A summary of these impacts and mitigation measures are presented in this chapter. Environmental Code of Practices (ECoPs) have been prepared and annexed to the EMF to manage all construction related impacts of the Project. Detailed ESIA studies will be conducted for terminals, landing stations, pilot river training works, and site specific EMPs will be prepared during the first year of implementation.

8.2. Impact Assessment Methodology

Potential environmental and social impacts were identified through field visits and stakeholder consultations. The significance of potential impacts was assessed using the following criteria:

Impact Magnitude: The potential impacts of the project have been categorized as major, moderate, minor or negligible on the basis of parameters such as: (a) duration of the impact; (b) spatial extent of the impact; (c) reversibility; (d) likelihood; and (e) legal standards and established professional criteria.

Sensitivity of Receptor: The sensitivity of a receptor has been determined based on review of the population (including proximity/numbers/vulnerability) and presence of features on the site or the surrounding area. Each detailed assessment has defined sensitivity in relation to the topic.

Assigning Significance: Following the assessment of magnitude, the quality and sensitivity of the receiving environment or potential receptor has been determined and the significance of each potential impact established using the impact significance matrix shown in Table 7.

Table 7: Significance of Impact Criteria

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

8.3. Summary of Assessed Impacts

The project's potential impacts and their significance have been assessed using the methodology described in Section 7.2 above. A summary of these impacts and their significance is presented in Table 8.

Table 8: Potential impacts and their significance

Impact from various activities	Magnitude	Sensitivity	Significance Prior to Mitigation	Residual Significance
Impacts related to dredging works in Component 1				
Impact of dredging on aquatic habitat	Major	Very Severe	Critical	Moderate negative
Impact on benthic habitat	Major	Very Severe	Critical	Moderate Negative
Sediment dispersion from dredging activities	Medium	Severe	High negative	Low negative
Impact of dredged material placement on land	Major	Severe	High negative	Low negative
Impact of dredged material placement in the river and estuary	Major	Severe	High negative	Moderate negative
Impact of dredging on bird habitats	Minor	Low	Minimal	Minimal
Emissions from dredging equipment and associated vessels	Medium	Mild	Moderate negative	Low negative
Impacts related to construction works in Component 2				
Impact of dredging on aquatic and benthic habitat	Major	Very Severe	Critical	Moderate negative
Impact of instream construction activities in the river on the aquatic habitat	Major	Severe	High negative	Moderate negative
Air pollution from construction works	Medium	Mild	Moderate negative	Low negative
Noise pollution from construction works	Medium	Mild	Moderate negative	Low negative
Water pollution	Major	Severe	High negative	Low negative
Soil and groundwater contamination	Major	Severe	High negative	Low negative
Generation of Solid wastes and hazardous wastes	Medium	Severe	Moderate negative	Low negative
Site clearance and restoration	Medium	Severe	Moderate negative	Low negative
Impact on livelihood sources	Major	Severe	High negative	Low to moderate negative
Impacts on Places of Religious Significance	Minor	Severe	High negative	Low negative
Impacts on community facilities	Medium	Mild	Moderate negative	Low negative
Occupational health and safety	Major	Severe	High negative	Low to moderate negative
Community health and safety	Medium	Severe	High negative	Low to moderate negative
Impacts during O&M of both Components 1 and 2				
Improved IWT	Major	-	High positive	High positive
Air pollution	Medium	Mild	Moderate negative	Low negative
Waste Generation from Ships	Major	Severe	High negative	Low to moderate negative
Water pollution	Medium	Mild	Moderate negative	Low negative

Occupational health and safety	Major	Severe	High negative	Low to moderate negative
Community health and safety	Major	Severe	High negative	Low to moderate negative
Navigational safety and risk of accidents	Major	Very Severe	Critical	High positive

8.4. Environmental Impacts from Dredging Works in Component 1

Impact of Dredging on Aquatic and Benthic Habitat: Dredging will be required to maintain navigability of river routes and ferry crossing. Maintenance dredging will also be required annually along the navigation routes. Dredging activities may cause several negative impacts on the aquatic habitat and fauna due to generation of high sediment flows, disturbance of benthic habitat, noise and emissions from construction machinery, and accidental spillage of fuels. Dredging activities in the Lower Meghna may particularly impact the hilsa if they are carried out during its spawning season of March -April and October-November. Various stages of the dredging and potential impacts from each of these stages is summarized below.

- **Excavation:** Excavation is the process of physical removal of the material from its in situ location on the bed of a water body. This will be done either hydraulically or mechanically by dredger heads. The physical changes that can take place during excavation are the generation of suspended sediments (causing an increase in turbidity, destruction of benthic environment, and changes to river morphology), mixing of soil layers and noise and air pollution from the equipment.
- **Lifting:** Lifting is the vertical transportation of the excavated material from the bed. Similar to excavation, this will also be done either hydraulically or mechanically. The physical changes that occur during lifting are the release of suspended sediments for example as overflow losses during loading. Sediment re-suspended in the water column in high concentrations can directly lead to physical abrasion of, for example, filter-feeding organs or gill membranes of fish and shellfish. Increase in turbidity, due to sediment resuspension, also reduces light penetration in to the water thus resulting in to reduction in primary productivity for phytoplankton. If the sediments are rich in nutrients and metals; the resuspension of sediments may release nutrients, organic matter and/or toxic chemicals in to the water.
- **Transportation:** Transportation is the process of transferring the excavated material to the placement location. This will be typically done hydraulically through a pipeline. The potential impacts during transportation are spillage and safety in relation to other transport users of the river.

The Contractor shall select the dredging equipment and methods to minimize suspension of sediments, minimize destruction of benthic habitat, and increase the accuracy of the dredging operation. The mitigation measures for the dredging and for environmental impacts related to the other project related construction activities within the scope of the PBC contract are given in a series of Environmental Code of Practices (ECoPs). The contractor shall comply with the mitigation measures proposed in ECoPs. The contractor shall not carry out any dredging activities within 100 m from the river banks and char lands. The contractor shall also maintain a minimum of 100 m distance from all reedlands (migratory bird habitats), mudflats, and mangroves. The dredging can be carried out during all seasons in the hilsa sanctuaries and spawning areas, but the contractor is required to undertake intense monitoring and reporting on all activities in these areas, particularly during the months of October to November, and March to April, to ensure that there are minimum impacts on the water quality and hilsa habitat in these areas. In ecologically sensitive locations, the Contractor will additionally keep TSS levels below

a 20% increase over baseline levels. Inspection and monitoring of dredging activities should be conducted to evaluate the effectiveness of impact prevention strategies, and re-adjusted where necessary. An ongoing ecological monitoring will be in place to evaluate the impacts of the dredging and develop additional mitigation measures as required.

Sediment Dispersion from Dredging Activities: A sediment dispersion modeling was carried to assess dispersion of sediment plumes from dredging activities. Sediment dispersion modelling shows that the maximum excess suspended sediment concentration due to dredging in the Lower Meghna river and Meghna estuary is 14mg/l within 100m from the center of the dredging in addition to the baseline suspended sediment concentration. Beyond 100m the excess sediment concentration is very insignificant. Based on field surveys carried out during monsoon season of 2015, the sediment concentration in the Lower Meghna and estuary range from 300 to 953 mg/l. During the dry season, sediment concentrations may be in the range of 40mg/l to 177 mg/l. The additional sediment concentration of 14 mg/l generated by dredging activities is very minimal compared to the baseline concentrations and is not expected to cause any significant impact on the aquatic habitat.

Impact of Dredged Material Placement on Land. Dredged material can be used for beneficial uses wherever there is a demand and the material is suitable (in Upper Meghna). At some villages near the dredging locations, there is a demand for the material for raising of the village roads and public facilities such as school and eidgha (mass prayer) grounds. About 20 ha of land in a year can be filled with an average height of 2.5m with the dredged material from the navigation routes along the Upper Meghna. The potential impacts from placement of material on the ground are land pollution due to dispersion of sediment material and release of sediment laden runoff. To mitigate these impacts, prior to filling commencing, the areas being filled will be subdivided into compartments by construction of temporary containment bunds of suitable material (e.g. dredged sand). Filling will be achieved by progressively pumping a slurry of sand and water into the bunded areas, allowing the surplus water to drain away to artificial and natural waterways in a controlled manner through the pipeline, without affecting floodplains. Drainage water will be monitored at the pipeline outlet to ensure water quality is within permissible thresholds. No agriculture land will be used for permanent or temporary filling up of the areas. If temporary filling is required, only government owned khas lands will be used or will be directly sold to the willing sand buyers.

Impact of Dredge Material Placement in the River and Estuary: The dredged material will be used for beneficial uses in the river such as filling of the scour areas in the rivers and placement in the eroding river banks. Several locations of scours have been identified near the dredging works (See Figure 2). The dredged material will also be placed in the river to minimize the need for any land acquisition on the land and to minimize the dredging cost. It will also be placed into river along the eroding river bank, which will also reduce the rate of erosion. The consultations with the DOE also suggested that dredged material placement in the river is comparatively better alternative than the placement on the land. The impacts from aquatic placement of dredged material will result in generation of high turbidity levels which may affect organisms that depend on light for their existence (photosynthesis) and fish. For fish, high concentrations clog the gills and affect the growth and survival of eggs and larvae, diet and reproduction. Indirect effects include deterioration of spawning beds and loss of food-benthos. The impacts on turbidity and sediment dispersion associated with aquatic placement can be minimized by submerged discharge (placing the pipe line vertically one meter below the water column or just above the river bottom) which result in a decreased resuspension and spread of the lateral extent material. The bottom relief created by mounds of dredged material may also provide refuge habitat for some fish. If additional scour holes are to be required during implementation, they will be selected based on the following criteria: (i) deeper scour holes (more than 5m), (ii) located along

the eroding river banks, except when within 100m of an environmentally sensitive location, (iii) subjected to continuous scouring or erosion, and (iv) subjected to high currents.

Impact on Bird Habitat: Dredging and dredged material placement activities will be carried out minimum 100 m away from the habitats of wintering birds that are mainly found on reed lands, chars and mudflats spread across the estuarine areas. Contractors will be required to use mufflers or acoustic enclosures for equipment, and to ensure that their workers refrain from disturbing and poaching. To mitigate light pollution on the birds, contractors will be required to use lower wattage flat lens fixtures that direct light down and reduce glare, and avoid use of floodlights. In addition, a biodiversity management plan was developed as part of ESIA and will be implemented targeting important sensitive habitats.

Effluents and Emissions from Dredging Equipment and Associated Vessels: Solid and liquid waste effluents will be generated from the dredgers and associated vessels. The solid waste will be mainly from the kitchen and liquid waste is mainly bilge water. The solid waste and bilge water should be collected and properly disposed after adequate treatment. Noise and air emissions will also be generated by the dredging equipment, which can be minimized regular maintenance of the equipment as per manufacturers specification.

8.5. Environmental Impacts from Construction of Component 2 Works

Impact of Dredging on Aquatic and Benthic Habitat: Dredging will be required for both during construction and maintenance phase of terminals. The impacts related to dredging activities will be similar to the dredging works in Component 1. The impacts from dredging can be minimized by avoiding the sensitive habitats of fish and other important species during their breeding and spawning period. The locations of the sensitive areas are given in ESIA. For example, dredging in Lower Meghna River and estuary should be avoided in the hilsa sanctuaries during the months of March and April, and during 11 days in the hilsa spawning season of Bangla month of Ashwin (5 days before and after the full moon), which usually occurs in the month of October and November. Dredged material from the terminal construction sites will be used for raising of the construction sites above the flood levels. Dredging activities in Buriganga river for Shasanghat and Pangaon terminals will be carried out in high flow season if the sediments are found to be contaminated in low flow season. The dredged material generated from the initial construction activities will be used for raising of the lands to be used for port development.

Impact of Instream Construction Activities in the River on the Aquatic and other Sensitive Habitat: Chandpur terminal is located in hilsa sanctuary and Ashuganj terminal is located near dolphins. Landing stations that are located in hilsa sanctuaries (where the fishing is banned during March and April) are: Hornia, Alubazar, Hornia, Hijla, Moju Chowdhry, Ilisha (Bhola), Beduria, Laharhat, Boddarhat, Daultkha, and Chairman ghat. Some of the landing stations (Sandwip, Tojumuddhin, and Monpura) are located in hilsa spawning areas (fishing is banned during 11 days in the Bangla month of Ashwin). Construction works in the river for terminals such as bank protection works and jetties may generate sediment load in the river and can thereby affect the aquatic habitat and particularly hilsa sanctuaries and spawning grounds. No instream construction and maintenance works of the terminals and landing stations will be carried out during the months of March and April in the hilsa sanctuaries; and 11 days during the Bangla month of Ashwin (5 days before and after the full moon in October/November). Underground noise and vibration levels caused by instream construction activities (such as piling and dredging) may cause disruption to fish migration and disturbance to dolphins, particularly near the Ashuganj terminal. The instream construction works should adopt a 'soft start'; using a low energy start to the piling/dredging operations to give dolphins an opportunity to leave the area, gradually ramp up the sound levels to scare the dolphins and other cetaceans away before

piling/dredging commences. Contractor will also use pingers upstream and downstream to chase away dolphins and other aquatic species from the construction areas.

Air Pollution and Greenhouse Gas Emission from Construction Works: The emissions from construction equipment and activity could deteriorate the ambient air quality and affect public health in densely populated areas and crowded markets around the terminal sites. Dust generated from these activities could also impact crops and livestock. Dust generation will be restricted as much as possible and water sprinkling carried out as appropriate, especially where earthmoving, and excavation are carried out. Emissions from construction equipment and traffic will comply with World Bank EHS guidelines and will be monitored.

Noise Pollution from Construction Works: Noise levels produced by vehicles, machinery, concrete mixing, and other construction activities will exceed the applicable standards. Noise control measures will be implemented near sensitive sites like schools, religious places and markets, and noise levels will be monitored.

Water Pollution: During the construction phase of terminals and landings, bank protection works and instream construction works may cause local increase in water turbidity, but this increase is unlikely to have a significant impact on overall water quality and aquatic fauna primarily because of its temporary and localized nature. Nonetheless, this will be evaluated at a site-specific level for each terminal and landing through the detailed ESIA to be carried out for these facilities during project implementation, and mitigation measures will be fully specified in contractor EMPs if required. Construction camps, offices and warehouses will generate substantial quantities of waste water. Other possible causes of land or water contamination include accidental leakage or spillage of fuels, oils, and other chemicals, and waste effluents from workshops and washing bays. All such discharges to the river will be treated to comply with relevant standards before release.

Soil and Groundwater Contamination: Soils in the construction areas of the ports, vessel shelters and landing stations and nearby agricultural lands will be prone to pollution from construction activities and facilities. Storage sites for fuel and hazardous materials and their handling are also potential sources for soil and water pollution. Leakages and spills of fuels may occur due to accidents (e.g. collisions, groundings, fires), equipment failure (e.g. pipelines, hoses, flanges), or improper operating procedures during fueling. Contractors will be responsible to prepare and implement a pollution management and spill prevention plan. For effluents to be discharged from workshops, camps, and offices, treatment arrangements such as retention ponds and septic tanks will be incorporated in the facility designs.

Generation of Solid Waste and Hazardous Waste: Domestic solid wastes will be generated daily from the construction camps and offices. Most of this waste will be bio-degradable. Small quantities of hazardous waste will also be generated from the vehicle maintenance. It is imperative that such waste is responsibly disposed of. Contractors will be required to prepare and implement a Waste and Pollution Management Plan, including emergency response plan, in accordance with the WB EHS Guidelines and environmental codes of practices (ECoPs).

Site clearance and Restoration: After completion of the construction, contractors will be required to remove all left over construction material, debris, spoil, and other wastes. Camps sites will be completely cleaned and restored in original condition to the extent possible. No waste will be disposed of out in the drainage channels and ponds.

8.6. Impacts from during Operation and Maintenance for both Component 1 and 2

Key impacts associated with ongoing use of the IWT routes, as well as operation and maintenance stage impacts of the river terminals, are outlined below. For the river terminals, these impacts will be assessed in more detail, and management measures fully specified, as part of the full ESIA to be carried out for these subprojects during project implementation, in parallel to the detailed design stage for these facilities. To support appropriate management of impacts and issues related to ongoing use of the IWT routes, various capacity building measures as well as additional studies and pilot initiatives will also be undertaken through the project.

Improved Inland Water Transport: The Project will greatly improve economy of the local communities along the project areas due to improved IWT connectivity and access to national markets. The Project will also greatly improve the bilateral trade of Bangladesh with India and Bhutan.

Air Pollution: During O&M, the sources of air pollution are the combustion emissions from the vessels. These emissions may not be significant on the river nor at the landing stations due limited vessel movements, but will be significant at the cargo and passenger terminals. These emissions will mainly consist of sulfur dioxide, nitrogen oxides, particulate matter and greenhouse gases such as carbon dioxide and carbon monoxide. However, net GHG emissions from IWT will be negative compared to the equivalent mode of land based transport due to the fuel efficiency per ton-km hauled for typical IWT vessels is lower than that of typical trucks and other vehicles on the roads. Land-based operations of the cargo terminals will also generate emissions from vehicles and equipment. Fuel storage facilities and transfer may also release volatile organic compounds. These could be minimized by utilizing cleaner fuels and maintaining the engines, as per the manufacturer's standards, of ships and equipment. Further studies are recommended during project implementation to develop strategy and implement pilot programs (worth USD 2 million) on greening the vessel fleet (including research, outreach, and incentive programs on developing and adopting cleaner technologies such as improvements in vessel engine and propeller design, fuel quality, port operational practices, cargo handling equipment, etc.).

Water Pollution: During operation phase, sources of water and sediment contamination are discharges of untreated waste water from terminal operations, storm water discharge, discharges of waste, runoff from roads which carries contaminated soil and soot particles; runoff from industrial sites (e.g. storm water runoff); spills (land and water), debris thrown overboard from ships. Spillage, leakage and accidents are significant potential sources of contamination, arising either directly from vessels, e.g. fuel oil and lubricants, or from their cargoes. Waste water releases from ships are covered under a separate section. To address the potential issues associated with waste effluents generated by O&M activities, the HSE Plan to be prepared and implemented by the BIWTA will include disposal mechanism for waste effluents as well.

Waste Generation from Ships: The waste generated from ships mainly include inert materials such as food packaging, and food waste. Solid waste is being collected by the ships and are being dumped in to the municipal dust bins located near the terminals. Liquid effluents associated with ships are sewage, bilge water (e.g. from oil tankers), and vessel cleaning wastewater from ships. Ship sewage and wastewater contains high levels of BOD and coliform bacteria, with trace concentrations of constituents such as pharmaceuticals, and typically low pH levels. Wash water may contain residues such as oil. Pollutants in bilge water contain elevated levels of BOD, COD, dissolved solids, oil, and other chemicals that accumulate as the result of routine operations. Presently there are no facilities at the terminals for collection of liquid waste from the ships. The ships usually dispose these wastes in the river. During detailed design of

terminals, adequate reception facilities will be provided at the terminals for receiving ship generated waste. The reception facilities can be fixed, floating or mobile and should be adapted to collect the different types of ship generated waste and cargo residues. The wastes should be adequately disposed or treated, based on the type of waste, in cooperation with the local municipal authorities.

Occupational Health and Safety: Potential issues associated with OHS are physical hazards, chemical hazards, dust and noise. The main sources of physical hazards at ports are associated with cargo handling and use of associated machinery and vehicles. Port workers may be exposed to chemical hazards especially if their work entails direct contact with fuels or chemicals, or depending on the nature of bulk and packaged products transferred in port activities. Work with fuels may present a risk of exposure to volatile organic compounds via inhalation or skin contact during normal use or in the case of spills. Fuels, flammable liquid cargo, and flammable dust may also present a risk of fire and explosions. Sources of dust hazards are exposure to fine particulates is associated with handling of dry cargo (depending on type of cargo handled, e.g. cement, grain, and coal) and from roads. Noise sources in ports may include cargo handling, including vehicular traffic, and loading / unloading containers and ships. During the O&M phase, the BIWTA will be required to implement HSE procedures and its own Emergency Response Plan.

Community Health and Safety: Community Health and Safety: During operation of the cargo terminals, the potential community health and safety issues are risk of accidents with activities associated with cargo handling in the terminals, visual impacts from the illumination of the ports, and traffic activities associated with the port. Other visual concerns from cargo operations are uncontrolled dumping, floating debris, derelict warehouses and broken machinery. During the O&M phase, the BIWTA will be required to implement HSE procedures and prepare its own Emergency Response Plan.

Navigation Safety and Risk of Accidents: Rules dealing with ship safety are generally preventive, designed to improve ship safety standards by reducing the risk of probability of accidents throughout the life cycle of a ship. Though there may be some casualties caused by weather, structural, mechanical or equipment failure, most shipping casualties in Bangladesh, like in other poor countries, are caused by substandard operation. Commercial pressure from owners and operators to return rapid profits is a major factor in all-substandard shipping operations. This more often than not to poor loading, poor stowage and overloading (especially in the peak holiday periods) - the main causes of capsizing and loss. This situation can also be compounded in a price-regulated market where tariffs set by the Government are insufficient to generate reasonable profits. Lack of information and guidance to mariners also impacts negatively on shipping safety. Regular information and guidance is to be provided mariners to improve the shipping safety. Use of radiotelephony, especially VHF, should be introduced to maintain a listening watch on general or distress frequencies. All vessels should be equipped with fog horns and powerful searchlights. A series of measures will be taken up under Component 3 of the Project, which include (i) the development of River Information Systems to improve navigational safety, and provision of a Traffic Monitoring System for passengers and cargo; and (ii) commissioning of a study to propose an institutional structure and reforms needed to develop an effective Search and Rescue organization.

9. Cumulative and Induced Impact Assessment

9.1. Objective

The Government has prioritized the improved development and maintenance of the Class I routes and linked Class II and III routes along the Dhaka-Chittagong IWT corridor. The GoB also has plans for a USD100 billion investment program, Capital Dredging Project, 'in all major rivers for sustainable river management through extensive dredging programs to control river bed siltation and aggradation, reclaim land, and improve inland navigation. The objective of the current cumulative and induced impact assessment (CIIA) is to evaluate the combined effects of proposed and induced developments along the proposed IWT corridor. The most significant valued environmental components (VECs) related to the proposed developments are identified as improved navigation development, aquatic biodiversity, hilsa and dolphin.

9.2. CIIA in Context of the Proposed Project

Study Boundaries: In the context of the proposed Project, the spatial boundaries of CIIA are based on full lengths (300km) of the waterways between Dhaka and Chittagong, the river basins/catchments upstream and downstream of the waterways, floodplain and drainage areas and patterns, areas of potential influence of existing and planned river ports, landings, terminals, vessel shelters, ferry crossings, and dredge spoil dumping locations along the waterways, areas of ecological importance along the waterways, current and planned areas being irrigated by or otherwise using waters from the waterways, roads leading to the spoil disposal sites, etc. According to GoB development plans, inland water transport, third sea port in Tentulia River in Rabnabad channel, construction of embankments and river training works along the bank of major rivers, development of a road network on the embankment, integrated river management program, economic zone and fish processing zone on the proposed corridor, mega power plants and defense training camps are considered as future major developments in next 20 years; and hence these projects are considered for CIIA study

Valued Environmental Components (VECs): The study focus on more relevant valued environmental components (VECs) related to IWT development programs in river basins, viz. (i) Aquatic biodiversity, (ii) dolphin and (iii) hilsa.

9.3. Aquatic Biodiversity

Baseline Conditions and Trend: The Ganges Brahmaputra and Meghna river system and their floodplains are the important source of both capture and culture fresh water fish in Bangladesh. The fish production in these rivers have been continuously decreasing due to changes in river morphology and pollution from the industrial and residential development.

Cumulative Impacts: The dredging and inland land construction activities proposed under the Project will negatively affect the aquatic biodiversity in the Project Rivers. The 'Capital Dredging Project' to improve navigation channels and reclaim land will have similar impacts on the aquatic biodiversity of the Ganges. Dredging will disturb the benthic habitat and the bottom fish feeders that depend on it. Dredged sediments will affect the quality of water and of the river habitat, which will also be at risk from oil spills and disposal of bilge water from barges.

9.4. Dolphin

Baseline and Trends: River dolphins are among the world's most threatened mammal species and Hilsa fish species usually migrate between sea and river and are also an important resource in the Project area. They inhabit some of the largest river systems of southern Asia, and their environmental requirements link them to food and water security issues in the world's most densely populated human environments. Populations of river cetaceans have declined

dramatically in recent years and much of their range has been lost. River cetaceans are threatened in many ways. Overharvesting of fish and crustaceans reduces the availability of their prey. Deforestation and intensive floodplain farming increase the sediment load of river channels and degrade cetacean habitat. Industrial effluents, human sewage, mining waste, and agricultural runoff contaminate water. Dolphins die from accidental entanglement in gill nets, and mortality rates increase as the use of these nets spreads.

The trend for this species is towards a shrinking range, as dolphins are eliminated from smaller tributaries, and a declining population, as animals are killed in fishing gear and directed hunts, and as they compete unsuccessfully with humans for shrinking water and prey resources. Accidental capture in fishing gear is among the most critical threats facing river dolphins. The absence of systematic effort to investigate the problem, however, makes it difficult to quantify its magnitude or to establish priorities for regulating fishing activities. Information on dolphin bycatch is particularly difficult to obtain. In some cases, there is a strong disincentive for fishermen to report by-catch because they can be prosecuted for causing the death of a dolphin. In other cases, fishermen keep the carcass for oil, or sell it or use the carcass or parts of the decomposing dolphin in pile fishing to attract fishes.

Cumulative Impacts: The cumulative impacts on dolphin from the proposed developments will result from the decrease of availability of prey. Very little is known about the effects of vessel traffic on river dolphins and porpoises. Ferry crossings, commercial ports, and primary fishing grounds in rivers are generally located downstream of convergent channels or sharp meanders, which are also the preferred habitat of river dolphins. River dolphins are often observed swimming in areas with high vessel traffic, that includes small boats, motorized ferries, and in some locations large container ships and oil tankers, with no visible damaging effects.

9.5. Hilsa

Baseline and Future Trends: Hilsa (*Tenulosa ilisha*) is one of the flagship diadromous fish species of Bangladesh that migrate only through the Ganges-Meghna river system route. Hilsa is a major cash crop of Bangladesh and the hilsa fishery contributes to about 1% of the national GDP. The confluences of Padma-Meghna and Tetulia River are very significant habitat. It plays an important role as the major nursery and breeding ground of hilsa and many other commercially important riverine fishes. Hence, the Department of Fisheries (DOF) has earmarked sanctuaries for hilsa in the Lower Meghna and associated rivers. Hilsa fishing is banned in the sanctuaries during months of March and April, and also for 11 days in Bangla month of Ashwin (October/November). Due to these conservation efforts, there has been a significant rise in hisla catches during recent years.

Cumulative Impacts: The potential developments in the IWT sector including development of terminals and landing stations may potentially affect the breeding grounds of hilsa due to dredging activities and waste water discharges.

9.6. Mitigation Measures

Mitigation Measures: To address the cumulative impacts associated with future dredging and induced environmental impacts from port development, detailed ecological monitoring will be carried out during implementation of the Project. The project will also support environmental enhancement, including habitat restoration and conservation activities for endangered river dolphins, hilsa, and other aquatic biodiversity, along the project waterways.

10. Environmental Management Plan

10.1. General

Various categories of mitigation measures: The EMP includes the following categories of mitigation measures and plans: (i) generic and non-site-specific measures in the form of environmental codes of practices (ECoPs) presented in Annex 4 of the EMF; (ii) project-specific and site-specific mitigation measures discussed in Chapter 7; (iii) construction environmental action plan (CEAP) requiring site-specific and contract-specific management plans to be prepared by contractors; and (iv) RAP, income and livelihood restoration, gender and public health.

Inclusion of EMP in contract documents: In order to make contractors fully aware of the implications of the EMP and responsible for ensuring compliance, technical specifications in the tender documents will include compliance with mitigation measures applicable to contractors proposed in the EIA and in WBG EHS guidelines. Contractors must be made accountable through contract documents for the obligations regarding the environmental and social components of the project.

Construction Environmental Action Plan: Contractors need to prepare site-specific management plans to address various environmental issues, showing how will comply with the requirements of ECoPs and EMP. Plans will be reviewed and approved by construction supervision consultant (CSC) and project implementation unit (PIU) before implementation of construction works.

10.2. Institutional Arrangements

BIWTA will be the Implementing Agency for the Project. It plans to set up a separate Project Implementation Unit (PIU) at the main office building headed by the Project Director reporting to the Chairman, BIWTA who is also Chair of the Project Implementation Committee (PIC) of BIWTA. The PIC, consisting of members from MoS and other agencies, will be supporting project implementation, monitoring implementation progress, and guide decisions at the implementation level. A Project Steering Committee (PSC) chaired by the Secretary, MoS with members from ERD, Ministry of Finance (MoF), Planning Commission, and BIWTA will be providing high-level guidance and monitoring especially at the policy level, and make decisions on high-value contracts above defined thresholds. The PSC will meet every six months or more often on an as-needed basis. The proposed organizational structure under PIU for implementation of EMP and RPF is shown in Figure 3.

Project Implementation Unit (PIU) would be responsible for all aspects of project implementation including technical, operational and financial management, and overseeing the implementation of EMP. The PIU will be headed by the Project Director (PD). The PIU will include an Environment and Social (E&S) Cell with qualified staff. This E&S Cell will assist the PD on issues related to environmental and social management and oversee the Dredging Supervision Consultant (DSC) for IWT route maintenance and Construction Supervision Consultants (CSC) for terminals and landing stations for environmental and social management, ESIA consultants (for terminals and landings), and the environmental and social aspects of various activities, studies and future project preparation to be carried out under the project. and contractors and will compile quarterly monitoring reports on EMP compliance, to be sent to the Project Director and also shared with the World Bank, throughout the construction period. The E&S Cell, with support from the DSC and CSC, will also provide trainings to the BIWTA field personnel responsible for monitoring of environmental compliance during both construction and O&M phases of the project. In addition, BIWTA will establish a permanent Environmental, Social and Climate Change Unit in its institutional structure, which will ensure the long term

sustainability, climate resilience and climate sensitivity of project investments as well as other activities across the organization.

EIA and SIA Consultants for Component 2: PIU will hire EIA consultants for carrying out EIA studies for Component 2 works in compliance with the GoB and World Bank guidelines following the EMF and RAP. They will be responsible for preparing EMPs for inclusion in the bid documents.

Other study consultants: The Project will also hire several other consultants to carry out studies on: Aid-to-Navigation Monitoring System; training; ESIA studies for component 3, climate change vulnerability assessment; collection of baseline data on biodiversity at sensitive locations, sustainable long-term maintenance of river terminals, landings and other BIWTA assets; techniques to minimize dredging and other maintenance needs through application of river training schemes, and development of proposed pilot activities; and to develop strategy and implement pilot program on greening the vessel fleet.

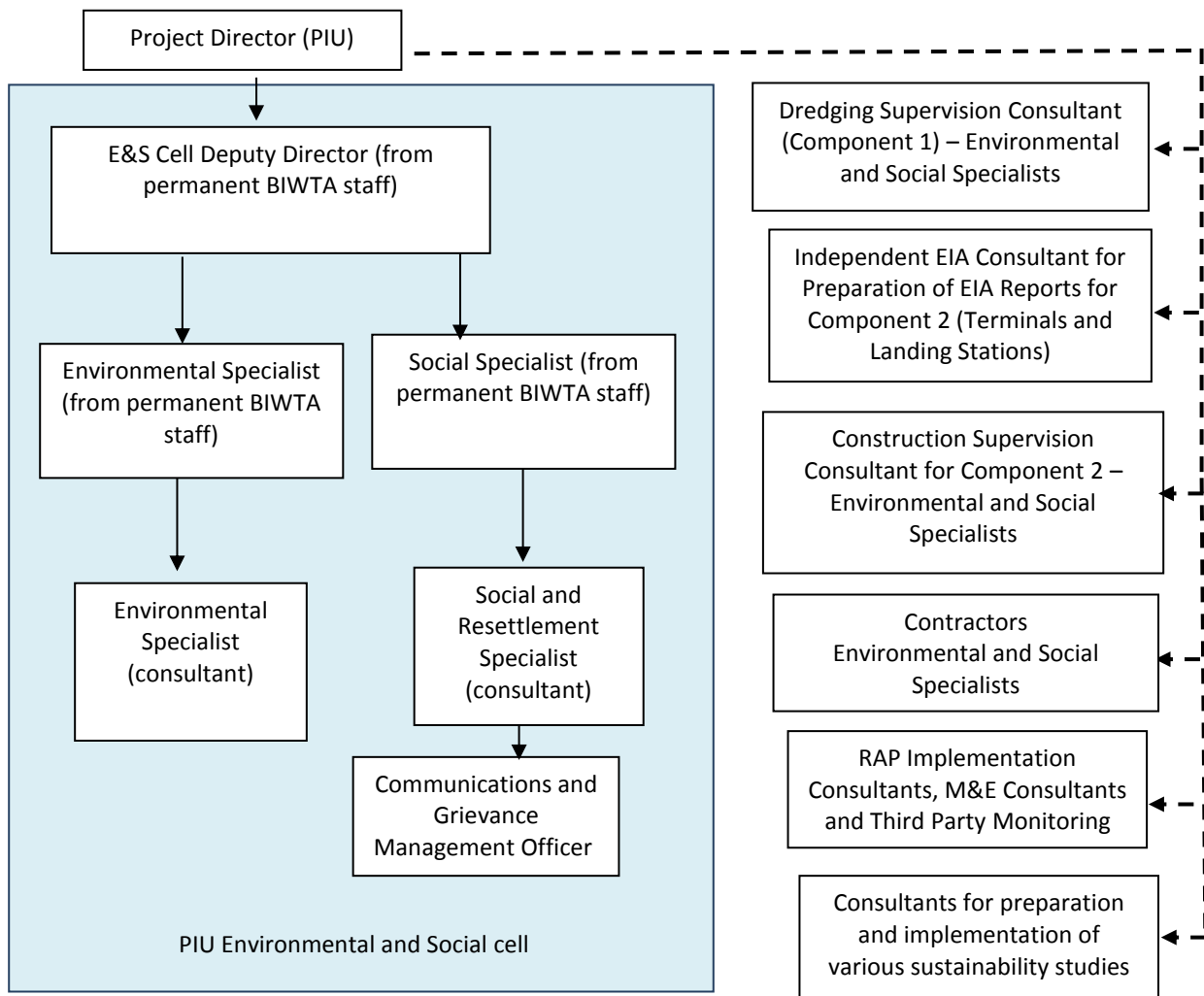


Figure 3: Proposed Institutional Structure for Implementation of the Project

Supervision Consultants will be responsible for supervising the contractors for the implementation of EMP. For this purpose, the DSC and CSC will appoint international and national environmental and social specialists, to ensure the EMP implementation during the project. They will supervise the contractor for the EMP implementation, particularly the mitigation

measures. They will also be responsible for implementing the monitoring of effects of these measures.

Contractors are also required to appoint appropriate number of environmental specialists, occupational health and safety specialists, environmental technicians, and community liaison officers for the implementation of EMP in the field, particularly the mitigation measures. The contractor will also be responsible for communicating with and training of its staff in the environmental/social aspects.

External Monitoring and Evaluation Consultants will be engaged by the PIU to conduct external and independent monitoring and evaluation of the EMP and RAP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S Cell, CSC, and contractors are effectively and adequately fulfilling their designated role for EMP and RAP implementation and that all the EMP and RAP requirements are being implemented in a timely and effective manner.

10.3. Environmental Management

(a) Environmental Codes of Practice

A set of environmental codes of practice (ECoPs) has been prepared for various environmental and social management aspects: ECoP 1: Waste Management; ECoP 2: Fuels and Hazardous Substances Management; ECoP 3: Water Resources Management; ECoP 4: Drainage Management; ECoP 5: Soil Quality Management; ECoP 6: Erosion and Sediment Control; ECoP 7: Top Soil Management; ECoP 8: Topography and Landscaping; ECoP 9: Borrow Areas Management; ECoP 10: Air Quality Management; ECoP 11: Noise and Vibration Management; ECoP 12: Protection of Flora; ECoP 13: Protection of Fauna; ECoP 14: Protection of Fisheries; ECoP 15: Road Transport and Road Traffic Management; ECoP 16: River Transport Management; ECoP 17: Construction Camp Management; ECoP 18: Cultural and Religious Issues; ECoP 19: Workers Health and Safety; and ECoP 20: Dredging Management. The Contractors will be contractually obligated to comply with these ECPs, presented in 'Annex 4' of the EMF.

(b) Site-specific Management Plans

The following site-specific plans will be prepared by the contractors to manage and mitigate/reverse potential adverse environmental impacts and all these plans will be submitted to the DSC/CSC for review and approval before contractor mobilization:

Dredging Management plan will be prepared and implemented by the contractors on the basis of the ECoPs, WBG EHS Guidelines (2007) and the mitigation measures given in Chapter 5. The Plan will describe among others the methodology to be adopted for dredging and dredged material placement and disposal, and documentation to be maintained for the dredging activity. The Plan will be submitted to the DSC/CSC for their review and approval before initiating the sand extraction activity.

Pollution Prevention Plan will be prepared and implemented by the contractors on the basis of the ECoPs and WBG EHS Guidelines (2007) that will be part of the bidding documents. The Plan will be submitted to the DSC/CSC for their review and approval before contractor mobilization.

Waste Disposal and Effluent Management Plan will be prepared and implemented by the Contractor on the basis of the EMP, ECoP, and WBG EHS Guidelines (2007), which will be part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Drinking Water Supply and Sanitation Plan: Separate water supply and sanitation provisions will be needed for the temporary facilities including offices, labor camps and workshops in order not to cause shortages and/or contamination of existing drinking water sources. A Plan will be prepared by the contractors on basis of the EMP and ECoPs, which are part of the bidding documents. The Plan will be submitted to the CSC for their review and approval before contractor mobilization.

Occupational Health and Safety (OHS) Plan will be prepared and implemented by each contractor on the basis of the WBG EHS Guidelines (2007), ECoPs, and other relevant standards. The Plan will be submitted to the DSC/CSC for their review and approval before contractor mobilization.

Traffic Management Plan will be prepared by each contractor (particularly for terminals and landing stations) after discussion with BIWTA and authorities responsible for roads and traffic. The Plan will be submitted to the CSC for their review and approval before contractor mobilization. The Plan will identify the routes to be used by the contractors, procedures for the safety of the local community particularly pedestrians, and monitoring mechanism to avoid traffic congestion.

Construction Camp Management Plan will be prepared by each contractor. The Plan will include the camp layout, details of various facilities including supplies, storage, and disposal. The Plan will be submitted to the DSC/CSC for their review and approval before camp establishment.

Fuel and Hazardous Substances Management Plan will be prepared by each contractor in accordance with the standard operating procedures, relevant guidelines, and where applicable, material safety data sheets (MSDS). The Plan will include the procedures for handling the oils and chemical spills. The Plan will be submitted to the DSC/CSC for their review and approval before contractor mobilization.

An Emergency Preparedness and Response Plan will be prepared by each contractor after assessing potential risks and hazards that could be encountered during construction. The Plan will be submitted to the CSC/BIWTA for their review and approval before contractor mobilization.

(c) Other Environmental Plans

Biodiversity Management Plan: A biodiversity management plan is prepared as part of ESIA to manage impacts on biodiversity from project related interventions. Additional studies will be carried out during early stages of project implementation (a) to collect baseline data on biodiversity at sensitive locations; and (b) to develop and implement biodiversity management programs including habitat enhancement and protection for key species

Dredged Material Management Plan: A dredged material management plan is prepared as part of ESIA. Further studies will be carried out during initial stages of implementation to develop additional plans.

Greening of Vessel Fleet and Ports: Further studies will be carried out during implementation to develop strategy and implement pilot program on greening the vessel fleet, including research, outreach, and incentive programs on developing and adopting cleaner technologies such as improvements in vessel engine and propeller design, fuel quality, port operational practices, cargo handling equipment, etc.

10.4. Monitoring Plan

Proposed monitoring plan to be carried during implementation of the project to ensure contractors compliance with the mitigation measures is given in Table 9 along with the

monitoring indicators and frequency. DSC/CSC will be responsible for supervision of implementation of the plan.

Table 9: Effects Monitoring Plan

Parameter/ Activity	Location	Means of Monitoring	Frequency	Responsible Agency	
				Implemented by	Supervised by
Dredging	At all dredging points	Ecological inspection of the site prior to development	Weekly	Contractor	DSC/CSC
Pb, Cd, Cr, Cu, Zn, Mn, As, Se, Hg, PCBs, POPs, and hydrocarbons	Riverbed sediments at 6 terminals; at 25 sites along dredging routes to be annually selected by DSC	Laboratory analysis of material for screening for metals and oil/grease	Before construction at sites of terminals; on annual basis at beginning of dry season at sites along dredging routes	Contractor through a nationally recognized laboratory	CSC/DSC
Soil Pollution	At terminal, vessel shelter and landing construction sites	Visual inspection that filling is through several compartments	Beginning of earth filling works	Contractor	DSC/CSC
	Construction and material storage sites	Ensure no contaminated effluent is leaving from the filling area to the nearby agricultural lands	Weekly	Contractor	DSC/CSC
Hydrocarbon and chemical storage	Construction camps and yards	Visual Inspection of storage facilities	Monthly	Contractor	DSC/CSC
Traffic Safety	Haul Roads	Visual inspection to see whether proper traffic signs are placed and flag-men for traffic management are engaged	Monthly	Contractor	CSC
Air Quality (dust, smoke)	Construction sites	Visual inspection to ensure good standard equipment is in use and dust suppression measures (e.g., spraying of waters) are in place.	Daily	Contractor	DSC/CSC
	Material storage sites	Visual inspection to ensure dust suppression work plan is being implemented	Monthly	Contractor	CSC

Air quality (PM, CO ₂ , SO _x , NO _x)	Near the terminal sites	24 hours continuous monitoring with the help of appropriate instruments and analyzers	Quarterly during the construction phase	Contractor	CSC
Noise	Construction sites	Noise measurement using noise meter; Ensure work restriction between 21:00-06:00 close to the sensitive locations	Weekly	Contractor	CSC
Water quality (For all drinking water parameters including As, and coliforms)	Locations of tube-well installation installed for each landing station (as applicable)	Depth of tube well should be more than 30m. Test water for arsenic and iron before installing of casing. If the quality is found not suitable further deepening will be done.	During drilling of wells	Contractor through a nationally recognized laboratory	CSC External Monitor
	Water wells to be used by contractors for drinking	Laboratory analysis of all drinking water parameters specified in national standards	After development of wells	Contractor through a nationally recognized laboratory	CSC
Water quality	at 100 m downstream of all the dredging and in-river dredge disposal locations	Spot analysis of suspended solids, turbidity, dissolved oxygen, and pH. Visual inspection on presence of petroleum products	Monthly	Contractor through a nationally recognized laboratory	DSC
Water quality	At discharge points of all on-land dredge disposal facilities	Sampling and analysis of pH, Temperature, Turbidity, TSS, TDS, EC, DO, BOD, TOC, Ca, Mg, Na, K, F, Cl, Br, SO ₄ , NO ₃ , PO ₄	Quarterly	Contractor through a nationally recognized laboratory	DSC
Waste Management	Construction camps and construction sites	Visual inspection that solid waste is disposed at designated site	Monthly	Contractor	DSC/CSC
Drinking water and sanitation	Camps, offices	Ensure the construction workers are provided with safe water and sanitation facilities in the site	Weekly	Contractor	CSC
Flora and Fauna	Sensitive habitats in Project influence area	Survey and comparison with baseline environment Ensure use of lighting at construction sites conforms with requirements to limit impacts to wildlife	Six-monthly	BIWTA through biodiversity consultant, Contractor	CSC/DSC, M&E Consultant, BIWTA

Cultural and archeological Sites	At all work sites	Visual observation for chance finds	Daily	Contractor	CSC, M&E Consultant, BIWTA
Restoration of Work Sites	All Work Sites	Visual Inspection	After completion of all works	Contractor	CSC, M&E Consultant, BIWTA
Safety of workers Monitoring and reporting accidents	At work sites	Usage of Personal Protective equipment and implementation of contractor OHS plan	Monthly	Contractor	CSC, M&E Consultant, BIWTA
Grievances	In the project area	Number of grievances registered and addressed; analysis by type of grievance and type of stakeholder	Monthly	PIU	DSC/CSC, M&E Consultant, BIWTA
During Operation and Maintenance					
Cleanliness	At all terminal sites	Visual Inspection	Monthly	Terminal Administration Offices	BIWTA
Waste effluents	Along the terminal sites	Visual inspection that solid and liquid waste effluents are properly managed during maintenance works	Six-monthly	Terminal Administration Offices	BIWTA
Waste reception facilities	At the terminal sites	Visual inspection that waste collection facilities are in use	Six-monthly	Terminal Administration Offices	BIWTA
Workers and community health and safety	At all terminal sites	Visual inspection on health and safety issues	Six-monthly	Terminal Administration Offices	BIWTA
Water Quality	At all terminal sites	Sampling and analysis	Six-monthly	BIWTA through a nationally recognised laboratory	BIWTA
Accidents	At all terminal sites	Visual assessment and Interviews with involved people	As and when happened	Terminal Administration Offices	BIWTA

10.5. Capacity Building

The environmental and social trainings will help to ensure that the requirements of the EMP are clearly understood and followed by all project personnel. The primary responsibility of providing these trainings to all project personnel will be that of the contractor and Supervision Consultants. The trainings will be provided to different professional groups separately such as managers, skilled personnel, unskilled labors, and camp staff.

10.6. External Monitoring

The BIWTA will engage an Independent Monitoring & Evaluation Consultant to conduct external and independent monitoring and evaluation of the EMP implementation. The main purpose of the external monitoring will be to ensure that all the key entities including E&S Cell, CSC, and contractors are effectively and adequately fulfilling their designated role for EMP implementation and that all the EMP requirements are being implemented in a timely and effective manner.

10.7. Reporting

The E&S Cell with assistance from DSC, CSCs, independent and third-party monitors, and contractors will produce environmental, health and safety monitoring reports which will be submitted quarterly during the performance based IWT maintenance contract period for Component 1, the construction period for Component 2, and annually for three years after completion of IWT maintenance and/or construction. One year after completion of construction, the E&S Cell will submit a Project Completion Environmental Monitoring Report which will summarize the overall environmental impacts from the Project. The External monitors will submit the quarterly reports throughout the contract time, impact evaluation report at the end of each year and finally a completion Report at the end of contract period.

SECTION C – Social Assessment and Resettlement Policy Framework

11. Social Assessment and RPF

This Social Assessment is a macro level assessment and not a site specific one.

11.1. Brief Socio-Economic Baseline.

Demography: The Project influence area falls in to 10 districts and 17 upazilas (sub-districts). The districts covered under the Project area are: Dhaka, Kishoreganj, Narsingdi, Brahman Baria, Chandpur, Laksmipur, Noakhali, Bhola, Chittagong and Barisal. The 17 upazilas covered under the Project are: Bhairab, Roypura, Ashuganj, Keraniganj, Chandpur Sadar, Haimchar, Matlab South, Matlab North, Laksmipur Sadar, Hatiya, Bhola Sadar, Doulatkhan, Tojumuddin, Monpura, Sandwip, Barisal Sadar and Dhaka Metropolitan. The total population of all 17 upazilas is 14 million and the average population density is 1,382 persons per km² (comparatively above the Bangladesh average of 1,200 persons/km²). The average household size is 4.72.

Income and Occupation: Based on socio-economic surveys of 585 households in the Project area. It is estimated that nearly 15 percent of all households have an income below the Bangladesh poverty line of 6,367 BDT (about 80 USD) per month. Nearly 60 percent households have an income around 10,000 BDT (USD 120) per month. Major income sources in the Project area are agriculture, business, fishing (7%) and day labour (2.41%). About 9 percent of surveyed people are unemployed and unemployment is a major problem for rural communities, especially for women and young people.

Education: The overall education level in the project area is low. Literacy rate is under 50 percent in eight Upazilas of the project area. These are under Bhola, Noakhali, Narsingdi and Kishoreganj districts. Literacy rate is over fifty percent in Dhaka, Ashuganj, Keraniganj, Chandpur Sadar, Matlab South, Matlab North, Laksmipur Sadar and Sandwip Upazila. Education level of the surveyed population is lower than that of the advanced area of Bangladesh. Only 0.45% of the sampled population have post graduate degree and 1.49% of the people have graduation degree. An university is located in Barisal sadar Upazila. Otherwise there are no any higher education facilities in remaining Upazilas in the project area. More than 25% of the people have finished Grade 4. Among the total population male are more educated than female as there is religious and social obstacles in free movement of the female students. Dropout rate is also very high for female students.

Landuse: Land use pattern adjacent to the river route has different scenarios for rural and urban sites. Terminals are established in urban or semi urban areas that have developed the Ghat areas as commercial centers of the region with shops and markets. These terminals generate sources of livelihoods for thousands of households. On the contrary, the terminals in rural regions with minimal transportation facilities are mostly surrounded by fallow land, cultivable land, ponds, ditches and canals. For example, Doulotkhan (Bhola), Sandwip, Tojumuddin, Laharhat, etc. have fewer shops and commercial entities compared to other terminals. Almost 65% of the private lands around the Ferry Ghats a Launch Ghats are found to be used for agricultural production. Majority of the titleholders use their land for commercial purposes. Majority of the non-titleholders are using GoB land for business and other purposes.

Health Services: All the villages have access to rural dispensary, community clinics and welfare centers, but bigger facilities are available only in the towns. Absence of doctors and lack of facilities are common problems in the public health sectors especially in the rural settings. Most of the people of project area have their health facilities and service within 1-5 kilometers. The journey to the nearest district hospital that can manage more severe cases and illnesses becomes often a challenge for these communities who lack resources for transportation and need to rely on a debilitating road system. In case of normal diseases almost 74-95 percent household consult a pharmacy or Rural Medical Practitioners, which are in reality medicine shops/service providers in the informal sector found at any Bazar. On the other hand, in critical condition 76-87 percent household go to the government hospital.

Agriculture: The floodplain areas are traditionally fertile land with fine-grained alluvium deposits, but their productivity is limited due to the depth of flood water during the monsoon. Along the river routes from Dhaka to Chittagong most of the areas are now being used for commercial purposes. Some of the areas nearer to the project routes, such as Comilla, South Matlab are fertile areas with high yield rates. Local aman rice, potato, vegetables, water melon, corn, gram pulse, chili, and some other Robi crops are hugely produced in this area. South Matlab was mostly vulnerable to flood damage before implementation of Meghna Dhonagoda Irrigation Project (MDIP). The farmers were very poor and under threat of migration from their locality due to lack of livelihood support. At present the farmers are mostly cultivating High Yielding Varieties (HYV) of Transplanted Aman and HYV Boro rice instead of local low yield varieties. Similarly the production per unit area of other popular crops increased in the Comilla, Chandpur, and Noakhali districts. Farmers use large amount of chemical fertilizers as of other areas of the country.

Gender Issues: Similar to many other regions of this lower middle income country, the efforts of women in socio-economic development and wellbeing of their family and surroundings is rather unrecognized. The sample population in this assessment study has been chosen mostly from river terminals and bordering shops and business centers, where majority are male employers or workers. However, among the total household (HH) population of the survey, 45% were female. The study findings indicate that the project sites offer minimal opportunities to women. In addition to that, the study also reveals that decision making role of women in the HH is negligible with only 1.03% households being headed by women.

11.2. Social impacts from Construction Activities

Most of the terminals are on GoB land, but proposed launch terminal facilities will require approximately 3 ha of land. The proposed six vessel shelters are planned to be constructed on public land to avoid any negative impacts on the population near project sites. At most of the project locations, land belongs to BIWTA. This land is used for common purposes such as Ghats for boats, by the nearby communities. There are Persons without title to the land on the BIWTA land with shop and residences. Places of worship are built on BIWTA Land. BIWTA has built shops and leased them to shop keepers. This will lead to loss of livelihoods. At some locations access to common property resources such as burial grounds will get restricted due to the present interventions. At some locations access granted to cultural practices such as immersion of ashes of the dead in rivers at certain ghats, will be impacted. Further access infrastructure such as roads will cause impacts as the present roads are narrow and they need to be widened for optimizing the capacity of the facilities built. As per the ESIA, there are no small ethnic communities; indigenous people, at the project locations. The key social impacts due to project interventions are Land acquisition and subsequent resettlement, Loss of Livelihoods, Inconvenience and nuisance during construction, Loss of access to common property resources and Likely increase in transport costs. For each of these sub-projects an RAP will be prepared, where required during the planning and design stage.

Land acquisition and resettlement: The project will follow World Bank Operational Policy 4.12 and GoB policy to avoid, minimize and mitigate any adverse land acquisition and resettlement impacts to the communities to be affected by the project. Land acquisition and resettlement will likely be required for all the proposed terminals, landing stations and vessel shelters. For the terminal sites, all activities will be carried out in BIWTA land but resettlement of squatters are required. The squatters will face both physical displacement and economic displacement at the proposed terminal locations. As a mitigation measure compensation for structures at replacement cost and other cash allowances as livelihood assistance is provided for these squatters. For vessel shelters, about 2.1 ha land acquisition will be required. The loss of land and structures will be compensated by replacement value based on current market prices and standing crops. Other resettlement benefits associated with structure, trees, business, wage, share cropping, crops, fish stock, etc. will also be paid. Vulnerable and female-headed households will receive special assistance. Resettlement Action Plan (RAP) will be prepared for all the sites following the guidelines given in the RPF.

Impact on livelihood sources: Construction of terminals and landing stations will negatively affect the livelihood of the squatters and the nearby business owners. Some agriculture land also will be affected due to land acquisition. Livelihood and restoration programs including skill development will need to be proposed in RAP. However, the construction of the proposed facilities, particularly landing stations will greatly improve the livelihoods of the rural business community as thousands of shops are located around the ferry ghats and landing stations.

Impacts on Places of Religious Significance: Though there are no identified PCRs located in the Project area which would likely be directly affected or displaced by proposed works, the development of ports at Shasanghat and Pangaon will affect the access to a Muslim graveyard and a Hindu ashes immersion point. Alternative access will need to be provided to these locations. In addition, 'chance find' procedures will be included in the EMPs for all works contracts.

Impact on Community Facilities: The potential impacts of the project on the community could include relocation, air quality deterioration, noise, and safety hazards. The construction activities can potentially damage the existing public and private infrastructures such as local roads, foot paths, and boat jetties. For noise, air quality, and safety hazard, the contractors will be required to ensure that activities in the vicinity of the sensitive receptors such as schools are carried out in a manner so as to minimize these risks (e.g., carrying out the construction activities after the school time). The construction site will be fenced near such places to minimize safety hazards. Safety signage will be placed and coordination will be maintained with the facility management as well as with the community to minimize the risks. Finally, any complaints of related to project impacts on the sensitive receptors will be addressed through a grievance redress mechanism.

Occupational Health and Safety: Construction activities may pose health and safety hazards to the workers at site during use of hazardous substances, lifting and handling of heavy equipment, operating machinery and electrical equipment, working near water or at height and more Inappropriate handling or accidental spillage/leakage of these substances can potentially lead to safety and health hazards for the construction workers as well as the local community. The contractor will prepare and implement Health, Safety and Environment (HSE) plan in compliance with WB EHS guidelines and ECoPs.

Community Health and Safety: During the construction phase, the population living in close proximity to the construction area, the construction workforce and individuals drawn to the area in search of income opportunities will all be exposed to a number of temporary risks such as safety hazards associated with the construction activities and vehicular movement, exposure to dust, noise, pollution, infectious disease, and various hazards, including potential conflict with "outsiders" to the project influence area about employment and income. The influx and

accommodation of a large work force will result in increased concerns for the health and safety of local population, including the spreading of sexually transmitted diseases such as HIV/AIDS. Contractor's HSE plan will also include measures and protocols to protect the nearby community against the risk of accidents and mishaps. In addition, the HSE plan will also include emergency response procedures to be followed in case any accident does take place.

Social Impacts of Dredged Material. All the dredged material will be disposed off into the river/ estuary and/ or in scour holes and there will not be any disposal on land. No agriculture land will be used for permanent or temporary filling up of the areas. If temporary filling is required, only government owned khas lands will be used or will be directly sold to the willing sand buyers. For any on land disposal, there will be written agreement with individuals/communities requesting this facility.

(d) Resettlement Policy Framework (RPF)

The primary objective of the RPF is to provide guidelines for preparing Resettlement Action Plans/Abbreviated Resettlement Action Plans. The other objectives of the RPF are to i) Ensure the principles of Social Justice is adhered to at all times, ii) Avoid or minimize any negative impacts on the communities, iii) If land is required for project facilities, then same may be purchased under Willing Buyer-Willing Seller norm, iv) Assist affected population in improving their living standards, income earning capacity, and production levels, etc., v) Encourage and enable community participation in planning and implementing project components vi) Provide assistance to affected communities in redressing their grievances, and vii) to address issues related to land acquisition and related impacts. The RPF addresses social issues such as Land Procurement, Community Engagement, Special Attention to Women and Other Vulnerable Groups and Grievance Redressal.

BIWTA will use the following principles to minimize adverse impacts on affected persons and their community:

- Avoid or minimize acquisition of private lands and use as much public land as possible;
- Avoid or minimize displacement of people from homesteads, land valued higher in terms of productivity and uses, buildings/structures that are used for permanent business and/or commercial activities;
- Avoid or minimize displacement of people from homesteads, land valued higher in terms of productivity and uses, buildings/structures that are used for permanent business and/or commercial activities, dislocation of squatters/encroachers; and impacts on community facilities, such as educational institutions, places of worship, cemeteries, etc., and buildings/structures that are socially and historically important.
- Where the portion of a plot remaining after acquisition becomes economically unviable, the landowner will have the option to offer the entire plot for acquisition.
- The policy principles adopted are inclusive and cover both titled and non-titled persons. The affected without title will also be entitled for resettlement benefits.

The RPF provides the following options for land procurement:

Buying Land – Willing Buyer and Willing Seller: Under the willing buyer and willing seller norm, suitable land is identified by BIWTA. After this, BIWTA representative will approach the land owner and obtain his/her consent. The willing sellers convey their readiness to sell the land in writing to BIWTA. The rate agreed will be on par with the existing market rate acceptable to both; and then the transaction is affected. The entire process of consultation, negotiation, agreement, transfer of land documents will be recorded by the BIWTA and will be available for review by the World Bank.

Land Acquisition: When land needs to be acquired as per the Act, BIWTA produces Land Acquisition Proposal (LAP) to DCs with Administrative Approval from the Ministry of inland water transport on the acquisition. After a feasibility study of the acquisition and other necessary procedures the land is acquired. Upon approval of the LAPs, BIWTA field office makes the payment to affected persons.

Compensation Payment Norms: BIWTA will ensure that the properties (land, structure, and non-structured assets) to be affected by the project will be compensated at their full replacement cost determined by a legally constituted Resettlement Sub-committee (RSC) as per structure and mandated outlined in the RAP. The payment of compensation and other assistance, target replacement of productive assets and restoration of loss of income and workdays by the relocated households, especially the vulnerable households will be ensured by this committee. Compensation and other cash assistance will be paid through bank bills (cheques) payable to Bank accounts opened by the affected persons eligible for compensation and assistance under RAP. The Bank account will be in the joint name of husband and wife as the case may be.

Regardless of their tenure status to the lands used for project component, the project affected persons/ households will be eligible for compensation and assistance except for compensation for land where a title of ownership would be required. All PAPs irrespective of their title will be entitled to compensation and assistance based on loss and impact categories identified through census survey in respect of the policy guidelines adopted for the project. Nevertheless, eligibility to receive compensation and other assistance will be limited by the cut-off date. The absence of legal title will not bar PAPs from compensation and assistance, as specified in the entitlement matrices. An Entitlement Matrix has been prepared for the project on the basis of field study and consultation with government officials as a part of preparing the resettlement policy framework. A person could be eligible for compensation/entitlement in more than one category of losses and in more than one mouza. DCs will pay CCL for each mauza separately for one person whose lands/assets have been acquired in more than one mauza.

Entitlement Matrix: An Entitlement Matrix has been prepared for the project on the basis of field study and consultation with all stakeholders including affected people, government officials as a part of preparing the resettlement policy framework. A person could be eligible for compensation/ entitlement in more than one category of losses. DCs will pay CCL separately for each person whose lands/ assets have been acquired. The other elements of the RPF are norms and guidelines for a) Community Engagement, b) Stakeholder Participation, and c) Special Attention to Women and Other Vulnerable Groups. The Entitlement Matrix is annexed to this executive summary.

The implementation of this RFP and RAP will be supervised by BIWTA and its representatives through a Supervision and Monitoring Evaluation Audit Learning (MEAL) protocol, Quarterly Monitoring and Evaluation and Bi-Annual Social Audit and Learning.

Communication Strategy: A formal communication strategy has been prepared for the project laying out various communication needs and outreach tools and explaining the responsibility of PIU to convey the project impacts and its implications for various stakeholders. A key aspect of this strategy shall be the communication of any project related impacts.

Community Engagement, Stakeholder participation and Vulnerable groups

BIWTA will ensure the engagement of target communities through continued consultations for planning and full community management of implementation and monitoring of sub-project

activities. Consultations will be held at regular intervals with target communities, GS/ GP members, Women, etc.

BIWTA recognizes the fact that affected communities are primary and key stakeholders of the project. Hence, the BIWTA would ensure that these stakeholders are consulted on issues and they participate in all the sub-project activities including planning and implementation. The BIWTA would address the legitimate concerns of community members and provide opportunities and avenues for consultation and their participation. In order to provide a sense of ownership and ensure sustainability, the community members would be a part of the decision making process. The project has a commitment for community participation in each of the sub-projects taken up.

The vulnerable groups include Women Headed Households, Destitutes, Below Poverty Line families, Old Aged, Differently Aged, Chronically Ill, Orphans and minority Groups. It is envisaged that in the course of conducting Social Assessment and preparing and implementing Resettlement Action Plans, interests of these vulnerable groups would be adequately addressed and protected.

11.3. Grievance Redress Mechanism

BIWTA will establish a project level Grievance Redress Mechanism (GRM) which will be implemented by Project Implementation Unit (PIU) under leadership of BIWTA Secretary who will oversee the grievance management. GRM will be implemented in two phases: 1) Phase 1 to support safeguards implementation, 2) Phase two of GRM will cover all components and overall project implementation. A formal grievance redress process for phase two will be outlined in the project's operational manual and a protocol will be set up and distributed to project staff and implementers. The project level protocol will build on existing institutional grievance management system which will be automated and include a toll free helpline service. It is envisaged that the Project Implementing Unit (PIU) will have a dedicated person who can oversee the preparation of the guidelines and rollout of the project GRM.

11.4. Institutional Arrangements

BIWTA will arrange for RPF/ RAP/ ARAP implementation and monitoring mechanism. The Project Implementation Unit (PIU) will have a Environmental and Social Cell in the PIU. At overall project level all RPF/ RAP/ ARAP oversight will be ensured by BIWTA. A Joint Director of BIWTA will head the Environmental and Social Cell of BIWTA. Two Deputy Directors, one each in charge for Environment and Social aspects of the project. The Deputy Director Social will be assisted by a Senior Land Acquisition and Resettlement Specialist and two other consultants each in charge for Community Engagement and Gender. The Supervision Consultants and Contractors will have Environmental and Social Specialists to supervise and implement RAP/ARAP provisions. NGOs will be commissioned for implementation of RAPs/ ARAPs. M&E Consultants will do the quarterly monitoring and mid-term and end-term impact evaluation and assessments. The E&S Cell will also provide trainings to the BIWTA field personnel. In addition, BIWTA will establish a permanent Environmental, Social and Climate Change Unit in its institutional structure, which will ensure that institutionalizing social safeguard measures to address adverse impacts, community engagement and prepare and implement socially inclusive investments. Proposed Institutional Structure for Implementation of the Project is shown in Figure 3.

EIA and SIA Consultants for Component 2: PIU will hire EIA and SIA consultants for carrying out EIA and SIA studies for Component 2 works in compliance with the GoB and World Bank guidelines following the EMF, RPF and RAP.

11.5. Monitoring and Reporting

An M&E Consultants will be commissioned to conduct quarterly monitoring and evaluation and report to BIWTA. The quarterly monitoring and evaluation will be done by these consultants. They will visit about an appropriate percentage of all category sub-projects, as decided by BIWTA. They will prepare appropriate formats for monitoring. BIWTA will send quarterly Monitoring Reports on RPF compliance to The World Bank. The M&E Consultants will conduct mid-term and end-term evaluation of RAPF/ RAP/ ARPA implementation. There is a need to internalize the Social Safeguards Management processes at all levels, as these cannot be treated as stand-alone and parallel functions any more. This internalization of social processes helps in better implementing the safeguards provisions, provided the capacity of implanting supervising agencies is adequately built in Safeguards Management.

SECTION D – Consultation and Budget

12. Stakeholder Consultations and Disclosure

12.1. Overview

Extensive consultations were carried out by both social and environmental study teams during the project preparation. Initial consultations, including a national level workshop in Dhaka, were held during September and October 2015 to share the project objectives and terms of references of the proposed Environmental and Social Assessment studies for the project (e.g., ESIA, EMF and RPF). Additional consultations were carried out during December 2015 with the communities at the anticipated dredging locations for planning of dredged material disposal. Consultations involved multiple methods – for example, key informant interviews, village wise meetings, focus group discussions and workshops. Details of participants consulted are given in Table 10 and they include (i) affected communities and population around the project area, (ii) farmers, fishing community, passengers using launch, disabled persons, business men, day labour, women (iii) national and local government authorities responsible for district administration, rural development, agriculture, fisheries, wildlife and environmental protection, and (iv) nongovernmental organizations. First round of public consultations were held in November 2015 to disclose the results of EIA and seek feedback from stakeholders. Newspaper advertisements and invitations were sent to relevant stakeholders before carrying out public consultations. Second round of public consultations were held through a national level workshop in Dhaka on 30th March 2016.

Table 10: Number of Persons Covered in Various Consultation Meetings

	Activities	No. of participants
1.	Individual household meetings (through questionnaire surveys of 585 households)	2,793
2.	Village meetings (31 meetings)	877
3.	Focus group discussions (29 meetings)	296
4.	National Consultation Workshop (at Dhaka on 14 Oct 2015)	127
5.	Public Consultations (at Ashuganj and Barisal on 17 th and 18 th November 2015, respectively)	106
6.	Pubic Consultatons at Dhaka on 30 th March 2016	114
Total		4,313

12.2. Consultations Feedback

A summary of main issues raised by various stakeholders and how these issues are addressed and incorporated are shown in Table 11.

Table 11: Key Issues Raised and Plans to Address the Issues

Stakeholders Type	List of concerned raised	Responses and mitigation measures under the Project – Summary
Shopkeepers	Shopkeepers opined in favor of the project but they want to see the launch ghat	Toilets and drinking water facilities will be included in the

	improved with more facilities such as toilets, sufficient space for shops on a designated area so that they will be bound to shift their structure frequently. They expressed that the project will increase their business opportunities and new venture of business will be open after completion of the project.	design of launch ghats and river terminals. The designs of terminals will also include shops and while leasing out these shops, priority will be given to the affected communities.
Physically Disabled	There is no special facility for the disabled people in the launch terminals and water vessels. But they want separate place in ghat and launch terminals for their easy movement. Wheel chair and bed facilities are available only for patients and for emergency situation. There are no doctors permanently on duty. Disabled persons want proper safety and security in terminal and launch as well. Disable persons do not know the facilities about river transports. Most of the people think that road transport is easier than river transport especially for the disables persons as they cannot swim. They want separate space/seat for them in the launch/ferry and easy riding facility such as smooth way, wheel chairs, etc. If such facilities are provided for the disable people, then they may comfortably use the river transport.	Ramps will be provided at the terminals for embark and disembark of disabled people. Other aspects will be explored in full in the detailed ESIA and design studies to be carried out during project implementation.
Fishermen	Fishermen communities are mostly living along the river or within one km from the river. They want modern signalling system and safety and security during fishing. Some time they are to face trouble from pirates or even some politically influenced persons who made them bound to pay money for fishing. They welcomed the project but requested to keep in mind about fish moving routes, season and fishing areas during dredging so that their livelihoods will not be disturbed.	Navigational signals will be provided along the navigational channels. Spawning areas of fish, migratory routes and commercial areas for fishing will be avoided for dredging and dredge material placement.
Launch and Ferry Workers	Launch and ferry workers expressed their views in favour of the project. They are concern about dredging and signalling system in the river routes as there are some incidents of collision among the water vessels. Improved signalling system may decrease accidents. They want sufficient personal protective equipment (PPE) for their safety in the launch and other water vessels. PPE can also be available for the passengers.	Safety measures are included in the project planning and such as provision of river information, VHF equipment and search lights.
Women	Female particularly housewives of the project routes move here and there by launch along with husband or even only with children for their needs. Safety and security, separate space for them in the launch terminals and vessels, separate ticket	Separate ticket counters, waiting rooms and toilets will be provided at the women passengers near the terminals. Separate toilets will also be provided at the landing stations. Specific design features

	counter, etc. are their needs.	to maximize women's needs, comfort and safety in using IWT will be studied in more depth during the detailed design and ESIA stage for river terminals and landings, as well as through a study to develop a gender action plan for the IWT sector, to be carried out during project implementation.
Mobile Vendors	Usually mobile vendors deal in the ferry/ launch ghats as well as in water vessels. They always move from one ghat to another and sell their goods. They need safety and security in the ghats as well as in the transport. Sometime they face trouble by the policemen and guard of the ghats and vessels	BIWTA will need to provide licenses to the mobile vendors. During the Project implementation, the social consultants will assist BIWTA in identifying these vendors and support their licensing process. .

12.3. Cost of Environmental and Social Management

The total cost for the environmental and social management and monitoring activities has been estimated to be USD 14.9 million (Table 12). Of this amount, USD 5.55 million has been included under Component 3 of the project (see Table 3); the remaining amount of USD 9.35 million is included in other project components, as shown in Table 12. The total administrative budget for RFP/RAP/ARAP implementation under this project has been worked out as US\$. 3.8 Million.

Table 12: Cost Estimates for Environmental Management and Monitoring of the Project

	Description	Amount, million USD	Project Component (See Table 5)
1.	Contractor's Budget (for development and implementation of management plans, staff, training, etc.)	1.0	Component 1: IWT
2.	Sediment, water, soil, air and noise quality monitoring during construction (quarterly for 6 years)	0.5	
3.	DSC Environmental and Social Staff	1.0	
4.	CSC Environmental and Social Staff	1.0	Component 2: Terminals
5.	Contractor's Budget (for development and implementation of management plans, staff, training, etc.)	1.5	
6.	Sediment, water, soil, air and noise quality monitoring during construction (quarterly for 6 years)	0.5	
7.	Administrative budget for RPF activities	3.8	Component 3: Institutional Capacity Development and Sustainability
8.	Study, development of action plan, and capacity building of BIWTA to ensure effective and sustainable long-term maintenance of river terminals, landings and other BIWTA assets. Origin destination survey of inland waterways along Dhaka-Chittagong corridor, including understanding which supply chains to promote, and logistics gaps for development	0.5 0.35	
9.	Social NGO to support BIWTA on implementation of Social Management Plans / RAPs for specific investments	0.2	
10.	Third party M&E consultant for social safeguards (including midterm and ex-post evaluations of RAP implementation)	0.25	
11.	Third party M&E consultant for environmental safeguards	0.25	
12.	Environmental NGO or firm to: (a) carry out additional baseline data collection on biodiversity at sensitive locations; and (b) develop and implement biodiversity management programs including habitat enhancement and protection for key species	0.5	
13.	Study to develop strategy and implement pilot program on greening the vessel fleet (including research, outreach, and incentive programs on developing and adopting cleaner technologies such as improvements in vessel engine and propeller design, fuel quality, port operational practices, cargo handling equipment, etc.)	2.0	
14.	PMU Environmental staff	1.5	
	TOTAL	14.9	

12.4. Disclosure

The ESIA of Component 1, EMF reports for Components 2 and 3 and RPF for the whole project have been disclosed in the BIWTA website, and hard copies of the reports have been made available in the BIWTA offices at the existing terminals. The Executive Summary of the Environmental and Social Assessment for the Project (this document) has been translated in to Bengali and also has been disclosed in BIWTA website. Hard copies of Bengali version of the Executive Summary have been made available at all the BIWTA terminal sites and local sub-district offices. The documents have also been disclosed on World Bank infoshop.

Annex 1: Entitlement Matrix

Entitled Person	Entitlement	Application Guidelines	Responsibility
A.1 : Loss of Agricultural Land			
<ul style="list-style-type: none"> • Legal owner(s), as determined by DC • Co-sharers of the acquired land 	<ul style="list-style-type: none"> • Cash Compensation at replacement value under Law (CCL), which includes 50% premium • Compensation for standing crops • Other compensation and benefits as per LA law 	<ul style="list-style-type: none"> • Market prices of land determined by the DC. • One month's advance notice to be issued in time to harvest standing crops. 	<ul style="list-style-type: none"> • BIWTA is responsible for overall execution and coordination, • DC will pay CCL to all legal owners • BIWTA to inform PAPs of RAP policies, assist in updating records, etc.
A.2 : Loss of Homestead Land			
<ul style="list-style-type: none"> • Legal owner • Co-sharers 	<ul style="list-style-type: none"> • Cash Compensation at replacement value under Law (CCL), which includes 50% premium on current market price. • Rental allowance (RA) 	<ul style="list-style-type: none"> • Market prices of land • Rental Allowance 	Same as A.1
A.3: Loss of Ponds and Fish Stock			
<ul style="list-style-type: none"> • Legal owner of the pond to get cash compensation at replacement value for land area, • While Persons without title to the land to get compensation for fish stock. 	<ul style="list-style-type: none"> • Cash Compensation at replacement value under law (CCL), which includes 50% premium including cost of land and digging. • If the pond is under lease compensation from DC as per lease conditions. 	<ul style="list-style-type: none"> • Market price for pond. • If the fishpond is on public land or on vested land and under lease from GoB, the PAP is entitled to compensation for existing fish stock at current market price as per law. 	<ul style="list-style-type: none"> • DC will pay CCL to all legal owners, genuine lease holders and those with the legal evidence of interest in the lands. DC will determine CCL of fish stock and market price of pond with assistance from concerned departments.
A-4: Loss of Houses/Structures Used for Living & Commercial Activities			
<ul style="list-style-type: none"> • Legal owner as determined by DC 	<ul style="list-style-type: none"> • Cash Compensation at replacement value under law (CCL), which includes 50% premium. 	<ul style="list-style-type: none"> • Legal Owners: Applies to all houses/structures standing on the acquired private lands at the time of issuance of Notice-3. 	<ul style="list-style-type: none"> • DC will pay CCL for structures to all legal owners, • DC will determine CCL
A-5: Loss of Trees, Bamboo and Banana Groves			

<ul style="list-style-type: none"> • Legal owners as determined by DC • People with valid lease • Groups sponsored by public agencies/ NGOs.³ 	<ul style="list-style-type: none"> • Timber trees and bamboos: Current market value. • Fruit-bearing trees (without timber value): • Banana groves • Trees grown under public/NGO sponsored program: 	<ul style="list-style-type: none"> • Estimated market value of different species of trees as per LA law, based on categorization as per Divisional Forest Office. • Where ownership is in group, compensation will not be paid for land to any individual or the sponsoring agency, but market value of trees will be paid to group members as per their share. 	<ul style="list-style-type: none"> • DC will determine market price of trees • BIWTA to inform PAPs of RAP policies, assist in updating records, • DC will determine CCL based on price provided by Forest Department.
A-6: Loss of Standing Crops			
Cultivator (person who planted the crop) whether owner, lease holder, tenant, sharecropper, etc.	<ul style="list-style-type: none"> • Compensation for standing crops • Cultivator will retain the crops and plants. 	<ul style="list-style-type: none"> • Estimated market value at harvest, to be determined by DC • Advance notice to be issued in time to harvest the standing crop. 	<ul style="list-style-type: none"> • DC will determine market price of crops with assistance from Department of Agriculture Extension and Marketing Department at district level
B: ADDITIONAL COMPENSATION/GRANTS			
B.1 Loss of Agricultural Land			
<ul style="list-style-type: none"> • Legal owner(s), as determined by DC • Co-sharers/ to be determined by title deeds/records by DCs. <p>Current owners and users of vested property (land) or without lease (to be identified by the PAVC during survey).</p>	<ul style="list-style-type: none"> • Top-up payment on CCL to reach Replacement Cost, where applicable. • Transition allowance (TA) for two crops @ BDT 300/dec/ crops • Rental allowance for vested non- resident (VNR) property (without lease) equivalent to DC's rate fixed for legally leased VNR. 	<ul style="list-style-type: none"> • Current market prices of land determined by the PAVC • Replacement Cost includes current market price (CMP) plus stamp duty and registration cost for titling. @ 10 % of CMP • One month's advance notice • Top-up will be paid by BIWTA and calculated when CCL is less than Replacement Cost. • TA will be paid to a person losing any quantity of productive land area @ BDT 300 per decimal/crop for two times 	<ul style="list-style-type: none"> • BIWTA is responsible for overall execution and coordination • DC will pay CCL to all legal owners, and those with the legal evidence of interest in the lands. • BIWTA will determine Replacement Cost with assistance from the projects' Property Assessment and Valuation Committee and the RAP Implementing Agency
B.2 : Loss of Homestead Land			

³NGOs or public agencies enter into contracts with groups of community peoples under the Social Forestry Rules 2004 (revised March 2010) for social forestation on slopes of flood embankments, roads, railway embankment, riversides or any other public spaces. These groups are not owner of the land but get a share of the revenues from the planted trees (sale of logs and residues) as they are also responsible to nurse the trees under the contract.

<ul style="list-style-type: none"> • Legal owner(s), as determined by DC • Co-sharers to be determined by title deeds to be determined by DC • Current owners and users of vested property (land) without lease 	<ul style="list-style-type: none"> • Top-up payment on CCL to reach Replacement Cost, where applicable. • Homestead development allowance (HDA) for title holders and Persons without title to the land • Restoration of pre-acquisition level basic utilities (water supply, sanitation, electricity, etc.). • Rental allowance (RA) for comparable living accommodations to owner users of lands 	<ul style="list-style-type: none"> • Current market prices of land determined by the PAVC to be the basis for determining Replacement Cost and top-up payment. • Replacement Cost includes current market price and stamp duty & registration cost for titling @ 10% of CMP. • Top-up will be paid by BIWTA • Homestead Development Allowance (HDA) for titled holder @ BDT 20,000 for each HH and for Persons without title to the land it is BDT 50 per square feet of floor area of affected primary structure • Rental Allowance (RA) will be paid to owner users of vested property without lease. 	<ul style="list-style-type: none"> • BIWTA is responsible for overall execution and coordination, ensuring GOB's support and timely financial disbursements. • DC will pay CCL to all legal owners • DC will determine CCL and BIWTA will determine Replacement Cost with assistance from the projects' Property Assessment and Valuation Committee.
<p>B.3: Loss of Ponds and Fish Stock</p>			
<p>Legal owner of the pond to get compensation for land area, while Persons without title to the land to get compensation for fish stock.</p>	<ul style="list-style-type: none"> • Top-up payment on CCL to reach Replacement Cost • Market price of fish stock (PFS) and PAPs are allowed to harvest and take away the fish stock. 	<ul style="list-style-type: none"> • If the fishpond is on public land or on vested land and not under lease from GoB, the PAP is entitled to compensation for existing fish stock at current market price 	<ul style="list-style-type: none"> • BIWTA is responsible for overall execution and coordination, ensuring GOB's support and timely financial disbursements. • BIWTA will determine current market price of fish stock and Replacement Cost of pond with assistance from the PWD.
<p>B.4: Loss of Houses/Structures Used for Living & Commercial Activities</p>			
<ul style="list-style-type: none"> • Legal owner as determined by DC 	<ul style="list-style-type: none"> • Top-up payment on ODC's CCL to reach the replacement cost • Structure Transfer Grant (STG) • House Construction Grant (HCG) • All house/structure owners are permitted to take away the salvageable building materials free of cost • Vulnerable and female headed households will 	<ul style="list-style-type: none"> • Legal Owners: Applies to all houses/structures standing on the acquired private lands at the time of issuance of Notice-3. • Persons without title to the land will be paid compensation (replacement cost) for all structures built on public lands • Shiftable Structure - Structure transfer grant (STG) for shiftable structures will be @ 10% (ten percent) 	<ul style="list-style-type: none"> • BIWTA to inform PAPs of RAP policies, assist in updating records, pay Top-up, HCG, STG, HDA and SGB, and monitor and report progress on RAP implementation. • BIWTA will determine Replacement Cost of structures with

	<p>get special cash assistance.</p> <ul style="list-style-type: none"> • Homestead development allowance (HDA) for land development • All house/ structure owners are permitted to retain the salvageable building materials. 	<p>of the replacement cost of structures and House construction grant (HCG) @ 10% (ten percent) of the replacement cost of structures;</p> <ul style="list-style-type: none"> • Non-Shiftable Structure - STG only for non-shiftable structures @ 10% of replacement cost of the structure. • Vulnerable households ; Physically handicapped and old aged household head) will be eligible for one-time cash assistance @ BDT 5,000 (five thousand). • Women headed vulnerable households without adult male members to shoulder household responsibilities will get additional one-time cash assistance of BDT 5,000 (five thousand). • Small mobile structures on wooden or bamboo legs (poles not fixed on ground) which can be shifted without dismantling (structures on legs) are not eligible for compensation (small pan-bidi shops, groceries, tea stalls, etc.) but will be assisted in finding alternative location and given Structure Transfer Grant (STG) to cover any damage and cost of shifting @ 10% (ten percent) of the replacement cost of structures. • Tenants of residential or commercial premises will be eligible for shifting grant of BDT 5000 (five thousand) for shifting of belongings and one month rental allowance @ BDT 3000 (three thousand). 	<p>assistance from the PWD.</p>
<ul style="list-style-type: none"> • Non-titled persons and Persons without title to the land those own houses/structures built on public lands (shops and residences) 	<ul style="list-style-type: none"> • Replacement cost of structures determined by PAVC. • Structure transfer grants (STG) and House construction grant (HCG) for houses/structures. • Structure transfer grant (STG) for shifting of temporary structures on legs. • Eligible for plot of 4.00 decimal at CCL value in 	<ul style="list-style-type: none"> • Same as above 	<ul style="list-style-type: none"> • Same as above

	<ul style="list-style-type: none"> the RS if they desire so. • Homestead development allowance (HDA) for land development • Vulnerable and female headed households will get special cash assistance. • All house/structure owners are permitted to retain the salvageable building materials. 		
• Tenants	Same as above	Same as above	• Same as above
• B.5: Loss of Trees, Bamboo and Banana Groves			
<ul style="list-style-type: none"> • Legal owners Socially recognized owners, such as Persons without title to the land • People with valid lease from GOB agencies. • Groups sponsored by public agencies/ NGOs.⁴ 	<ul style="list-style-type: none"> • Top up payment (if any) on DC's CCL for timber trees, bamboo, fruit bearing trees (with timber), etc. and 30% of timber value in case of fruit bearing trees. • Banana groves: Top up payment on DC's CCL estimated for one time crop of each grown-up tree on private land or current market value planted on government land (not covered by DC). • Trees grown under public/NGO sponsored program 	<ul style="list-style-type: none"> • Estimated market value of different species of trees, based on categorization as per Divisional Forest Office. • Value of fruits for the grown up (big and medium) trees will be calculated as 30% of timber value for one year. • Where ownership is in group, compensation will not be paid to any individual or the sponsoring agency. 	<ul style="list-style-type: none"> • BIWTA to inform PAPs of RAP policies, assist in updating records, pay market price Top-up, HCG, TRG, and CS, and monitor and report progress on RAP implementation. • DC will determine CCL and BIWTA will determine Replacement Cost of structures with assistance from the projects' Property Assessment and Valuation Committee
B 6: Loss of Standing Crops			
<ul style="list-style-type: none"> • Cultivator whether owner, lease holder, tenant, sharecropper, etc. (formal or informal arrangements) identified by PAVC. 	<ul style="list-style-type: none"> • Top up payment (if any) on DC's CCL for legal owner and market price of crops planted on GoB land by local people • Cultivator will retain the crops and plants. 	<ul style="list-style-type: none"> • Estimated market value at harvest, to be determined by PAVC. • Advance notice to be issued in time to harvest the standing crop. 	• Same as above
B.7 Loss of Community Properties			
<ul style="list-style-type: none"> • Community/ Managing Committee of the affected Community properties constructed on Private/ Wakf or Government including access to 	<ul style="list-style-type: none"> • Top-up payment on DC's CCL to reach the Replacement Cost or Replacement Cost in case of non-payment by DC. 	<ul style="list-style-type: none"> • Project Authority and consultant will consult the Community including Managing Committee to finalize relocation site of the new community structure 	<ul style="list-style-type: none"> • BIWTA to inform PAPs of RAP policies, assist in updating records, pay Top-up, STG, HCG, and monitor

⁴ NGOs or public agencies enter into contracts with groups of community peoples under the Social Forestry Rules 2004 (revised March 2010) for social forestation on slopes of flood embankments, roads, railway embankment, riversides or any other public spaces. These groups are not owner of the land but get a share of the revenues from the planted trees (sale of logs and residues) as they are also responsible to nurse the trees under the contract.

graveyards and immersion points	<ul style="list-style-type: none"> • Structure Transfer Grant (STG) • House Construction Grant (HCG). 	<ul style="list-style-type: none"> • Community structure will be better or at least similar to the previous one if it is constructed by the project. • If the structure is constructed by the managing committee, the project will ensure monitoring during construction. • In case on mosque, the affected one cannot be demolished until new one is constructed • In case of graveyards and immersion points, the project design will make sure access is provided. 	<p>and report progress on RAP implementation.</p> <ul style="list-style-type: none"> • BIWTA will determine Replacement Cost of structures with assistance from the projects' Property Assessment and Valuation Committee and the INGO
C. OTHER RESETTLEMENT BENEFITS			
C.1: Loss of Business Income from Displaced Commercial Premises			
<ul style="list-style-type: none"> • Business operators in the affected permanent premises (title-holders and vulnerable Persons without title to the land without titles; whether owning or renting premises) <p>Owner of the rented-out premises situated on private and public lands</p>	<ul style="list-style-type: none"> • Compensation for loss of business/ trading income. • Cash assistance for 30 (thirty) days • Cash assistance for 60 (sixty) days net income for Permanently relocated business • Compensation for loss of rental income from rented-out premises on the right of way. 	<ul style="list-style-type: none"> • Compensation for loss of permanent loss of business income for large-scale⁵ business premises based on average daily net income but not over 1000 (one thousand) per day for 45 (forty five) days as determined by PAVC. • Compensation for loss of permanent loss of business income for small and medium business premises based on average daily net income but not over BDT 500 (five hundred) per day for 60 (sixty) days as determined by PAVC. • Partially and temporarily affected business owners will receive compensation for the number of days needed to repair and/or reopen the businesses not exceeding 30 (thirty) days @ daily net income but not over BDT 500 (five hundred)/day. • Three months' rent to owner of the rented out premises on private land, as determined by PAVC. 	<ul style="list-style-type: none"> • DC may determine compensation for loss of business income based on onsite verification jointly with BIWTA or only consider business structures. • BIWTA will determine average net daily income from affected businesses with assistance from the projects' Property Assessment and Valuation Committee and the IA and based on findings will determine compensation for loss of business/rental income. • BIWTA to inform PAPs of RAP policies assists in updating records, pay Top-up or market price, and monitor and report progress on RAP

⁵ Business premises operating large business such as industry, wholesale depot, etc. and having Income Tax certificate

			implementation.
C 2: Temporary Loss of Income (Wage Labors in affected shops)			
<ul style="list-style-type: none"> • Adult persons employed continuously for at least six months in businesses displaced from private and public lands. 	<ul style="list-style-type: none"> • Grant to cover temporary loss of income (GTL) from wage employment 	<ul style="list-style-type: none"> • Length of employment to be counted backward from the cut-off date. • GTL will be equivalent to 30 days wage at the rate of daily wage at current market price not over BDT 300/day determined by PAVC. 	<ul style="list-style-type: none"> • BIWTA will determine average daily wage rate in the project area with assistance from the projects' Property Assessment and Valuation Committee and the IA and based on findings will determine compensation for loss of wage.
<ul style="list-style-type: none"> • Women and other Vulnerable persons 	<ul style="list-style-type: none"> • Additional allowance of 30% over and above the entitlements • Women will be actively considered and will get employment opportunities in created by project and as specified in RPF. 	<ul style="list-style-type: none"> • RPF guidelines for women and other vulnerables 	<ul style="list-style-type: none"> • BIWTA Environment and Social Cell