



Urban Development Directorate

Interim Report

Strategic Environmental Assessment

Preparation of Payra-Kuakata Comprehensive Plan focusing Eco-tourism



November 2022

CEGIS

Center for Environmental and Geographic Information Services

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Strategic Environmental Assessment

**Preparation of Payra- Kuakata Comprehensive Plan
focusing Eco-Tourism**

Acknowledgements

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There is some overlap in the description of the background, approach, methodology and some of the baseline content in this report, with the January 2020 "Strategic Environmental Assessment of South West Region of Bangladesh for Conserving the Outstanding Universal Value of the Sundarbans". Also, the team that conducted that SEA is much the same as the team conducting this SEA, with the exception of Dr Barry Dalal Clayton, who was the Team Leader for the 2020 SEA. Some text in this scoping report has been sourced from the 2020 SEA.

Grateful thanks are especially due to all stakeholders, organisations and individuals who have provided perspectives, information, advice and support, and participated in video-based meetings to discuss key issues as well as the approach and focus of the SEA.

Authorship of Report

This report was compiled by the assistance of Peter Tarr (SEA Team Leader) and the SEA research team of CEGIS (Appendix D).

Transparency Statement

This Scoping Report and all other reports prepared during the SEA process are intended as open access documents for sharing with all stakeholders, all those who have participated in the SEA process, and any other interested individuals or organisations. All documents are made available at the earliest opportunity to download on the SEA website to be established.

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Abbreviation and Acronyms

CIA	Cumulative impact assessment
CITES	Convention on International Trade in Endangered Species
DIA	Direct Influence Area
EIA	Environmental Impact Assessment
ESMF	Environmental and Social Management Framework
GIS	Geographical Information System
IIA	Indirect Influence Area
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unregulated, Unreported
KBA	Key Biodiversity Areas
PKCP	Payra- Kuakata Comprehensive Plan focusing on Eco-Tourism
PFS	Pre-Feasibility Study
RAP	Resettlement Action Plan
SAP	Strategic Action Plan
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Program
SoP	Series of Projects
ToR	Terms of Reference
UDD-GoB	Urban Development Directorate of the Government of Bangladesh
UNFCCC	United National Framework Convention on Climate Change
VEC	Valued ecosystem component

Bengali Terms

Baor	Oxbow lake
Beel	Wetland depression
Chingri	Shrimp
Haor	A bowl- or saucer-shaped shallow wetland depression. During monsoon, haors receive surface runoff water from rivers and canals to become vast stretches of turbulen water. They turn into a vast inland seas within which the villages appear as islands.
Jalmahal	Physically defined state-owned waterbodies for which the fishing rights are auctioned out by government
Khas	Government-owned fallow land
Upazila	Sub-district

Executive Summary

The objective of this SEA is to “weigh and recommend environmentally-optimal regional land-use planning guidelines for coastal regions”. The Terms of Reference state that “the present malaise is assessed, as regards inefficiencies, non-suitability, non-sustainability, enhancing factors of environmental degradation, and potentially destructive consequences of current land-use alteration”. It is expected that the SEA will result in guidance for addressing key environmental and socio-economic concerns during land-use planning decision-making.

The overall goal of the PKCP is to lead the development or redevelopment of Patharghata Upazila in order to enhance the residents' socioeconomic circumstances through the following broad objectives:

- Enhancing biodiversity and aesthetic beauty through the planned introduction of indigenous plants along development sites.
- Assessing hydro-geological properties to identify spatial distribution of quality and quantity of water considering seasonal variation and high recharge area considering interaction between surface and ground water source.
- Exploring geomorphological, geological, engineering geological, and geophysical properties (shear wave velocity) of the surface and subsurface condition of the study area to rank suitable sites for physical development and to prepare risk sensitive landuse plan.
- Protecting local people's sustenance and integrating the community into the mainstream development process of the country through improved transportation and communication system.

Patharghata Upazilla has the Haringhata Eco-tourism site and wildlife sanctuary. There are no major development activities in this area and there is potential for additional areas to be developed as tourist destinations with proper infrastructure. It anticipates that local entrepreneurs can be aided in promoting ecotourism. Small family cottages for isolation, as well as group cottages for group tourism, might be developed using locally sourced construction materials.

During this scoping phase the team has attempted to define the project boundaries in terms of direct and indirect influence areas (DIAs and IIAs), but we expect to have a better understanding of the likely Series of Projects (SoPs) that will be undertaken. We understand that some of the SoPs will essentially be an upgrade/rehabilitation of existing infrastructure/systems in a brownfield sites, whilst others might be “brand new”.

It is understood that the spatial boundary of SEA would consider the Kuakata-Patuakhali Regional Plan Area which was defined taking the Upazila administrative boundary of the potential interventions into consideration. Therefore, the study area would include the seven Upazilas- Patharghata, Barguna Sodor, Amtali, Taltoli, Galachipa, Kalapara, and Rangabali. It would thus include the footprint of the structural and strategic interventions, the Area of Influence (direct and indirect influence area) and the control area (Figure E1). It would cover the both mainland areas and the estuarine chars of the Patuakhali-Kuakata region.

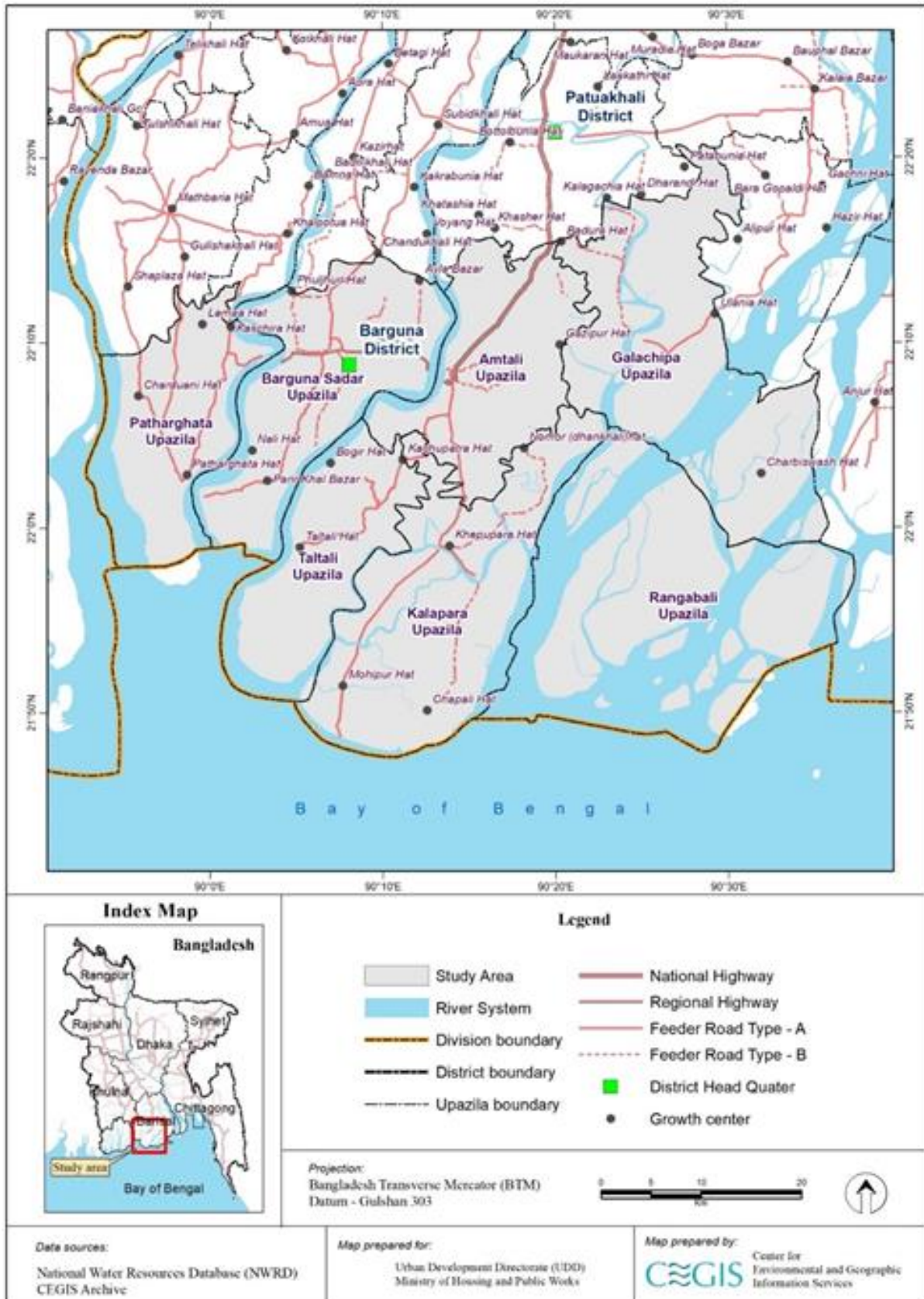


Figure E1: The SEA Area of Focus

Chapter 1 is an introduction which describes the objectives of the SEA, outlines the role of SEA and the main steps involved. It includes a flowchart that sets out the overall process and shows how each step is a building block for later steps.

Chapter 2 sets out the aims of the scoping phase (the focus of this report). The main components of scoping have included:

- undertaking stakeholder analysis;
- preparing 13 thematic baseline papers and identifying the key environmental, social and economic issues and concerns on which the SEA will focus. These thematic papers have already been delivered as a 600 page report, but a summary thereof has been included in this Scoping Report;
- reviewing the legal, regulatory and relevant institutional framework of Bangladesh;
- identifying key environmental and socio-economic concerns in the study area – to be used during the main assessment phase.

The 2018 Inception Report on Socio-Economic & other related Survey under “Preparation of Payra-Kuakata Comprehensive Plan focusing on Eco-Tourism (PKCP)”, provided an initial overview of key environmental and, to a lesser extent, social concerns. These are summarized below.

Table E1: Key Environmental Concerns

Environmental issues and concerns	Comment /examples of potential impacts
1. Pollution & waste (solid & liquid): <ul style="list-style-type: none"> • Surface water pollution. Brackish and sea water • Groundwater pollution • Air pollution • Oil • Waste treatment and disposal • Plastics 	Pollution & waste management is a major concern for the ecological integrity of Bangladesh due to various and increasing developmental initiatives.
2. Water flow dynamics in rivers	Reduction of water flow in rivers may change the region’s economic sustainability/integrity as well as livelihood patterns and crop production.
3. Sedimentation and siltation (fluvial and tidal) <ul style="list-style-type: none"> • Dredging and disposal 	Sedimentation and siltation management is a challenge to maintain river flows. Disposed dredged materials can affect the regeneration of trees & survival of existing forests as well as benthic aquatic biodiversity.
4. Salinity: <ul style="list-style-type: none"> • Groundwater • Soil 	Due to reduced flow of upstream fresh water and channel siltation, and resultant sea water intrusion/inundation, soil and groundwater salinity has increased and soil productivity has decreased as well as livelihood diversity
5. Noise - particularly due to shipping in the rivers, especially in Rabanabad Channel	Noise from the regular movement of ships (notably along major rivers of the project area) can disrupt wildlife movement, cause localisation of populations and result in inbreeding.
6. Habitat isolation	Increased numbers of vessels passing along the navigable channels, the noise they cause and use of lights at night may also disrupt the

Environmental issues and concerns	Comment /examples of potential impacts
	dispersal of fauna. These factors tend to disturb animal behaviour (eg feeding, breeding) and may lead to genetic isolation and also threaten effective biodiversity conservation.
7. Loss of biodiversity	Some environmental as well as regional & local activities may affect biodiversity, with loss of keystone species and their prey base due to poaching and habitat degradation as a result anthropogenic activity. Biodiversity losses may also occur due to climate change and natural dynamic changes in the ecosystem.
8. Invasive alien species	Water hyacinth has become a major problem, clogging baors and ponds, and some water channels. <i>Prosopis Juliflora</i> is also spreading on embankments although it is used as a fuelwood by local people. At present, however, forest managers are concerned about their potential future spread and impacts.
9. River bank erosion – due to port expansion and boats	River bank erosion is a particular concern in the project area due to bow waves from the increased numbers of fast-moving ships and due to river bed siltation, formation of new islands and changed river courses, as well as increasing sea water inflow in this area.
10. Climate change <ul style="list-style-type: none"> • Sea level rise • Salt water intrusion • Erratic rainfall & distribution • Increased average temperatures • Cyclones & storm surges • Greenhouse gas emissions 	<ul style="list-style-type: none"> • Sea level rise is a global threat that will impact on the region. • Many factors have reduced river flow in the region, decreasing flushing time, with increased periods of saltwater exposure. • Shifting of monsoon with erratic rainfall has impacted on the cropping season and pattern. • There is no evidence of significant increased temperatures yet, but climate models predict a significant increase in the future. • Cyclones making landfall impact on livelihoods (killing people and causing damage). Cyclone frequency has decreased but may rise in the future. • Rapid industrialisation and urbanisation is likely to lead to increased carbon dioxide emissions from power and energy sector (including transport). Expansion of flood-irrigated paddy rice has increased methane emissions.
11. Exceptional floods (with potentially damaging water levels): <ul style="list-style-type: none"> • Freshwater floods (due to rain) upstream • Tidal • Poor drainage infrastructure 	Freshwater flooding may occur due to: heavy rain in the upstream/catchment areas of this area, lack of drainage infrastructure and high tidal flow.
12. Industrialisation: <ul style="list-style-type: none"> • Power generation – oil, gas, coal • Pipelines • Petroleum • Cement • Special economic zones 	Industrialization of the inland parts of this area can create air & water pollution as well as other potential impacts on biodiversity & livelihoods of the region. Hilsa fish breeding ground is facing threats.
13. Urbanization	Rapid urbanization as well as in the environmentally critical area can affect the extent of air & water pollution and agricultural productivity etc.

Environmental issues and concerns	Comment /examples of potential impacts
14. Land use changes	Land use changes are arising due to population & economic growth of this area, e.g. shrimp cultivation, infrastructures & urbanization, etc. Impacts of this include loss of biodiversity, reduced soil productivity and loss of livelihood opportunities.
15. Livelihoods: <ul style="list-style-type: none"> • Conflicts between economic sectors • Access to resources (e.g. in Sundarbans) • Salinity 	<ul style="list-style-type: none"> • Salinity intrusion causes conflicts, e.g.: shrimp cultivators vs crop producers; powerful/rich land controller's vs the powerless, smallholder and marginalized people, etc. • Access by forest-dependent people to forest resources (to support their livelihood options) is limited so as to prevent exploitation and to maintain a sustainable flow of resources. • Causes health problems (e.g. skin conditions), reduces drinking water quality – impairing people's ability to work, and affects crop production, etc.
16. Out-migration	Both involuntary and economic out-migration (mainly poor people) is common in this area. Much is driven by disasters, indebtedness, dispossession/land grabbing, lack of livelihood options, etc. Poor people move to unhealthy urban slums and become further marginalised in an uneven job market. Some educated people move to urban areas /overseas for employment. Migrant remittances can supplement family incomes and contribute national economy.
17. Health & sanitation: <ul style="list-style-type: none"> • Water-borne, respiratory & salinity-related diseases • Diet • Negative health impacts of air pollution (mainly pollution by particulate matter) • Inadequate health facilities and access • Arsenic contamination (of drinking water & irrigated rice) 	<ul style="list-style-type: none"> • Local people, especially children and elderly people, are particularly susceptible to water-borne, respiratory and salinity-related skin diseases. • Poor diet causes malnutrition. • The dominant way of cooking causes indoor air pollution which has a serious impact on human health. • Health service providers are based in city/urban and peri-urban areas. They are not easily accessible by people and/or emergency patients living in remote areas, due to poor communication networks. • Inadequate public toilets in urban and semi urban areas. As a result, local people, especially women face problems during public gatherings and at local markets. • This is a serious issue in parts of the Ganges River floodplain and the northern part of the tidal floodplain.
18. Gender-related issues	Women face socio-political exclusion in decision-making processes - both in the home and society. They also bear a heavy burden for collecting potable water, Women often encounter security problem while travelling alone to/from remote areas.
18. Education: <ul style="list-style-type: none"> • Low environmental awareness • High male dropout 	<ul style="list-style-type: none"> • Males from poor households need to support family income, resulting in high drop out and/or lower attendance at school. • Poor communication network in the rural area often discourages school attendance.
19. Loss of traditional knowledge	Technological advancement & other development activities may be causing loss of traditional knowledge.
20. Loss of cultural heritage	Inadequate maintenance & negligence due to low revenue return, inadequate budget allocation, etc.
21. Security – kidnapping of	Kidnapping of forest produce extractors for ransom is an important

Environmental issues and concerns	Comment /examples of potential impacts
resource extractors	issue for the management of the forest.
22. Seasonal tourism	Uncontrolled tourism causes loss of biodiversity, disruptive noise and water pollution etc.
23. Illegal activities: <ul style="list-style-type: none"> • Poaching and hunting • Poison fishing • Illegal tree cutting • Trafficking of wildlife products • Corruption 	These issues are of major concern in this area, causing loss of habitat and biodiversity (terrestrial & aquatic) & economic loss for communities.
24. Institutional issues	Inadequate manpower, capacity development & logistics impede environmental management (In general).

This chapter shows that there is a well-developed environmental and social safeguards framework in place in Bangladesh, particularly the environmental impact assessment system. Whilst a growing number of countries in the region that have introduced formal requirements for SEA, Bangladesh currently has no legal or institutional framework for SEA, although the National Environment Policy 2018 sets an objective to establish SEA in Bangladesh. However, some SEAs have been conducted with donor assistance and several SEA-related initiatives have been undertaken or are underway. This chapter also summarises the international conventions, agreements and protocols that have been ratified by Bangladesh.

Chapter 3 describes phase 2 of the process, namely “full SEA”. The engagement of the public and effective stakeholder consultation is an extremely important part of this SEA; it promotes a sense of ownership and trust. Our approach to Public Participation, consultation and disclosure takes into consideration the IFC’s Good Practice Handbook.¹ We already engaged with stakeholders during scoping and will continue engaging during the full SEA phase. This chapter also explains how the team will construct scenarios and assess cumulative impacts. With that understanding, the team will be in a position to propose alternatives and mitigation options.

Chapter 4 describes phase 3 of the process, namely finalizing the SEA report and compiling the Strategic Environmental Management Plan (SEMP). The SEMP will make recommendations for how existing and likely future development projects or activities might need to be adjusted/ revised to minimize/ mitigate potential negative environmental and/or socio-economic impacts, and enhance likely positive outcomes.

¹ ‘Stakeholder Engagement: Good Practice Handbook for Companies Doing Business in Emerging Markets’
http://www.ifc.org/wps/wcm/connect/938f1a0048855805beacfe6a6515bb18/IFC_StakeholderEngagement.pdf?MOD=AJPERES
 IFC, 2007

1. Introduction

1.1 Strategic Environmental Assessment

Strategic Environmental Assessment (SEA) is “a framework to assess the environmental and social implications of development policies, plans and programmes (PPPs) (OECD, 2012). Also, SEA is increasingly used in a geographical area where there is no specific PPP, but rather an incremental increase in developments and resultant cumulative impacts.

Where a SEA is done early and where there is good integration between it and plan-making process, SEA has proven to be effective as “a plan shaper” (that helps make PPPs more sustainable), but may also be regarded as a “fine tuner”.

According to the OECD DAC Guidelines, development assistance is increasingly being provided through strategic-level interventions, aimed to make aid more effective. To ensure environmental² considerations are taken into account by donors and developers, established environmental assessment (EA) tools at the project level need to be complemented by approaches fully adapted to policies, plans and programmes. SEA meets this need.

From our experience, we have learnt that SEA requires a flexible and iterative process. There is no template of procedures and methodologies such as those available in the application of project-level EIA. The methodology varies according to the purpose of the SEA. However, there is a growing set of evolving principles and criteria, which typically includes a range of analytical and participatory approaches. These aim to integrate environmental considerations into PPPs and evaluate the inter linkages with economic, social and other considerations. SEA can be described as a family of approaches, which uses a variety of tools, rather than a single, fixed and prescriptive methodology.

Thus, we believe a good SEA is adapted and tailor-made to the context in which it is applied. This can be thought of as a continuum of increasing integration: at one end of the continuum, the principle aim is to integrate environment, alongside economic, social and other concerns, into strategic decision making; at the other end, the emphasis is on the full integration of the environmental, social and other factors into a holistic sustainability assessment.

SEA is not a substitute for, but complements, EIA and other assessment approaches and tools (Figure 1.1 and 1.2).

² The term “environment” is defined broadly to include the ecological, social, health and other components of the environment, and their interactions with each other.

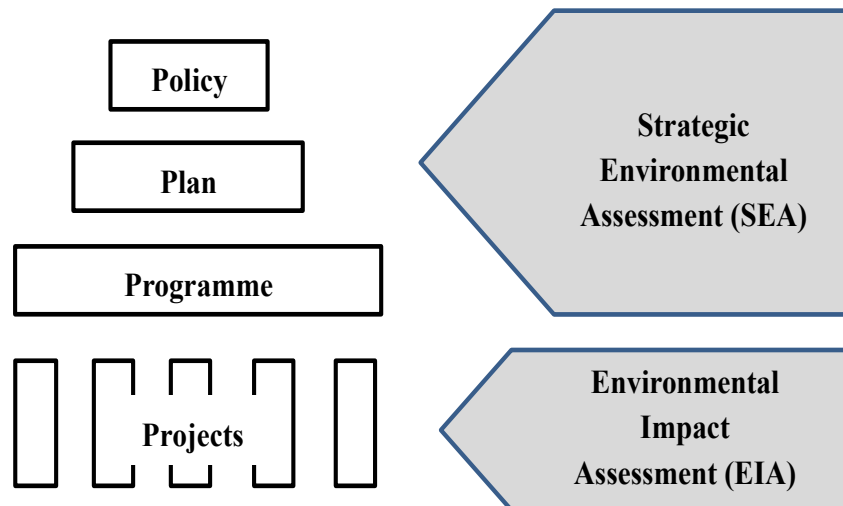


Figure 1.1: Hierarchy of Common Environmental Safeguard Tools (SEA and EIA)

Used in this way, SEA has an important role in informing the planning process and helping to deliver more sustainable development outcomes. It will indicate whether the key long-term focuses of envisaged PPPs, and the goals set for them, can be driven forward in a way that balances the different pillars of sustainability; and to indicate whether there are likely synergies that would deliver sustainable development objectives more effectively.

The diagram below shows the linkage between SEA and project-level EIAs.

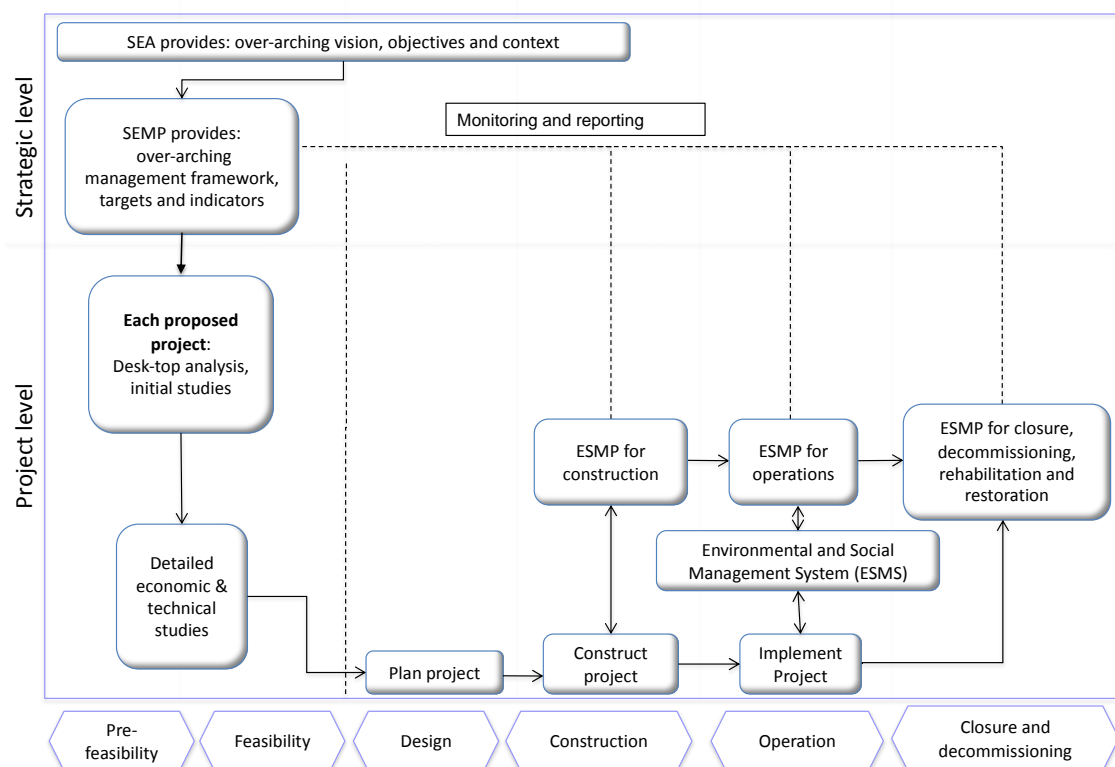


Figure 1.2: Linkages between SEA and Downstream Project-level EIAs

1.2 Objectives of the SEA

The ToRs state that the objective of this SEA is to “weigh and recommend environmentally-optimal regional land-use planning guidelines for coastal regions”. Apparently “the present malaise is assessed, as regards inefficiencies, non-suitability, non-sustainability, enhancing factors of environmental degradation, and potentially destructive consequences of current land-use alteration”. It is expected that the SEA will result in guidance for addressing key environmental and socio-economic concerns during land-use planning decision-making.

The overall goal of the PKCP is to lead the development or redevelopment of Pathorghata Upazila in order to enhance the residents' socioeconomic circumstances through the following broad objectives:

- Enhancing biodiversity and aesthetic beauty through the planned introduction of indigenous plants along development sites.
- Assessing hydro-geological properties to identify spatial distribution of quality and quantity of water considering seasonal variation and high recharge area considering interaction between surface and ground water source.
- Exploring geomorphological, geological, engineering geological, and geophysical properties (shear wave velocity) of the surface and subsurface condition of the study area to rank suitable sites for physical development and to prepare risk sensitive landuse plan.
- Protecting local people's sustenance and integrating the community into the mainstream development process of the country through improved transportation and communication system.

Whilst laudible, the broad objectives described above are regarded as rather vague for the purposes of conducting a substantive SEA. The SEA team has attempted to obtain more details on the actual planned activities of the PKCP, though we remain concerned that there is still inadequate detail.

The March 2022 PKCP document describes the Structure Plan “as basically a policy document that sets the ground and serves as the guideline for subsequent local level plans”. It notes that “the overarching purpose of the Structure plan is to promote long-term, comprehensive development of the Payra-Kuakata Coastal Region through integrated planning and implementation involving several organizations and community participation for optimal resource utilization and poverty reduction. The planning area includes seven unions namely Raihanpur, Nachnapara, Charduani, Kalmegha, Kakchira, Kathaltali and Pathorghata Sadar. Only one paurashava in the study area is named pathorghata”.

However, the March 2022 document provides very little detail on what the Structure Plan will actually result in in terms of activities or projects.

The plan explains that Pathorghata Upazilla has the Haringhata Eco-tourism site and wildlife sanctuary. There are no major development activities in this area and there is potential for additional areas to be developed as tourist destinations with proper infrastructure. It anticipates that local entrepreneurs can be aided in promoting ecotourism. Small family cottages for isolation, as well as group cottages for group tourism, might be developed using locally sourced construction materials.

During this scoping phase the team has attempted to define the project boundaries in terms of direct and indirect influence areas (DIAs and IIAs), so our ideas in this regard are still being formulated. As noted above, the SEA will need to concentrate its focus on the identified Series of Projects (SoPs) that will be undertaken. We understand that some of the SoPs will essentially be an

upgrade/rehabilitation of existing infrastructure/systems in a brownfield sites, whilst others might be “brand new”.

- Our understanding is that the spatial boundary of SEA would consider the Kuakata-Patuakhali Regional Plan Area which was defined taking the Upazila administrative boundary of the potential interventions into the consideration. Therefore, the study area would include the seven Upazilas-Patharghata, Barguna Sodor, Amtali, Taltoli, Galachipa, Kalapara, and Rangabali. It would thus include the footprint of the structural and strategic interventions, the Area of Influence (direct and indirect influence area) and the control area (Figure 1.3). It would cover the both mainland areas and the estuarine chars of the Patuakhali-Kuakata region.

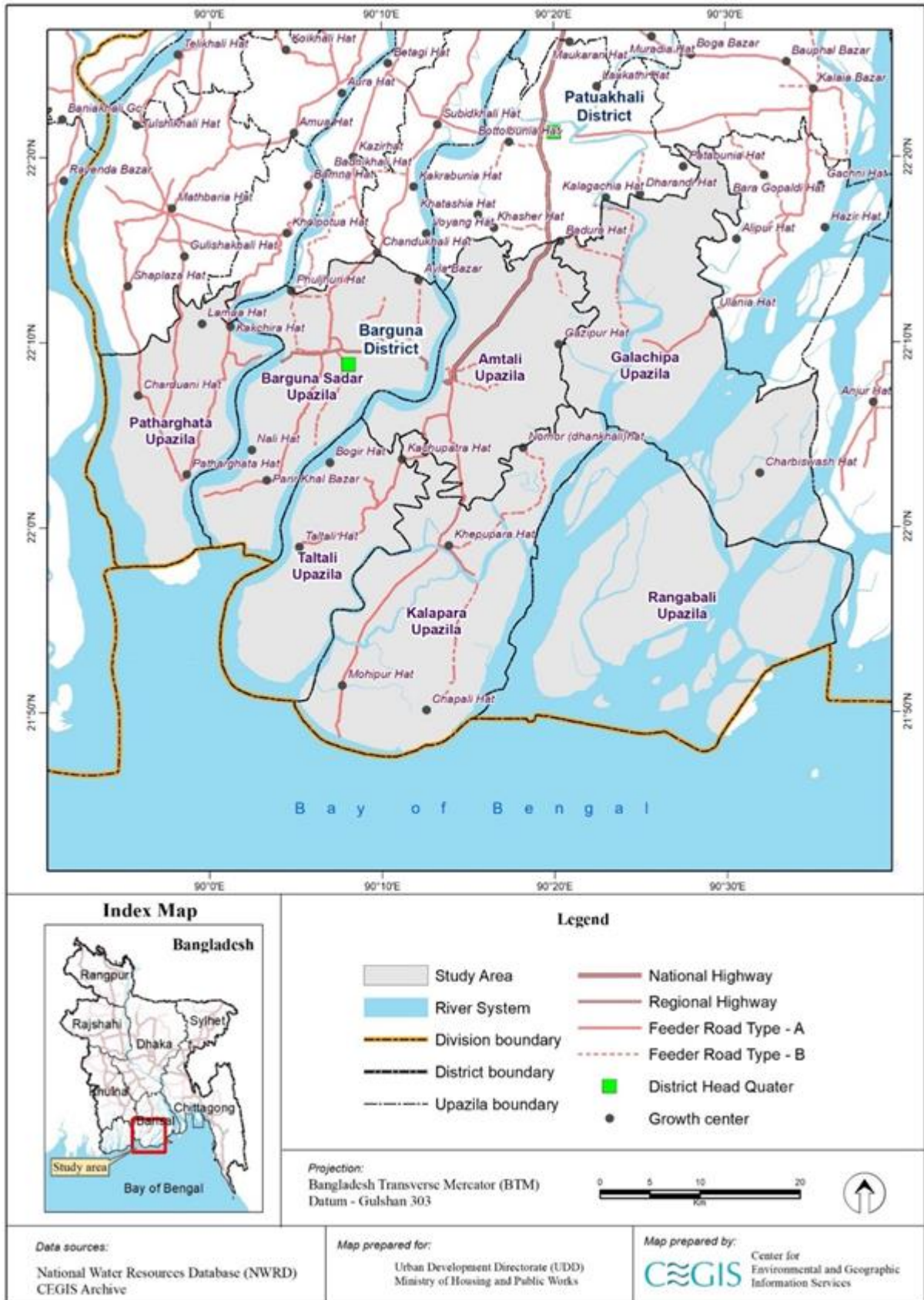


Figure 1.3: SEA Spatial Extent (the Study Boundary)

1.3 The SEA Team

The key and non-key staff members as well as the management on the SEA project team and level of effort are shown in appendices C and D.

As discussed during the inception meeting, the level of effort for the team members is regarded as indicative and CEGIS maintain a degree of flexibility, within reason, in this regard. Since we know from experience that SEA is not recipe-driven, as is often the case with project-level EIA, the consultant is often required to adjust the resources for a specific sub-task, and redeploy these for other sub-tasks. In the previous SEA that this team conducted in Bangladesh (2020-1), some staff had to be replaced because of a death (in one case) and illnesses in other cases. Flexibility of resource mobilisation based on professional judgment is thus important for ensuring that the assignment is properly executed to the highest possible standard.

1.4 Steps in the Overall SEA Process

As noted earlier, this SEA is an important tool to guide the UDD-GoB and other stakeholders on systematically integrating environmental and socio-economic concerns in policy, regulations and planning.

With this in mind, the likely SoPs in the area are expected to provide a significant boost to Payra-Kuakata's socio-economic development. The SoPs may, however, create adverse social and environmental impacts in a local and regional context. This is not just during the construction phase, but may extend into the operational phases. These impacts can affect the environment in a profound way because they may result in cumulative impacts, which overlap in time and space.

Despite there being similarities to a site specific EIA in terms of the steps followed, the SEA has a much larger scope in terms of time, space and coverage and enables a holistic assessment of the entire Payra- Kuakata area through identification and analysis of the cumulative and residual impacts of the PKCP and other developments. Figure 4 sets out the full SEA process as proposed during the inception meeting.

As illustrated in Figure 1.4 the consultant has proposed a stepwise approach that ensures foundations laid earlier in the process are logically built-upon subsequently. However, the steps are not strictly linear, but rather iterative. The team will engage in vertical and horizontal thinking throughout the process, and team members will engage with each other in an integrated way to avoid sectoral thinking.

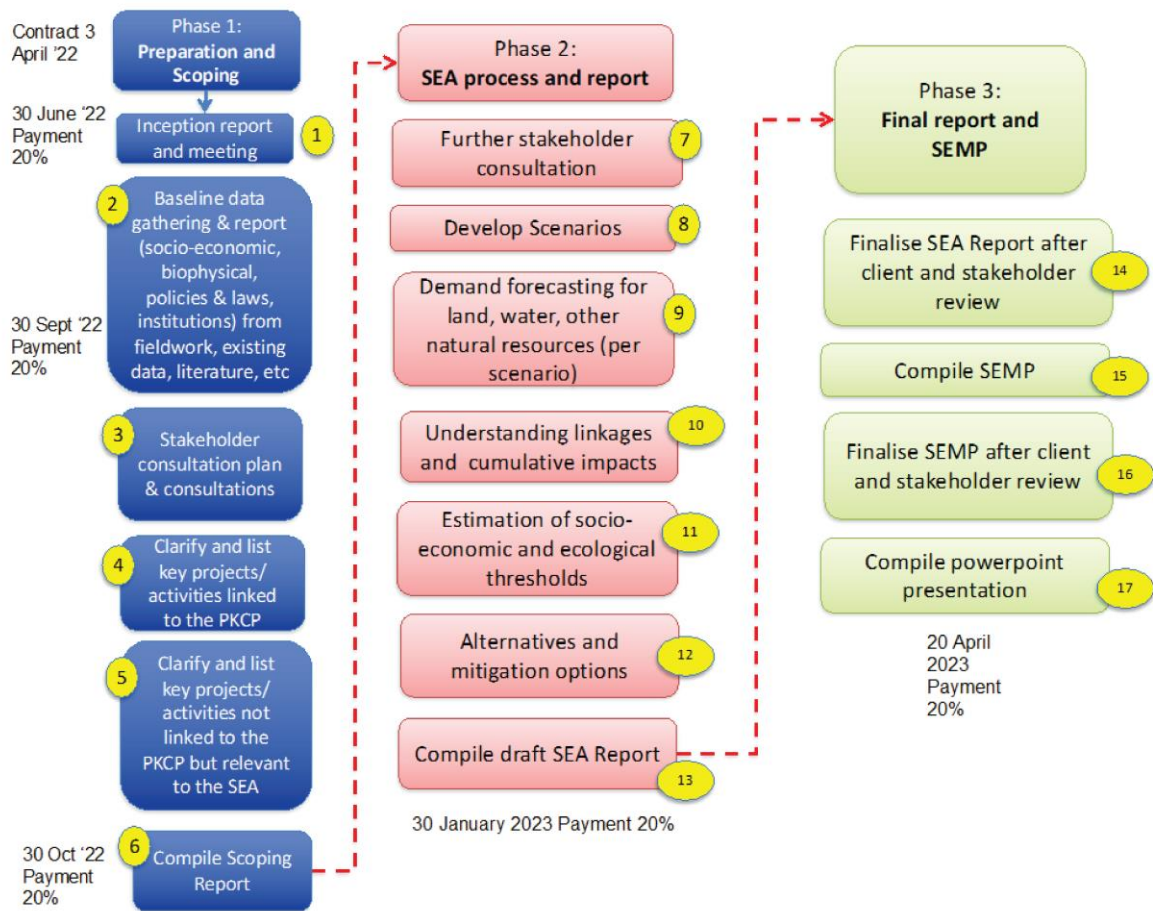


Figure 1.4: An Overview of the SEA Process

2. Phase 1: Scoping

The OECD SEA Guidance (2006) sets out the aims of scoping in SEA – it should:

- Establish the content of the SEA, i.e.. the key issues that the SEA should focus on;
- Identify the relevant criteria for assessment, e.g. goals and objectives set out in national policies and strategies, preferably those that focus on sustainable development;
- Take a pragmatic view on how much can be achieved given the time-scale, available resources, and existing knowledge about key issues;
- Follow an open and systematic process;
- Actively engage key stakeholders to identify significant issues;
- Set objectives based on the identified key issues. Such objectives should represent goals to achieve such as reducing loss of biodiversity or improving employment opportunities. These objectives will be used later to assess the impacts likely to arise when implementing PPPs;
- Identify decision criteria and suitable ‘indicators’ of desired outcomes.
- Recommend alternatives to be considered, suitable methods for analyses of key issues and sources of relevant data.

This is the approach that has been followed. It has provided an opportunity to focus the SEA on the important issues to maximise its usefulness to the authorities, decision-makers and public. It does not preclude changes in the scope of the SEA if the need for them arises at a later stage. To the extent possible the scoping process has been open and iterative, involving key stakeholders.

2.1 Baseline Overview

As required in the Terms of Reference 13 thematic baseline reports were compiled and delivered as a stand-alone 600-page volume on 2nd October 2022. In addition to contributions from the core team, compiling the baseline reports included inputs from various experts from outside the team. The reports relied mostly on existing data and literature, but the consultant also undertook field visits, met with stakeholders, and gathered primary data. Additional information was sourced from key informants who were identified on the basis of their subject knowledge and expertise.

Where appropriate these thematic baseline reports will be revised/updated during the SEA process. Based on the baseline papers, the provisional list of key environmental, social and economic issues (included in the Inception Report) has been reviewed and some additional issues and sub-issues included. The list of key issues will be further revised after further stakeholder consultations.

Thus, the thematic baseline papers will provide the substrate from which to derive a baseline environmental and socio-economic profile of the study area to be included in the SEA Report. For simplicity, the 13 baseline reports referred to earlier have been clustered under four main headings (see below), summarised and shortened to avoid excessive bulk in this scoping report.

2.1.1 Biophysical

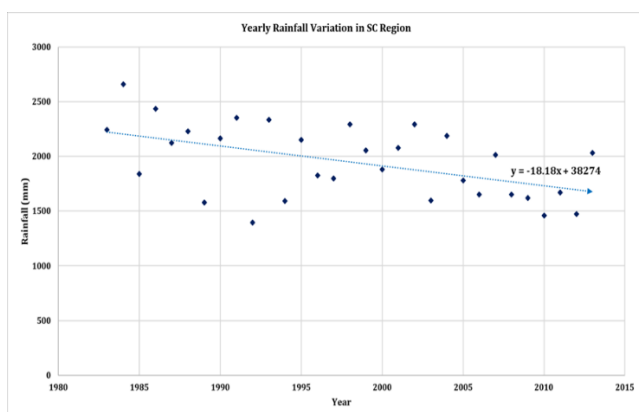
Water Resources

The coastal zone of Bangladesh is located in the tropical region and can be broadly divided into three regions: the deltaic eastern region, the deltaic central region, and the stable deltaic western region. It is highly vulnerable to climatic hazards, especially tidal inundation induced from occasional

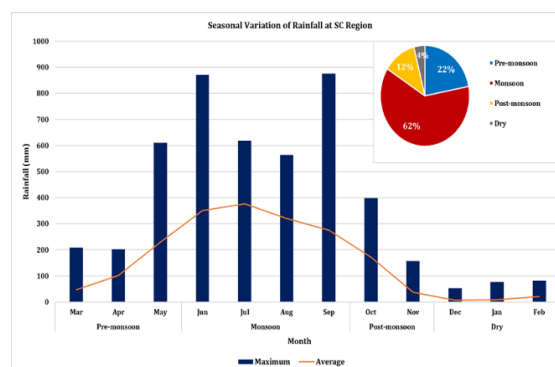
horrendous cyclones and storm surges that is followed by consequent intrusion of saline water. Land subsidence is also quite prominent in the coastal area. Moreover, being enclosed by man-made polders, the region is often subjected to water logging resulting from inadequate in-polder water management. However, the coastal zone of Bangladesh is rich in natural resources and provide various benefits towards the nation. The mangrove, fisheries, tourism, sea culture activities, shipping and inland navigations, etc. are some examples of these benefits. Water resources of coastal region play a key role in the livelihood and economic stability of the local people. Some development plans overlook environmental considerations in planning which encourages exploitation of the natural resources. On this point, water resources can be highlighted as it is widely discriminated in the process of implementing any project. Urban Development Directorate considers the south-central coastal region, consisting seven districts (Faridpur, Madaripur, Shariatpur, Barisal, Patuakhali, Barguna and Bhola), to be potential for the purpose of expanding regional infrastructure and thus uplifting the overall socio-economic status. On this backdrop, a Strategic Environmental Assessment (SEA) is in progress and this report can be used as a baseline for the water resources management of area of interest under this project.

Hydrological Setting

The average total rainfall data for three stations located at the SC region is taken for analysis to represent the yearly and seasonal trend of the entire region. From the analysis of data, the overall trend of rainfall shows a decreasing pattern, which can be a precursor to less generated run-off and subsequent reduced flow in the rivers within the vicinity. From the analysis of seasonal variation of the rainfall, it has been observed that the rainfall increases significantly in monsoon period (June-September) and again begins to decrease in the post-monsoon period and reaches to the least amount in December. Only 4% of the total rainfall occurs in the dry period (December-February), whereas 62% precipitation occurs in monsoon (June-September). The remaining 34% rainfall occurs during pre-monsoon (March-May) and post-monsoon (October-November) period.

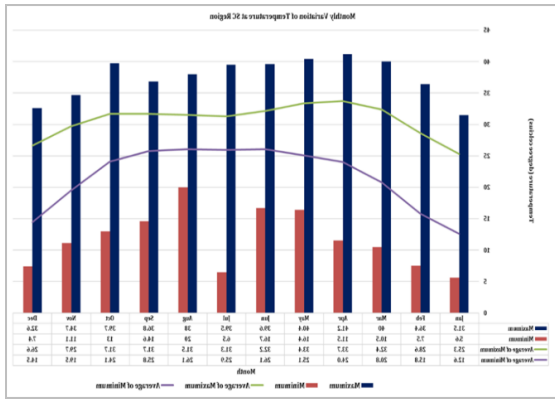


Trend of Yearly Rainfall in SC Region

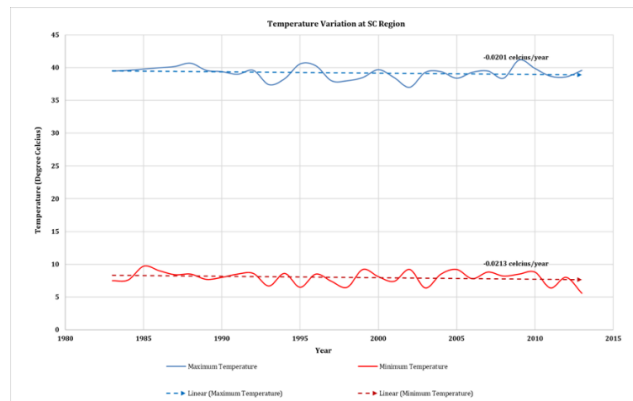


Seasonal Rainfall Variation at SC Region

For analyzing temperature and relative humidity, average value of six stations located within the SC region are considered as representative for the entire scenario of region. Temperature data has been analyzed for the period 1983-2013. Decreasing pattern has been found in both maximum and minimum. It indicates that the overall temperature at SC region is reducing. The highest temperature has been observed to rise up to 40.5°C in the month of May and lowest temperature is observed to occur in January.



Monthly Variation of Temperature at SC Region



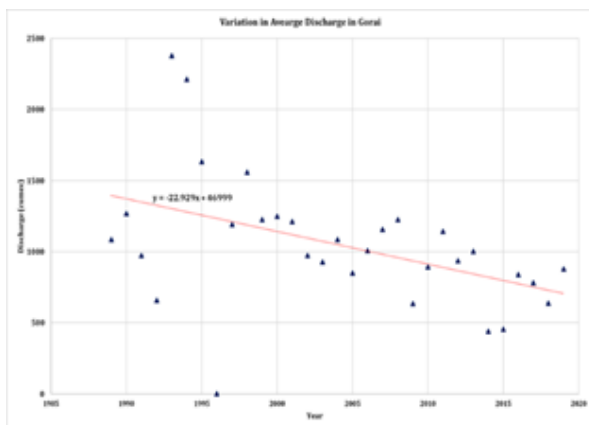
Trend of Yearly Temperature at SC Region

Main Rivers System

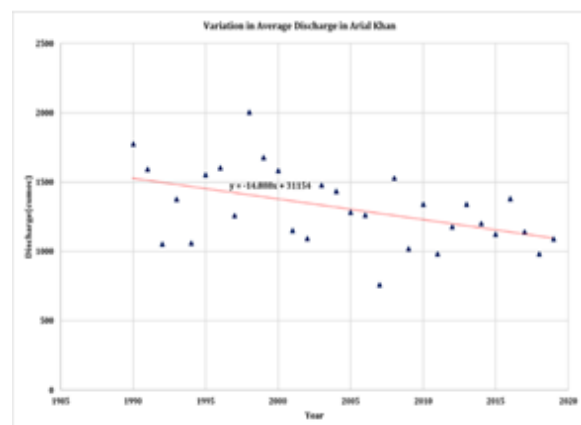
Several river systems provide fresh water in the South-Central region in Bangladesh. Among them Arial Khal river system and Meghna-Tentulia river system are the main source of fresh water to the south coastal region.

Availability of Freshwater

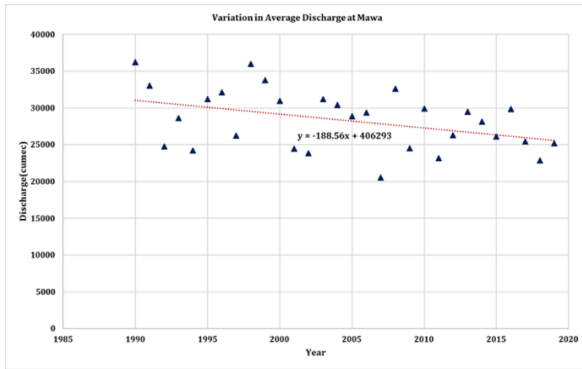
To analyze the freshwater inflow at SC region, Gorai Railway Bridge (99) in Gorai River, Chowdhury Char (4A) in Arial khan and Mawa (93.5L) in Padma River has been selected. The trend is observed to be decreasing for all the stations. The negative slopes of the trendline at the selected three locations translate to reduction in freshwater inflow in the SC region. The probable cause for such decreasing flow may be due to lack of flow augmentation from upstream. Sedimentation at river beds of this delta results in reduction of conveyance capacity of the natural alluvial rivers. The Flow Duration curve for Mawa point shows that the discharge at this location exceeds 10,000 cumec in 70% of the time whereas at Gorai River and Arial Khan River, this huge discharge almost never occurs. Gorai River and Arial Khan River have low flow, and thus 2000 cumec flow is exceeded at these station in only about 25% and 27% of the time respectively.



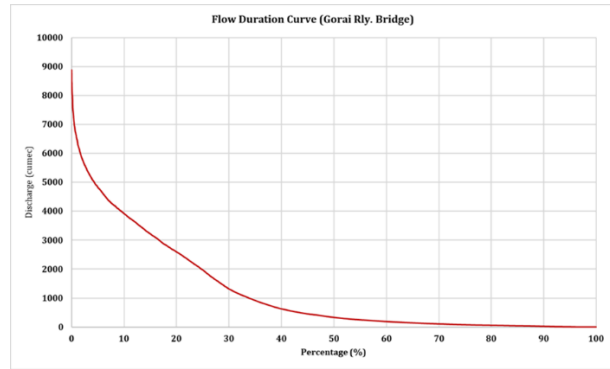
Trend in Discharge at Gorai Railway Bridge from 1989 to 2019



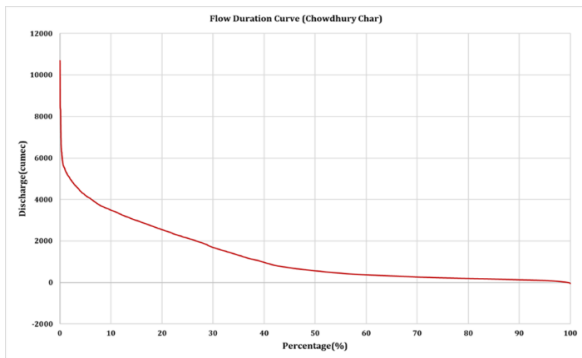
Variation in Discharge at Chowdhury Char from 1964 to 2019



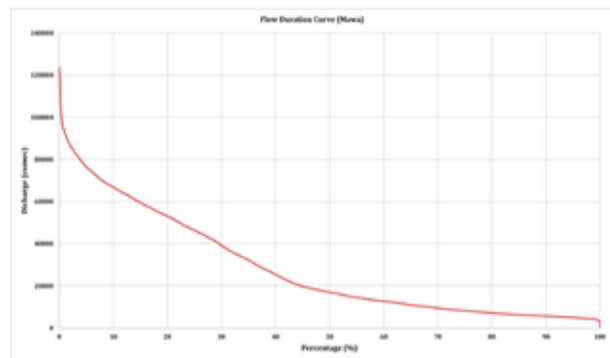
Discharge at Mawa from 1990 to 2019



FDC Analysis at Gorai Railway Bridge



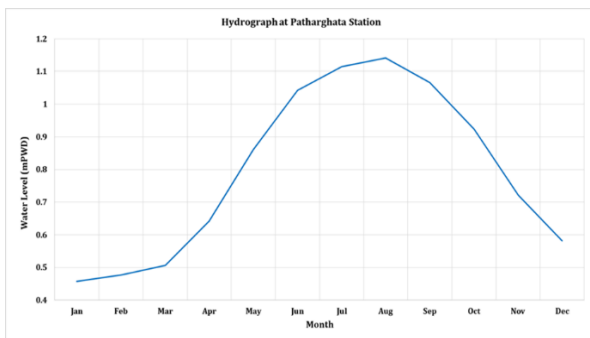
FDC Analysis at Chowdhury Char



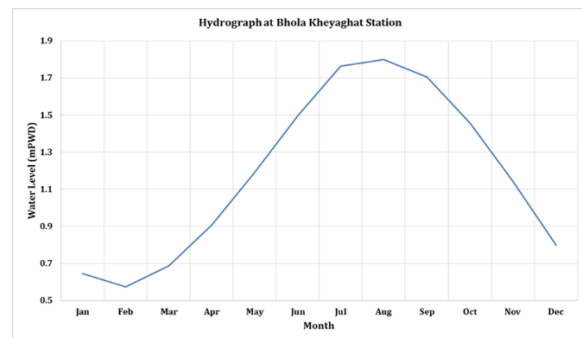
FDC Analysis at Mawa

Water Level and Flood Frequency Analysis

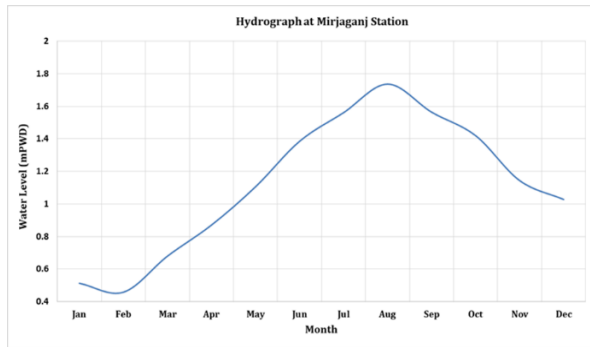
The water level is analyzed for four representative stations (Bhola Kheyaghat, Rayanda, Mirjaganj and Patharghata) to gather the overview of the entire SC region. Both the trend of the maximum and minimum water level show increasing pattern indicating that the water level at these stations have been increased from the past for all the station. Though the water level is highest at Bhola Kheyaghat (observed from the historical data analysis), the increasing trend is faster at Patharghata (Bishkhali River). This indicates that the water level is rising faster near the coast as Patharghata is way downstream of Bhola Kheyaghat. This rise in water level indicates the increased probability of tidal flood. The observed water level at Pathorghata reaches its peak, about 1.14 mPWD; at Bhola Kheyaghat it is about 1.8 mPWD; at Mirajganj 1.75 mPWD; at Rayanda 1.71 mPWD. From flood frequency analysis it can be observed that for 50-year return period, the water level at Patharghata is highest (4.14 mPWD). It is indicative of tidal flood occurring at SC region.



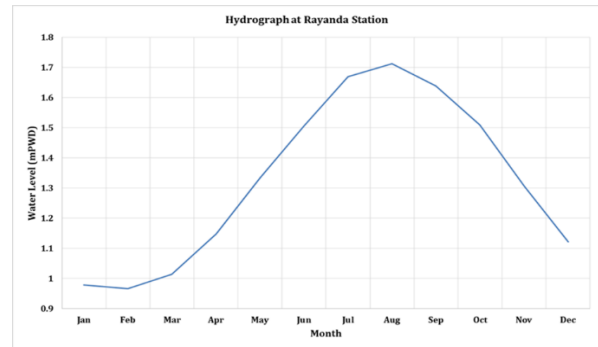
Trend of Water Level at Patharghata



Trend of Water Level at Bhola Kheyaghat

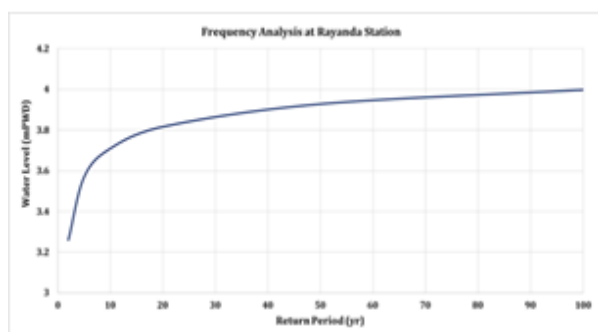
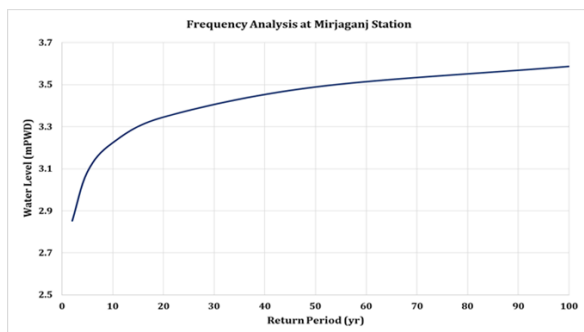
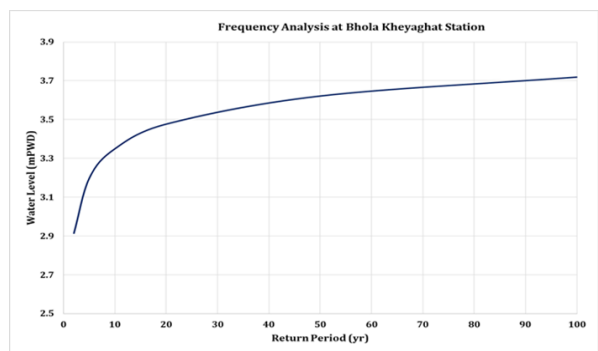
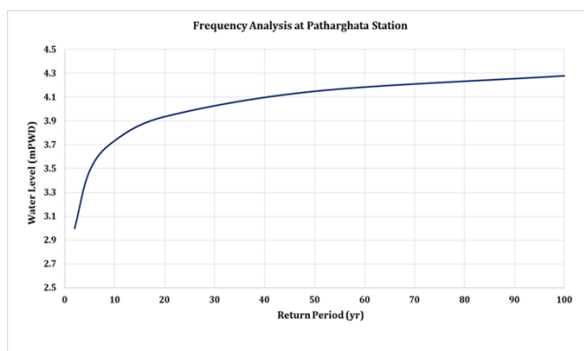


Trend of Water Level at Mirjaganj



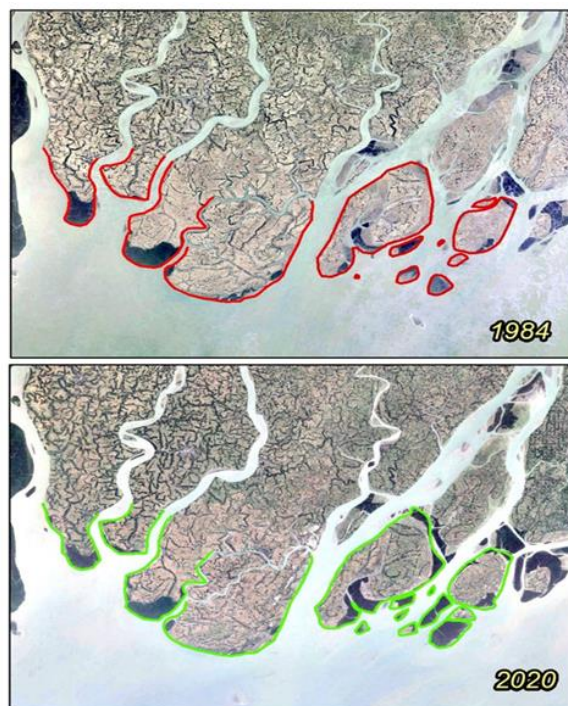
Trend of Water Level at Rayanda

Water Level Corresponding to Various Return Periods at Four Tidal Stations

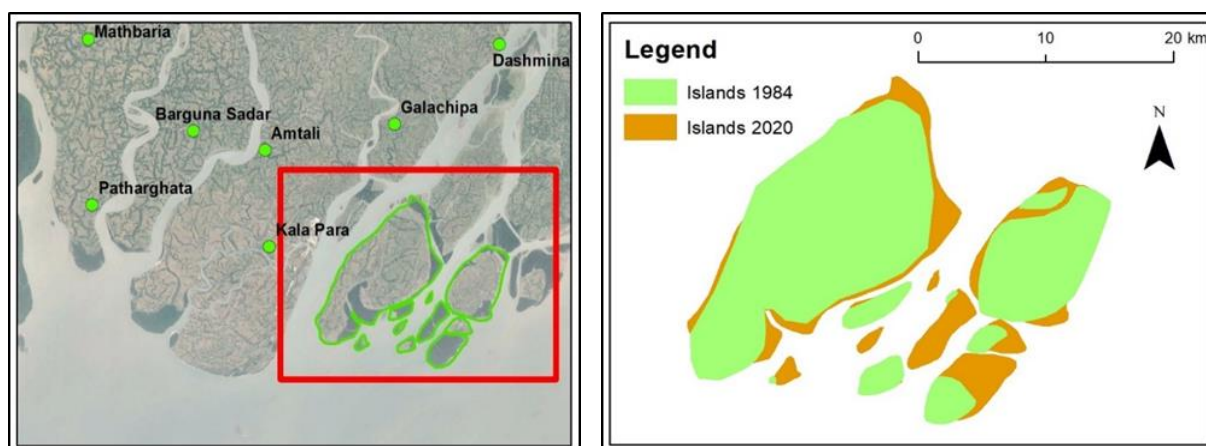


Morphological Setting

Rivers are very dynamic in the delta of Bangladesh especially in the south-central region. Baleshwar, Bishkhali, Burishwar-Payra, Andharmanik, Lohalia, Rabnabad and Tentulia are the major rivers in the study area. At present all the water flow and sediment of Ganges and Brahmaputra merge with Meghna River at Chandpur and fall in Bay of Bengal through Meghna Estuary. It can be seen that the west part of the study area has eroded slightly, whilst the estuary of Tentulia has experienced deposition of sediment as well as formation of new islands.



Comparison of coastline for study area between 1984 and 2020



Changes of island area at Tentulia-Rabnabad estuary from 1984 to 2020

The extent of the Tentulia-Rabnabad estuary was 30,855 Ha in 1984. In 2020, it increased to 36,275 Ha because of an additional 17.6% of land. Artificial mangroves at this zone have accelerated the land progradation process. Coastline analysis shows more sedimentation in the mouth of Tentulia channel compared to the estuaries of Baleshwar or Bishkhali-Burishwar Payra systems. This sedimentation occurs mainly due to the upstream combined flow of Ganges-Brahmaputra-Meghna Systems.

Erosion/accretion

The total amount of eroded and accreted lands are 3500 Ha and 2700 Ha respectively. Hence the erosion is about 30% higher than the accretion.

River	Erosion of 1989-2021 (ha)	Accretion of 1989-2021 (ha)
Tentulia	797	197
Lohalia-Rabndabad	855	601
Burishwar Payra	625	396
Bishkhali	483	727
Baleshwar	439	227
Andharmanik	200	363
Others (Tiakhali, Hauder Bharani, etc.)	101	189
Total	3,500	2,700

Source: River wise erosion and accretion for 1989-2021

Natural Disasters

Bangladesh is situated downstream of the largest delta in the world. Thousands of rivers crisscross the whole country, resulting in flooding almost every year. In the coastal region, generally rain-fed flood, river flood and tidal floods occur. The area is frequently hit by severe cyclonic storms.

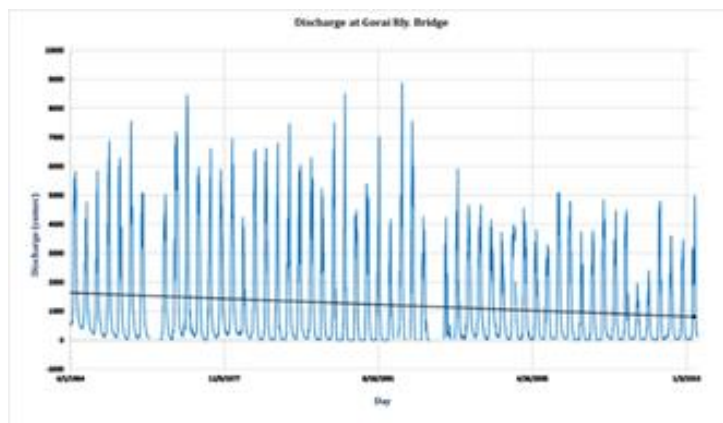
Development of Navigation and Drainage

To increase agricultural production and other economic activities, embankments were constructed in the coastal area during the 1950s and 1960s. The purpose was to prevent salt-water flooding of the floodplain areas inland and provide increased security for monsoon-season rice production. Sluices in the embankments prevented the inflow of salt-water at high tide and allowed ponded rainwater to drain away at low tide. Tide normally governs the navigation in the tidal rivers. Sediment enters the tidal system during flooding and exits during ebbing. But due to tidal asymmetry, sediments result in rivers becoming silted up. As a result, dredging the channels is difficult and expensive.

Present and Future Risks

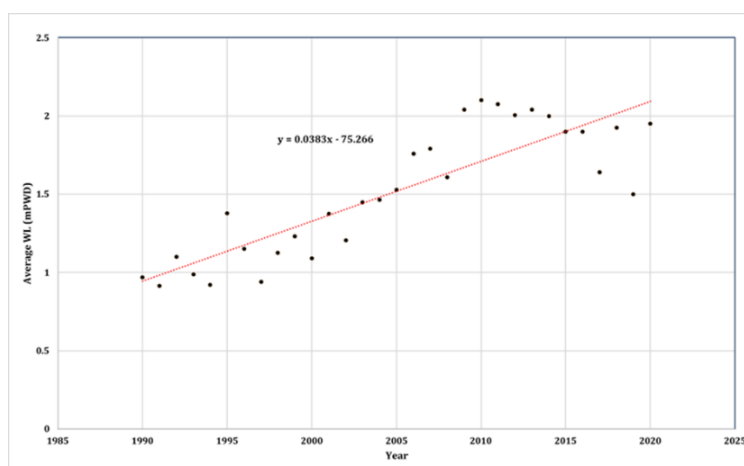
Present challenges of the SC region include waterlogging, storm surge, salinity water intrusion, water supply and coastal morphology.

Future Risk of the SC region includes decrease in fresh water flow. The graph below illustrates the decline in the amount of discharge. This aggravates salinity intrusion with multiple impacts on the local population.



Trend of Daily Discharge in Gorai

Sea Level Rise is a threat to the coastal zone of Bangladesh, a low-lying delta that is often subjected to land subsidence. It is estimated that in 2050 and 2100 respectively, there will be inundation of 2%, 4% and 17.5% of total land mass respectively. Based on 22-year historical data, SMRC has developed a trend of sea level rise in three tidal stations in the coast of Bangladesh and the trend depicts a worrying picture where coastal areas would experience 5.9 mm sea level rise annually. Saline water intrusion inward of the coastal zone is an aftermath of sea level rise. Moreover, during the dry season freshwater inflow is reduced, thus worsening the overall situation.



Sea Level Rise at Patharghata

Policies, Plans and Programs

Relevant policies, plans and programs are- National Water Policy (1999), The National Water Management Plan (2001), National Strategy for Water Supply and Sanitation (2014), Coastal Zone Policy (2005), Meghna Estuary Study (1998), Perspective Plan of Bangladesh (2012), 7th Five Year Plan (FY2016-2020), Bangladesh Delta Plan 2100. Some challenges and gaps in policies are-

- Inadequate synergy between and among sector policies, and none of the existing policies propose concrete action on how to bring about the required co-ordination.
- The legal environment is not specifically covered in the policy documents, e.g. the National Water Policy (1999) proposes development of guidelines by integrating both water-use and land-use planning. But, it is not clear which organization will undertake the responsibility to conduct the critical integration of planning.

- Most policies are formulated with small sectoral developments in mind. They are not part of an overall framework.
- Policies aim mostly at blue print planning, but are inadequate regarding the process.

Climate Change

Bangladesh is situated in the sub-tropical regions but displays a tropical monsoon climate characterized by heavy seasonal rainfall variations, moderate warm temperatures, and high humidity along with four prominent seasons, namely winter (December-February) which is cool and dry, hot pre-monsoon (March-May) summer, hot and humid rainy monsoon (June-September) and hot, humid but drier autumn or post-monsoon (October-November) (Shahid, Wang, & Harun, 2014; Ludwig et al. 2018; MoEFCC, 2018).

Hilly terrains in the eastern parts of the country cause the country to receive huge amounts of water during the monsoon season from June to September. The mean annual temperature in the country is about 25°C, ranging between 18°C in January and 30°C from April to May. The highest temperatures are between 38°C and 41°C.

The average annual rainfall in the country is about 2,200 mm. About 80% of the total rainfall occurs from May to September (MoEFCC, 2018). Relative humidity remains below 60% and cloud cover during winter is the lowest, about 10% country-wide. This is due to the cold dry winds from the north-western part of India during the winter season. In contrast, the humidity is more than 80% with 80 – 90% cloud cover during monsoon. In general, climatic characteristics of Bangladesh can be classified based on its seasonality, variability in arrival and departure of monsoon and variability of regions or climatic sub-regions identified by Rashid (1991) as shown in following figure.

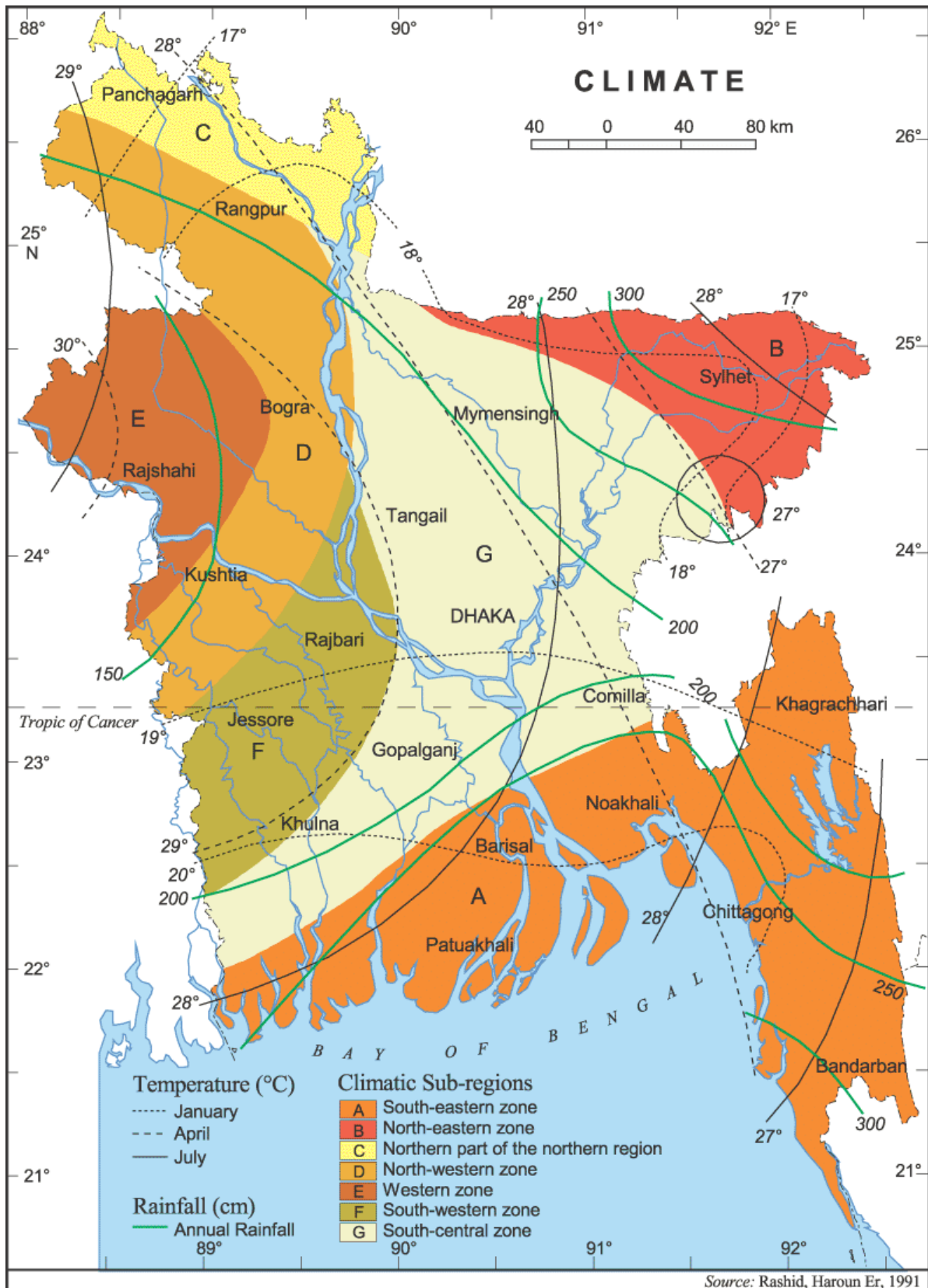


Figure 2.1: Climatic Sub-regions of Bangladesh

Bangladesh is vulnerable to geophysical and climatic hazards, including climate change. Its climate characteristics include high temperatures, heavy and highly variable rainfall. Physical and climatic settings of the region, as well as the severity and duration of hazards, are significantly influenced by changes in these climatic variables. Planning for improved water management, agricultural growth and disaster management will be more effective by a better understanding of the characteristics and distribution of climatic patterns.

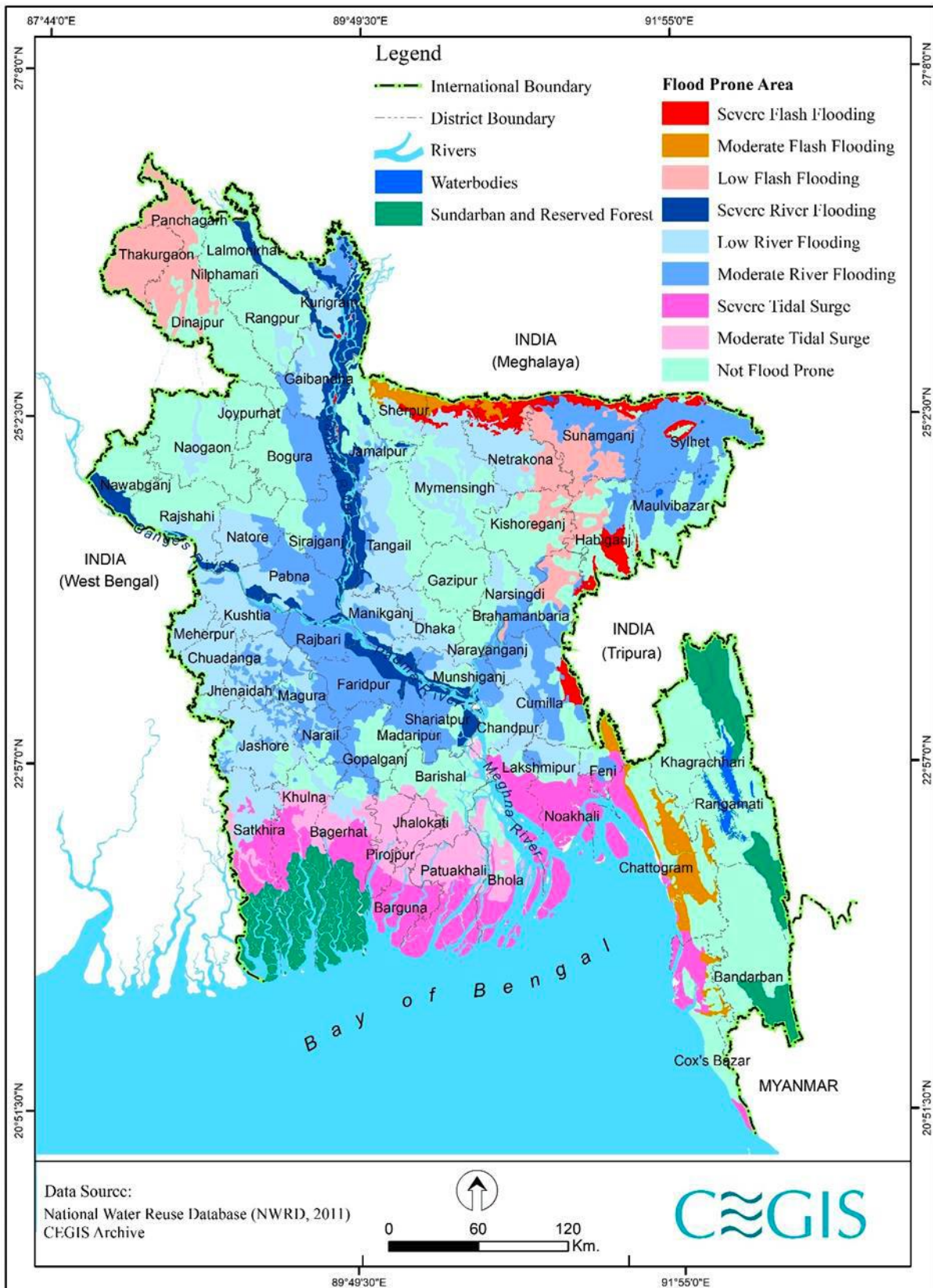


Figure 2.2: Flood Prone Areas in Bangladesh

People in the Payra-Kuakata region live in an extremely dynamic estuarine environment facing many threats such as cyclone and storm surge, erosion, flood, drainage congestion, salinity intrusion, drought and ecosystem degradation. Climate change is increasing these threats which will likely affect almost every aspect of people's lives and livelihood choices. Also, the 'Payra-Kuakata coastal region' includes environmentally sensitive areas which need to be protected. In this case, considering these two interconnected needs, accomplishment of the PKCP objectives would require formulation and enforcement of an integrated development plan. For efficient integration of climate change adaptation planning, a deeper understanding of climatic variability, with a focus on the seasonal, decadal, and spatial elements in the Payra-Kuakata Coastal region, is required.

There is evidence of recent sea-level changes along the southwest coast. Trend analysis based on Sen's slope of 30 years BWDB, CPA and BIWTA tidal water level reveals that the upward trend in the south west Ganges tidal floodplain is 7-8 mm/year (DoE, 2016). The trend is 6-10 mm/year in the Meghna Estuarine flood plain and 11-21 mm/year in the Chittagong coastal plain areas (DoE, 2016). Brown and Nicholls (2015) used data extracted from Holgate et al. (2013) and the Permanent Service for Mean Sea Level (2014) to illustrate that sea level rise varies from 4 mm/yr (Hiron Point) to 19 mm/yr (Khepupara).

There is mixed evidence about whether the frequency of cyclones and tropical depressions affecting Bangladesh has increased. According to Roy et al. (2017), 123 cyclones and tropical depressions (TD) made landfall in Bangladesh over the period of 1877–2014. They suggest that about 60% of those cyclones and TDs made landfall in the southwest coastal region (Figure 2.3). 50-year timeseries data for cyclones (1960-2010) compiled by Saha and Khan (2014) suggest that while cyclone severity has increased, the percent of cyclones making landfall on the southwestern and central coast has also increased. Vissa et al. (2013) suggest that intensification of severe cyclones is likely to be linked with the increasing sea surface temperature and high enthalpy flux exchange and with available moisture content during post-monsoon over the Bay of Bengal.

According to Ahmed & Amir, 2012, Bangladeshi coastal areas faced fifty two major cyclones in the 19th century and among them seven cyclones were in Kalapara. During last 10 years of the present century, coastal areas have faced at least four devastating cyclones of which two hit Kalapara Upazila. The number of death and loss of socio-economic condition are also increasing with the increasing number of cyclones.

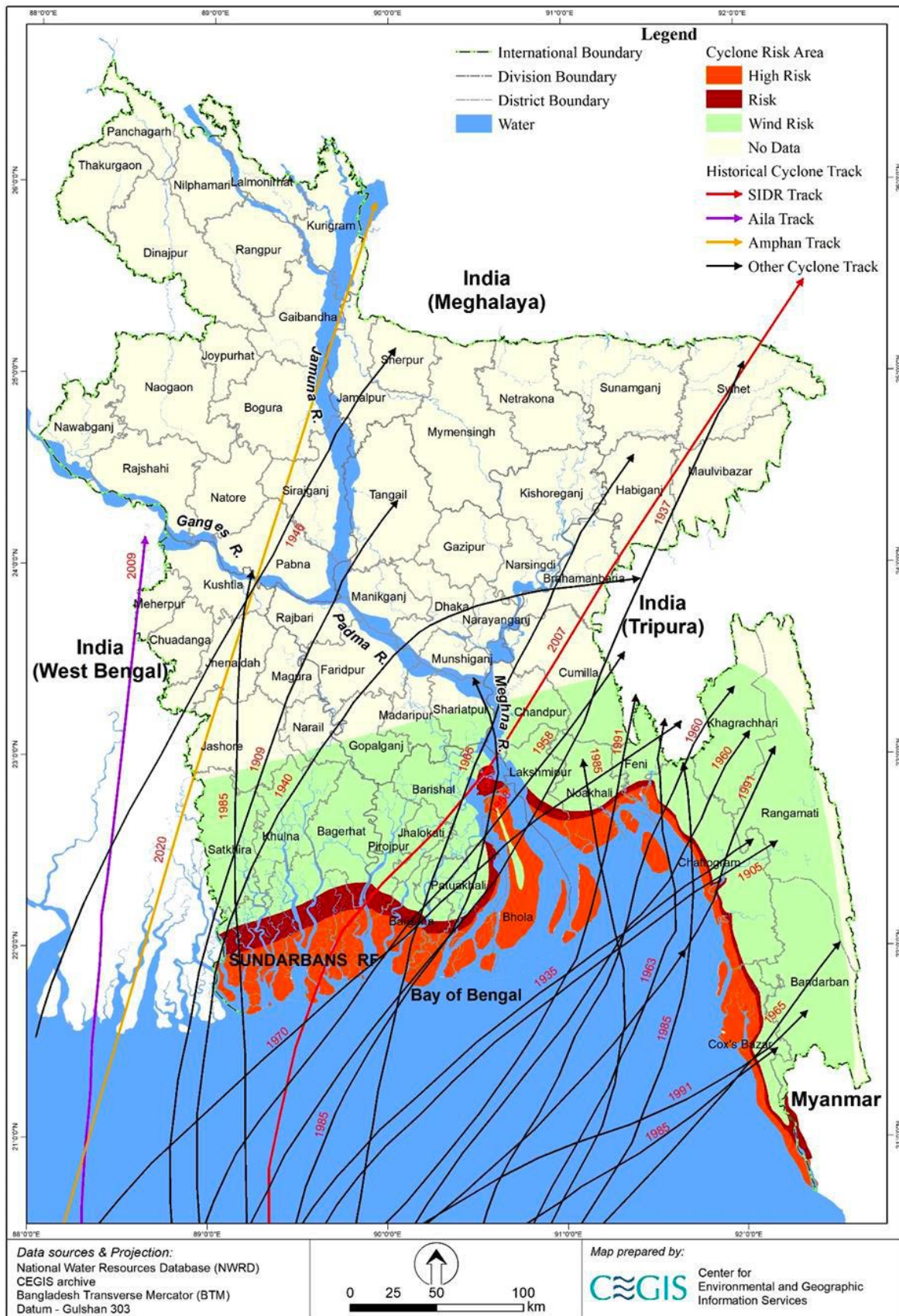


Figure 2.3: Historical Cyclone Tracks over Bangladesh

Future climate change

Future climate change anomalies have been assessed comparing the future projections of dynamically downscaled RCM simulations under different RCPs i.e. RCP4.5 and RCP8.5 with base period (1971-2000). Future changes in rainfall, maximum temperature and minimum temperature due to climate change has been analysed for the study area.

It is expected that there will be an increase of annual maximum temperature over the whole coastal zone irrespective of change in location. Maximum temperature may increase 1.1°C to 2.0°C in 2050s and 1.3°C to 3.4°C in 2085s considering both RCPs and different seasons. Also, minimum temperatures may increase 1.5°C to 2.7°C in 2050s and 1.9°C to 4.9°C in 2085s considering both RCPs during different seasons.

In coastal zone, annual rainfall is expected to increased by 6% in 2050s and 8% in 2085s under RCP4.5 and 5% in 2050s and 16% in 2085s under RCP8.5. The models show higher increases during winter and pre-monsoon season. The monsoon rainfall is expected to increase in 2085s substantially, while post monsoon rainfall will decrease.

IPCC (2013) predicts global mean sea level rise between 0.2 to 1m for low to high emission scenarios by 2100 for the Bay of Bengal. For the future, the IPCC projections for very high emissions (red, RCP 8.5) and very low emissions (indigo, RCP 2.6) are shown (IPCC, 2013) in following figure.

As a result of global warming and sea level rise, the cyclone and storm surge will likely impact more areas of coastal Bangladesh. This might cause inundation of 16-23% of coastal areas with districts of Barisal, Jhalokati and Pirojpur in southcentral region getting the major hit (CEGIS, 2020). The ocean areas of Bangladesh will face increasing sea temperature and consequent changes in pH and other constituents. This will impact the ecosystem in the Bay of Bengal. The salinity intrusion along the coastal Bangladesh will move further inland in the coming future. The 1 ppt salinity front will move 9-13 km inwards in the south west and south-central regions, while the 5ppt salinity front will move 25-37 km inwards. This will have serious impacts in agriculture, livelihoods and ecosystem in the coastal areas.

Disaster Management

- i. SEA is considered to be an opportunity to mainstream DRR and Resilience Building into strategic planning. Thus, this SEA will explore disaster management policy and planning issues and screen which disasters are strategically important. The PKCP area is typically exposed to cyclone, storm surge, erosion, lightning, drought, etc. According to the INFORM sub-national risk index of 2022 Barguna district is ranked 4th and Patuakhali 11th according to the country's multi-hazard risk level. For the PKCP area cyclone, storm surge and river bank erosion are strategically important natural hazards.
- ii. A recent study conducted under CEIP-I project of BWDB carried out an assessment which classified the Patuakhali, Kuakata and Barguna (partial) with high probability of cyclone and storm surge and with high inundation depth (Figure 2.4). Historically the south-central part of the coast (PKCP area is under south central) faces severe cyclones and storm surges. The 1970 event which claimed over 500,000 lives mostly affected the south-central part of the coastal zone. This region was also affected by the 1991 cyclone, and Cyclone Sidr (2007). Recently, Cyclone 'Mohaseen' made land fall between Bhola and Patuakhali districts of Barisal division, Bangladsh on May 16, 2013. Almost 10,42,340 people in the three coastal districts where Barguna is worst affected considering the scale and proportion of the population. Around 59% of the population of Barguna and 19% of population of Patuakhali district were affected by 'Mohaseen' and the number of affected households was 1,74,399.

Significant impact on agriculture were also noted where Barguna was again the worst affected district in terms of cultivated land (57% was affected), followed by Patuakhali (46%).

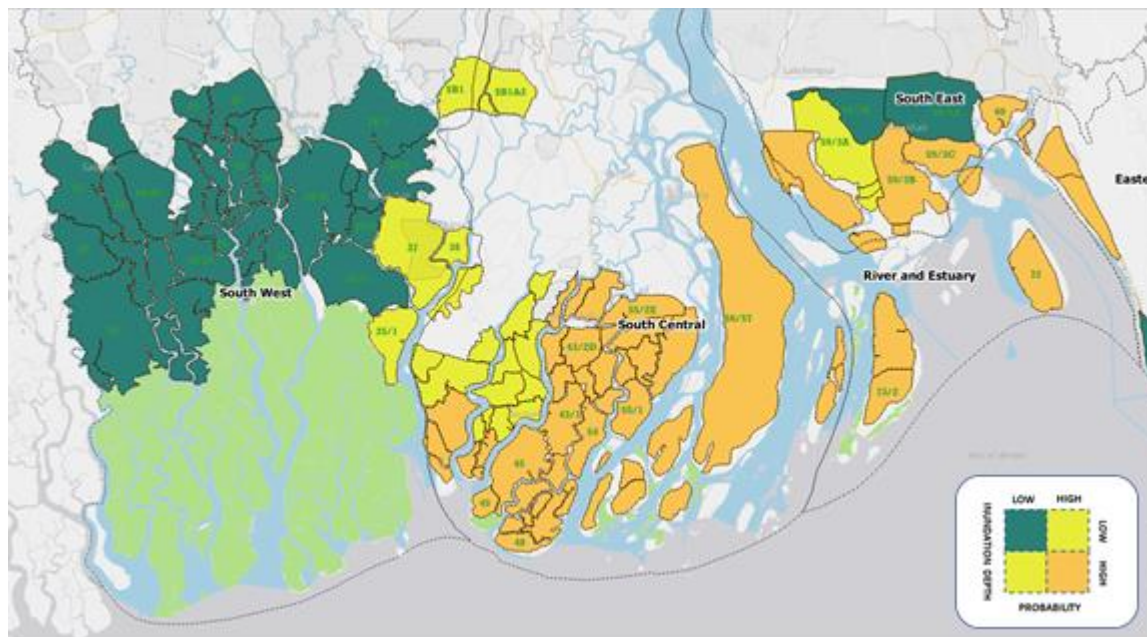


Figure 2.4: Simplified Storm Surge Hazard Map in the Coastal Region (based on Storm Surge Modelling CEIP-I)

- iii. River bank erosion is another major threat. CEGIS estimates the rate of erosion along the major river varies between 38.13 ha/year to 0.2ha/year. The highest erosion was observed in Rabnabad river. The accretion rates vary between 56ha/year to 0.2ha/year. The highest accretion was observed in Lohalia river. In general, erosion is dominating in Rabnabad channel.
- iv. Being a coastal region, the PKCP area is also exposed to fluvio-tidal flood and the pluvial floods. However, according to MRVA the overall flood risk level is low to moderate due to low level of flood intensity and low to moderate level of vulnerabilities to floods. The Risk Atlas of the Planning Commission also shows the similar risk level. The coastal polder in this region (Polder 41~48, Polder 55/1~4, etc.) played an important role in minimizing the risk of fluvio-tidal floods.
- v. The PKCP reasonably considered vulnerabilities of natural disasters especially cyclone and storm surge, river bank erosion, water logging and drainage congestion, salinity intrusion and arsenic contamination. The regional plan which was developed as a part of the PKCP proposed a number of Disaster Risk Reduction Measures for vulnerable infrastructure. For example, these included construction and rehabilitation of coastal embankments, flood control and drainage infrastructure, integration of DRR measures in road construction and urban services, construction of cyclone shelters, DRR measures for water supply infrastructures, disaster resilient water supply and sanitation, etc.
- vi. The Disaster Management Act 2012 is the primary legislation for disaster management in the country. The legislation gives – i) the overall outline of the disaster management practices which should be carried out, ii) organization structure and coordination mechanism, and iii) definition of the disasters and terminology to be used in practice. Under the Act, two rules have been enacted, one for regulating the disaster management funds and

another for organizational structures and coordination. For effective operation of disaster management activities, the government has been publishing “Standing Order of Disaster” since 1997. The current Standing Orders were updated and published in 2019. These specify the roles and responsibilities of different organizations, committees and agencies involved in disaster management activities. The SOD 2019 also recognized the contribution of Humanitarian Agencies and mentioned their roles and responsibilities.

- vii. Moreover, Government has been publishing National Disaster Management Plans from time to time with the aim of building country’s resilience against disasters. The NDMPs have always been prepared in line with the international frameworks like Hugo Framework, Sendai Framework, etc. The current plan is for 2021-2025 which proposes a number of programs and plans. For guiding the social protection programs and to align them with disaster management goals, government published the National Social Security Strategy in 2015.
- viii. The OECD recognized SEA to be an efficient tool mainstream DRR in policies, plans and programmes³. The SEA brings further opportunity to explore appropriate DRR measures for PKCP and to ensure their implementation. In line with the OECD guideline, this SEA will analyse how the development objective of PKCP would be affected by the prevailing and possible disaster risk and how PPP can influence the vulnerabilities of the community to disaster risk. At the end, the SEA would explore and propose strategic DRR measures/plans for PKCP.

However, the following are some of the key challenges of Disaster Management in the PKCP area-

- The PKCP area has high vulnerability and risk to multi-hazard. Among different hazards, cyclone and storm surge are deadly and damaging. Therefore, any regional development plan should consider integrated disaster risk reduction against cyclone and storm surge in the plan.
- Financial Protection of Critical Infrastructures like port, embankment, utility etc.
- Next to cyclone and storm surge, erosion is another natural hazard here. Therefore, infrastructure along the river bank should have erosion protection measures.
- The Government has recently introduced a new regulatory requirement for project appraisal- the implementing agency must conduct Disaster Impact Assessment (DIA) for a project before submitting it to the Bangladesh Planning Commission for appraisal.
- The Department of Environment also require carrying out DIA together with EIA for any red category project.
- The Shock Responsive Social Protection Program and Forecast based Financing are two promising initiatives being tested. These could improve people’s disaster resilience.

Ecosystems and Wildlife

Bangladesh is situated in between the Indo-Himalayas and Indo-Chinese sub-regions with distinct physiographic characteristics. Variations in hydrological and climatic conditions and differences in the soil properties contribute to diverse ecosystems with rich flora and fauna. The study area falls in the coastal part of the country that is vulnerable to the coastal hazards but also houses one of the

³ OECD, 2010. Strategic Environmental Assessment and Disaster Risk. DAC Network on Environment and Development Cooperation (ENVIRONET), OECD.

world's richest ecosystems characterized by fertile soils and mangrove forests. The coastal populations are mostly poor, some of them are landless and they earn their livelihood through agriculture, fishing, shrimp farming, salt farming etc. As most of the livelihoods are dependent on natural resources therefore it is very important to protect, conserve and where possible, improve ecosystem services.

Landscapes of the Area

The major landscapes of the study area comprise forests, rivers, mudflats, beaches and sand dunes (Figure 2.5). According to Bangladesh Forest Department, 5 categories of forested land (Reserved Forests, Protected Forests, acquired forest/Vested forests, Unclassified State Forest, Unclassified Revenue Forest) are maintained with a total area of 10,43,843 ha. Besides, a total of 1,164.5 seedling km plantation had been raised under the social forestry program in the last 5 years. Recent satellite image shows that study area consists about 19,000 ha of mangrove forest coverage, most of which lies within the intertidal zone and south facing along the coastal part.

Table 2.1: The Major Landscape Features of the Study Area

Upazila Name	Landscapes Area (ha)			
	Mangrove Coverage	Mudflats	Sand Dunes and Beaches	Water bodies
Barguna Sadar	631	-	-	-
Galachipa	2,334	322	-	-
Kalapara	895	-	244	212
Patharghata	2,216	-	1	3
Rangabali	9,609	706	195	86
Taltali	3,123		61	230
Total	18,809	1,028	501	531

Note: The above figures are generated through analysis of present landcover using available recent satellite image; Government forest land is much more than these figures

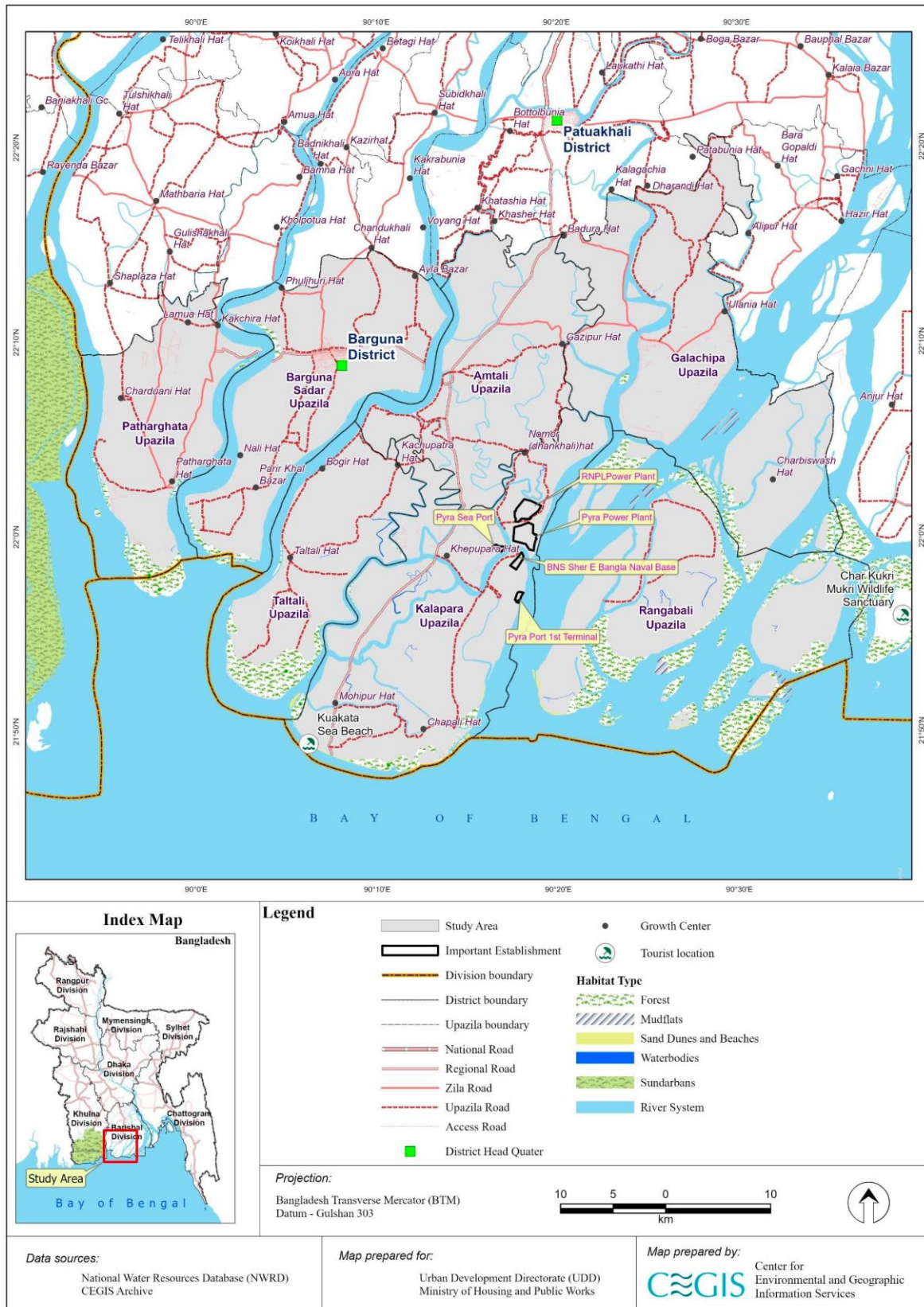


Figure 2.5: Habitat Map of the Study Area

Protected Areas (PA)

Some of the habitats described earlier are protected under the Wildlife (Protection and Safety) Act, 2012 and designated as reserved forests, Ecopark, wildlife sanctuaries, national parks. Although Sundarban Reserve Forest is not within the PKCP area, it is located nearby. The area includes one Important Bird and Biodiversity Areas (IBAs) and touches the eastern side of Sundarban ECA (Ecologically Critical Area).

Table below shows the information of PA within PKCP area.

Table 2.2: Protected Areas within PKCP Area

Sl. No.	Type of PA	Name	Approx. Area (ha.)
1	Reserve Forests	Reserve forests within Kalapar, Galachipa, Rangabali, Barguna Sadar, Taltali and Patharghata Upazilas	43,453 ⁴
2	Wildlife Sanctuaries	<ul style="list-style-type: none"> • Tengragiri Wildlife Sanctuary • Sonarchar Wildlife Sanctuary 	4,048 ⁵
3	National Park	Kuakata National Park	1,613
5	Ecologically Critical Area (ECA)	Sundarban ECA (part)	17,515 ⁶
4	Important Bird and Biodiversity Area (IBBAs) and Key Biodiversity Area (KBAs)	Ganges-Brahmaputra-Meghna Delta IBA (Part)	83,500 ^{7,8}

Distribution and Conservation of Biodiversity in the Study Area

The field survey under this study found that there are 190 species of flora including herbs, shrubs, climbers and trees, and 104 species of fauna including amphibians, reptiles, birds and mammals, within the area. Distribution of these floral species are in mangroves, homestead, cropland, roadside, shorelines, canals, rivers and small water body habitats. According to IUCN- Bangladesh (2015), Greater Flameback, Grey-headed Fisheagle, Fishing Cat, Smooth-coated Otter and Irrawaddy Dolphin are categorized as threatened species which occur in the charlands, mangrove forest, rivers and estuaries. Table 2.3 and 2.4 below shows the biodiversity hotspots of the study area.

⁴ Coastal Forest Division, BFD, 2022

⁵ <http://www.bforest.gov.bd/site/page/5430ce33-561e-44f6-9827-ea1ebaa2c00d/->, last accessed 7th June, 2022

⁶ DoE, Bagerhat

⁷ <https://www.keybiodiversityareas.org/> Last accessed 14 June, 2022.

⁸ <http://datazone.birdlife.org/country/bangladesh/ibas>, last accessed on 15 Sep, 2022.

Table 2.3: Important Location with Threatened Floral Species of the Study Area

Sl. No.	Location	Ecosystem Type	Threatened species
1	South kathaltoli, Kathaltoli, Patharghata, Barguna	Terrestrial	<i>Bombax ceiba</i> , <i>Pongamia pinnata</i>
2	4No Keorabunia, Patharghata, Barguna	Terrestrial	<i>Bombax ceiba</i> , <i>Pongamia pinnata</i>
3	Lotabaria, 9No Keorabunia, Barguna Sadar	Terrestrial	<i>Tamarindus indica</i>
4	College Branch Road. 8No ward, Barguna Sadar	Terrestrial	<i>Streblus asper</i>
5	Boro Onkujanpaea, 1No ward, Nishanbari, Taltoli, Barguna	Terrestrial	<i>Bombax ceiba</i>
6	Kumir Mara khal, East Sonatola, Nilganj, 3no ward	Aquatic	<i>Typha elephantiana</i>
7	Mora Nodi 6 no ward, Nachnapara, Amtoli, Barguna	Aquatic	<i>Lindernia anagallis</i>
8	6 no ward, Ulania, Mativanga, olachipa, Patuakhali	Aquatic	<i>Tamarindus indica</i>
9	Haringhata Ecopark, Cholhati, Hariyantana, Patharghata, Patuakhali	Mangrove Forest	<i>Tamarindus indica</i>
10	Tengra giri wildlife Sanctuary, Cholhati, Hariyantana, Patharghat, Barguna	Mangrove Forest	<i>Heritiera fomes</i>
11	Lebur Char, Trimohoni, Jhaubon, Leburchar, Kuakata, Patuakhali	Mangrove Forest	<i>Cuscuta Sp.</i>
12	Ghora Padma beach Mangrove, Cholabunia, Joyalbhanga, Barguna Sadar	Mangrove Forest	NA
13	Taltali Char Mangrove, Barisal Tap biddut, Taltoli, Barguna	Mangrove Forest	<i>Lindernia anagallis</i>
14	Kuakata Mangrove Kuakata Beach	Mangrove Forest	<i>Heritiera fomes</i>

Source: CEGIS Field Survey, 2022

Table 2.4: Wildlife Hotspots and Key Species of the Study Area

Sl. No.	Spot/Habitat	GPS Coordinates		Key Species (Wildlife/Fauna)
		Lat	Long	
1	Bihanga Char	22.02093	89.90658	Migratory Birds in winter
2	Harina Ghata	21.9641	89.975462	Otter, Fishing Cat, Wild Cat
3	Harina Ghata	21.98406	89.940986	Wild Boar
4	Majher Char	22.17988	90.03424	Migratory Birds in winter
5	Mangrove Forest In Bainchotki Ferry Ghat	22.15183	90.046505	Snake, Deer
6	Ammtoli Ferry Ghat	22.13265	90.218293	Irrawardy Dolphin
7	Near Powerplant of Payra	21.95369	90.035613	Irrawardy Dolphin, Indo-pacific Humpback Dolphin
8	Char Bijoy	21.7243	90.20504	Migratory Birds in Winter, Crab

Sl. No.	Spot/Habitat	GPS Coordinates		Key Species (Wildlife/Fauna)
		Lat	Long	
9	Lebur Ban	21.83313	90.094439	Resident Bird Species, Fishing Cat, Wild Boar
10	Pakhi Mara	21.9481	90.178599	Resident Bird, Fishing Cat
11	Ammtoli	22.13658	90.2302	Colony of Heron Egret
12	Harina Ghata Forest Office	21.97576	89.96402	Northern Plains Grey Langur
13	Harina Ghata	21.9716	89.936662	Migratory Birds in Winter
14	Kuakata	21.80291	90.161237	Fox

Existing Threats

Several threats to flora and fauna include urbanization on the natural habitat, extension of agricultural practices to forestland including the mangrove ecosystem, pollution on air and waterways, increase of cattle grazing within the forest peripheries and newly planted charlands, illegal hunting, and degradation of forestland through felling of trees. Expansion of invasive alien species such as water hyacinth also threatens indigenous biodiversity. Table 2.5 illustrates the threatened wildlife of the locality.

Table 2.5: Threatened Wildlife of the Study Area

Scientific Name	English Name	Class	Order	Family	Conservation Status	
					IUCN Bangladesh Red List (2015)	IUCN Global
<i>Chrysocolaptes guttacristatus</i>	Greater Flameback	Aves	Piciformes	Picidae	NT	VU
<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish-eagle	Aves	Accipitriformes	Accipitridae	NT	NT
<i>Ichthyophaga ichthyaetus</i>	Grey-headed Fish-eagle	Aves	Accipitriformes	Accipitridae	NT	NT
<i>Prionailurus viverrinus</i>	Fishing Cat	Mammalia	Carnivora	Felidae	EN	EN
<i>Lutrogale perspicillata</i>	Smooth-coated Otter	Mammalia	Carnivora	Mustelidae	CR	VU
<i>Orcaella brevirostris</i>	Irrawaddy Dolphin	Mammalia	Cetartiodactyla	Delphinidae	NT	VU

Note: NT-Near Threatened, EN-Endangered, VU-Vulnerable, CR-Critically Endangered

Management of Existing Ecosystems

Ecosystem management in this area is mainly executed by the Bangladesh Forest Department (BFD), Department of Fisheries (DoF) and Department of Environment (DoE) with the assistance of District Administration, Police Department, Judiciary department, and support agencies- Rapid Action Battalion (RAB), Coast Guard, Bangladesh Navy, Payra Port Authority, Bangladesh Tourism Board (BTB), Department of Livestock (DLS), Zilla Parishad of Patuakhali and Barguna.

Marine and Blue Economy

In as much as the concept of “blue economy” is a socio-economic issue, its economics are intertwined with biophysical considerations. Without a properly functioning marine ecosystem, many components of the blue economy would not exist. Apparently, both the terms “blue economy” and “ocean economy” are used alternatively but, unlike “ocean economy” the definition of “blue economy” promotes sustainable development of the ocean economy.

Bangladesh has claim to 118,813 km² in the Bay of Bengal comprising her territorial sea, Exclusive Economic Zone (EEZ) and Continental shelf (MoFA, 2014). The shallow shelf sea constitutes about 20% and 35% respectively, and the rest (45%) is lying in deeper waters. Approximately 18.2 percent of the population is dependent on the country’s ocean economy (World Bank Group, 2018).

Twenty-six potential Blue Economy sectors have been identified by the MoFA, including fisheries, maritime trade and shipping, energy, tourism, coastal protection, maritime safety and surveillance. For the purposes of this scoping report, we will focus on fisheries and tourism only, given that these sectors are highly dependent on ecosystem services. The other sectors falling within the “blue economy” are less so. This is underlined by the importance of mangrove forests, which store carbon at higher rates than tropical forests. They also underpin the provision of ecosystem services in the study area.

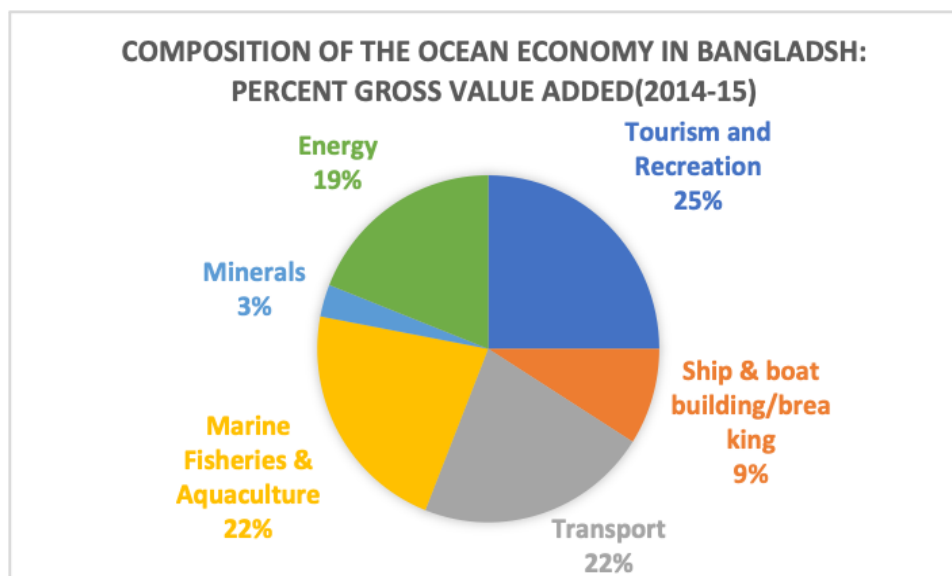


Figure 2.6: Comparison of the Ocean Economy of Bangladesh

Mangrove forests in Bangladesh make up more than 3 percent of the global total (Giri et al., 2011 and Giri et al., 2015), ranking the country 12th in the world by mangrove area (Hamilton and Casey, 2016). Almost all of these mangroves are located within the Sundarbans forests, providing a range of ecosystem services (such as carbon sequestration) with benefits beyond the country (Das and Vincent, 2009 and Miteva et al., 2015). Current research suggests a carbon density in the Sundarbans (including carbon stored above ground, below ground, and in the top meter of soil in mangrove ecosystems) of 239.91 Mg/ha for the 435,861 hectares of mangroves (Lee et al., 2015, 2016, and unpublished data). To illustrate the scale of carbon emissions reduced by conservation of the Sundarbans mangroves, a global average loss rate of 0.7 percent per year was applied (Pendleton et al., 2012) using a price of US\$5/Mg CO₂eq. These calculations, while hypothetical, suggest a total value of US\$122.8 million for carbon sequestration over 20 years.

Bangladesh ocean waters cover the widest continental shelf area in the Bay of Bengal. The coastline includes a number of estuaries, and further inland some 230 rivers running 24,000 kilometers long support large freshwater fisheries, along with small lakes (beels), permanent bodies of floodplain water, and temporary lakes created by rains or floods (FAO, 2014). About 475 species of fish are found in the Exclusive Economic Zone (EEZ) of Bangladesh compared to 250 inland sweet water species (Iqbal, 2020).

Some 5.5 million hectares of fertile floodplains support aquaculture production. Annual production levels increased from 91,000 tons in 1980 to 1.7 million in 2012, making Bangladesh the world's fifth largest aquaculture producer (FAO, 2014; 2016). Although many countries do not consider fishing and aquaculture that are categorised as “freshwater” or “inland” to be part of the blue economy, the geography of Bangladesh makes it logical to include these habitats.

It is estimated that Bangladesh catches only 0.70 million tons of fish every year out of the total 8.0 million tons of fish available in the Bay of Bengal. Marine fisheries contribute 19.40% of the total fish production of the country. Integrated multi-tropic offshore aquaculture is the fastest growing global food sector providing 47% of the fish for human consumption. The bulk of production from marine capture fisheries consists of small pelagic species (e.g., hilsa shad, 53%), with high-value crustaceans (e.g. crabs and shrimp), large pelagic (e.g. tuna and sharks), and demersal (e.g. croaker) making up a total of roughly 11 % (FAO, 2017).

Together with rice, fish is the major contributor of the Bangladeshi diet, providing 60% of the animal protein intake in the country, as well as other essential vitamins and nutrients (DoF, 2017). For poorer groups in Bangladesh, fish is most often the only source of protein. An estimated 70% of the rural population occasionally fishes for subsistence (FAO, 2014).

Marine and coastal tourism in Bangladesh has flourished in recent years, representing an estimated 16% of the country's total sector in terms of leisure and recreation visitor days (Emerton, 2014). On average, 81% of the international tourists visit Cox's Bazaar; the largest sea-beach in the world (Bangladesh Bank, year).

In 2016, tourism and recreation contributed just over US\$10 billion to national GDP and created more than 2 million direct and indirect jobs (WTTC, 2017). In 2013, the estimated gross value of the ocean economy of the country was US\$1.6 billion. Although marine tourism is expanding Bangladesh, no recreational fishing occurs in the country's marine waters (Humayun et al., 2016).

2.1.2 Fisheries

Fisheries management in the study region is mainly concentrated on the riverine and marine fisheries, with more limited management in open water bodies such as fish sanctuaries and beel fisheries. To maintain stock and production in open water fisheries, the following management practices are implemented in the region:

- Establishment of fish sanctuaries to conserve diversity;
- Prohibited or restricted fishing in some areas of the rivers to ensure safe breeding and conservation of fish biodiversity;
- Enhancement of stock by releasing fish fingerlings in open waterbodies;
- Community-based fisheries management in open waterbodies;
- Leasing and licensing for fishing of “Jalmohal” (Government-owned water bodies);
- Restricting gear and fishing of fecund fishes in the breeding season;
- Habitat restoration programmes, including re-excavation of rivers and connectivity (refers to canal/Khals that connect rivers and floodplain at the onset of monsoon).

Bangladesh has vast inland water areas which cover 4.7 million ha comprising of capture fishery 3.86 million ha and culture fishery 0.84 million ha (DoF, 2021). The country has 166,000 sq.km of marine area including its Exclusive Economic Zone (EEZ). The country's 710 km long coastline is composed of the interface of various ecological and economic systems, including mangroves, tidal flat, estuaries, sea grass, about 70 islands, accreted land, beaches, a peninsula, rural settlements, urban and industrial areas, and ports (Ahmad H., 2019). The coastal area is highly productive and rich in biological diversity. One of the unique features of the area is mangrove forests, which support diverse fish species and other commercially important aquatic organisms (Hoq, M.E., et al, 2013). The fisheries sector contributes 3.57% to the national GDP and 26.50% to the agricultural GDP. More than 12 percent of population are directly or indirectly dependent on the fisheries sector for their livelihoods (DoF, 2021).

The study area is situated on the coastal area of Bangladesh spatially dispersed over Patuakhali and Barguna Districts.

The estimated total fish habitat area is about 172,792 ha, which is an assemblage of open water fishery and aquaculture by about 98% and 2% respectively. The open water fisheries are dominated by floodplain habitat followed by river and canal, and mud flat/inter tidal area. The aquaculture includes various culture technology adopted fish ponds i.e. extensive pond, semi-intensive pond and intensive pond. The extent of fish habitats is shown in the Table 2.6.

Table 2.6: Extent of Fish Habitats in the Study Area

Habitat category	Habitats	Habitat area (ha)	Percent (%) of area
Open water fishery	River and canal	71,466	41.4
	Floodplain	94,932	54.9
	Mud flat/Inter tidal area	2,703	1.6
Sub-Total		169,101	97.9
Aquaculture	Extensive fish pond	664	0.4
	Semi-intensive fish pond	2953	1.7
	Intensive fish pond	74	0.04
Sub-Total		3691	2.1
Total		172,792	100

Source: CEGIS estimation based on land use data, 2019

Rivers are major hydrological feature in the Barguna and Patuakhali District. They support riverine fishes and shrimp/prawn. Similarly, floodplains functions are important for fish breeding, grazing and nursing grounds. The floodplain become inundated during periods of high river flow during the rainy season and remains under water for three to four months, providing fish habitat. In the study area, the highest extent of floodplain area is found in Kalapara Upazila. Inter tidal areas are also important in respect grazing and nursing ground of fishes. The inter tidal area becomes inundated during high tide and remain under water about 06 hours for twice a day. In the study area, maximum inter tidal area is found in Rangabali Upazila of Patuakhali District.

Ponds are constructed to facilitate aquaculture: in the study area there are three types i.e., extensive pond, semi-intensive pond and intensive pond. Semi-intensive fish ponds are the most widespread and are found in a number of Upazilas. The highest number of semi-intensive fish ponds are in Kalapara Upazila of Patuakhali District.

The estuary and river systems in the study act as the major migration route for both anadromous and catadromous fishes. The Meghna River System supports all the basic requirements of biology of

various fish species. These requirements include feeding, grazing, nursing, breeding and even spawning. Major migratory species are Hilsa (*Tenualosa ilisha*), Daitna (*Acanthopagrus latus*), Bele (*Glossogobius giuris*), Gagra (*Nemapteryx nenga*), Koral (*Lates calcarifer*), Loittya (*Harpodon nehereus*), Paissa (*Liza persia*), Pangas (*Pangasius pangasius*), Poma (*Poma poma*), Tairel (*Eleutheronema tetradactylum*), Topse (*Polynemus paradiseus*), Tular Dandi (*Sillaginopsis panijus*), etc.

The Meghna River estuary is the largest estuarine ecosystem in Bangladesh which support diverse fisheries. The most important fin fish from an economic perspective are hilsa (*Tenualosa ilisha*) and the most important crustaceans are tiger shrimp (*Panaeus monodon*), giant freshwater prawn (*Macrobrachium rosenbergii*) and mud crab (*Scylla olivacea*) (Hoq, 2008). Other economically important species include silver jew fish (*Johnius argenteus*), white grunter (*Pomadasys hasta*), Asian sea bass (*Lates calcarife*), fatty catfish (*Pangasius pangasius*), tilapia (*Oreochromis niloticus*), green back mullet (*Chelon subviridis*), grey mullet (*Mugil cephalus*), long whiskered catfish (*Mystus gulio*), rui (*Labeo rohita*), catla (*Catla catla*), common carp (*Cyprinus carpio*) and silber barb (*Barbonymus gonionotus*).

As noted earlier, mangroves serve various functions for animals and plants including acting as reservoirs, refuges, feeding grounds and nursery grounds for many terrestrial and aquatic wildlife species. Decomposed mangrove detritus acts as a feed source for many aquatic organisms, including commercial species (e.g. shellfish, shrimps, lagoon fish) (Sukardjo et al. 2013).

Inland water fish species are mostly resident (except for major carps, pangas and ilish which are migratory), and breed in almost any water bodies. They can be grouped according to their spawning pattern:

- Floodplain breeders include Golsha (*Mystus gulio*), Tengra (*Mystus cavasius*), Paissa (*Liza persia*), Chewa (*Apocrypte bato*), Punti (*Puntius spp.*), Chanda (*Chanda nama*), Mola (*Amblypharyngodon mola*), etc.
- River breeders include Rui (*Labeo rohita*), Catla (*Catla catla*), Kalibaus (*Labeo calbasu*), Mrigel (*Cirrhinus cirrhosus*), Ghagot (*Arius gagora*), Ayre (*Sperata aor*), Pangas (*Pangasius pangasius*), Bhangon (*Mugil cephalus*), Tapse (*Polynemus paradiseus*), Tairel (*Eleutheronema tetradactylum*), Koral (*Lates calcarifer*), etc.

Breeding starts at the onset of monsoon flooding, when water in the rivers and channels flows into the low-lying area. Piscivorous (carnivorous) species-Boal (*Wallago attu*), Shol (*Channa striata*) and Gazar (*Channa marulius*) breed earlier than the non-piscivorous species. Most of the catfish, live fish and other small fish move to inundated shallow waters and start breeding at the end of March and early April.

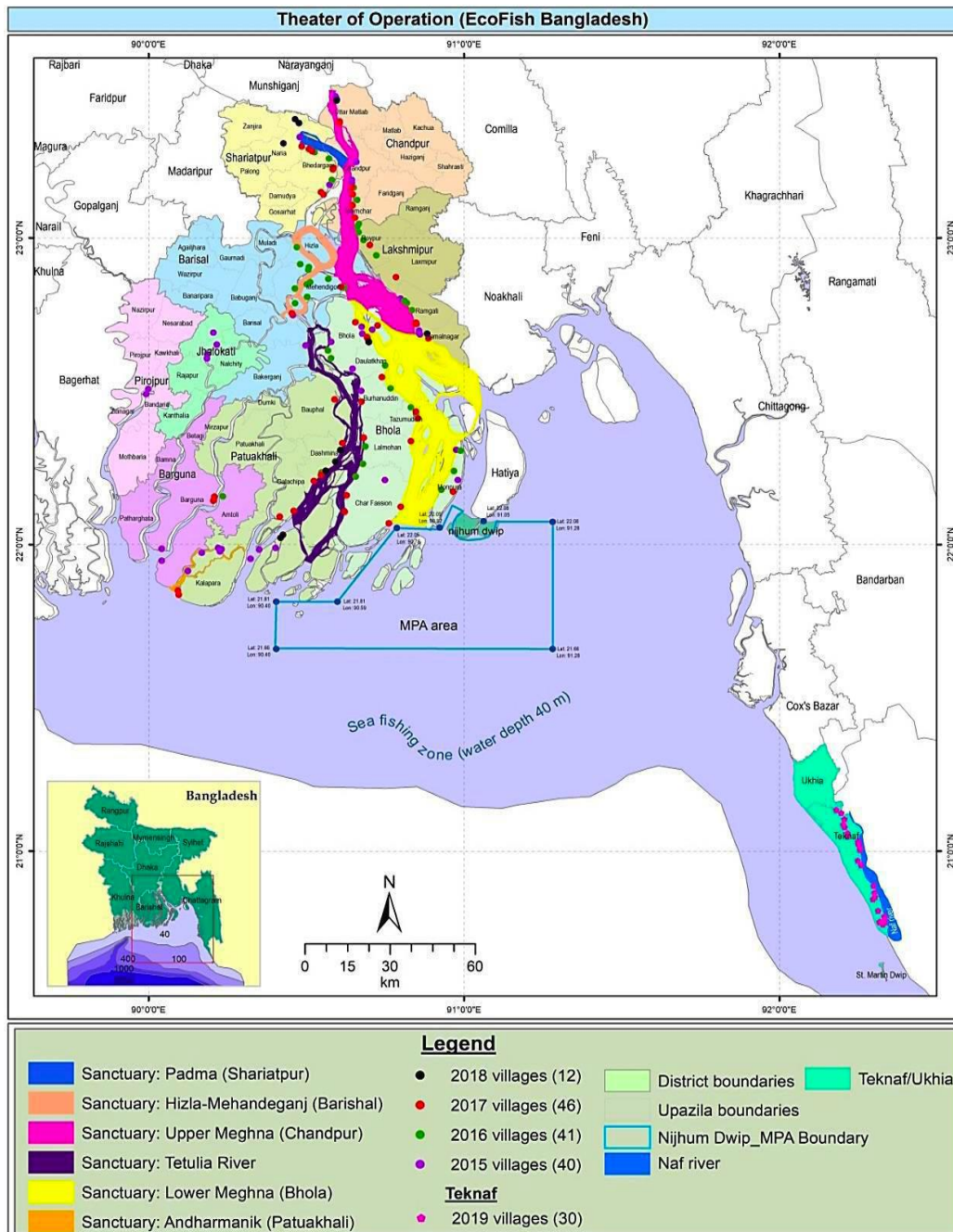
Torrential rainfall with thunder stimulates breeding of Boal (*Wallago attu*), Pabda (*Ompok pabda*), Koi (*Anabas testudineus*), Paissa (*Liza persia*), Punti (*Puntius spp.*), etc. Species such as Boal (*Wallago attu*), Foli (*Notopterus notopterus*), Pabda (*Ompok pabda*), Shol (*Channa striata*), Gazar (*Channa marulius*), Lati (*Channa punctata*) and Koi (*Anabas testudineus*) prefer a newly inundated weedy area with shallow water and slow current.

Reproductive patterns are more diverse among the river breeders. Ayre (*Sperata aor*), Rita (*Rita rita*), Ghagot (*Arius gagora*) and Guizza (*Sperata seenghala*) dig breeding pits in shallow places in April and May and are also known to breed around "Katha" (artificial fish aggregation devices often involving tree or roots, or tree branches). Chital and Foli breed during May to June in shallow areas over hard substances such as stones, bamboo or submerged tree branches. Small fish including Chela (*Chela cachius*), Kachki (*Corica soborna*), Baila (*Glossogobius giuris*) and Baim (*Mastacembalus armatus*) breed in shallow areas of rivers in April and rani prefer to breed in calm and quiet places.

Chital and Foli breed during May to June in shallow areas over hard substances such as stones, bamboo or submerged tree branches.

Hilsa Sanctuary and Spawning Ground

There are six hilsa sanctuaries that have been declared in Bangladesh. Among them, two were established in the Andharmanik and Tentulia River which are in the study area. Moreover, there are four important hilsa spawning grounds in the country which are- i) Dhalerchar of Charfashion in Bhola (about 125Km²); ii) Monpura in Bhola (about 80Km²); iii) Moulavichar of Hatia in Noakhali (about 120Km²); and iv) Kalirchar of Sandwip (about 194Km²) (M.M. Islam, 2016). Among the spawning grounds, two are situated in the study area as shown in Figure 2.7.



Source: World Fish, 2020

Figure 2.7: Hilsa Sanctuary in Bangladesh

Hatcheries and Nurseries

In the study area, the most common cultivated species of fish include: Rui (*Labeo rohita*), Catla (*Catla catla*), Marigal (*Cirrhinus mrigala*), Silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Ctenopharyngodon idella*) and Common carp (*Cyprinus carpio*). Other fish species also cultivated in ponds include: mono sex tilapia (*Oreochromis nilotica*), Thai pangus (*Pangasius sutchi*), Thai sharpunti (*Puntius gonionotus*), mirror carp (*Cyprinus carpio specularis*), bighead carp (*Hypophthalmichthys nobilis*) and bata (*Cirrhinus reba*).

In the study area there are 10 government hatcheries and 12 private hatcheries of which Barguna District has 4 and Patuakhali District has 8 in numbers (Table 2.7).

Table 2.7: Hatchling Production from Govt. and Private Hatcheries

Hatchling Production (kg) of Govt. Hatchery, 2020											
Name/ Location of Hatchery	No. of Hatchery	Major Carp	Exotic Carp	Pangas	Thai Punt	Bata	Koi	Shingi/ Magur	Other	Total	Tilapia Juvenile (Lakh)
Barishal Division	10	336	34	20	5	0	0	15	15	425	1.10
Hatchling Production (kg) of Private Hatchery, 2021											
Barguna	4	0	0	0	0	0	25	0	1850	1875	127
Patuakhali	8	3660	1685	236	1588	0	110	215	0	7494	50

Source: DoF, 2021

The estuarine systems, braided rivers and tidal floodplain are suitable for growing fish, shrimps and crabs. Hilsa is the largest fishery in this region and shrimp brings the highest cash and export earnings. While aquaculture is the major contributor to national fish production, agricultural GDP and export earnings. The future growth and sustainability of both aquaculture and fisheries in the region face many challenges including change in the flow of rivers due to siltation and reduced upstream flow, climate change, sea level rise, and outbreaks of disease in fish and crustaceans.

The estimated total fish production in the study area is 54,531 MT, which is contributed mostly by the capture fishery at 80% and the culture fishery shares the rest. The capture fish production is dominated by the riverine habitat (about 43%) followed by floodplain habitat (about 37%) and inter tidal area. Similarly, the culture fish production is dominated by the semi-intensive fish pond at about 18% followed by extensive fish pond and intensive fish pond as presented in Table 2.8.

Table 2.8: Fish Production Estimation in the Study Area

Habitat category	Habitats	Production (MT)	Percent (%) of Production
Capture	River and Khal	23,226	42.6
	Floodplain	19,936	36.6
	Mud flat/Inter tidal area	203	0.4
Sub-Total		43,365	80
Culture	Extensive fish pond	930	1.7
	Semi-intensive fish pond	9,745	17.9
	Intensive fish pond	492	0.9
Sub-Total		11,167	20
Total		54,531	100

Source: CEGIS estimation based on DoF 2021 (FRSS 2020-21)

2.1.3 Forests

A Forest Area, is regarded as an area more than 0.5 hectares, with trees higher than 5 meters (exception for the *Cerriops decandra* with height of 2 meters) and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under rural settlement, agricultural or urban land use therefore trees grow outside forest land are considered as non-forest trees (BFD, 2017). According to Bangladesh Forest Department, 5 categories of forested land (Reserved Forests, Protected Forests, Acquired forest/Vested forests, Unclassified State Forest, Unclassified Revenue Forest) are maintained by the department with an total area of 25,79,387.9 acre or 10,43,843 ha (BFD 2016). The study area consists about 19,000 ha of mangrove forest coverage (CEGIS Landuse Analysis, 2022). Most of the forests are lies within the intertidal area and south facing along the coastal part.

2.1.4 Agriculture

The southern region of Bangladesh, home to more than 35 million people, accounts for about a third of the country's landmass. About half of the southern zone is open to the sea. Being coastal, farming systems of southern agriculture are different from other parts of the country due to land type, soil type, etc. Climate change poses an especially serious challenge to southern agricultural production. Agriculture in these regions is at high risk due to cyclones, tidal waves, the salinity of soil and water, and submergence. Mechanization of agriculture, cropping pattern change as well as varietal change, seasonal change of crop production, etc. should help sustain crop production in this region.

Agriculture is the main livelihood of the PKCP area. Local farmers of the area cultivate crops mainly twice in a crop calendar which are Kharif-II and Rabi. Due to drainage constraints, the maximum amount of land cannot be used for cultivation. Salinity and irrigation water constraints also hamper desirable crop production in the Boro season.

Transplanted Aman rice followed by pulses is the main cropping pattern. Nowadays, the Department of Agricultural Extension (DAE) emphasizes oil crops (sunflower, soybean, etc.) production to meet up-country demand. The cropping intensity of the area is around 200% which is similar to the national cropping intensity.

The PKCP area comprises two Agro-Ecological Zones named Ganges Tidal Floodplain (78%) and Young Meghna Estuarine Floodplain (22%) of the area. Details of the AEZ are presented below in Table 2.9.

Table 2.9: Agro-Ecological Zone (AEZ) of the PKCP Area

AEZ No.	Region Name	Rangabali	Galachipa	Kalapara	Amtoli	Taltoli	Barguna Sadar	Patharghata	Total Area (ha)
13	Ganges Tidal Floodplain	2198.03	30375.38	43623.51	29259.82	22494.56	31653.74	22247.66	181852.70
18	Young Meghna Estuarine Floodplain	37877.39	13257.80	0	0	0	0	0	51135.19
Total									232987.90

Source: National Water Resource Database (NWRD), 2015

Land use of the PKCP area is shown in below (Tables 2.10 and 2.11). Kolapara and Amtoli Upazila have the most (62% of the total) land used by agriculture (crop agriculture). Rangabali Upazila uses 33% of the total land.

Table 2.10: Land Use of PKCP Area

Sl No	Landuse	Area ha)						
		Golachipa	Kolapara	Rangabali	Barguna Sadar	Amtoli	Taltoli	Patharghata
1	Agricultural Land	28511	30333	22164	18418	19181	13380	12681
2	Water Bodies	10363	7978	32056	6703	2439	6874	7970
3	Mangrove Plantation	1611	694	8645	439	3	2904	958
4	Orchards and Other Vegetation	4	1	219	82	32	48	107
5	Settlement	12167	9510	4670	11580	9082	4730	7932
6	Others	106	511	235	504	228	138	223
	Total	52762	49027	67988	37726	30966	28073	29871

Source: National Water Resource Database (NWRD), 2015

Table 2.11: Land Use Percentage (%) of PKCP Area

Sl No	Landuse	Area (%)						
		Golachipa	Kolapara	Rangabali	Barguna Sadar	Amtoli	Taltoli	Patharghata
1	Agricultural Land	54	62	33	49	62	48	42
2	Water Bodies	20	16	47	18	8	24	27
3	Mangrove Plantation	3	1	13	1	0	10	3
4	Orchards and Other Vegetation	0	0	0	0	0	0	0
5	Settlement	23	19	7	31	29	17	27
6	Others	0	1	0	1	1	0	1
	Total	100	100	100	100	100	100	100

Source: National Water Resource Database (NWRD), 2015

Medium highland is the dominant land type in all seven Upazilas of the PKCP area. Details land type of the seven Upazilas is presented below in Table 2.12.

Table 2.12: Land Type of PKCP Area

SL No.	Land type	Golachipa	Kolapara	Rangabali	Barguna Sadar	Amtoli	Taltoli	Patharghata
1	Medium Highland	34,701	38,955	17,500	25,236	25,623	18,080	18,734
2	Medium Lowland	1,923	20	3,271	-	37	2,415	-
3	Lowland	1,189	7	5,103	-	4	-	-
4	Others	14,953	9,803	41,913	12,414	5,302	5,527	11,148
	Total	52,765	48,785	67,787	37,649	30,966	26,022	29,882

Source: National Water Resource Database (NWRD), 2015

Clay loam type soil is the dominant soil type in Kolapara, Barguna Sadar, and Amtoli Upazila of the PKCP area. In the case of Taltoli and Patharghata percentage of clay is higher among the soil classes. Both clay and clay loam type are dominant in Golachipa Upazila. Details of soil texture of the PKCP area is presented below in Table 2.13.

Table 2.13: Soil Texture of PKCP Area

SL No.	Drainage	Golachipa	Kolapara	Rangabali	Barguna Sadar	Amtoli	Taltoli	Patharghata
1	Clay	14,868	78	-	11,023	11,266	10,001	12,289
2	Clay Loam	15,025	38,601	7,125	14,125	14,357	8,079	4,388
3	Loam	7,919	303	18,749	87	41	2,415	2,057
4	Others	14,953	9,803	41,913	12,414	5,302	5,527	11,148
	Total	52,765	48,785	67,787	37,649	30,966	26,022	29,882

Source: SOLARIS

Drainage plays a vital role in the management of soil. Poorly drained soil is dominant in all Upazilas except Barguna Sadar Upazila. Very poorly drained soil is the dominant soil class in Barguna Sadar Upazila. Details of soil drainage classification of PKCP area are presented below in Table 2.14.

Table 2.14: Drainage Classification of PKCP Area

SL No.	Drainage	Area (ha)						
		Golachipa	Kolapara	Rangabali	Barguna Sadar	Amtoli	Taltoli	Patharghata
1	Very Poorly Drained	1,189	27	5,103	5,988	41	2,415	0
2	Poorly Drained	36,509	38,955	20,771	587	25,623	18,080	18,734
3	Imperfectly Drained	114	0	0	0	0	0	0
4	Others	14,953	9,803	41,913	31,074	5,302	5,527	11,148
	Total	52,765	48,785	67,787	37,649	30,966	26,022	29,882

Source: SOLARIS

2.1.5 Socio-economic

There are limited data regarding the socio-economic status of the study area, so this section of the scoping report provides rather limited insight in this regard.

Bangladesh export earnings during FY 2020-21 was US\$ 45367.19 million and import payment for the same year was US\$ 61571.40 million which shows that export earning covered 73.68% of import bill. During 2019-20 and 2018-19 export earning covered 71.46% and 74.99% of import bill respectively. Export earnings during FY 2020-21 was US\$ 38758.31 million and import payment for the same fiscal year was US\$ 54344.40 million of goods sector. On the other hand, export earnings during FY 2020-21 was US\$ 6608.88 million and import payment for the same year was US\$ 7227.00 of service sector.

Bangladesh commonly has a trade deficit mainly due to heavy import of fuel, capital machinery, industrial raw material required for rapid industrialization.

Bangladesh is an agriculture-based nation. Agriculture is the main source of income for most people. For the fiscal year 2020–2021, agriculture's contribution to the national GDP was 11.63%, third-highest among all sectors. Through agriculture Bangladesh has made significant progress in food security in recent years compared to many of its Asian counterparts. With more than 58.5 million people facing mild chronic food insecurity (IPC Level 2), representing 36% of the total population, and 69.8 million people facing IPC Level 1, representing 43% of the total population. Nearly 35 million people, or 21% of Bangladesh's total population, face moderate and severe chronic food insecurity (IPC Levels 3 and 4), with 11.7 million of those individuals facing severe chronic food insecurity (IPC Level 4), and 23.1 million of those individuals facing moderate chronic food insecurity (IPC Level 3).

Of the eight divisions in Bangladesh, the divisions of Chattogram and Dhaka have the lowest proportion of people in Moderate or Severe Chronic Food Insecurity (18% and 16% respectively). The largest percentage of people facing moderate or severe chronic food insecurity (31%) is found in Rangpur division, followed by Barishal division (24%) and Rajshahi division (23%).

Out of all 64 districts, 19 districts have been classified in IPC Level 2. Forty-three districts have been classified in IPC Level 3. The study area Barguna and Patuakhali districts have been classified in IPC Level 3.

Comparing the upazilas overall employment rates, it is evident that a large proportion of the population is employed. However the upazilas of Patharghata, Barguna Sadar, and Taltali have the highest rates of unemployment. The upazilas with the highest employment rates are Kalapara and Rangabali. Household work as expected is high in all upazilas. Galachipa upazila contributes the most to national employment among the seven, according to an analysis of employment data for the upazilas and a comparison with overall employment. With 25,079 TPEs, it accounts for 0.1% of all employment across the country. Taltali upazila contributes the least (0.03%) (TPE – 6,482). The towns of Galachipa, Barguna Sadar, Kalapara, Amtali, Patharghata, Rangabali, and Taltali are listed in decreasing order of total employment.

Land Use

The baseline information on land resources (agro-ecological characteristics, land use, major challenges, trend analyses-related land use patterns, land degradation, erosion, accretion, coastal land management, land governance) have been collected, mainly from secondary sources. The data were screened, verified, co-related and analyzed, and presented in the baseline situation of Payra Kuakata Coastal Region. The present land resource policies/strategy documents/plans in Bangladesh have been evaluated. The land sector policies include those related to land use policy,

coastal zone policy (CZPo), National agricultural policy, national water policy, environmental policy, national rural development policy and Coastal development strategy.

About 49% of land is used for agriculture and agricultural related land use like forests, mangroves, rivers, lakes, beels and haors. Aquaculture occupies 31% of total land of Payra-Kuakata Coastal Region. The remainder (21%) is non-agricultural land (rural and urban settlement, industrial zone, and accreted).

Analyses on land use pattern or trends of various land use with drivers have been incorporated in the report. Land covering maps of Payra- Kuakata region were estimated by using Landsat 5 TM for the year 2010 and Landsat 8 for the year 2020. The findings indicated that the land use pattern is continuously changing, while the suitability of land is also changing. Mainly the agricultural land has been converted to other lands. For instance-in the last 10 years about 566 hectares (0.09%) of crop land has been lost from 146,357 hectares in 2010 to 145791 hectares in 2020. The wetland area changed between 2010 to 2020. A total of 6363.66 hectares (2.13%) of wetlands have been converted in past 10 years. In 2020, about 1762 hectares area of land has been changed into settlements which is about 1.34% of the total area of PKCP region. But about 670 hectares forest land has increased by the year of 2020.

Infrastructural Development

Sustainable infrastructure plays an important role regarding socio-economic development of Bangladesh as well as facilitating decision making for investment. Infrastructure development has been accelerated due to demographic and economic needs. Ministry of housing and public works, roads and highway department, Bangladesh railway, Ministry of civil and aviation, department of disaster management, Local government engineering department, Payra port authority, BIWTA, BREB, WZPDCL, BEPZA, BEZA are the major government organizations responsible for infrastructural development. Integrated Multi-Model Transport Policy 2013, national land transport policy 2004, road master plan 2009, railways master plan (2016-2045), Bangladesh delta plan 2100, Building construction act, 1952 are key PPPs relating to infrastructure which have been reviewed and described in terms of major environmental and socio-economic impacts.

According to RHD and LGED road database, total regional road, zila road of Payra-Kuakata region are 80.95 km and 81.52 km respectively. Some National and Regional Highways of Bangladesh indirectly influence the PKCP area. Regional highways (R881) and national highways (N8) relate to Asian highways (AH1 & AH41). Railway network of PKCP area is under construction which will connect this area to capital. PKCP is a riverine region having a navigable network (river and canal combined) varying from 2432 km round the year to 2676 km during the monsoon. There is only one sea port which is Payra sea port.

There are 1,222 educational institutes in PKCP area. But the number of colleges, technical and vocational institutions are not adequate for the population. Health care facilities in the PKCP area are similarly insufficient.

Payra-Kuakata contains unique flora, fauna, forests, lakes and rivers, making the region ideal for ecotourism development. The main tourist attractions are Sonakata ecopark, Shuvo Shondha beach, Misripara Buddhist temple, Kuakata sea beach, Laldia forest, Haringhata forest, and Bohongo island.

Some mega infrastructure projects are planned and some are under construction in Payra-Kuakata region that will extend roads, improve energy efficiency, create rail connectivity, create employment, industry etc. This infrastructure development leads to rapid urbanization. Padma multipurpose bridge, Bhaga-Payra rail link, ship construction and improvement, Payra port development, different

power plan development, costal town improvement, construction of fire service and civil defense building are examples of the major projects in the PKCP area.

Eco tourism

As noted above, the Payra-Kuakata regions have tourism potential for both domestic and international visitors. Forests, beaches, lakes, rivers, archeological and historical places make the region unique to tourists in all aspects (Figure 2.8).

Kuakata sea beach popularly known as “Sagar Kannya” (Daughter of the Sea) is one of the major tourist destinations in Bangladesh. This is the second-largest sea beach after Cox’s Bazar. Standing at the same place on the beach, one can view the rising and setting of the sun in the blue water of the Bay of Bengal which makes the beach unique.

The Payra-Kuakata region's tourist attractions can be broadly categorized into three groups named natural, cultural/ historical, and religious/spiritual.

Natural attractions include Gangamotir Char, Kawar Char, Pakhir Char, Sonar Char, Lembur Char, Fatrar Char, Shuvo Shondha Beach, Tengragiri Eco- Park, Haringhata Forest from where one can observe an abundance of mangrove species including birds, red crabs, etc.

Payra-Kuakata region’s Rakhain cultural heritage is one of the major tourist attractions in Kalapara and Taltoli. Tourists can experience Rakhain culture, lifestyle, artisans and tradition in this area.

Additionally, this region is a hub for religious tourism having archaeologically important monasteries of the Buddhist community, including Misreepara Buddhist Temple, Srimangal Buddhist Temple, etc. Another attraction is the traditional ‘Rash Mela’, one of the main festivals of the Hindu community held at ‘Dublar Char’ Island in Sundarbans located in the Bagherhat district in Khulna division of Bangladesh.

According to the General Secretary of Kuakata Hotel and Motel Association, currently, about 15,000 to 20,000 tourists can be accommodated daily in approximately 150 residential hotels/motels/guest houses. The rent of these accommodations varies depending on the quality of the accommodations, rooms amenities, and seasons.

Road and launch are two popular transportation modes for the tourists of this region. By road, it takes only 6 hours to reach Kuakata traveling 300 kilometers from the Capital city Dhaka. While launches are also available from Dhaka to Kuakata via Patuakhali and Dhaka to Kuakata via Barisal routes and ticket fare ranges from BDT 850 to 4,000 per person depending on room quality and services.

There are approximately 15 private travel agencies located in Kuakata which provide tour packages from Dhaka to Kuakata along with local tour guides. There is some local community engagement and ownership in the tourism industry of Kuakata but no foreign investment.



Figure 2.8: Map Showing Major Tourist Spots of the Study Area

The National Tourism Policy of 2010 guides all legislation and regulations of the tourism sector. Other policies and acts that directly and indirectly influence tourism are : Bangladesh Tourism Board Act 2010, Bangladesh Tourist Reservation Area and Special Tourism Zone Act 2010, Bangladesh Tour Operators and Tour Guides (Registration and Operation) Act 2021, Bangladesh Parjatan Corporation (Amendment) Act, 2022, National Environment Policy 2018, National Coastal Zone Policy 2005, National Forest Policy 1994, National Industrial Policy 2016, National Land Use Policy 2001. The mandate for most of the policies and acts is to support government and any other people or organizations related to tourism in coordination, planning, legislation, entrepreneurial support, stimulation, promotion, social tourism, and public interest protection.

Moreover, directives of 8th Five Year Plan, Bangladesh Delta Plan 2100, SDG 2030 has also encouraged ecotourism and community-based tourism as alternative income generation for the local people.

The Ministry of Civil Aviation and Tourism (MoCAT) was first established in 1975, but was then reorganized several times before being re-established in 1986. MoCAT provides policy and regulatory direction to its line agencies for providing safe, secured and efficient civil aviation facilities and attracting tourists at national, regional and local levels. Figure 2.9 shows the government and private agencies working in the tourism sector.

These organizations have been mandated for preparing Bangladesh as an attractive tourist destination through creating various tourism facilities and improving tourism services by developing well trained and efficient human resources.

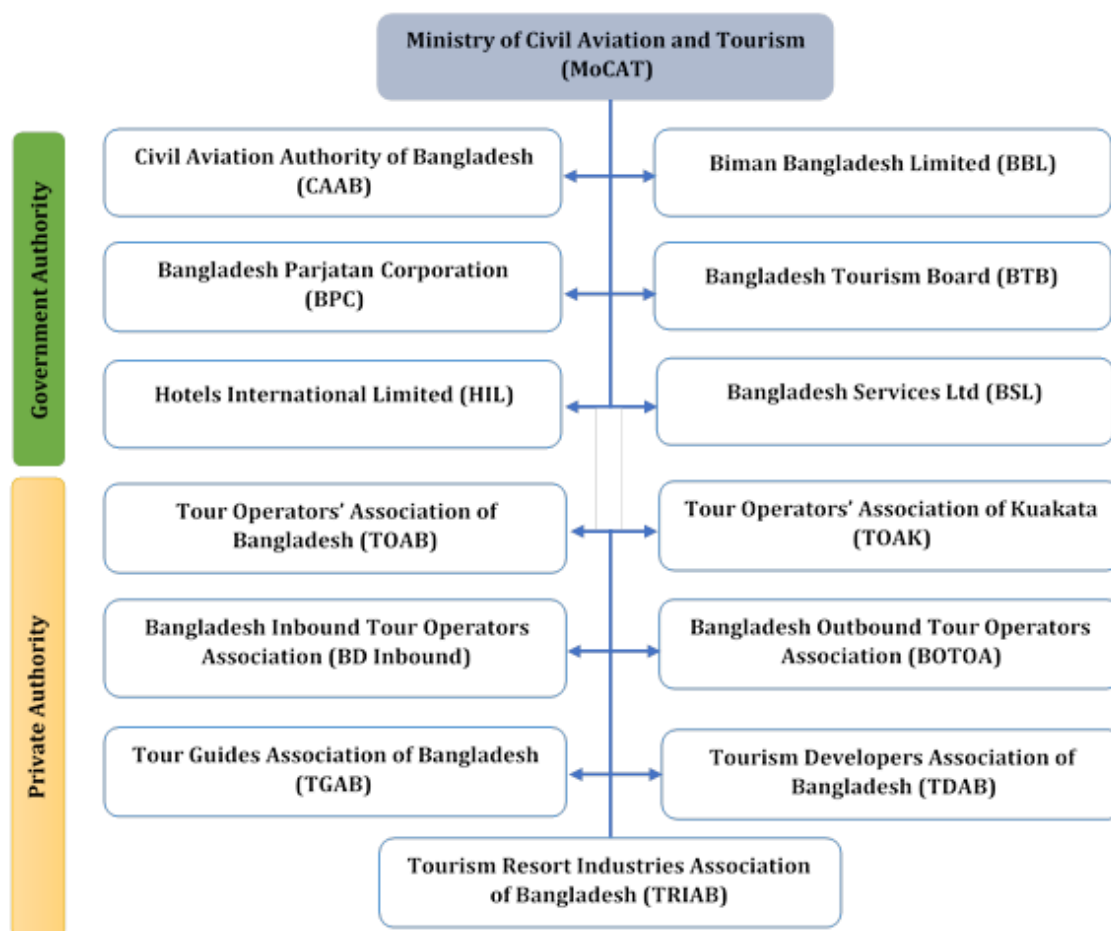


Figure 2.9: Responsible Authorities and Organizations of Tourism Industry in Bangladesh

Energy & Power Sector of Bangladesh

This SEA is being undertaken partly because concerns have been raised, particularly by UNESCO, about the possible impacts on the environment, socio-economic from the Payra coal-fired power station and industrial development in the Payra-Kuakata area. Power generation is a major polluter (particularly airborne pollution).

Energy consumption per capita is 0.28 toe, including around 489 kWh of electricity (2020). The country's overall energy consumption is increasing (4.5%/year since 2010), driven by rapid economic growth (6.9%/year). Gas is the main energy source (57%), ahead of biomass (17%), coal (13%), and oil (12%) (2020)⁹.

Sources of Energy

Natural Gas, liquefied gas, coal, biomass & biofuel, hydro energy, wind energy, solar energy are the main available energy resources in Bangladesh. Biomass accounts for about 27% of the primary energy and the rest 73% is being met by commercial energy. Natural gas accounts for about 62% of the commercial energy (with 8% imported LNG). Imported oil accounts for most of the rest.

Natural Gas

The use of natural gas in Bangladesh began in the 1960s, at present it is the main source of the energy. Until now, 27 gas fields have been discovered. Natural gas covers about 75% of the total fuel consumption of the country being used in electricity production, fertilizer factories, domestic and commercial cooking, CNG vehicles, tea estates and other industries.

Liquefied Petroleum Gas (LPG)

According to the data of "Upending the Natural Gas Market in Bangladesh: Growth Prospects of LPG in Bangladesh", the local annual consumption of LPG grew to 0.95 million ton in 2019.

The maximum LPG production capacity from local sources is about 22,000-25,000 tons. Bangladesh total consumption was around 400,000 tons in 2016-2017, 650,000 tons in 2017-2018, 825,000 tons in 2018-2019, and increased to 950,000 tons in 2019¹⁰.

Coal and Peat

Bangladesh has reserves of 3,100 million tons of coal with 13% in the proven category¹¹. The reserves include five coalfields, all of which occur in the north western area that is sandwiched between the Jamuna River and the Padma River in north western Bangladesh. Currently, Barapukuria is the only mine supplying coal to the Barapukuria Coal Based Thermal Power Plant.

Liquefied Natural Gas (LNG)

Recently, Power Division suggested that coal based power plants, which made little progress or could not secure financing, be turned into LNG based plants. These ongoing projects have a total capacity of 13,000 megawatts – which is more than the country's current power consumption.

⁹ <https://www.enerdata.net/estore/energy-market/bangladesh/>

¹⁰ <https://databd.co/wp-content/uploads/sites/5/edd/2019/05/LPG-White-Paper-May-2019.pdf>

¹¹ Proven coal reserves: coal located in active mines, and that can be extracted under current economic and technical conditions

Use of Primary Fuel

Presently, primary commercial energy resources include natural gas, oil, condensates, coal, peat and renewable energy resources. Biomass still plays an important role in the country's energy consumption in the rural areas. Government is now actively considering use of nuclear energy for electricity generation.

Power Production

Net energy generation in total net energy generation in FY 2020-21 was 80,423 GWh where - 60.19% derived from natural gas, 21.76% from furnace oil, 0.76% from diesel, 6.21% from coal, 0.81% from hydro and 0.20% from renewable sources and 10.08% of electricity was imported from India (BPDB, 2021¹²). Status of the electricity production in Bangladesh has presented on the following table.

Table 2.15: Electricity Production in terms of Fuels in Bangladesh 2011 - 2021

	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total	GWh	44205	48909	53174	55880	59043	68911	73157	78612	70,533	71,419	80423
Coal		827	936	1225	1100	997	1102	1031	1500	1230	2968	4997
Oil		4191	5991	6692	8209	9666	11384	13332	16292	13448	9600	18106
Gas		38263	40858	44169	45799	47624	55325	57572	59437	48306	51290	48403
Hydro		924	824	948	623	600	1920	1041	1086	725	825	655
Solar PV				136	145	154	165	177	291	39	62	158
Wind				4	4	4	5	5	6	-	-	-

Source: Bangladesh Power Development Board

Status of Electricity Sector

Electricity is the major source of power for most of the country's economic activities. Bangladesh's total installed electricity generation capacity (including captive power) was 22,031 MW (BPDB Annual Report) in the year of 2020 -2021. During fiscal year 2020-21, transmission grid substation capacity also increased due to completion of new Sub-stations and augmentation of existing grid substation. At the end of fiscal year 2020-21, grid capacity increased by 13% at different voltage level.

The utility electricity sector in Bangladesh has one national grid with an installed capacity of 22,562 MW as of October 2019 (including captive and renewable energy). Annual Report 2019 of BPDB confirm that around 95% of the population had access to electricity in 2019.

Electricity demand is growing day-by-day. In order to mitigate the demand-supply gap, an aggressive plan in the Seventh five-year plan 2015 has been prepared by the government for the addition of an envisaged 17,304 MW new generation capacity by 2023. The plan includes 50 power generation projects of capacity 15,151 MW which are now under construction. Distribution system losses are between 7 and 8 % (2nd Perspective Plan: 2021-2041).

¹² Bangladesh Power Development Board, Annual Report 2018-19; link: https://www.bpdb.gov.bd/bpdb_new/resourcefile/annualreports/annualreport_1574325376_Annual_Report_2018-19.pdf

Power plants in the Barishal Division of Bangladesh

There are Seven power stations operating in the Barishal of Bangladesh which are connected to the national grid. These power plants are fuelled by Gas, Coal, High Speed Diesel (HSD) and Heavy Fuel Oil (HFO). The present and future status of these power stations is presented in the following Tables.

Table 2.16: Status of Existing and Future Power Station in the Barishal Division

Sl. No.	Existing Power Plants			Future Power Plants			
	Name of the Power Station	Fuel Type	Capacity (MW)	Name of the Power Station	Fuel Type	Capacity (MW)	Expecting Commissioning Date
1	Barisal 110 MW PP (Summit)	HFO	110	Borisal 307 MW Coal Fired Power Plant	Imported Coal	307	October, 2022
2	Bhola 33 MW PP (Venture)	Gas	40	Patuakhali 1320 (2x660) MW USCPP (Phase-1)	Imported Coal	1320	U#1: August, 2023 U#2: December, 2023
3	Bhola 225 MW CCPP	Gas	194	Payra 1200 MW LNG based CCPP (1st Phase)	RLNG	1200	June, 2024
4	Bhola 95 MW PP (Aggreko)	Gas	0	-	-	-	-
5	Payra 1320 MW	Coal	1244	-	-	-	-
6	Bhola Nutan Biddut BD LTD	Gas	220	-	-	-	-
7	United Payra Power Ltd.	HFO	150	-	-	-	-

Power Transmission Network

The national grid, operated by the state-owned Power Grid Company of Bangladesh (PGCB), covers the whole country and operates at 132 kV, 230 kV, and 400 kV. The country's transmission system is also connected to the national grid of India through 400 kV lines at Bheramara and Comilla. The first 400 kV transmission line runs from Meghnaghat to Aminbazark. Three other 400 kV transmission lines are under construction – one these is from Mongla to Aminbazar.

The utility electricity sector has one national grid with an installed capacity of 21,419 MW as of September 2019. The PGCB transferred 41,200 gigawatt-hours (GWh) in FY2015, 47,759 GWh in FY2016, and 50,846 GWh in FY2017 at the wheeling charge of Tk 0.27 per kilowatt-hour.

Gas Transmission Network

There are six companies involved in gas distribution in Bangladesh: Titas Gas Transmission and Distribution Company Limited (TGTDC), Bakhrabad Gas Distribution Company Limited (BGDCL), Jalalabad Gas Transmission & Distribution System Ltd. (JGTDSL), Pashchimanchal Gas Company Limited (PGCL), Karnaphuli Gas Distribution Company Limited (KGDCL), and Sundarban Gas Company Limited (SGCL) all of them are subsidiary companies of the Petrobangla (the government-owned national oil company).

Institutional Arrangements of Energy Sector

In Bangladesh, the Ministry of Power, Energy and Mineral Resources (MoPEMR) Power Division manages the electricity business. Under its control, the Bangladesh Power Development Board (BPDB) generates power. Some power plants are departments and subsidiaries of BPDB. There are also independent power producers (IPPs) and private power generation companies. A schematic diagram of current managing directives of the major relevant government line agencies of Power and Energy are displayed in Figure 2.10.

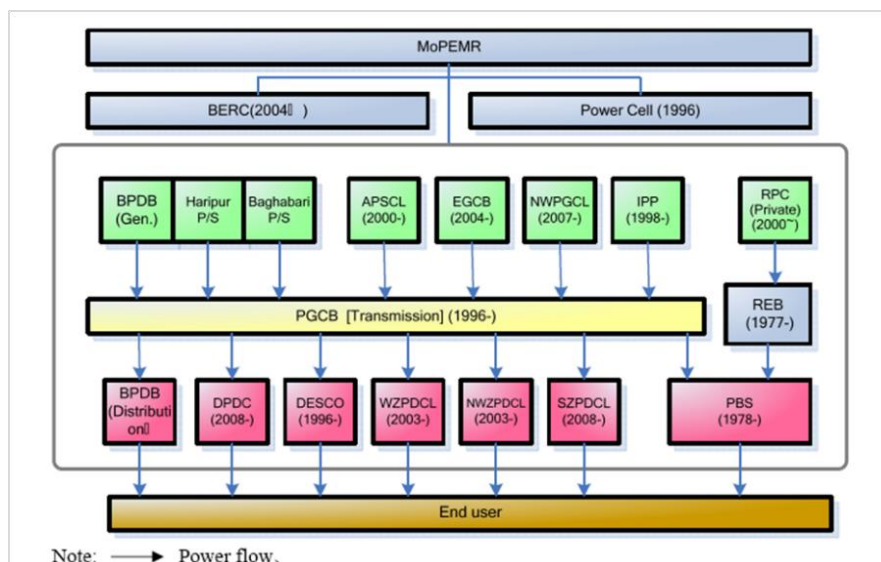


Figure 2.10: Structure of the Electric Power Sector in Bangladesh

2.1.6 Environmental and Social Laws and Regulations

Introduction

A review has been undertaken of the main legal and regulatory instruments for each of the key line sectors as well as for cross-sector or over-arching matters - those for which there are PPPs that are considered by the SEA.

The practice of EIA in Bangladesh started with some guidelines in 1992 for infrastructure development in the water sector through the Flood Action Plan (FAP). The process of EIA in Bangladesh includes screening, scoping, alternative analysis, identification and assessment of impacts, and preparation of an EMP. Current EIA process typically do not include Cumulative Impact Assessment (CIA) from multiple projects in the same site etc. SEA is a good tool for understanding of cumulative impacts.

The two most important documents ensuring environmental governance in Bangladesh are the 7th 5-year Plan and National Environmental Policy 2018. Vision 2021, Vision 2041, and the 7th FYP (FY2016–FY2020) all emphasized the incorporation of SEA in the ongoing national development strategies (GED/GOB, 2015). The following figure has shown the evolution of EIA to SEA in Bangladesh.

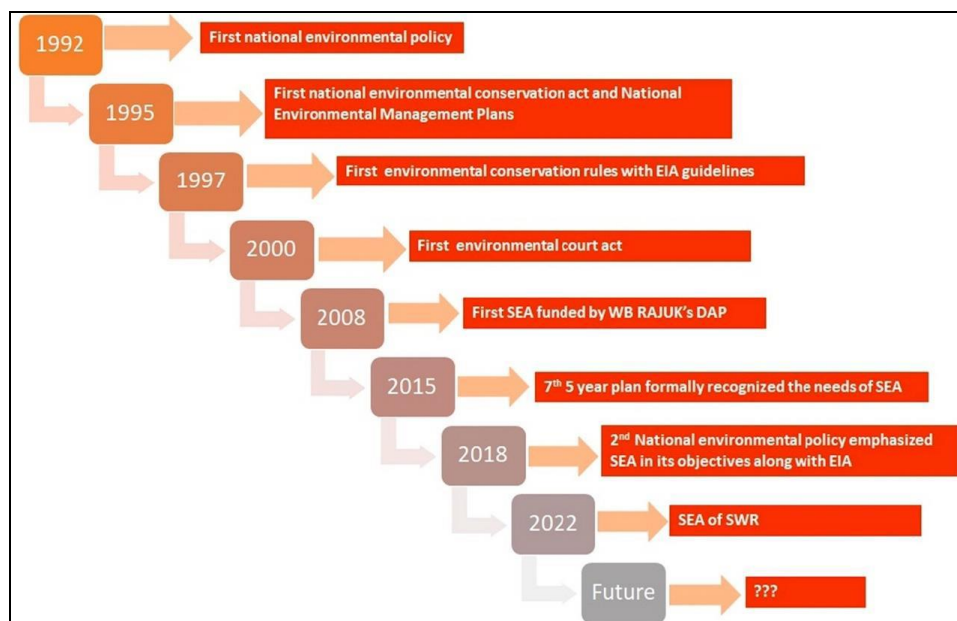


Figure 2.11: Evolution of EIA to SEA in Bangladesh (from 1992 to 2022)

The main environmental regulations in Bangladesh are the Environment Conservation Act (ECA) 1995 (amended 2000, 2002, 2007 and 2010) and Environment Conservation Rules (ECR) 1997. The ECA 1995 provides the requirements on environmental protection, improvement of environmental standards, and control and abatement of environmental pollution. Through the ECA 1995, the Department of Environment (DoE) is mandated to undertake any activity needed to conserve and enhance the quality of environment and to control, prevent and mitigate pollution.

The ECR, 1997, provide the parameters for: (a) the declaration of ecologically-critical areas and restrictions on operations and process which can or cannot be carried out/initiated in such areas, (b) securing an environmental clearance certificate, (c) environmental quality standards, (d) acceptable limits for discharges of waste, and (e) guidelines on pollution prevention. Overall, the ECA, (1995) and ECR, (1997) outline the regulatory mechanism to protect the environment in Bangladesh.

In addition, there are around 200 laws with direct relevance to environment (In most of the cases, their primary objective does not concern natural resource management or addressing environmental pollution directly. However, they can be invoked with regard to sectoral environmental issues related to public services and practices concerning, for example, use of pesticides, land use, human health and urban facilities (Farooque and Hasan, 1996).

Laws relevant to natural resource management in Bangladesh can be broadly divided into the following categories (Farooque and Hassan 1996):

- Non-sectoral laws, e.g. Environment Conservation Act (ECA), 1995; and the Environment Conservation Rules (ECR), 1997;
- Sectoral laws – covering: land use, agriculture and irrigation, water resources, fisheries, forestry, wildlife, energy, health, food and consumer protection, transportation, local government, urban and rural development.

National Legislation

Table 2.17 summarises the national environmental regulations and other relevant laws. Further details are provided in the following sections.

Table 2.17: National Legislation Relevant to Sectoral Development Activities

Issue	Legislation or Regulation	Brief description of the legislation
Protection of Environment including protected areas and pollution management	Environment Conservation Act- 1995 (with amendments till 2010)	The ECA 1995, amended in 2010, covers environment conservation, standards development, pollution control and abatement, declaration of ecologically critical areas (ECAs) and imposing of restriction for operations within the jurisdiction of such areas, defining and conserving wetlands, hill cutting, ship breaking, and hazardous waste disposal. The 2010 amendment empowered the government to enforce more penalties than before. Moreover, affected persons were given provision for make objections or take legal actions against polluters or any entity creating a nuisance.
	Environment Conservation Rules- 1997 (including all amendments)	These rules, promulgated under the ECA 95, categorise industries and projects and identify the types of environmental assessments needed for the categories, and established national environmental quality standards.
	Environment Court Act 2010)	The objective of this act is to expedite trials concerning environmental crimes. Previously, environmental crimes were not usually considered as serious offences. The act allows government to take necessary legal action against any parties who create environmental hazards/ damage to environmentally sensitive areas as well as human society. According to this act, government can take legal actions if any environmental problem occurs due to interventions of the River Management Improvement Programme.
	The Forest Act, 1927 (amended in 1982, 1989 and 2000)	This Act aims to protect forest resources and provides for reserving forests over which the Government has an acquired property right. It enables the restriction of many activities that may cause damage to forests and wildlife resources within forest areas and the imposition of punishment for violation. Relevant people are bound to inform and assist Forest or Police Officers to prevent crime in the forests.
	The Protected Area Rule 2017	This rule provides for the formation of Co-management Committees for the management of Protected Areas. The Committees involve stakeholders including the resources users and especially ethnic people. It empowers the Committee to act as official actor for the protection of forests and collect revenue, and also provides for sharing of revenue to cover the recurrent costs of co-management. Recently introduced in Sundarbans.
	The Social Forestry Rule 2004	Provides regulation for plantation on marginal lands besides roads, canals, embankments and railways with the involvement of local residence as beneficiaries. The latter are given the majority of the harvested crops in return for their contribution to protect the seedlings planted. The rule allows tree firming funds from the sale proceeds of harvested plantation for replanting.
	Wildlife (Conservation and Security) Act- 2012-	Provides for the conservation and safety of biodiversity, forest and wildlife of the country by repealing the Bangladesh Wildlife (Preservation) Order 1973 relating to conservation and management of wildlife of Bangladesh. Under this Act, hunting, trapping, killing, driving or damaging of wildlife are strictly prohibited.

Issue	Legislation or Regulation	Brief description of the legislation
	Bangladesh Biodiversity Act 2017	As a dualist country, Bangladesh requires implementing domestic legislation to give legal effect to the provisions of international treaties. The act was introduced 25 years after Bangladesh signed the Convention on Biodiversity in order to fulfil the State's international obligations. The law introduces an access and benefit-sharing (ABS) mechanism and also promotes research related to biotechnology and documentation of traditional knowledge.
	Noise Pollution Control Rules- 2006	This Rules give a right to the respective authority to mark off the areas under their jurisdiction as silent, residential, mixed, commercial or industrial. Also describes the approved standard limit of sound for each area.
	Bangladesh Water Act-2013	Makes provisions for integrated development, management, abstraction, distribution, use, protection and conservation of water resources.
	National River Protection Commission Act-2013	This act created the National River Protection Commission. It establishes composition, duties and responsibilities of the Commission to manage and control pollution of rivers caused by industries and construction of illegal structures, to prevent irregularities and restore the normal flow of rivers, to control floods and drainage, and monitor hydrology and use of surface and ground water; and examine equipment.
	The National River Conservation Commission Act, 2013	Established the Commission to prevent illegal occupation of rivers, pollution of water and environment, pollution of rivers caused by industrial factories, illegal constructions and various irregularities and ensuring multidimensional use of rivers for socio-economic development including restoration of the normal flow of rivers, proper maintenance thereof and making them navigable.
	Natural Water Bodies Protection Act 2000	According to this Act, the character of water bodies, i.e. rivers, canals, tanks, or floodplains identified as water bodies in the master plans or in the master plans formulated under the laws establishing the municipalities in division and district towns, shall not be changed without approval of concerned ministry.
	The Ground Water Management Ordinance (1985)	Describes the management of ground water resources and licensing of tube wells.
	The Water Supply and Sanitation Act (1996)	Regulates the management and control of water supply and sanitation in urban areas.
	Bangladesh Climate Change Trust Act 2010	An Act to establish a trust to be called the Climate Change Trust to redress the adverse impact of climate change on Bangladesh and to take measures on other matters relating thereto. The objective of the Trust is to use funds beyond the revenue and development budget to address vulnerability to climate change issues.
	The Ship Breaking and Recycling Rules-2011	The Rules promulgated under the ECA of 1995 (amended) defines and classifies hazardous materials (hazmats) (including hazardous wastes) and provides for safe and environmentally

Issue	Legislation or Regulation	Brief description of the legislation
		sound ship recycling in Bangladesh.
	Embankment and Drainage Act 1952	An Act to consolidate the laws relating to embankment and drainage and to make better 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.
Agriculture and Fisheries	The Protection and Conservation of Fish Act 1950 (amended 1973, 1982, 1995, 2002)	The act sets requirements to protect and conserve fish. Defines fish as “all cartilaginous, bony fishes, prawn, shrimp, amphibians, tortoise, turtles, crustacean animals, molluscs, echinoderms and frogs at all stages in their life history.”
	The Protection and Conservation of Fish Rules- 1985	The Rules focus on the protection of fisheries/fishes and aim to prevent the destruction of fish in the natural waters and killing of fish by poisoning.
	Private Fisheries Protection Act 1889	Provides for the protection of private fishing rights.
	Irrigation Act 1876	Makes provision for the construction, maintenance and regulation of canals, for the supply of water therefrom, and for the levy of rates for water so supplied, in Bangladesh.
	Marine Fisheries ordinance 1983 and Marine Fisheries Rules-1983	Covers fisheries conservation and management.
	Biosafety Rules-2012	Provide regulations on the approval process for biotech products developed domestically or by a third country. Requires all GE products to be approved before they can be imported or sold domestically within Bangladesh.
Toxic and hazardous substances	Agricultural Pest Ordinance 1962	An Ordinance to provide for the prevention of the spread of agricultural pests in Bangladesh.
	Agriculture and Sanitary Improvement Act 1920	Act to consolidate and amend the law relating to the construction of drainage and other works for the improvement of the agricultural and sanitary conditions.
	Drug Act 1940	An Act to regulate the import, export, manufacture, distribution and sale of drugs.
	Drug Control Order 1982	An Ordinance to control manufacture, import, distribution and sale of drugs.
	Poison Act 1919	An Act to consolidate and amend the law regulating the importation, possession and sale of poisons.
	Agricultural Pest Ordinance 1962	An Ordinance to provide for the prevention of the spread of agricultural pests in Bangladesh
	Pesticide Act-2018 and Pesticide Rules, 1985 (Amendment) in 2010	Bans harmful toxic substance which were earlier imported and used for pest control.
Land, land use and cultural	Antiquities Act 1968	The Act focuses on protection and preservation of archaeological and historical artefacts.

Issue	Legislation or Regulation	Brief description of the legislation
heritage	Acquisition and Requisition of Immovable Property Act, 2017	Repealed the Acquisition and Requisition of Immovable Property Ordinance 1982 and provides certain safeguards for the owners and has provision for payment of “fair value” for the property acquired. Also gives the right to the land owner to appeal against land acquisition.
	Balumahal and Soil Management Act 2010	This Act has the provision for protection of uncontrolled mining of sand from water ways and prohibits sand quarrying within a kilometre of bridges, culverts, dams, barrages, embankments, highways, rail tracks, residential areas and other important structures, as well as sand lifting without permission.
	Non-Agricultural Tenancy Act 1949-for land use	Makes provisions relating to the certain non-agricultural tenancies in Bangladesh.
	State Acquisition and Tenancy Act 1950-land use	Introduced to eradicate flaws and gaps in the provisions for collection and receiving of rents for land. It also declares forests and waterbodies as non-retainable properties.
	Acquisition of Waste Land Act 1950	This Act authorizes the government to acquire private lands that have not been cultivated during last five years, for any public purposes including afforestation.
	Land Reforms Ordinance 1984 Land use	Reformed the law relating to land tenure, land holding and land transfer with a view to maximising production and ensuring a better relationship between land owners and bargadars (people who cultivate the land for others).
Water Transportation, handling and storage, pollution and coastal resources management,	Territorial Water and Marine Zone Act 1974 & Maritime Rules- 1977	Provide guidelines for transportation through marine and inland water ways and control of pollution in the surrounding waterways, and for the conservation, management and development of marine fisheries.
	Ports Act- 1908	The Act has guidelines for controlling pollutant discharges (oil, grease, oily water, bilge and ballast water, rubbish etc.), creation of fires, creation of obstacles for navigation and spread of infectious diseases in the surrounding environment or damage of shore/bank.
	Hazardous Wastes and Ship Breaking Waste Management Rules, 2011 (22 December, 2011; MoEF)	The legislation is premised on the Basel Convention. It bars the import of wastes if ships are not certified by authorized agents of exporting countries as not containing hazardous wastes; provides regulations for safe disposal of hazardous waste. Implementation through an emergency response plan Implementation is the responsibility of a National Technical Committee under MoEF.
	The removal of wrecks and obstructions in inland navigable water-ways Rules, 1973	The Rules has provision to take action against any obstruction created in the water ways. The wreck or obstruction can be required to be raised, removed or destroyed.
	Bangladesh Merchant Shipping Ordinance- 1983	The Act provides for the engagement of seaman during project activities.
	The inland shipping Ordinance-1976	The law makes provision for BIWTA to issue a permit for navigation.

Issue	Legislation or Regulation	Brief description of the legislation
	Coast Guard Act 2016	The Act makes provisions to control pollution discharges and protect the surrounding environment.
	Rules for Removal of Wrecks and Obstructions in inland Navigable Water Ways (1973)	The Rules apply to inland navigable waterways, including all rivers, canals, lakes, shores, inland river ports, piers and terminals (as per Section 2, clause I) and deal with any kind of obstruction and all wrecks (as per Section 2, clause IV) impeding navigation. The appointed Authority may dispose, remove or destroy obstructing items or even take possession of them and issue a public notice in this regard.
	Canals Act 1864	This old law in need of amendment and consolidation. It covers the collection of tolls on canals and lines of navigation.
	Inland shipping Ordinance 1976	An Ordinance to provide for the survey, registration and control of navigation of vessels plying on inland waters.
	Mongla Port Authority Ordinance- 1976	The legislation enables the controlling, anchorage and sailing of ships and provides guidelines for environmental pollution control in the surrounding sea and land environment.
Road transportation	The Vehicle Act (1927) and the Motor Vehicles Ordinance (1983)	This Act provided for the better control of horse-drawn vehicles in certain areas in Bangladesh. The Ordinance consolidated and amended the law relating to motor vehicles in Bangladesh. These laws regulate vehicular exhaust emissions, air and noise pollution including road safety.
Power generation, energy, mining, industry and utilities	Electricity Act, 2018	The Act repealed a 2010 law relating to the supply and use of electrical energy. The 2018 Act specifies conditions of distribution, sale and use of electricity, including related generation and transmission infrastructure, and obligations regarding the need for preservation of the environment, and associated protection and safety clauses.
	Bangladesh Energy Regulatory Commission Act-2003	Makes provisions for the establishment of an independent and impartial regulatory commission for the energy sector.
	The Telegraph Act (Act XIII of 1885)-1885	Sections 10-19 specify parameters and obligations for government-built transmission lines throughout the country.
	NG Safety Rules 1991 (amended 2003)	Provides guidelines on the materials, design and construction of gas transmission and pipeline industry. This Safety Rules were based on the American National Standard Codes for Gas Transmission and Piping System.
	Bangladesh Petroleum Act 1974	Provides for the exploration, development, exploitation, production, processing, refining, and marketing of petroleum.
	Petroleum Act 2016	An Act to consolidate and amend the law relating to the import, transport, storage, production, refining, blending, or reclaiming by recycling of petroleum and other inflammable substances. This Act, consisting of six Chapters, regulates petroleum import, transport, storage, distribution, refining, blending, testing, licensing and all aspects related to petroleum exploitation.
	Bangladesh Gas Act 2010	Regulates the transmission, distribution, marketing, supply and storage of natural gas and liquid hydrocarbon.
NG Safety Rules 1991 (amended 2003)	Provides guidelines on the materials, design and construction of gas transmission and pipeline industry. This Safety Rules were based on the American National Standard Codes for Gas	

Issue	Legislation or Regulation	Brief description of the legislation
		Transmission and Piping System.
	Brick Manufacturing and Brick Kiln Establishment (Amendment) Bill 2019	The proposed law (passed by parliament in February 2019) is a modified version of the 2013 Act and will prohibit conventional technologies in the brick-making industry.
	Speedy Increase of Electricity & Fuel (Special Provision) 2010	An Act to make special provisions for facilitating effective and urgent measures to enhance the generation, transmission, transportation and marketing of electricity and energy with a view to ensuring uninterrupted supply of electricity and energy keeping pace with the demands of agricultural, industrial, commercial and domestic activities, and for quick implementation of the plan to import electricity and energy from abroad, if necessary, and for implementation of the decisions on urgent extraction and utilization of minerals related to energy.
	SREDA Act 2012, Renewable energy Act-2012	Sustainable and Renewable Energy Development Authority (SREDA) has been formed under Sustainable and Renewable Energy Development Authority Act, 2012 as a nodal agency to promote, facilitate and disseminate sustainable energy (SE), i.e. covering both the areas of Renewable Energy (RE) and Energy Efficiency (EE) to ensure the energy security of the country.
	BEZA Act 2010	An act to make provisions for the establishment of economic zones in all potential areas including backward and underdeveloped regions and development, operation, management and control thereof including the matters ancillary thereto with a view to encouraging rapid economic development through increase and diversification of industry, employment, production and export.
	Bangladesh Electricity & Energy Research Council Act 2015	This Act created the Bangladesh Energy and Power Research Council. It prescribed the composition, duties and responsibilities of the Council regarding research and development of the country's power and energy sector. It specifies the authorized use of electricity and fuel diversification for the identification, conservation and conversion of energy to ensure the safety of the power and energy sector in the country with a view to long-term planning study of the sector.
	Mines Act 1927	The Act focuses on mineral resources development and management. It requires amending and consolidation regarding the regulation and inspection of mines.
Procurement in Bangladesh	The Public Procurement Regulations- 2003 (and all amendments)	The regulation focuses on each of the project services and equipment which will be procured following the government rules.
	Import and Export Control Act-1950	The Act outlined guidelines on the export and import of goods. The Government may prohibit, restrict or otherwise control the import or export of goods of any specified description, or regulate generally all practices (including trade practices) and procedures connected with the import or export of such goods.
Health and Safety and	The Penal Code 1860	The Code contains still valid provisions relating to pollution management, environment protection, and protection of health

Issue	Legislation or Regulation	Brief description of the legislation
labor management		and safety.
	Dangerous Cargoes Act 1953	The Act provides for guidelines for cargos to avoid any discharges of hazardous materials in the surrounding water ways and adjacent land.
	Explosives Act 1884, Explosive Rules-2008.	An Act to regulate the manufacture, possession, use, sale, transport and importation of Explosives.
	Pressure Vessel Rules 1995 (amended 2004)	The Rules provide the safety requirements for units handling divergent types of hazardous materials.
	Explosive Substances Act 1908 and Explosive Substances (Amendment) Act, 1987.	This amendmet act imposed a penalty for causing an explosion with intent to commit an offense, and punishment for exploding, making or possessing explosives under suspicious circumstances.
	Fire Prevention and Extinguish Act, 2003	The Act has provisions for controlling and prevention of fire and accidental events.
	Bangladesh Labour Act 2006 and Bangladesh Labour (Amendment) Act, 2013.	The 2013 amendment makes a large number of changes to the 2006 Act. It provides regulations that aim to protect the interests and rights of the workers, provision for a comfortable working environment, reasonable working conditions, and to ensure workers' safety and wellbeing during project life cycles. In addition, it stipulates that children under 18 years are not allowed to be employed during project life cycle.
	Bangladesh Labour Rules 2015	The Rules require that any establishments which want to employ labour must have service rules and must get permission from the Chief Inspector of Labour. The Manpower Supply Agency is registered under the Labour Act. The Rules prescribed the process for investigating misconduct. They also cover festival bonuses, provident fund, holidays, health and fire safety, calculating wages, a form for use in labour court cases, and approval of factory plans and extensions.

2.1.7 Key Environmental and Natural Resource Legislation

Environmental Conservation Act (1995 and amendments)

The Bangladesh Environment Conservation Act of 1995 (ECA, 1995) is the key legislation in relation to environment protection in Bangladesh. It covers environment conservation, standards, development, pollution control, and abatement. The Act provides for:

- Declaration of ecologically critical areas and restriction of operations and processes which can or cannot be carried/initiated in such areas;
- Regulations of vehicles emitting smoke harmful for the environment;
- Environmental clearance;
- Regulation of discharge permits for industries and other development activities;
- Promulgation of standards for quality of air, water, noise and soil for different areas for different purposes;
- Promulgation of a standard limit for discharging and emitting waste; and
- Formulation and declaration of environmental guidelines.

The Act was amended in 2000, 2002, 2007 and 2010 (Box 1).

Box 1: Amendments to the Environmental Conservation Act

2000: focuses on: (1) ascertaining responsibility for compensation in cases of damage to ecosystems, (2) increased provision of punitive measures both for fines and imprisonment and (3) fixing authority on cognizance of offences.

2002: elaborates: (1) restriction on polluting automobiles, (2) restriction on the sale and production of environmentally harmful items like polythene bags, (3) assistance from law enforcement agencies for environmental actions, (4) break up of punitive measures and (5) authority to try environmental cases.

2007: modified the Environmental Conservation Rules 1997 by abolishing the Orange-B category of projects.

2010: introduces new rules and restrictions on: (a) ensuring proper management of hazardous wastes to prevent environmental pollution and health risk, (b) preventing the filling/changing of any water body, except in the case of national interest with clearance by the relevant department, (c) binding emitters those responsible for any activities/incidents to control the emission of environmental pollutants that exceeds the existing emission standards, and enables the government to (d) declare any ecosystem as “ecologically critical area” if it appears to be degraded or expected to be degraded and take all precaution measures to protect that ecosystem. In addition, government shall stop any ongoing activities and will not allow any new developments in the ecosystem after declaration as an “Ecologically Critical Area”.

Environment Conservation Rules (1997 including amendments)

The Bangladesh Environment Conservation Rules (ECR), 1997, were the first set of rules promulgated under the ECA 95. Three amendments have subsequently been made (February and August 2002 and April 2003).

Rule 3 empowers the Government to declare an area as an 'Ecologically Critical Area (ECA) if it is satisfied that the ecosystem of the area has reached or is threatened to reach a critical state or condition due to environmental degradation. The Government is also empowered to specify which of the operations or processes shall not be carried out or shall not be initiated in the ecologically critical area.

Rule 7 classifies industrial units and projects into four categories depending on environmental impact and location for the purpose of issuing an Environmental Clearance Certificate (ECC): Green, Orange A, Orange B, and Red.

- All existing industrial units and projects and proposed industrial units and projects that are considered to be low polluting are categorized under "Green" and shall be granted Environmental Clearance.
- For proposed industrial units and projects falling in the Orange-A, Orange-B and Red Categories, firstly a site clearance certificate and thereafter an environmental clearance certificate will be required. A detailed description of these four categories of industries is given in Schedule-1 of ECR'97 (Annex-1).
- Apart from general requirement, for proposed industrial unit or project in the Red category, the application must be accompanied by a feasibility report, an Initial Environmental Examination (IEE), an Environmental Impact Assessment (EIA) based on terms of reference approved by the DoE, and an Environmental Management Plan (EMP).
- As per ECR'97, all sectoral development projects must be screened based on schedule attached to the ECR'97 and, accordingly, environmental and social safeguard documents

must be prepared for the respective projects in order to secure environmental clearance from the DoE.

The ECR'97 describes the procedures for obtaining Environmental Clearance Certificates (ECC) for different types of proposed units or projects. The application for such certificate must be in the prescribed form together with the prescribed fees laid down in Schedule 13, through the deposit of a Treasury Challan in favour of the Director General. The fees for clearance certificates have been revised in ECA 2010. Rule 8 prescribes the duration of validity of such certificate (three years for green category and one year for other categories) and compulsory requirement for renewal of certificate at least 30 days before expiry of its validity

Noise Pollution Control Rules (2006)

The Environmental Conservation Act, 1995, gives the authority to all the Union Councils, Paurasabhas, City Corporations and City Development Authorities to mark off the areas under their jurisdiction as silent, residential, mixed, commercial or industrial. They should also put signs to mark those areas. The Act describes the approved standard limits of sound in Schedules 1 and 2. In Schedule 1, silent area means an area up-to a radius of 100 metres around hospitals, educational institutions or special institutions or establishments identified/to be identified by the government. In the silent area it is prohibited to use any kind of horns of vehicles, audio signals and loudspeakers. According to this act, daytime is counted from 6am to 9pm whereas night is considered from 9.00 pm to 6.00am.

The Motor Vehicle Ordinance, 1983

The Motor Vehicle Ordinance, 1983 imposed a penalty of maximum two hundred taka for those vehicles that emit smoke that poses health hazard in public places. It also restricts passengers from smoking in public service vehicles and in any other vehicles carrying a 'no smoking' notice. This ordinance is enforced only occasionally. More regular enforcement would help to reduce air pollution in big cities. However, of the penalty is currently very low and not a deterrent.

Water Act-2013

The Bangladesh Water Act 2013 aims to ensure "integrated development, management, abstraction, distribution, use, protection and conservation of water resources". It vests all rights over surface water, ground water, sea water rain water and water in the atmosphere in the State. Notwithstanding this, "rights over the surface water on any private land shall remain with the owners of such land", and such right to use the water shall be subject to the provision of the Act". Furthermore, the "right to potable water, and to water for hygiene and sanitation shall be treated as the highest priority right".

The Act makes a provision for constituting a National Water Resources Council headed by the Prime Minister. The Council is the highest decision-making body and is empowered to make policies, give instructions to develop a National Water Resources Plan for integrated development and safe abstraction of water and its proper use to ensure protection and conservation of water resources. The Council is also mandated to approve the National Water Resources Plan and ensure its implementation, as well as give advice to the Government to enter into agreement, through signing memorandum of understanding and/or signing conventions and treaty, with any Government and international or regional organization to undertake joint survey, exchange data/information with respect to common water resources and its abstraction and development and undertaking joint measures to prevent pollution of common water resources.

The Act also makes a provision for approving National Water Resources Plan prepared in accordance with the Water Resources Planning Act, 1992, containing, among other elements:

- Analysis of economic, natural, social, political, environmental, and ecological and institutional elements, characteristics and impact of water resources;
- Integrated use of surface and ground water emphasizing the highest possible use of rain water;
- Determination of water quality standard;
- Fixation of priority of water use;

The Act also makes further provision for:

- Declaration of a water stress area and management thereof;
- Preferential use of water in the water stress area and exemption thereof;
- Fixing the lowest safe yield level of aquifer and restrictions on abstracting groundwater; and
- Protection of flood control embankments - “to ensure the sustainability of the flood control embankment, no person shall, without the permission of the appropriate authority, be allowed to construct any house, establishment or any other structure on, or on the slope of such embankment.”

Finally, if anybody deliberately violates or ignore the responsibility or protection under this Act, in that case, under the provisions of sub-section (2), she/he will imprisoned for a maximum of 5 years or fined up to maximum Tk. 10,000, or both.

The Forest Act, 1927 (amendment up to 2000)

The Forest Act of 1927 provides for reserving forests over which the government has an acquired property right. This act has made many types of unauthorized uses or destruction of forest produce punishable. The government may assign any village community its right to, or over, any land which has constituted a reserved forest.

The government has prohibited certain activities in the reserved forest area such as any intervention that: kindles, keeps or carries any fire; trespasses or pastures cattle, or permits cattle to trespass; causes any damage by negligence in felling any tree or cutting or dragging any timber; etc.

The hunting, capturing, driving, damaging wildlife or any parts are also prohibited in all part of Bangladesh under the Wildlife (Conservation and Security) Act 2012; and hunting, shooting and poisoning water is prohibited within forests under the Forest Act 1927. The Private Forest Ordinance of 1959 provides for the conservation of private forests and for the forestation, in certain cases, of waste-land in Bangladesh.

Protected Area Rule, 2017

The Protected Area Rule, 2017 provides for establishing a system of co-management for protected areas in which the Forest Department shares management responsibilities with local stakeholders. Co-management Committees are established involving relevant government agencies, elected members of Union Parishad, local elites and resources extractors along with members from ethnic groups. The Rule also provides for establishing a Village Conservation Forum (VCF) with local residents to function as official actors in motivating local people to better conserve resources, Community Patrol Group (CPG) members join the foresters in guarding the resources. Committees are empowered to collect revenue, 50% of which will be allotted to cover recurrent expenditure and to implement plans for landscape development and the well being of the society.

Wildlife Act 2012

The Wildlife Act of 2012 enabled the government to form a “Wildlife Advisory Board” of experts. The Board will assess present conditions and give direction from time to time in relation to the development and management of biodiversity, wildlife and forest. The Act empowered the government to declare any area as a protected area and can designate these as a sanctuary, community conservation area, safari park, eco park, botanical garden, wildlife reproduction center. The government can designate a landscape zone or corridor, buffer zone or core zone in relation to wildlife and plant preservation, protection and their smooth growth.

The Act also prohibited many activities including entrance, establishing or undertaking of any activities, disturbing or threatening any wildlife, or use chemicals, explosives or any other weapon or substances which may destroy wildlife habitat. Any person performing any kind of wildlife trade without a license may be jailed for at least a year.

Biodiversity Act 2017

The Bangladesh Biological Diversity Act 2017 was enacted to enable the State to fulfil its international obligations having become a signatory to the Convention on Biological Diversity. Existing environmental laws broadly cover THE conservation of biodiversity and biosafety issues. So, the significance of this Act lies in introducing an Access and Benefit-Sharing (ABS) mechanism. The Act also promotes research on biodiversity and biological resources – leading to biotechnological inventions and their commercial utilization through preparing a nation-wide biodiversity register and documenting traditional knowledge (TK). The commercial utilisation will generate economic benefits which need to be shared in a fair and equitable manner.

Climate Change Trust Act, 2010

The Act established the Bangladesh Climate Change Trust (BCCT) under the Ministry of Environment and Forests (now MoEFCC). It has adopted various policies focusing mainly on adaptation as means of tackling the challenges of climate. Its functions include:

- The overall management of the Climate Change Trust Fund;
- Providing secretarial support to the Trustee Board on Climate Change and Technical Committee;
- Reviewing projects proposed for funding by different government ministries/divisions;
- Coordinating with different government ministries/divisions on the progress of their climate change mitigation projects;
- Liaising with beneficiaries, civil society, NGO, private sector and international organizations on climate change issues;
- Undertaking monitoring and evaluation of projects under implementation;

The Protection and Conservation of Fish Act (1950)

This Act aims to conserve and manage the country’s fisheries resources in a sustainable and environmentally-responsible manner. The act and associated rules have introduced a range of measures:

- Ban on the use of certain fishing equipment and techniques (e.g. dynamite fishing), and regulation for others (e.g. mesh size restrictions for some types of nets);
- Restriction on catch size for certain species;
- Seasonal fishing closure in certain areas;

- Regulation of certain activities which may cause pollution of water bodies;
- Regulation of activities which may obstruct water courses; and
- Establishment of fish sanctuaries and provision of rules for managing these areas.

This act primarily prescribes the manner in which dredging works must be carried so as to limit potential impacts on fisheries resources and ensure that fishermen have a reasonable level of access to dredging particular areas.

The Protection and Conservation of Fish Rules, 1985

These rules in line with the overall objectives of the Fish Act. They aim to ensure that sectoral development activities are conducted in a manner that does not cause damage to fisheries in inland or coastal waters:

- Section 5 requires that “No person shall destroy or make any attempt to destroy any fish by explosives, gun, bow and arrow in inland waters or within coastal waters”.
- Section 6 states that “No person shall destroy or make any attempt to destroy any fish by poisoning of water or the depletion of fisheries by pollution, by trade effluents or otherwise in inland waters”.

Pollution Discharge Management

Some of the legal instruments concerned with pollution are described briefly in Table 2.18. Where the government has not set standards in the ECR, International finance Corporation (IFC) standards¹³ apply. Where government standards vary from IFC standards, the more stringent values apply when implementing development projects.

Table 2.18: Environmental Pollution Issues and Related Legal Instruments

Environmental pollution issues	Legal instruments	Remarks
Gaseous emissions; Noise;	ECA (1995) and ECR (1997) including related all amendments	Schedules 2-11 of the ECR (1997) have been established to regulate uncontrolled emissions and discharges
Liquid and solid wastes discharges to the surrounding environment may ultimately impact natural resources	Noise Pollution Control Rules (2006)	Schedule of Noise Pollution Control Rules (2006).
Accidental events or unplanned events which may create catastrophic conditions and cause damage/degradation of the natural environment.	Forest Act (1927) and all amendments Wildlife Act (2012) Relevant WB guidelines.	Where there are no GOB regulations, WB guidelines apply.

¹³ IFC General Environmental, Health and Safety guidelines and also IFC specific standards and guidelines for industries

2.2 Environmental and Social Safeguards Framework

2.2.1 Environmental Impact Assessment¹⁴

Bangladesh initiated environmental impact assessment (EIA) guidelines in 1992 for the water sector development. The country enacted Environmental Conservation Act (ECA) in 1995 (including amendments) followed by Environmental Conservation Rules (ECR) in 1997 (including amendments) to govern all development activities, requirements of IEE/EIA studies based on the project categories and also obtaining of Environmental Clearance Certificate for each project. A number of evaluations have concluded that although performance is improving, it is not making full use of the potential of environmental and social impact assessment (ESIA).

Legislative and Regulatory Provisions for EIA

The National Environmental Policy (1992) required EIA for all new public and private projects. The Environmental Conservation Act (ECA) (1995) introduced mandatory provisions for environmental clearance of all industrial units and projects. Formal status for EIA was also given through the Environmental Conservation Rules (ECR) (1997) which provided a procedure for granting environmental clearance under article 7. The Environmental Conservation Act was amended through the Environment Court Act (Act No. 11 of 2000) with further amendments introduced in 2002 and 2003. Further amendments to the Rules were made in 2012, and to the Environment Conservation Act in 2010. Additionally, ECA rules for public comments have been drafted.

Guidelines

EIA-related guidelines are available for (a) industries (1997) and (b) the water sector - prepared under the Flood Action Plan (1992 and updated in 2003). The DoE has drafted EIA guidelines for several sectors including: coal mining, gas, pharmaceuticals, cement factories, water and transport sectors. The Water Resources Planning Organization (WARPO) and the Local Government Engineering Department (LGED) have developed their own EIA guidelines.

Scope of EIA application

EIA is required for all activities (private, public and foreign investment) that fall under the category of red projects as stipulated under Schedule One of the Environmental Protection Rules.

Payment system

Project proponents pay a fee to obtain an Environmental Clearance Certificate, and a fee to renew the certificate once a year for Red, Orange – A and B category projects and once every three years for Green category projects.

Screening

Screening of projects is undertaken by the DoE based on a list contained in Schedule I of the Environment Conservation Rules (1997). Projects are placed in one of 4 categories based on location and impact on the environment (a location clearance is required for location and an environmental clearance is required for environmental impacts).

¹⁴ Based on information on <https://www.eia.nl/en/countries/bangladesh/esia-profile>

- Green - require no site clearance but an environmental clearance (all other categories require a site clearance);
- Orange A - requires a layout plan, process flow diagram and outlines of plans for relocation and rehabilitation;
- Orange B - require both an Initial Environmental Examination (IEE) and an EMP for clearance;
- Red - require a full EIA and an EMP.
- Sensitive areas: under the ECR (1997), the government may declare certain areas as sensitive. Projects in such areas require a full EIA.

Scoping

After an IEE is approved and the proponent has obtained a Site Clearance Certificate for the project, the proponent is allowed to begin preparation works for the project. For Red category projects, the DoE prepares a Terms of Reference in conjunction with the proponent which is used by the proponent to prepare an EIA. Scoping mainly involves baseline studies.

Assessment

The EIA Guidelines for Industries advise the use of checklists, matrix networks, overlays, environmental index using factor analysis, cost-benefit analysis and simulation modelling. It also suggests methodologies on impact evaluation, prediction and identification of mitigation measures. The guidelines suggest public participation. The public and NGOs are invited (discretionary) to give their views on the draft EIA report that is produced.

EIA reports are required to address standard contents:

- baseline studies;
- impact identification;
- impact prediction;
- impact evaluation;
- mitigation measures;
- monitoring program;
- special studies (for example risk assessment, rehabilitation study etc).

EIA Review

The DoE is responsible for EIA report review through a technical committee which follows the industrial and water sector guidelines on review. In general, the DoE offices in each of the six divisions receive applications and issue Environmental Clearance Certificates for proposed investments within that division.

The divisional offices verify supporting documents and the divisional head then assigns an inspector for follow-up. The inspection report is treated as follows:

- Green and Orange A category projects – application submitted to the district office for decision.
- Orange B category projects – application submitted to the district office which conducts inspection and prepares a review report. This report is sent to the divisional/regional office for decision.

- Red category projects – application submitted to the district office which conducts an inspection and prepares a review report. This report is sent to the divisional office and is then forwarded to the DoE Head Offices ECC Committee for decision.

Timeline for Review

Article 11 of the Environmental Conservation Rules prescribes that for projects under category Red, the EIA report shall be approved or the application for an environmental clearance certificate shall be rejected within 60 working days from when the EIA report was submitted.

Compliance Monitoring

There are no clear legal provisions for EIA compliance and monitoring. Monitoring is said to be conducted on an ad-hoc basis.

Non-compliance Penalties

Suspension of clearance is possible. The ECA provides that failure to comply with any part of it may result in the punishment of a maximum of 5 years imprisonment or a maximum fine of 100,000Tk. or both.

Stakeholder Engagement

There are no legal requirement for public consultation during the EIA process or even for provision of information to affected people. The Environmental Conservation Rules do not mention public nor community. However, the water sector guidelines suggest public participation at the early stage of an EIA study and recognize the need to consider socio-cultural, physical and biological impacts. According the EIA guidelines for industries, opportunities for the public to participate are under the discretion of the Director General of DOE.

Appeal

The Environmental Courts Acts of 2000 establishes Environmental Appeal Courts for environmental offences (in general). Appeals can also be made to specialized magistrate courts where environmental laws provide for a penalty of an imprisonment not exceeding 2 years or a fine not exceeding 10,000Tk. or both. The decision on the issuance of an Environmental Clearance Certificate can be appealed.

Any person may appeal, within 30 days from the date of issuance of the notice. An appeal fee of 1000 Tk. is charged to any appellant including the general public.

Professional bodies

The National EIA Association of Bangladesh (NEAB) comprises planners, practitioners and enforcement agencies. It works to create awareness of EIA in all sectors of Government planning. It has assisted in the development and extension of EIA, prescribing a code of conduct for EIA professionals, building national capability and establishing a liaison between EIA practitioners and policy-makers in Bangladesh.

The Bangladesh Environmental Lawyers Association (BELA) has played a role in the introduction of public interest litigation cases to higher courts (the High Court and the Supreme Court). An important achievement won by BELA in response to its appeal was the Supreme Court decision in 1998 to grant citizens and NGOs the right to enforce environmental laws.

The Forum of Environmental Journalists, Bangladesh (FEJB) has been particularly effective in creating environmental awareness, and a number of State of the Environment Reports have been produced by civil society organizations.

2.2.2 Strategic Environmental Assessment

A growing number of countries in the region that have introduced formal requirements for SEA, But Bangladesh currently has no legal or institutional framework for SEA. However, Some SEAs have been conducted with donor assistance and several SEA-related initiatives have been undertaken or are underway:

- Policies v through Bangladesh Water Development Board, 2017.
- In March 2019, staff of MoEFCC attended SEA training provided by SIDA/Niras, and support for SEA is being provided to MoEFCC by the Netherlands Commission for Environmental Assessment.
- The Bangladesh Water Development Board (BWDB) conducted a Strategic Environmental and Social Assessment (SESA) of the River Stabilization Plan under the Flood and Riverbank Erosion Risk Management Investment Program (report in 2016).
- A call for bids has been issued (February 2020) to conduct an SEA for the ' Payra-Kuakata' Comprehensive Plan.
- Strategic Environmental and Social Assessment (SESA) of River Stabilization (2016) under by consultants under the Flood and Riverbank Erosion Risk Management Investment Program (FRERMIP), Project-1).
- Country Environmental Analysis (CEA) of Bangladesh = a joint project of the Ministry of Environment and Forests (MoEF) and the World Bank (World Bank, 2006, 2012).
- The World Bank (2007) conducted an SEA for the Dhaka Metropolitan Development Plan: Strategic Environmental Assessment.
- The GoB began using policy SEA as a decision-making tool in late November 2006 at the request of Rajdhani Unnayan Kartripakha (RAJUK) and the Ministry of Housing and Public Works and finalized it in 2007.
- Another policy SEA included the development and conservation of the Sundarbans, the world's largest mangrove forest (World Bank 2012).
- SEA is also reflected in the development of a cumulative environmental assessment for the planning of development in the coastal zone of Bangladesh: "The SEA for Coastal Embankment Improvement project (ongoing)" (World Bank 2012).
- Hydrobiology (an environmental consulting company) reports online (2019) that it is working with Asian Development Bank (ADB) on an SEA for a renewable energy floating solar project in Bangladesh (source: <https://www.hydrobiology.biz/exciting-new-strategic-environmental-assessment-project-in-bangladesh/>).

2.3 Commitments to International Conventions, Treaties and Protocols

Bangladesh has already had accessed to, ratified or signed a number of important multilateral environmental agreements (MEAs) related to environment protection and conservation of natural resources which have been already accommodated in the national policies of the country. The Environment Policy, National Conservation Strategy, National Biodiversity Strategy and Action Plan are examples of instruments that were influenced by obligations under international conventions, treaties and protocols (ICTPs).

Such ICTPs act as international guidelines that Bangladesh is obligated to comply with when implementing sectoral development activities and projects. Table 2.19 lists the important relevant ICTPs signed and ratified by Bangladesh.

Table 2.19: International Conventions, Treaties and Protocols Ratified by Bangladesh

Sector	International convention, treaty or protocol	Description	Date Ratified	Date Entered into Force
Environment and biodiversity, environmental pollution	Convention on Biological Diversity (1992)	Requires signatories to develop national strategies (National Biodiversity Strategy and Action Plan) for the conservation and sustainable use of biological diversity.	03-05-1994	29-12-1993
	Convention on International Trade in Endangered Species of Wild Fauna and Flora (Washington 1973) – also known as CITES	Addresses the exploitation patterns and overharvesting that threaten species of flora and fauna. Under this Convention, the governments agree to restrict or regulate trade in species that are threatened by unsustainable patterns and to protect certain endangered species from overexploitation by means of a system of import/export permits.	20-11-1981	01-07-1975
	The International Plant Protection Convention (IPPC), 1951	Aims to secure coordinated, effective action to prevent and to control the introduction and spread of pests of plants and plant products.	01-09-1978	
	Kyoto Protocol (1997)	Commits its Parties to set internationally-binding emission reduction targets. This agreement is linked to the UNFCCC.	22-10-2001	16-02-2005
	United Nations Framework Convention on Climate Change (UNFCCC), 1992	Aims to achieve stabilization of greenhouse gas (GHG) concentrations in the atmosphere at a level low enough to prevent dangerous anthropogenic interference with the climate system.	Adopted in 1992 and enforced from 15-04-1994	15-04-1994
	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (1989)	Aims to reduce the amount of waste produced by signatories and regulate the international traffic in hazardous wastes.	01-04-1993	05-05-1992
	Convention on Wetlands of International Importance ("Ramsar	Provides a framework for national action and international cooperation for the conservation and wise use of wetlands and their	21-9-1992 (ratified)	1971

Sector	International convention, treaty or protocol	Description	Date Ratified	Date Entered into Force
	1971").	resources.		
	Convention on the Conservation of Migratory species of wild Animals (Bonn 1979)	Aims to conserve migratory species within their migratory ranges.	01-12-2005 (ratified)-	1979 and enforced in 1983
	Vienna Convention for the Protection of the Ozone Layer (Vienna, 1985)	A framework for efforts to protect the globe's ozone layer by means of systematic observations, research and information exchange on the effects of human activities on the ozone layer and to adopt legislative or administrative measures against activities likely to have adverse effects on the ozone layer.	02-08-90 (ratified).	1985
	Montreal Protocol on Substances that Deplete the Ozone Layer (Montreal, 1987).	Designed to protect the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion.	02-08-1990	1987
	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer (London, 1990. Copenhagen Amendment).		18-03-1994	1990
	International Convention on Oil Pollution Preparedness, Response and Cooperation (London, 1990.)	Parties are required to establish measures for dealing with pollution incidents, either nationally or in co-operation with other countries.		Signed 30-11-1990 and enforced from 13-05-1995
	Convention on persistent Organic Pollutants, Stockholm-2001	Aims to eliminate or restrict the production and use of persistent organic pollutants (POPs).	12-03-2007	2001 and effective 2004
Nuclear Pollution	The Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency is a 1986 treaty of the International Atomic Energy Agency (IAEA)	Parties agreed to provide notification to the IAEA of any assistance that they can provide in the case of a nuclear accident that occurs in another state that has ratified the treaty.	1988	1986

Sector	International convention, treaty or protocol	Description	Date Ratified	Date Entered into Force
Aquaculture and Fisheries	Agreement on the Network of Aquaculture Centres in Asia and the Pacific (Bangkok, 1988.)	Recognises the importance of fisheries in the Asia Pacific region, that aquaculture plays a vital role in the promotion and better use of fishery resources and that the maintenance of a network of aquaculture centres in the region can make a significant contribution to the development of aquaculture.	15-05-90	1988
Land degradation	UN Convention to Combat Desertification (UNCCD) 1994	A legally binding international agreement linked to sustainable development. It addresses most vulnerable ecosystems and peoples living in the dryland area.	1995	1994
Cultural and natural Heritage	Convention Concerning the Protection of the World Cultural and Natural Heritage (Paris 1972)	Defines and provides for the conservation of world's heritage by listing the natural and cultural sites whose value should be preserved.	03-11-1983	23-11-1972
Sea, maritime safety and marine pollution	International Convention for the Safety of Life at Sea (SOLAS), 1974 (amended)	Specifies minimum standards for the construction, equipment and operation of ships, compatible with their safety.	04-11-2002	25-05-980
	United Nations Convention on the Law of the Sea (Montego Bay, 1982.)	Provides guidance on ship-based pollution control and management	1982	1982
	The International Convention for the Prevention of Pollution from Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78, The current convention is a combination of 1973 Convention and the 1978 Protocol, which entered into force on 2 October 1983.	Includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations	4-11-2002	02-10-1983
	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW),	Prescribes minimum standards relating to training, certification and watchkeeping for seafarers which countries are obliged to meet or exceed.	1984	Entered into force in 1978

Sector	International convention, treaty or protocol	Description	Date Ratified	Date Entered into Force
	1978			
	International Convention for the Prevention of Pollution of the Sea by Oil (London, 1954 (as amended on 11 April 1962 and 21 October 1969.))	Applies to all ships, except tankers of under 150 tons gross tonnage and other ships of under 500 tons gross tonnage, registered in the territory of, or having the nationality of, a Party. Naval ships and ships engaged in whaling are accepted (art. 2). Discharges are prohibited, except when a ship is proceeding en route or when the instantaneous rate of discharge does not exceed 60 litres per mile.	28-12-1981	Entered in 1954 and amended in 1962 and in 1969
Women affairs	Convention on the Elimination of Discrimination against Women (CEDAW), 1984		2000	1984

2.3.1 Institutions

There is a common practice in Bangladesh that central government executes the whole project. This results in government officials, including the Deputy Commissioner, Upazila Nirbahi Officer (UNO), and heads of district and sub-district administrative units to control the local institutions. The PKCP will be executed over 07 upazilas under Barguna and Patuakhali district, where there is inadequate institutional capacity to manage E&S risks and their mitigation.

As per Bangladesh Environmental Conservation Rules (ECR)'97, most the activities associated with PKCP components/sub-components are likely to fall under either Orange A, Orange B or Red categories. There will be environmental and social screening for all activities at the initial stage and based on screening results, and if recommended by the Department of Environment (DoE), further IEE or EIA will be carried out for specified activities. DoE is the regulatory body and the enforcement agency of all environmental related activities in development projects.

The Planning Commission within the Ministry of Planning guides the country's development strategy and approves all the development projects. The DoE is the technical arm of the MoEFCC and is the agency responsible for environmental planning, management, and monitoring of the project. The Ministry then compiles and finalizes an "environment opinion" based on information collected from its subordinate departments such as the DoE, Forest Department (FD), Bangladesh Climate Change Trust (BCCT), etc.

2.3.2 Central EIA Authority

The Department of Environment (DoE) is the responsible body for implementing and enforcing EIA. Under the provision of the Environment Conservation Act, 1995, DoE and its six divisional offices, are authorized to review and approve the EIA reports and to process and issue environmental clearance for all types of industrial units and projects. They are also mandated to formulate environmental guidelines and advise the Government to reject manufacturing processes, materials

and substances likely to cause environmental pollution. Within the office of the Director, a unit coordinates EIA-related services.

2.3.3 Other Key (Governmental) Parties Involved in EIA, and Their Roles

The Ministry of Environment, Forest, and Climate Change (MoEFCC) is the principal government institution responsible for environmental activities in Bangladesh and for all matters relating to National Environmental Policy and regulatory issues. It plays key roles in planning, reviewing, monitoring and environmental initiatives and ensuring that environmental concerns are properly handled. MoEFCC supervises the DoE and can formulate policies and rules. The DoE has constituted a Technical Committee for the review process.

2.4 Socio-economic and Biophysical Concerns

The Payra-Kuakata region mainly falls under the Ganges Tidal floodplain which is vulnerable to climate-change induced the sea level rise. People live in an extremely dynamic estuarine environment facing such threats as: cyclone and storm surge, land erosion, flood, drainage congestion, salinity intrusion, drought, tectonic process and deteriorating coastal ecosystems. These threats affect almost every aspect of life and limit livelihood choices of the people. These vulnerabilities create insecurity, which in turn discourage investments, limit economic activities and employment opportunities. An effective disaster warning system is being developed and comprehensive disaster management program (CDMP) is being implemented. Agricultural activities suffer from water and soil salinity as well as inadequate safe drinking water. The water supply sector has achieved commendable success over the last few decades; overall about 95 percent of the population now has access to water from tube-wells, taps or ring-wells.

The coastal zone of Bangladesh experiences extensive ecosystem degradation. Some of the factors causing degradation are drainage for agriculture; dredging and canalization for navigation; conversion of land for aquaculture, commercial, industrial or residential purposes; construction of dykes for flood control and irrigation and other structures; discharge of pesticides and herbicides; disposal of solid waste, domestic and industrial waste; agricultural runoff and sedimentation; hydrological alternation by canals; building of roads and other structures; and subsidence due to extraction of groundwater.

Whilst the area supports diverse flora and fauna, over exploitation, deforestation, inefficient forest management, agriculture and industrial pollution are key concerns.

Both urban and rural areas suffer from inadequate private health facilities and sanitation, and there is a notable disparity between urban and rural areas of Patuakhali and Barguna district.

Another key concern is the disparity among the Upazilas in terms of service facilities. These include:

- Educational facilities: Primary schools, high schools, and Madrashes.
- Commercial facilities: Growth Centres and Rural Markets.
- Health facilities: Upazila Health Complexes/Hospitals, Family Welfare Centres and Community Clinics.
- Disaster management facility: Cyclone Shelters.

In the present study, the following suitability analysis has been done:

- Agricultural Suitability;
- Hydro-Geological Suitability;
- Flood Depth Analysis;
- Urban Land Use Suitability;

The Urban Suitability analysis took into consideration the above and a composite land use/infrastructure suitability map has been compiled. It shows most of the area is moderately suitable (approx. 33.31%) to poorly suitable (approx. 35.35%) for infrastructure development.

A union level multi-criteria analysis shows that 14 unions or pourashavas have high development potential, with 18 having moderate potential. A further analysis was performed to identify the potential location for eco-town development. All eco-towns should comply with planning policy statements including those relating to sustainable development such as: climate change adaptation, pollution control, open space, biodiversity, transport, and flooding, housing and economic development.

Tourism Development

Payra-Kuakata region's tourism potential is due to unique flora and fauna, panoramic views, forests, beaches, lakes and rivers. A composite tourist zoning map identifies 13 zones which have important tourism attractions, including three high quality beaches, five have a combination of forest and char (small island) and another five have both beach and mangrove forest. For proper development of these zones recommendations will be made during the full SEA for provision of adequate and proper Tourist Service Infrastructure for attracting tourists from home and abroad.

Transportation System Development

A comprehensive plan is to promote tourism and to enhance socio-economic and infrastructural development. A transportation network is needed to enhance regional connectivity. The transportation model suggests that the proposed land use change will significantly increase vehicular movement in the future, i.e., expansion of road network needed to handle future traffic demand, avoid congestion, and enable decent operating speed. Recommendations have also been made to improve the water transportation system by addressing the problems related to (i) siltation, (ii) day & night navigational problems, (iii) shortage of passenger & cargo handling facilities including transit shed at river ports, (iv) Presence of manual loading/unloading of cargo at river ports, (v) underdeveloped rural launch landing stations, inadequate number of watercrafts etc.

Payra Port development and its impacts in the Region

The Payra Port (and Authority) were established on 19 November 2013 through the Payra Sea Port Act of 2013. The port started commercial operations from August 2016. The Payra deep seaport is still under construction. It is situated in the Southern part of Bangladesh, in Patuakhali District's Kalapara Upazilla. The port and related facilities (airport, free trade zone etc.) would employ about 13000 people in different sectors. Total employment (direct and indirect) in the new township adjacent to the port may be 43,550 with a total population of about 1,26,000.

Economic Growth Potentials of Upazilas

Taltali and Amtali upazila are relatively fast-growing. Taltali upazila has grown substantially from 2003 with the second highest percentage increase in employment (116%) which is faster than other upazilas. The Education sector employs the greatest number of people, indicating that this sector serves people from outside the region. From the shift-share analysis, it was found that only Amtali upazila can be considered Fast-Growing in terms of regional growth. Other upazilas are lagging the national growth. All the upazilas are found to be Slow-Growing region in terms of Industry Mix.

The 2018 Inception Report on Socio-Economic & other related Survey under "Preparation of Payra-Kuakata Comprehensive Plan focusing on Eco-Tourism (PKCP)", provides an initial overview of certain components of the environment. Once the baseline report has been approved by the client, and after the team workshop scheduled for mid-January 2023, the consultants will update the

existing list of key environmental and, to a lesser extent, social concerns. These are summarized below.

Table 2.20: Key Environmental Concerns

Environmental issues and concerns	Comment /examples of potential impacts
1. Pollution & waste (solid & liquid): <ul style="list-style-type: none"> • Surface water pollution. Brackish and sea water • Groundwater pollution • Air pollution • Oil • Waste treatment and disposal • Plastics 	Pollution & waste management is a major concern for the ecological integrity of Bangladesh due to various and increasing developmental initiatives. Degraded coastal environment due to industrial pollution as a result of increased non-farm industrial activities; Local environment pollution will be increased due to infrastructural development.
2. Water flow dynamics in rivers	Reduction of water flow in rivers may change the region's economic sustainability/integrity as well as livelihood patterns and crop production.
3. Sedimentation and siltation (fluvial and tidal) <ul style="list-style-type: none"> • Dredging and disposal 	Sedimentation and siltation management is a challenge to maintain river flows. Disposed dredged materials can affect the regeneration of trees & survival of existing forests as well as benthic aquatic biodiversity.
4. Salinity: <ul style="list-style-type: none"> • Groundwater • Soil 	Due to reduced flow of upstream fresh water and channel siltation, and resultant sea water intrusion/inundation, soil and groundwater salinity has increased and soil productivity has decreased as well as livelihood diversity
5. Noise - particularly due to shipping in the rivers, especially in Rabanabad Channel	Noise from the regular movement of ships (notably along major rivers of the project area) can disrupt wildlife movement, cause localisation of populations and result in inbreeding.
6. Habitat isolation	Increased numbers of vessels passing along the navigable channels, the noise they cause and use of lights at night may also disrupt the dispersal of fauna. These factors tend to disturb animal behaviour (eg feeding, breeding) and may lead to genetic isolation and also threaten effective biodiversity conservation.
7. Loss of biodiversity	Some environmental as well as regional & local activities may affect biodiversity, with loss of keystone species and their prey base due to poaching and habitat degradation as a result anthropogenic activity. Biodiversity losses may also occur due to climate change and natural dynamic changes in the ecosystem.
8. Invasive alien species	Water hyacinth has become a major problem, clogging baors and ponds, and some water channels. <i>Prosopis Juliflora</i> is also spreading on embankments although it is used as a fuelwood by local people. At present, however, forest managers are concerned about their potential future spread and impacts.
9. River bank erosion – due to port expansion and boats	River bank erosion is a particular concern in the project area due to bow waves from the increased numbers of fast-moving ships and due to river bed siltation, formation of new islands and changed river courses, as well as increasing sea water inflow in this area.
10. Climate change	<ul style="list-style-type: none"> • Sea level rise is a global threat that will impact on the region.

Environmental issues and concerns	Comment /examples of potential impacts
<ul style="list-style-type: none"> • Sea level rise • Salt water intrusion • Erratic rainfall & distribution • Increased average temperatures • Cyclones & storm surges • Greenhouse gas emissions 	<ul style="list-style-type: none"> • Many factors have reduced river flow in the region, decreasing flushing time, with increased periods of saltwater exposure. • Shifting of monsoon with erratic rainfall has impacted on the cropping season and pattern. • There is no evidence of significant increased temperatures yet, but climate models predict a significant increase in the future. • Cyclones making landfall impact on livelihoods (killing people and causing damage). Cyclone frequency has decreased but may rise in the future. • Rapid industrialisation and urbanisation is likely to lead to increased carbon dioxide emissions from power and energy sector (including transport). Expansion of flood-irrigated paddy rice has increased methane emissions.
<p>11. Exceptional floods (with potentially damaging water levels):</p> <ul style="list-style-type: none"> • Freshwater floods (due to rain) upstream • Tidal • Poor drainage infrastructure 	<p>Freshwater flooding may occur due to: heavy rain in the upstream/ catchment areas of this area, lack of drainage infrastructure and high tidal flow.</p>
<p>12. Industrialisation:</p> <ul style="list-style-type: none"> • Power generation – oil, gas, coal • Pipelines • Petroleum • Cement • Special economic zones 	<p>Industrialization of the inland parts of this area can create air & water pollution as well as other potential impacts on biodiversity & livelihoods of the region. Hilsa fish breeding ground is facing threats.</p>
<p>13. Urbanization</p>	<p>Rapid urbanization as well as in the environmentally critical area can affect the extent of air & water pollution and agricultural productivity etc.</p>
<p>14. Land use changes</p>	<p>Land use changes are arising due to population & economic growth of this area, e.g. shrimp cultivation, infrastructures & urbanization, etc. Impacts of this include loss of biodiversity, reduced soil productivity and loss of livelihood opportunities.</p>
<p>15. Livelihoods:</p> <ul style="list-style-type: none"> • Conflicts between economic sectors • Access to resources (e.g. in Sundarbans) • Salinity 	<ul style="list-style-type: none"> • Salinity intrusion causes conflicts, e.g.: shrimp cultivators vs crop producers; powerful/rich land controller's vs the powerless, smallholder and marginalized people, etc. • Access by forest-dependent people to forest resources (to support their livelihood options) is limited so as to prevent exploitation and to maintain a sustainable flow of resources. • Causes health problems (e.g. skin conditions), reduces drinking water quality – impairing people's ability to work, and affects crop production, etc.
<p>16. Out-migration</p>	<p>Both involuntary and economic out-migration (mainly poor people) is common in this area. Much is driven by disasters, indebtedness, dispossession/land grabbing, lack of livelihood options, etc. Poor people move to unhealthy urban slums and become further marginalised in an uneven job market. Some educated people move to urban areas /overseas for employment.</p>

Environmental issues and concerns	Comment /examples of potential impacts
	Migrant remittances can supplement family incomes and contribute national economy.
<p>17. Health & sanitation:</p> <ul style="list-style-type: none"> • Water-borne, respiratory & salinity-related diseases • Diet • Negative health impacts of air pollution (mainly pollution by particulate matter) • Inadequate health facilities and access • Arsenic contamination (of drinking water & irrigated rice) 	<ul style="list-style-type: none"> • Local people, especially children and elderly people, are particularly susceptible to water-borne, respiratory and salinity- related skin diseases. • Poor diet causes malnutrition. • The dominant way of cooking causes indoor air pollution which has a serious impact on human health. • Health service providers are based in city/urban and peri-urban areas. They are not easily accessible by people and/or emergency patients living in remote areas, due to poor communication networks. • Inadequate public toilets in urban and semi urban areas. As a result, local people, especially women face problems during public gatherings and at local markets. • This is a serious issue in parts of the Ganges River floodplain and the northern part of the tidal floodplain.
18. Gender-related issues	Women face socio-political exclusion in decision-making processes - both in the home and society. They also bear a heavy burden for collecting potable water, Women often encounter security problem while travelling alone to/from remote areas.
<p>18. Education:</p> <ul style="list-style-type: none"> • Low environmental awareness • High male dropout 	<ul style="list-style-type: none"> • Males from poor households need to support family income, resulting in high drop out and/or lower attendance at school. • Poor communication network in the rural area often discourages school attendance.
19. Loss of traditional knowledge	Technological advancement & other development activities may be causing loss of traditional knowledge.
20. Loss of cultural heritage	Inadequate maintenance & negligence due to low revenue return, inadequate budget allocation, etc.
21. Security – kidnapping of resource extractors	Kidnapping of forest produce extractors for ransom is an important issue for the management of the forest.
22. Seasonal tourism	Uncontrolled tourism causes loss of biodiversity, disruptive noise and water pollution etc.
<p>23. Illegal activities:</p> <ul style="list-style-type: none"> • Poaching and hunting • Poison fishing • Illegal tree cutting • Trafficking of wildlife products • Corruption 	These issues are of major concern in this area, causing loss of habitat and biodiversity (terrestrial & aquatic) & economic loss for communities.
24. Institutional issues	Inadequate manpower, capacity development & logistics impede environmental management (In general).
25. Excess tourist movement and expansion of tourist facilities	<p>Increased waste generation and thus pollute forest soil and sea/river water;</p> <p>Expansion of tourist infrastructures within the plantation and forest areas;</p> <p>Disturbance to wildlife due to excess tourist movement within the</p>

Environmental issues and concerns	Comment /examples of potential impacts
	wildlife habitats; Increase of tourist activity will degrade forests and its habitat Due to increase of tourists, creates more noise and that will decrease wildlife population;

As part of the full SEA, the relevant environmental issues and concerns will be detailed as follows:-

- Past trend to present status;
- Impacts;
- Management framework and current practices etc.

To do so, each of the environmental and socio-economic issues will be detailed out using secondary information generally. However, the primary environmental and ecological data will also be used since some data were already collected during scoping, and additional data will also be collected during the next few months.

The secondary information and data collection was obtained from the following sources: -

- Relevant department, line agencies and ministries;
- Relevant formal and informal stakeholders;
- Project documents from government and non-government line agencies;
- GoB and public-private partnership websites, database, knowledge hub etc.;
- Information from client's project document;
- CEGIS archives;
- World database and information centers;
- Research documents from universities and institutional entities;
- National and international peer reviewed journals, articles and other documents.

3. Phase 2 of the SEA Process

3.1 Stakeholder Engagement

The engagement of the public and effective stakeholder consultation is an extremely important process for a SEA; it promotes a sense of ownership and trust. Our approach to Public Participation, consultation and disclosure takes into consideration the IFC's Good Practice Handbook.¹⁵ We already engaged with stakeholders during scoping and will continue engaging during the full SEA phase. This task has the following sub tasks:

- Update and refine the Stakeholder Engagement Plan (SEP); and
- Conduct Stakeholder Consultations.

We will take into consideration the previous work and existing knowledge base that already exists and the stakeholder collaboration that has been undertaken during Scoping. We realise that there may be some difficulties for some stakeholders to get involved due to resource constraints, that and there may be different levels of engagement for different stakeholder groups. Stakeholders should be from all levels.

Stakeholder Groups are likely to be divided into the following:

- Government/Ministries/Departments at national, regional and local level;
- Universities and research institutions/organisations;
- Local businesses (including tourism);
- Local communities; and
- Local and International NGOs.

It is important to communicate information to stakeholders early in the process. This needs to be in a practical, pragmatic and meaningful way. Consultations will be in Bangla.

CEGIS is organizing meetings and forums for participation and consultation to enable interested and affected parties to present their concerns and opinions regarding the SEA. As noted earlier our initial thoughts are, at a minimum, meetings in some of the larger centres complemented by Focus Group Discussions (FGDs) e.g. water, agriculture, fisheries and tourism sectors (government and private, as applicable); environmental NGOs; Chambers of Commerce, Regional/provincial and Local Authorities etc). However, CEGIS is conducting consultation meetings at union, upazila and the district levels including the FGDs and KIIs as needed.

Following on from the initial meetings that were held during Scoping, a second round of meetings are being held to present the findings towards the end of the SEA. In addition to the above, a representative of our team is communicating with various government and parastatal agencies (wherever they are located) to exchange information and views regarding the SEA and finally ensuring their participation in the SEA consultation. Usually, we include an issue-response form in the SEAs that we undertake (see "dummy" example below). This ensures that issues raised by stakeholders are appropriately dealt with or, in some cases, ignored with justification.

¹⁵ 'Stakeholder Engagement: Good Practice Handbook for Companies Doing Business in Emerging Markets'
http://www.ifc.org/wps/wcm/connect/938f1a0048855805beacfe6a6515bb18/IFC_StakeholderEngagement.pdf?MOD=AJPERES
IFC, 2007

Table 3.1: Issue Response Form

#	Issue	Raised By	Raised How	Response
1	We have inadequate access to information about the SEA, because we don't have internet	Madam Jane Carter	During the Public meeting on 1 November 2020	The SEA Team has undertaken to provide information via local radio in the local language. Also, information will be provided to the local Headman for onward dissemination
2	Etc.....			

Besides, CEGIS is also collecting information on the issues found at the baseline report. A list of the issues are presented in Appendix E. The ongoing stakeholder engagement plan and the status are presented below.

Month	Week	Date	Location	Upazila	District	Layers of consultation	
January	W-2	09-01-2023	Char Mantaz	Rangabali	Patuakhali	Union level	
	W-2	09-01-2023	Panpatti	Golachipa	Patuakhali	Union level	
	W-2	10-01-2023	FGD, KII, Informal interview	Rangabali	Patuakhali	Upazila and Union level	
	W-2	10-01-2023	FGD, KII, Informal interview	Golachipa	Patuakhali	Upazila and Union level	
	W-2	11-01-2023	Rangabali	Rangabali	Patuakhali	Upazila Level	
	W-2	11-01-2023	Golachipa	Golachipa	Patuakhali	Upazila Level	
	W-3	15-01-2023	Report writing				
	W-3	16-01-2023	Report writing				
	W-3	16-01-2023	Patharghata	Patharghata	Barguna	Union level	
	W-3	17-01-2023	Charduani	Patharghata	Barguna	Union level	
	W-3	18-01-2023	Patharghata	Patharghata	Barguna	Upazila Level	
	W-3	19-01-2023	FGD, KII, Informal interview	Patharghata	Barguna	Upazila and Union level	
	W-4	22-01-2023	Report writing				
	W-4	23-01-2023	Report writing				
	W-4	29-01-2023	Taltali	Taltali	Barguna	Upazila Level	
	W-4	30-01-2023	Sonakata	Taltali	Barguna	Union Level	
W-4	31-01-2023	Chotobogi	Taltali	Barguna	Union Level		
February	W-1	01-02-2023	FGD, KII, Informal interview	Taltali	Barguna	Upazila and Union level	
	W-1	05-02-2023	Report writing				
	W-1	05-02-2023	Report writing				
	W-1	06-02-2023	Arpangashia	Amtali	Patuakhali	Union Level	
	W-1	07-02-2023	Amtali	Amtali	Patuakhali	Upazila Level	
	W-2	08-02-2023	To be fixed	Amtali	Patuakhali	Union Level	
	W-2	09-02-2023	FGD, KII, Informal interview	Amtali	Patuakhali	Upazila and Union level	
	W-2	12-02-2023	Report writing				
	W-2	13-02-2023	Report writing				

Month	Week	Date	Location	Upazila	District	Layers of consultation
	W-2	13-02-2023	Union name to be fixed	Barguna Sadar	Barguna	Union Level
	W-2	14-02-2023	Union name to be fixed	Barguna Sadar	Barguna	Union Level
	W-3	15-02-2023	Barguna Sadar	Barguna Sadar	Barguna	Upazila Level
	W-3	17-02-2023	Report writing			
	W-3	18-02-2023				
	W-4	22-02-2023	Patuakhali	Patuakhali	Patuakhali	District Level
	W-4	28-02-2023	Barguna District	Barguna	Barguna	District level
	W-3	20-02-2023	Lata Chapli	Kalapara	Patuakhali	Union Level
	W-4	22-02-2023	Lalua	Kalapara	Patuakhali	Union Level
	W-4	23-02-2023	Kalapara	Kalapara	Patuakhali	Upazila Level
	W-4	26-02-2023	Report writing			
	W-4	27-02-2023				
March	W-2	13-03-2023	Dhaka	Dhaka	Dhaka	National level

Stakeholder by Layers		
<i>Policy (Top) layer</i>	<i>Institutional (mid) layer</i>	<i>Local (bottom) layer</i>
<ul style="list-style-type: none"> Ministry of Environment, Forests and Climate Change Ministry of Water Resources Ministry of Local Government, Rural Development and Cooperatives Ministry of Fisheries and Livestock Ministry of power, energy and mineral resources Ministry of Industries Ministry of Agriculture Water Resources Planning Organization (WARPO) Bangladesh Water Development Board (BWDB) River Research Institute (RRI) PETRO Bangla Bangladesh Economic Zone Authority (BEZA) Ministry of Civil Aviation & Tourism. Ministry of Law Justice and Parliamentary Affairs Ministry of Transportation & 	<ul style="list-style-type: none"> Department of Environment (DoE) Bangladesh Forest Department (BFD) Sundarbans Forest Divisions Department of Public Health Engineering (DPHE) Department of Fisheries (DoF) Department of Livestock Services Department of Agricultural Extension Disaster Steering Committee Red Cross/Red Crescent (zilla committee) Bangladesh Water Development Board (BWDB) Bangladesh Inland Water Transport Authority (BIWTA) Road and Highways Department (RHD) NGOs Payra Port Authority (PPA) Bangladesh Climate Change Trust (BCCT) 	<ul style="list-style-type: none"> LGIs NGOs (Water Aid, AOSED, UTTARAN) University (Barisha, Patuakhali) Fisherfolk Farmers Forest Resource Collectors Local Government Authorities Ethnic community Co -Management Organizations: Sundarbans Dependent Fishermen, Crab & fry collectors Kuakata Tour Operators Association. Launch Malik Somity Forest dependent Communities: Wood Traders Tourists Poachers Hunters

Stakeholder by Layers		
<i>Policy (Top) layer</i>	<i>Institutional (mid) layer</i>	<i>Local (bottom) layer</i>
Communication <ul style="list-style-type: none"> • Ministry of Social Welfare • Ministry of Shipping • Ministry Disaster Management and Relief • Ministry of Housing and Public Works 	<ul style="list-style-type: none"> • Bangladesh Forest Department • Deputy Commissioners Barguna and Patuakhali. • Police Department Khulna Barguna and Patuakhali. • Coast Guard, Barishal • Rapid Action Battalion Barishal Division. • Power Cell • Bangladesh Power Development Board (BPDB) • Bangladesh Rural Electrification Board (BREB) • Power Greed Company of Bangladesh (PGCB) • Geological Survey of Bangladesh (GSB) • Gas Transmission Company LTD. (GTCL) 	

3.2 Scenario Development and Projections

Planning for the future is uncertain and no-one can predict exactly how development activities will unfold in the area. Scenario building is a method of coping with the uncertainties of future plans, programmes and projects (see shaded box). As noted earlier, we are still in the process of obtaining clarification on the SOPs – essentially an updated inventory of programmes and projects – existing, planned and possible, in the area. Programmes and projects are what cause the cumulative impacts, in addition to population growth, footprint creep (e.g. expanding settlements and land conversion), and externalities (e.g. climate change).

The “existing, planned and possible” developments will form the basis of our three scenarios, which may simply be low, medium and high-growth (each of these unpacked in detail). We have developed a table into which we will record noteworthy projects/activities or developments in the study area that merit analysis in the SEA. The information required to populate this table will be gathered through interviews during visits to offices in cities, regional centres, villages, etc. Where available, supporting documents (e.g. project feasibility studies) will be collected as well. Also, we will make use of remote sensing to map as many development projects as possible, and field staff will try to visit sites to verify conclusions drawn from the satellite images.

- **Project** means a distinct development, like a lodge, irrigation scheme, road, etc.
- An **activity** is broader than just a project, and could include things like pest control, dredging the river, creating a park or reserve, etc.
- **Developments** are similar to activities though they might include creating zones for future town expansions, changing ownership rights, etc. Developments might include a now policy direction that the government is planning to implement.

For the purposes of this table, we will not differentiate between a project, activity or development, but ignoring minor things like somebody expanding their house or vegetable garden. There is no

hard rule about what is included and what is excluded, but rather we will be guided by whether a project, activity or development is big enough to have likely significant impacts beyond just the local level.

The SEMP will make recommendations for how existing and likely future development projects or activities might need to be adjusted/revised to minimize/ mitigate potential negative environmental and/or socio-economic impacts, and enhance likely positive outcomes.

The table below will contain a list of the key sectors in the study area, with columns for more detailed projects or activities – those existing today (ie the baseline) and those likely to come in the future.

- **Category A:** plans, projects and activities that have already been approved/authorised and budgets have been secured. Feasibility studies have been completed. Design is underway. There is a 90% + chance that they will be implemented
- **Category B:** plans, projects and activities that are in advanced stages of discussion. Not yet approved/authorised. Pre-Feasibility studies have been initiated. The chances of these going ahead are 50/50
- **Category C:** ideas for new plans, projects and activities are only in the conceptual phase. Some may just be a “pipe dream”. Maybe only 10% of these will see the light of day.

Sector	Existing projects, activities or developments	Category A projects, activities or developments	Category B projects, activities or developments	Category C projects, activities or developments
Forestry	??	Wildlife Conservation and Habitat Development in Bangladesh (1st Phase)	??	??
	??	Afforestation in Coastal Region including the Newly Accreted Chars of Bay of Bangle (1st revised) (Jan 2018-Dec 2022)	??	??
	??	Sustainable Forest and Livelihoods (SUFAL) Project (Jul 2018-June 2023)	??	??
	??	Protection of the Sundarban Reserve Forests (Jan 2021-Dec 2024)	??	??
	??	Feasibility Study for Infrastructural Development and Renovation Works of Existing Structure of Forest Department	??	??

For practical (space saving) reasons, only one sector is shown in this table.

We will use a simple but very visual scenario building methodology, which is easy-to-grasp for all levels of decision-makers.

We will juxtapose other kinds of scenarios (e.g. climate change) to get as complete a picture as possible about what the future might hold and whether the resources of the area can absorb the cumulative impacts of the various growth scenarios. SEA typically looks at 3 scenarios and a 10-15 year horizon.

We intend to apply the Dynamic Adaptive Pathways approach to get:

- Insights into trade-offs of different actions and policies, between sectors and over time;
- Identification of low-regret options and potential lock-ins or path dependency in near-term actions;
- Insight into knowledge gaps and areas for further study;
- Capacity building in adaptive planning for stakeholders/decision-makers;
- Community of practice building for resilience planning.

Scenario construction is a method for imagining possible or likely futures – a tool commonly used by planners, economists, corporates, the insurance industry, banking, etc.

When done well, it simplifies the avalanche of data into a limited number of possible states. It evaluates each scenario for internal consistency and plausibility.

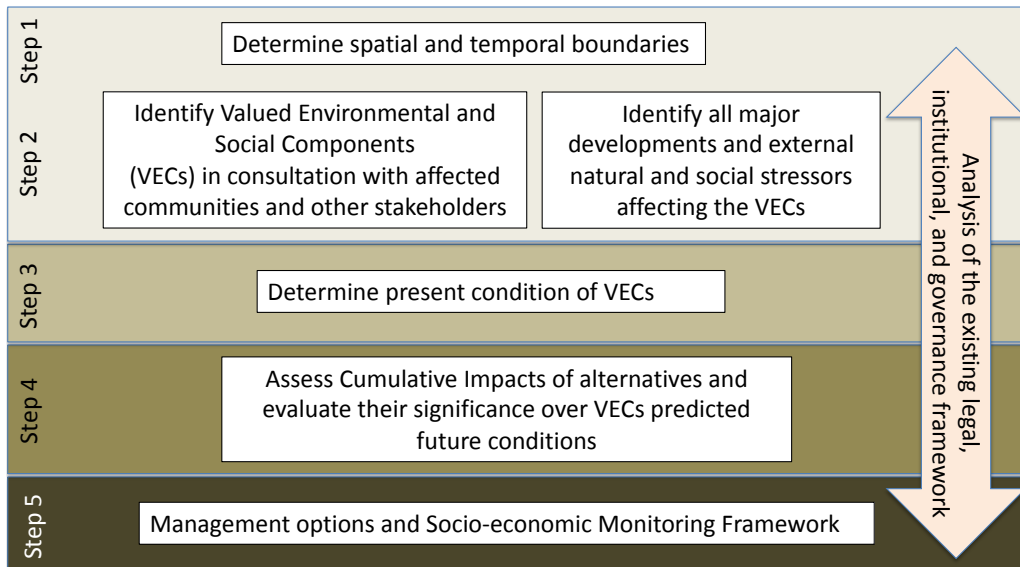
In short, scenario planning attempts to capture the richness and range of possibilities, stimulating decision makers to consider changes they would otherwise ignore. At the same time, it organizes those possibilities into narratives that are easier to grasp and use than great volumes of data.

3.3 Cumulative Impact Assessment and Thresholds

Cumulative Impact Assessment (CIA) is the cornerstone of the SEA. The importance of understanding the cumulative environmental and social impacts from multiple projects, actions, or activities—or even from the same actions over an extended period of time—located in the same geographic region or affecting the same resource (e.g., watershed) has been acknowledged for decades. In some cases, the most ecologically devastating environmental effects and subsequent social consequences may result not from the direct effects of a particular action, project, or activity but from the combination of existing stresses and the individually minor effects of multiple actions over time.

CIA is evolving and there is no single accepted state of global practice. What is important, is that during the process of identifying environmental and social impacts and risks, planners and developers are committed to avoiding and/or minimizing negative impacts to the greatest extent possible, whilst maximising benefits. Furthermore, decision-makers need to understand that some developments may be at risk because of an increase in cumulative effects over ecosystem services they may depend on.

We see CIA as a process that involves continuous engagement with affected communities, developers, and other stakeholders. In practice, effective design and implementation of complete CIA processes is usually beyond the technical and financial capacity of a single developer. CIA thus transcends the responsibility of a single project proponent. We propose conducting CIA as a multistakeholder, iterative, expert-input process that requires the involvement of a multidisciplinary team and an effective, efficient and transparent process. The following diagram illustrates our proposed CIA process. This process is a more detailed “zoom-in” of the “Scoping” and “Impact Assessment” activities and is discussed below:



Source: Modified from IFC Cumulative Impact Assessment Good Practice Handbook, 2013

Figure 3.1: Process for Assessing Cumulative Impacts

Defining thresholds for Valued Environmental and Social Components (VECs) is important because the viability or sustainability of VECs, whether ecological, biological, or related to human communities, is their capacity to endure - i.e., for the ecosystem, community, or population to remain diverse and productive over time (meaning that it retains its inherent resilience). This is reflected in the definition of *sustainable use* in the Convention on Biological Diversity: using the “components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of future generations.”

The viability or sustainability of VECs depends upon both the forces that affect them and their social and ecological vulnerability (sensitivity), i.e., the degree to which they are susceptible to and unable to cope with injury, damage, or harm. The attributes related to a VEC can include biological, cultural, ecological, environmental, physical and social issues. We will carefully evaluate the above VECs as there may be others depending on project specific areas of influence. Where possible supported by data gathering broad VEC categories listed above may be streamlined to specific refined attributes. During the full SEA we will consider the relevant VECs, having reflected on the baseline report and discussed them with the client. The following activities are planned in the full SEA:

- Identification/definition of VEC parameters;
- In needed, additional data collection to determine present condition of VECs;
- Assessment of current threats and stressors; and
- Preparation of GIS map overlays on all physical, biological and socio/cultural environment parameters and their distribution.

Defining thresholds of acceptable VEC condition involves social and ecological scoping informed by scientific understanding. In setting them, one considers points at which there is an abrupt change in

VECs are the principal quantifiable materials of the CIA process and are defined as any part of the environment that is considered important in the assessment process.

Importance can be determined on the basis of cultural values, ecosystem maintenance functions and provisioning ones, or scientific concern.

a VEC condition, where small changes in a given environmental or social driver produce large responses in the condition of the VEC. Ecological thresholds for physical VECs such as air, water, and soil quality are often readily available in either government-established ambient quality standards or in international scientific literature.

The risk of cumulative impacts can be categorised as follows:

- *Significant risk for cumulative impacts/significant leverage:* The development/activities under consideration represent a significant contributor to the expected cumulative impacts or will be the first of several future reasonably anticipated developments that will use the same resource. In these cases, through consultation with stakeholders, the potential cumulative impacts that could be expected over time will be assessed and required avoidance/mitigation measures recommended.
- *Significant risk for cumulative impacts/limited leverage:* The development/activities under consideration is immersed in an environment where the cumulative impacts are evident but the issues are complex, many actors are already involved, and the solution is clearly beyond any individual project sponsor. In this case, the SEA could recommend to: (a) determine the significance of the overall cumulative impacts and their contribution to these cumulative impacts; and (b) design environmental and social management plans and procedures to appropriately mitigate those contributions.
- *Limited to no contribution to cumulative impacts:* The team determines that even though there are clear cumulative impacts, the development's contribution to the cumulative impacts are negligible or nil. In this case, no measures would be necessary.

The above section has explained our proposed approach to assessing cumulative impacts. As part of the CIA methodology already outlined, we also propose providing a holistic *social-ecological systems assessment* (SES).

SES provides an understanding of both the strategic implications of social, economic and ecological system components, and the systemic relationships that link these components. The SES matrix focuses on the level of *systemic latitude*¹⁶ available to accommodate additional change (figure 20), rather than only assessing the significance of a given impact on the receiving environment. Accordingly, the SES matrix has an inverse rating system, with **HIGH** indicating high levels of latitude available (i.e. comparable to a low impact significance rating in an EIA rating system) and **LOW** indicating limited or no latitude available (i.e. comparable to a high impact significance rating in an EIA rating system). The assessment matrix is graphically presented below.

Assessment rating	Interpretation
VERY HIGH	The SES has extensive latitude to accommodate change (impact). Such change would typically be new developments introduced into the SES.
HIGH	The SES has sufficient latitude to accommodate change. Such change would typically be either new developments introduced into the SES, or relatively limited expansion of existing activities already present in the SES.
MEDIUM	The SES has latitude to accommodate change. Care should however be taken with introducing such change as the SES is nearing its capacity to accommodate further change and, as a result, could assume a LOW or VERY LOW rating. Such change would generally be new additions or expansions of activities already present within the SES.

¹⁶ *Latitude* means the ability of the receiving environment to absorb impacts, recover, and self-correct. If it cannot self-correct, it may do so with external input (e.g. a rehabilitation plan for a mine).

Assessment rating	Interpretation
LOW	The SES has very little latitude to accommodate change. Changes should be approached with caution or avoided altogether as the SES should shift into an (undesirable) alternate state should further pressure be placed on it. Such change would generally be associated with either new additions or extensions or expansions or expansions of activities already present within the SES.
VERY LOW	The SES has no latitude to accommodate change. Changes should be approached with extreme caution or preferably be avoided altogether as the SES could easily shift into an (undesirable) alternate state. Such change would generally be associated with either new additions and extensions or expansions of activities already present within the SES.

Finally, a tool we have found to be particularly useful and practical, is the construction of linkage diagrams to improve the understanding of direct and indirect impacts, and unintended consequences of major programmes or projects (see below). Linkage diagrams will be constructed “internally” by the experts in the SEA team, the client and invited outside specialists during a week-long workshop scheduled for mid-January 2023. Below are examples which illustrate this methodology.

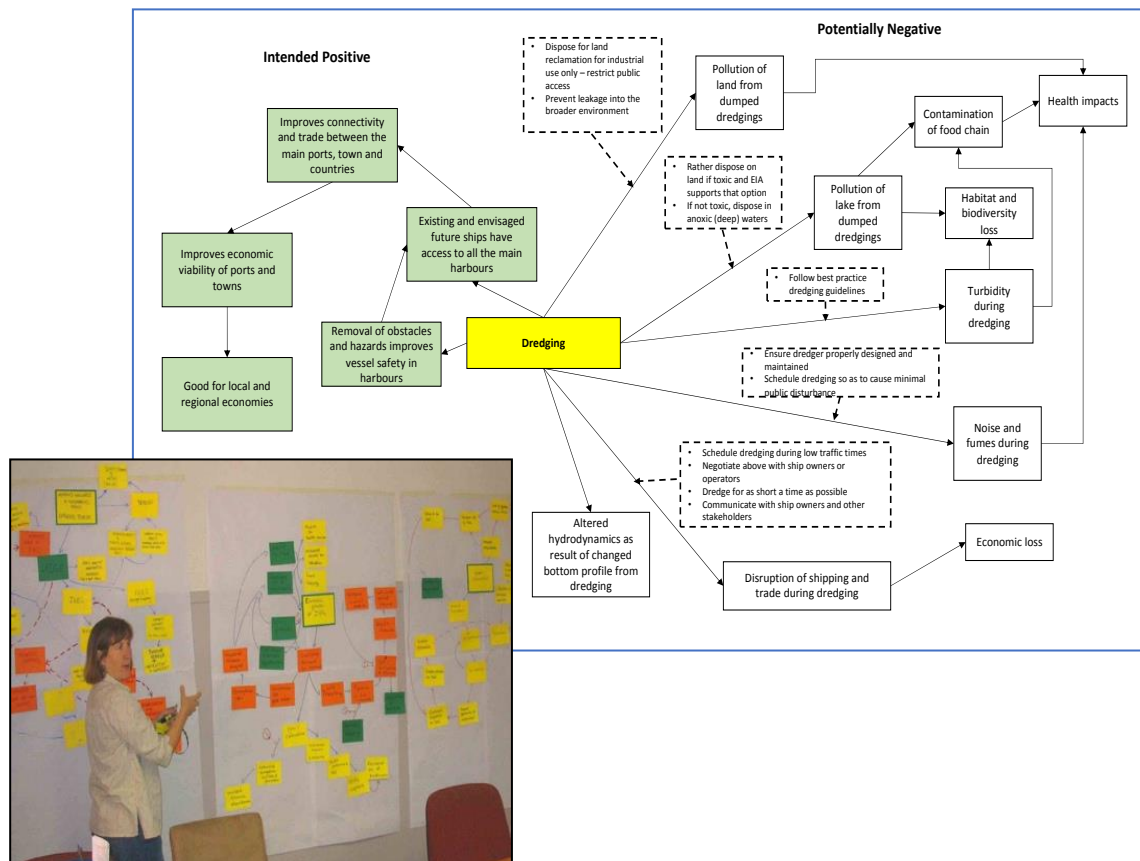


Figure 3.2: Constructing a Linkage Diagram as Part of the SEA for Namibia’s Millennium Challenge Compact (l) and (r) an Example of a Completed Linkage Diagram for the Lake Tanganyika SEA

3.4 Alternatives and Mitigation Options

The Payra-Kuakata region includes environmentally sensitive areas which need protection from anthropogenic factors. At the same time, it is acknowledged that development activities are needed

for poverty reduction and improving livelihoods. This requires the formulation and enforcement of an integrated development plan. The priorities are:

- Management of the coastal environment including its protection and regeneration,
- management of the water resources in the region,
- facilitating sustainable economic development of coastal communities,
- development of productive economic activities,
- development of infrastructure, and
- development of social facilities including education, health, water and sanitation, mitigation of natural disasters.

In order to address the increasing risks pertaining extreme events due to climate change such as cyclone, storm surge, coastal flood, windstorm etc., a substantial magnitude of public investment program is required. The purpose is to create resilient infrastructure, including drainage and flood control, water supply, sanitation, cyclone shelters, emergency access roads and bridges, slum improvements, bus terminals, boat landings, and markets. All the projects selected for such programme should be assessed considering effects of climate change based on agreed technical criteria and climate projections for 2040. Institutional capacity to integrate climate and disaster risks into urban and regional planning and infrastructure management also need to be addressed. The priority investment program for mitigating natural disasters and ensuring safety and protection of the coastal population should focus on the following: Coastal embankment construction and rehabilitation, Flood control and drainage, and Infrastructure and urban services.

For the development of the coastal zone, two sectors – tourism and fisheries, are identified where investments in projects can be done. For investment, among others mitigation measures, environment management and water resource management, should be prioritized. Implementation of these strategies require the support of national and local government budgets, private investment (including foreign investment), NGO program resources, and multilateral and bilateral donors.

The alternative scenario of the Patuakhali–Kuakata region in line with the Comprehensive Regional Plan (focusing on ecotourism) would be developed through stakeholder consultation. Preliminary scenarios will be developed by the SEA team which would be further corrected, updated, and validated with the UDD team and relevant stakeholders. These scenarios would be the basis of the identification of plausible impacts of the proposed Regional Plan, Land-use Plan and Structural Plan.

4. Phase 3 of the SEA Process

4.1 Finalise SEA Report

The Report will be concise, concentrating only on the key findings and recommendations. As far as possible, the background (baseline) information, methodology etc. will all be contained in appendices that will only be read by those requiring more detail. Also, the main report will be well illustrated with maps, diagrams, graphs and photographs to make it more accessible to lay-persons. As with all technical reports, there will be an executive summary that is geared specifically for lay-persons and high-level decision makers.

A separate document (but linked to the SEA) will be compiled to synthesise the monitoring actions that will be needed to track progress in avoiding or mitigating negative cumulative impacts and enhancing synergies. This document will be the Socio-economic and Environmental Monitoring Framework (SEMP) required by the ToRs. The framework will be compiled in tabular form, containing a collection of practical activities, assigned to appropriate authorities or other stakeholders, as appropriate.

The proposed table of contents for the SEA report appears in Appendix A.

4.2 SEMP

As noted earlier, the ToRs state that “the procedure of SEA is inextricably linked to decision making. The SEA report is a decision-support instrument aimed at providing as detailed a picture as possible of the environmental impacts related to the implementation of a plan, policy or programme. In the case of plans, the SEA report must contain sufficient information to assess the acceptability of the impacts, and consequently to propose suitable modifications and mitigations”.

In response to this, we propose developing a Strategic Environmental Management Plan (SEMP) to guide the implementation of the “mitigation hierarchy”.

Since the SEMP will be based on the results of the SEA the SEMP and the SEA report are critically linked documents. Both will refer to baseline materials and analyses contained in earlier reports produced during the SEA process.

The PKCPs area of influence has both local, regional and national significance due to its diversity, uniqueness, biological productivity and rich ecosystems, with a number of rare or endangered species, including terrestrial and aquatic mammals, birds and reptiles. Its habitats provide essential ecological services such as nursery grounds for many fish species, and coastal erosion protection against storms, tidal surges and cyclones.

But, recently, concerns have been raised about the potential impacts of existing and planned developments in the area.

The SEA will help with the understanding of positive impacts versus more risks and negative environmental and socio-economic impacts relating to the implementation of the PKCP and associated developments. The SEMP will be the key instrument to guide the enhancement of benefits and promote synergies, and to avoid or mitigate negative outcomes and counteract antagonisms.

This SEMP will set out what needs to be done, who needs to do it, when and how, and indicate associated requirements (resources – financial, manpower, equipment). It will also propose a coordination mechanism for overseeing its implementation. This is exactly what the ToRs require.

The management actions detailed in this SEMP, and the indicators chosen for ongoing monitoring, will be the best current options but it is anticipated that the SEMP will be refined and updated over time, based on the lessons learnt and changing circumstances during the process of implementation. Whilst this is normal and expected, the foundations laid by this first iteration should provide a solid platform for future versions.

The organization of this SEMP will follow a standard, commonly used framework. Its aim will be to guide future planning, management decisions and monitoring in the area as regards environmental, social and linked economic concerns. It will be compiled through team meetings and consultation workshops with a SEMP Liaison Group comprising representatives of key government ministries that are likely to be responsible for its implementation. This should ensure that the recommendations are realistic, practical and implementable, and that the main implementing parties are already aware of what is expected of them so that they can plan and budget for the necessary management actions to be taken.

Usually there are six categories of responses required for the implementation of the SEMP. These are:

1. Establishing an appropriate institutional arrangement for managing the SEMP, inclusive of developing conducive working relationships with implementing and supporting sector agencies, mostly within government, but also with civil society, academia and the private sector.
2. Adjusting existing policies so that they are either (a) better able to respond to the needs of delivering progress towards achieving the goals of higher-level Plans or (b) better aligned with each other – i.e. removing inter-sector contradictions and improving synergies.
3. Diligent application of existing social and environmental safeguards (e.g. EIA and EMP) using existing legal and regulatory frameworks, and perhaps improving this over time.
4. Monitoring of indicators – these will be listed in the SEMP.
5. Linked to response No. 4, is the possible need for undertaking new studies for issues regarded as important, but where information is lacking.
6. Suggested actions for the improved management of the area.

The proposed table of Contents for the SEMP report appears in Appendix B.

4.3 Powerpoint Presentation

Whilst not required in the ToRs, the SEA Report will be accompanied by a powerpoint presentation.

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Appendices

Appendix A: Table of Contents for the SEA Report

Executive Summary

Acknowledgments

List of Abbreviations

Glossary

Section 1 : SEA Introduction and Background

1.1 Introduction and summary of Terms of Reference

Section 2 : The Payra-Kuakata Comprehensive Plan Focusing on Eco-Tourism (PKCP)

2.1 Background, context and goals of the PKCP, and alternatives

2.2 The PKCP, and its relationship with other relevant plans, programs and projects

2.3 PKCP area of influence and spatial extent of the SEA

Section 3 : SEA Methodology

3.1 Scoping, SEA analysis and report

3.2 Strategic Environmental Management Plan (SEMP)

3.4 Assumptions and limitations

Section 4 : Overview of the current state of the environment, threats and trends

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4.2 Physical environment and current threats and trends

4.3 Biological environment and current threats and trends

4.4 Social (including health and gender) and cultural environments and current threats and trends

4.5 Interrelationship between the various components of the environment

Section 5 : The policy, legal and institutional Environment

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5.3 Protection and management of the biological environment

5.4 Protection and management of heritage resources

5.5 Consideration of Human health and gender aspects

5.6 Planning and management of infrastructure, industries, transport

5.7 Pollution control and waste management

Section 6 : Stakeholder input

- 6.1 Interested and Affected Parties, their concerns and aspirations

Section 7: Cumulative Impact Assessment

- 7.1 Likely changes to the environment in the absence of the PKCP
- 7.2 Cumulative impacts of the PKCP on:
 - 7.2.2 Physical environment
 - 7.2.3 Biological environment
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- 7.3 Resilience of the environment to current and future impacts
- 7.4 Conclusion of cumulative impact significance

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- 8.1 Consideration of strategic alternatives
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Appendices

- Terms of Reference
- Report compilers and their CVs
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Appendix B: Table of Contents for the SEMP

Executive Summary

Main Body

1. Introduction
2. Role and purpose of SEMP
3. Methodology followed in developing the SEMP
4. Summary of main SEA findings
5. Environmental & socio-economic objectives, targets and indicators
6. Management, monitoring, mitigation & reporting framework
7. Institutional roles & responsibilities, capacity, skills, equipment and budget requirements
8. Conclusions & recommendations

Annexes

Annex A. Guidelines and model ToR (for sectors, EIAs, etc.)

Annex b. Glossary and abbreviation

Annex c. Acknowledgments

Annex d. References (if any)

Appendix C: Revised Hours of Works

The Contract for the SEA assignment was signed between the UDD-GoB and CEGIS on 1 April 2022 in Dhaka, Bangladesh. The Contract is set to run for 12 calendar months and the SEA is thus scheduled to be completed by End-March 2023. For various reasons, start-up was slightly delayed but the consultants are confident that the pace will be accelerated in due course and that deliverables will be on time.

A Schedule of Activities is provided overleaf. As is the case with staff deployment and level of effort, and as discussed during the inception meeting, the schedule of activities is regarded as indicative and CEGIS will maintain a degree of flexibility, within reason, in this regard.

As noted earlier, we know from experience that SEA is not recipe-driven, as is often the case with project-level EIA. The consultant is often required to adjust the time required to complete a specific sub-task (either needing less or more time, as the case may be). We have seen how the recent COVID pandemic wreaked havoc with project timelines in various parts of the world, including Bangladesh.

Other factors such as natural disasters, unrest, etc. also need to be considered as these are external factors that are usually not in the control of the consultants.

Flexibility based on professional judgment is important for ensuring that the assignment is properly executed to the highest possible standard and within the overall contract period.

Stage	Activities	2022												2023																																					
		March			April			May			June			July			August			September			October			November			December			January			February			March													
		13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	1	2	3	4	5	6	7	8	9	10
Preparation	Negotiation and Contract Signing	[Orange bar from March 13 to 17]																																																	
Inception Phase	Begin literature review, secondary information and document collection	[Orange bar from March 13 to 25]																																																	
	Preparation of Inception Report	[Orange bar from March 17 to 21]																																																	
	Final Team Formation and Task Allocation	[Orange bar from March 17 to 21]																																																	
	Resource Allocation and Refine Operating Budget	[Orange bar from March 17 to 21]																																																	
	Submission of Draft Inception Report	[Green diamond at May 21]																																																	
	Client Review of Inception Report	[Yellow bar from May 21 to 22]																																																	
	Submission and Acceptance of Final Inception Report	[Green diamond at June 25]																																																	
Database and Baseline Report	Compile Environmental and Social Baseline Reports (Desk Based)	[Orange bar from June 25 to 30]																																																	
	Environmental Survey Conduction (Water, Air, Soil and Noise Level)	[Orange bar from June 25 to 30]																																																	
	Ecological survey conduction (Flora, Fauna, Habitat and Relevant data collection)	[Orange bar from June 25 to 30]																																																	
	Development of GIS Database for all Relevant and Available Data	[Orange bar from July 1 to 10]																																																	
	Preparation and Submission of Draft Database Report	[Orange bar from July 1 to 10]												[Green diamond at August 37]																																					
	Preparation and Submission of Draft Baseline Report	[Orange bar from July 1 to 10]												[Green diamond at September 37]																																					
	Client Review of Database and Baseline Report	[Yellow bar from August 37 to 38]												[Green diamond at October 41]																																					
Scoping Report	Submission and Acceptance of Final Database and Baseline Report	[Green diamond at October 41]																																																	
	Stakeholder Consultations and Analysis	[Orange bar from October 41 to 45]																																																	
	Preparation of the SEA Working Papers/Theme Papers	[Orange bar from October 41 to 45]																																																	
	Review of Legal and Regulatory Framework	[Orange bar from October 41 to 45]																																																	
	Review of Insitutional Capacities	[Orange bar from October 41 to 45]																																																	
	Scenarios Generation (Low, Medium, High)	[Orange bar from October 41 to 45]												[Green diamond at November 45]																																					
Draft SEA Report	Interim Report Preparation and Submission	[Green diamond at November 45]																																																	
	Finalization of GIS Database	[Orange bar from November 45 to 46]																																																	
	Assessment of Land Use Change Trajectories under Various Development Scenarios	[Orange bar from November 45 to 46]																																																	
	Assessment of the Cumulative Impacts of the PKCP	[Orange bar from November 45 to 46]																																																	
	Assessment of Alternatives, Mitigations, Synergies	[Orange bar from November 45 to 46]																																																	
	Second Round of Stakeholder Engagement	[Orange bar from November 45 to 46]																																																	
	Preparation and Submission of Draft SEA Report	[Orange bar from November 45 to 46]												[Green diamond at January 3]																																					
Final SEA Report	Client Review of Draft SEA Report	[Yellow bar from January 3 to 4]																																																	
	Develop the SEMP	[Orange bar from January 3 to 4]																																																	
	Revise SEA Inlight of Client Review and Stakeholder Inputs	[Orange bar from January 3 to 4]																																																	
	Submit Revised SEA Report and SEMP	[Orange bar from January 3 to 4]												[Green diamond at January 5]																																					
	Client Review of Above Reports	[Yellow bar from January 5 to 6]																																																	
	Finalise Above Reports in Response to Client Review	[Orange bar from January 5 to 6]																																																	
	Collate All Documents and Data Sets for Handover to the Client	[Orange bar from January 5 to 6]												[Green diamond at February 9]																																					
Assignment Closure	[Green diamond at February 9]												[Green bar from February 9 to 10]																																						

Appendix D: Personnel and Sub-Consultants

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
Dr. Peter Tarr	CEGIS	<p>Ph.D. in Environmental Management and Planning from University of Aberdeen, Scotland, 1995-1999.</p> <p>M.Sc. in Environmental Management and Planning from University of Aberdeen, Scotland, 1994-1995.</p> <p>National Diploma Nature Conservation from Pretoria Technikon, South Africa, 1980-1982.</p> <p>More than 40 years of experienced in:</p> <ul style="list-style-type: none"> • Strategic Environmental Assessments, Environmental Impact Assessments, Integrated Environmental Assessments, and Environmental Sustainability Appraisals. • Policy formulation, strategy, programme, project appraisal and review • Land use and environmental planning, and land evaluation for sustainable natural resource management • Protected area management; • Community-based natural resource management. 	Strategic Environmental Assessment (SEA) Expert/Team Leader	<p>He will be responsible:</p> <ul style="list-style-type: none"> • To conduct the SEA of Project areas and prepare all aspects of planning, liaison and reporting; • Identify the SEA Procedure of the project • Screening of Policies, Programs, Plans (PPPs) that have significant socio-economic and environmental impacts to be included in SEA in the field of urbanization • Review of PPPs with baseline socio-economic and environmental data of various sectors identified through screening, stakeholder analysis, legal and regulatory framework, environmental and socio-economic objectives, For SEA, Scenario Development issues including setting environmental and socio-economic objectives of the concerned sector, identifying institutional capacity, level of environmental pollution • Deeper Assessment of Preferred Alternative based on Initial Impact (Positive and Negative) Assessment (High, Medium, Low) and Initial Impact Assessment of different sectoral PPPs for SEA. • Preparation of Strategic Environmental Management Plan (SEMP) based on SEA, including Critical Issues, Role and Responsibilities of Concerned

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
				Institutions/Agencies, Mitigate to Negative Impact of PPPs and Coordination for Implementation of SEMP for Positive Impact and Monitoring Mechanism
Kazi Kamrul Hassan	CEGIS	Doctor of Philosophy (Sustainable Resource Management with particular focus on Environmental Policy and Legislations) Master of Environmental Management and Development Graduate Diploma in Environmental Management and Development 25 years of experience <ul style="list-style-type: none"> • Worked as Environmental and Ecological Specialist to carry out IEE, EIA, CEIA, ESIA and ESHIA studies. • Experience in SEA • prepared and implemented Environmental Management Plan (EMP) including Environmental Monitoring Plan • Thorough knowledge and experiences on Ecosystem, Biodiversity including forest, wetlands and Natural Resources management 	Environmental Analyst	He will be responsible for <ul style="list-style-type: none"> • Evaluating environmental changes/trends during the last 10 years – analyze influence of land-use patterns on this trend; • Outline future evolution of environmental changes/trends if no land use plan intervention is taken; • Assessing Land Potentials and Environmental Improvements; • To delineate spaces in terms environmental parameter; • Analyze and Compare Socio-economic and Environmental Effects of Alternatives; • Develop Land Use Planning Alternatives, and Consult with Relevant Stakeholders; • Formulate EMP
Dr Kazi Md. Noor Newaz	CEGIS	Ph.D. in Biological Science/ particularly Ecology (Adaptation and distribution of species in natural environment) M.Sc. in Environmental Science M.Sc. Part-I (research) in Env. Microbiology 37 years of experience including <ul style="list-style-type: none"> • Research and conducting environmental ecological studies • Ecological reports (inventory of flora, fauna and their habitats, ecological habitat restoration and enhancement of ecosystem services), ESIA, CEIA, DIA and ESHIA • Involved as ecologist, biodiversity management and 	Ecologist	He will be responsible <ul style="list-style-type: none"> • To make an inventory of all types existing flora and fauna; • To identify the potentiality of the natural resources (flora and fauna); • To identify hazards that might be imparted on the flora and fauna due to proposed development; • To prepare a map of habitat for existing flora and fauna; • To earmark the conservation areas, which

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		compliance specialist in SEA study of SW region of Bangladesh		<p>would not be disturbed by any kind of development</p> <ul style="list-style-type: none"> • To identify threats for wildlife assessing impacts of existing and future development impact on wildlife resources; • Developing and preparing Management plan of wildlife resources
Dr. Md. Shibly Sadik	CEGIS	<p>Ph.D. in Civil and Earth Resources Engineering from Kyoto University in 2019 Research on Post-Disaster Recovery after Cyclone Aila M.Sc. in Technology for Integrated Water Management from University of Gent, Belgium in 2013. M.Sc. in Water Resources Development from Bangladesh University of Engineering and Technology in July 2009. B.Sc. in Environmental Science from Khulna University in 2006. More than 15 years of experience in</p> <ul style="list-style-type: none"> • Conducting environmental assessment including SEA, IEE, EIA, ESIA, and environmental monitoring • Preparation of hazard map, hazard assessment and hazard mitigation guideline preparation, noise modeling, air quality modeling, preparation of ESMP for noise reduction, and environmental pollution. 	Hazard Management Expert	<p>He will be responsible for</p> <ul style="list-style-type: none"> • Shortlisting national level policies for coastal region regarding hazard management and formulate strategies for spatial plan of Payra-Kuakata; • Prepare composite hazard map (flood and cyclone) and guidelines for hazard mitigation including climate change; • Integrate the engineering geological and DRR data with urban and regional planning database to prepare risk sensitive spatial
Malik Fida A Khan	CEGIS	<p>M.Sc. in Hydro informatics B.Sc. in Civil Engineering 30 years of working experience in:</p> <ul style="list-style-type: none"> • Climate Change and vulnerability assessment, analysis and mitigation measures • Coastal and river system management • water resources and, integrated and strategic planning 	Climate Change Adaptation Expert	<p>He will be responsible for:</p> <ul style="list-style-type: none"> • Shortlisting national level policies for coastal region and formulate strategies for the spatial plan; • Projection of water requirement with seasonal variation; • Assess coastal hazards and prepare hazard map, guidelines for hazard mitigation including climate change;

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
				<ul style="list-style-type: none"> • Generate erosion and accretion model; • Identify, evaluate and quantify climate change impacts on the region; • Coordinate the climate change related activities and data collection; • Analyze and interpret the historical climate data; (viii) Project next 20 years climate change scenario
Mohammad Nur Nobi	CEGIS	<p>M.Sc. in Environmental Economics and Management from Swedish University of Agricultural Sciences (SLU), Uppsala, Sweden, 2013.</p> <p>M.S.S. in Economics from University of Chittagong, Chittagong, Bangladesh, 2000.</p> <p>B.S.S. (Hons) in Economics from University of Chittagong, Chittagong, Bangladesh, 1999.</p> <p>More than 15 years of working experience in:</p> <ul style="list-style-type: none"> • Natural Resource and Environmental Economics • Assessment and valuation of ecosystem services, blue economy, tourism, and sustainable development 	Economist (Blue Economy)	<p>He will be responsible for</p> <ul style="list-style-type: none"> • Assessment of coastal and marine resource of the region; • Assess scope further expansion of port related facilities; • Assess scope for further scope for fishing in the coast; • Assess the scope for eco-tourism in the region; • Assessment of Pollution from ports and other coastal activities and propose measures to limit pollution
Dr. M A Quassem	CEGIS	<p>PhD in Participatory Management, Barrington University, USA, 1998.</p> <p>Post-Graduate Diploma in Rural Policy and Planning, (specialization in monitoring and evaluation) Institute of Social Studies, The Hague, 1988.</p> <p>Post-Graduate Diploma in Hydraulic Engineering, International Institute of Hydraulic Engineering, Delft, 1979.</p> <p>B.Sc. Engineering (Civil) from Bangladesh University of Engineering and Technology (BUET), 1966.</p> <p>More than 40 years of working experience in:</p> <ul style="list-style-type: none"> • Planning and research, construction, operation & 	Institutional Management Expert	<p>He will be responsible</p> <ul style="list-style-type: none"> • To propose organizational setup for Payra-Kuakata Development Authority; • Charter of duties for the professionals; • Procedure of coordination among the agencies; • Role of UDD after the completion of current development plan

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		<p>management</p> <ul style="list-style-type: none"> Working with government at different levels and delivering high quality outputs Public and private sector organizations in a management capacity and advising to institutional reform and on improving organizational performance and business development 		
Dr. Farhana Ahmed	CEGIS	<p>Ph.D. on Resilient Adaptation to Flood Risks under Urban Growth and Climate Change Dynamics from Vrije University of Amsterdam, the Netherlands, July 2019.</p> <p>M.Sc. in Environmental Science (Specialization in Environmental Planning and Management), UNESCO-IHE, The Netherlands, April 2008.</p> <p>Masters of Urban and Regional Planning (M.U.R.P), BUET, Dhaka, December 2008.</p> <p>Bachelor of Urban and Regional Planning (B.U.R.P), BUET, Dhaka, April, 2002.</p> <p>More than 15 years of working experience in:</p> <ul style="list-style-type: none"> Urban planning, regional planning, landscape planning and design Conducting various environmental and socio-economic studies focusing on planning at local and regional level, strategy formulation, vulnerability assessment and adaptation to climate change Formulation of Urban Sector Policy to support Urban Governance Reform of Bangladesh Preparing adaptive flood management for urban areas in the delta regions in light of the changing urban and climatic environment 	Land Use Planner	<p>She will be responsible</p> <ul style="list-style-type: none"> To formulate structure plan policies from strategic environmental assessment; To formulate Structure plan considering sectoral policies; To formulate Growth centre plan for the region; (iv) Formulate Urban Area Plan
Syed Monowar	CEGIS	Masters in Port Management and Harbor Administration, University of Antwerp (Belgium), 1994-95	Navigation Expert	<p>He will be responsible for</p> <ul style="list-style-type: none"> Assessment of River navigation baseline

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
Hussain		Post Graduate Diploma in Personnel Management, Bangladesh Institute of Management, 1985-86 M.A. Dhaka University, Bangladesh, 1976. B.A. (Hons), Dhaka University, Bangladesh, 1974 More than 35 years of working experience in: <ul style="list-style-type: none"> • Management and operation of all inland ports and landing stations • Outsourcing the actual operation of the ports and stations including the employment of labor in the ports • Traffic analysis Intermodal connectivity. Regulatory and infrastructure requirement for handling of both international and domestic goods, development planning according to traffic demand, bilateral and regional transport connectivity, inland container handling, private sector participation, regulatory provisions in respect of transport and handling of goods. 		condition of the in the region; <ul style="list-style-type: none"> • Impact assessment of existing and future vessel movements in region; • Identify impacts of water navigability and Prepare carrying capacity of rivers and canals in the region; • Suggest facilities for improvement for inland port related facilities; • Assess facilities and connectivity on inland ports due to Payra port
Dr. Md. Wasiul Islam	CEGIS	Ph.D. in School of Business (Tourism Discipline), The University of Queensland (under G8), St. Lucia Campus, Brisbane, QLD 4072, Australia, January 2014 to March 2018. Master of Science in Forest and Nature Conservation, Faculty of Environment Science, Wageningen University and Research Center, the Netherlands, September 2007 to August 2009. Master of Science in Forestry, Forestry and Wood Technology Discipline, Khulna University, Bangladesh, June 2000 to November 2002. B.Sc. (Hon's) in Forestry, Forestry and Wood Technology Discipline, Khulna University, Bangladesh, June 1995 to December 1999. More than 15 years of working experience in: <ul style="list-style-type: none"> • Tourism management, planning and development • Tourist carrying capacity analysis and community-based 	Tourism Development Expert	He will be responsible for <ul style="list-style-type: none"> • Assessment of Baseline Condition of the Tourism sector in the region; • Assessment of Impacts on Tourism sector; • Identify impacts due to development of Tourism sector in the region; • Preparing relevant environmental management plan

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		tourism <ul style="list-style-type: none"> • Preparing adaptive co-management plans in tourism destinations • Formulating EMP for tourism sector 		
Mohammad Abdur Rashid	CEGIS	M.S in Agricultural Engineering (FPM), Bangladesh Agricultural University, Mymensingh, 2005. B.Sc. Agricultural Engineering, Bangladesh Agricultural University, Mymensingh, 2000. More than 15 years of experience in <ul style="list-style-type: none"> • IEE, EIA and SIA studies of Water Resources, Communication, Power, Gas and Planning sector projects. • Agriculture planning, crop modeling, crop water demand assessment, irrigation water management, and climate change and disaster management. 	Agronomist	He will be responsible for <ul style="list-style-type: none"> • Identifying problems (including climate change) of recent practice in agriculture with spatial pattern; • Strategy for distribution of agriculture infrastructures in different settlement hierarchy; • Integrate rural settlement with agricultural activities; • Integrate agriculture activities in urban areas; • Assessing the impacts of the proposed interventions agricultural practices; • Policy measures to conserve agricultural land and integrate it with land use plan.
Zahir Uddin Ahmed	CEGIS	M.Sc. Forestry, University of Chittagong, 1988. M.Sc. Chemistry, Dhaka University, 1981. B.Sc. (Hons.) Chemistry, Dhaka University, 1980. More than 15 years of working experience in: <ul style="list-style-type: none"> • Forest resources assessment particularly health assessment, forest service assessment. • Plantation program in Coastal regions. • Sustainable management of forest resources. • Supervising forest plantation programs (coastal mangrove forest high forest). • Developing forest management plan. • Analysis of the paradigm shifting of forest management in 	Forest Resource Management Expert	He will be responsible for <ul style="list-style-type: none"> • Preparing baseline of the forest, flora and fauna in the region; • Compare all existing and previous management plans and suggest guideline to prepare future management plan; • Assessment of impact on forest due to development and human intervention; • Policy measures to integrate forest resource management with spatial plan;

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		Bangladesh. <ul style="list-style-type: none"> • Impact assessment on forest resources due to natural and anthropogenic causes. • Policy formulation on forest resources management. • ESIA and SEA experiences in Bangladesh. 		
Mir Fahim Shaunak	CEGIS	MURP (Masters of Urban and Regional Planning), Department of Urban and Regional Planning, Jahangirnagar University. BURP (Bachelor of Urban and Regional Planning), Department of Urban and Regional Planning, Jahangirnagar University. More than 13 years of working experience in: <ul style="list-style-type: none"> • Executing Remote Sensing/GIS and Urban Planning based activities such as DTM Generation, City Clutter Mapping with geodatabase, Extracting Features from images, Image Processing (Image referencing, Image mosaic, Image interpretation, Image Classification, Ground Truthing, Accuracy Assessment, Mosaic and Subset Images, Enhancement of Images), 3D City Modelling, 3D Vector Mapping from Aerial Photograph, GPS and DGPS Field Survey, Socio-economic Survey, Landscape Design, etc. 	GIS Database Manager	He will be responsible for <ul style="list-style-type: none"> • Manage all related Spatial and attribute database of the project (not only SEA component) and check consistency; • Integrate SEA database with the GIS database; • Perform Spatial and environmental analysis for strategic planning; • Prepare Regional, Structure, Urban Area Planning database; • Prepare map layout for Regional, Structure, Urban Area Plan
Md. Amanat Ullah	CEGIS	M.Sc. in Botany from National University, 2001 B.Sc. (Hons.) in Botany from National University, 2000 More than 10 years of working experience in: <ul style="list-style-type: none"> • Floral inventory survey in the coastal areas. • Identification of flora habitat. • Threats assessment for the floral vegetation in respect to land use changes and climate change. • Spatial mapping and habitat suitability assessment of the vegetation in coastal areas. • Conducting feasibility, IEE, EIA and Environmental Monitoring studies of water resources, power, forestry, 	Ecology Associate (Ecology)	He will be responsible for <ul style="list-style-type: none"> • Conduct field survey to make an inventory of all types existing flora; • Field study to identify the potentiality of the natural resources (flora); • Conduct field trip to identify hazards that might be imparted on the flora due to proposed development; • Collection of field data to prepare a map of habitat for existing flora; • Field verification of the conservation areas, which would not be disturbed by any kind of

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		climate change, communication and various planning sector projects. <ul style="list-style-type: none"> • Natural resources management and ecological impact assessment, biodiversity assessment, preparation of ecological management plans, plantation design, evaluation of ecosystem services and biodiversity conservation. 		development; <ul style="list-style-type: none"> • Data analysis and report writing;
H M Nurul Islam	CEGIS	Master in Limnology and Wetland Management; M.Sc. (2017) and B.Sc. (2008) in Environmental Science. More than 10 years' experience in <ul style="list-style-type: none"> • Assessment of floral and faunal biodiversity. • Identification of environmental problems and issues in rivers, wetlands, terrestrial ecosystem, and in generally to natural resources. • Tourist carrying capacity assessment of any tourism center or island or any region. • Conservation management zones assessment for the coastal forests, and other landscapes. • Environmental monitoring of the resources. • Ecosystem service capacity assessment. • Wetland management and habitat suitability assessment of flora and fauna. 	Environmental Associate (Environment)	He will be responsible for <ul style="list-style-type: none"> • Conduct field survey to identify the environmental issues related to flora and fauna and lastly the ecosystem; • Tourism impact assessment on natural vegetation, fauna, the terrestrial and aquatic ecosystems; • Water quality assessment, monitoring assessment of seasonal variation; • Conduction of survey for air quality, noise quality assessment in the study area; • Meteorological information measuring and collection of secondary information form the BMD; • Waste characteristics analysis and waste dumping and recycling mapping development; • Carrying capacity assessment of the tourism center or areas. • Data analysis and report writing;
Mohammad Kamruzzaman	CEGIS	M.Sc. (Wildlife Ecology, Management and Conservation Biology) in 2000 University of Chittagong, B.Sc. (Honors) Zoology in 1999 University of Chittagong.	Ecology Associate (Wildlife)	He will be responsible for <ul style="list-style-type: none"> • Conducting field survey to make an inventory of all types existing fauna; • Field study to identify the potentiality of the natural resources (fauna);

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		More than 10 years of working experience in: <ul style="list-style-type: none"> • Inventory of fauna scientifically. • Habitat mapping of faunal biodiversity. 		<ul style="list-style-type: none"> • Conduct field trip to identify hazards that might be imparted on the fauna due to proposed development; • Collection of field data to prepare a map of habitat for existing fauna; • Field verification of the conservation areas, which would not be disturbed by any kind of development; • Field study to identify threats for wildlife assessing impacts of existing and future development impact on wildlife resources; • Data analysis and report writing;
Md. Habibur Rahman	CEGIS	M.Sc. in GIS for Environment and Development B.Sc. in Civil Engineering Diploma Engineering in Civil More than 18 years of working experience in: <ul style="list-style-type: none"> • GIS data development, system analysis and development, designing survey form and database structure, organizing data entry and data cleaning job. • Data collection with Differential GPS, Spatial analysis of different aspects, generating contours from water level data, Transferring data in between different systems, Geo-referencing and geographic databases. • preparing spatial database to use GIS as planning tool in both Vector GIS and Raster GIS, making data usable, structuring databases, analyzing database, aerial photo interpretation, graphics design, cartographic design for display presentation and hard copy map production. • Designing and developing methodology for capturing spatial and tabular data to create GIS database and to produce thematic information for various fields. 	GIS Associate	He will be responsible for <ul style="list-style-type: none"> • To manage all related Spatial and attribute database of the project (not only SEA component) and check consistency; • To integrate SEA database with the GIS database; • To perform Spatial and environmental analysis for strategic planning; • To prepare Regional, Structure, Urban Area Planning database; (v) Prepare map layout for Regional, Structure, Urban Area;

Name of Staff	Firm/ Organization	Qualification and Area of Expertise	Proposed Position	Task Assigned
		<ul style="list-style-type: none"> Topographic survey with Total Station to generate contours and DEM (Digital Elevation Model). 		
Md. Firoz Alam	CEGIS	<p>Masters in Information Technology (GIS-RS), IIT, Jahangirnagar University, 2017; B.Sc. in Civil Engineering, World University of Bangladesh, 2012; Diploma in Civil Engineering, Dhaka Polytechnic Institute, 1991 More than 25 years of working experience in:</p> <ul style="list-style-type: none"> GIS data development, system analysis and development, designing survey form and database structure, organizing data entry and data cleaning job Data collection with Differential GPS, Spatial analysis of different aspects, generating contours from water level data, Transferring data in between different systems, Geo-referencing and geographic databases. Preparing spatial database to use GIS as planning tool in both Vector GIS and Raster GIS, making data usable, structuring databases, analyzing database, aerial photo interpretation, graphics design, cartographic design for display presentation and hard copy map production. Designing and developing methodology for capturing spatial and tabular data to create GIS database and to produce thematic information for various fields. Topographic survey with Total Station to generate contours and DEM (Digital Elevation Model). 	GIS Associate	<p>He will be responsible for</p> <ul style="list-style-type: none"> To manage all related Spatial and attribute database of the project (not only SEA component) and check consistency; To integrate SEA database with the GIS database; To perform Spatial and environmental analysis for strategic planning; To prepare Regional, Structure, Urban Area Planning database; (v) Prepare map layout for Regional, Structure, Urban Area;

Appendix E: Environmental and Social Issues

আর্থ-সামাজিক সমস্যা এবং চ্যালেঞ্জ

১. শিল্পায়ন ও নগরায়নঃ মাত্রা, স্ট্যাডি এরিয়াতে এই মহা পরিকল্পনার প্রভাব, পরামর্শ।
২. ভূমি অধিগ্রহণ এবং অপসারণঃ ভূমি ব্যবহারের পরিবর্তন, বিগত বছরের প্রবনতা, কারন এবং পরামর্শ। উর্বর জমি অধিগ্রহণ, বিকল্প কর্মসংস্থানের স্বল্পতা, কর্মসংস্থানের সুযোগ এবং নতুন উদ্যোক্তা বিষয়ক প্রশিক্ষণের স্বল্পতা। এই মহা পরিকল্পনার জন্য প্রভাব।
৩. জীবিকাঃ নির্ভরশীল পেশাগত দলসমূহ, বিকল্প জীবিকার অপ্রতুলতা, কর্মসংস্থান সৃষ্টি বা উদ্যোক্তা তৈরির জন্য কার্যকর প্রশিক্ষণের অভাব, সাম্প্রতিক উন্নয়নজনিত প্রভাব
৪. অভিবাসনঃ ক্রমবর্ধমান অভিবাসন এবং অভ্যন্তরীণ গতিশীলতা/বাস্তুচ্যুতি, অভিবাসনের ধরনঃ অভ্যন্তরীণ, বাহ্যিক।
৫. স্বাস্থ্যবিধানঃ বর্তমান অবস্থা, বর্তমান উন্নয়ন কাজের কারণে প্রভাব।
৬. দুর্যোগঃ উন্নয়ন বিপর্যয় বা জলবায়ু পরিবর্তন সুরক্ষিত অবকাঠামো, সবচেয়ে বেশি ক্ষতিকারক দুর্যোগ, মহিলাদের প্রবেশাধিকার বিবেচনা করে সাইক্লোন শেল্টার ডিজাইন;
৭. নারী ও শিশুঃ নারী সহিংসতা, আয়ে নারীর অবদান, উচ্চ শিক্ষায় নারীদের তালিকাভুক্তির ক্ষেত্রে অল্প অর্জন, সামাজিক মর্যাদা, বাল্যবিবাহ, শিশু মৃত্যু;
৮. শিক্ষাঃ বর্তমান অবস্থা, মানসম্পন্ন শিক্ষার দুর্বল অর্জন, বর্তমান উন্নয়ন কাজের প্রভাব, শিক্ষার ধারাবাহিকতায় নিম্ন অর্জন, ঝরে পড়া;
৯. অপরাধ এবং অপরাধঃ ডাকাতি, মুক্তিপণ;
১০. প্রান্তিক জনগোষ্ঠীঃ জাতিগতভাবে প্রান্তিক এবং দুর্বল সম্প্রদায়;
১১. সাংস্কৃতিক ঐতিহ্যঃ বর্তমান উন্নয়নের কারণে প্রভাব;
১২. পর্যটনঃ বর্তমান অবস্থা, স্থানীয় অংশগ্রহণ এবং জীবিকা, বর্তমান উন্নয়ন কাজের কারণে প্রভাব;

দুর্যোগ প্রস্তুতি ও ব্যবস্থাপনা

১৩. সবচেয়ে ঘন ঘন সংঘটিত হয় এবং যা জীবন, জীবিকা, অর্থনীতি এবং জীবনযাত্রার অন্যান্য উপায়গুলিকে প্রভাবিত করে এমন দুর্যোগ গুলো কি? (যেমন ঘূর্ণিঝড়, নদীভাঙ্গন, লবণাক্ততা ইত্যাদি)
১৪. প্রাকৃতিক বা মানব-সৃষ্ট বিপর্যয়মূলক ঘটনার কারণে সবচেয়ে বেশি ক্ষতিগ্রস্ত খাত কোনটি? (যেমন মৃত্যু, আঘাত, জীবিকা, কৃষি ইত্যাদি)?
১৫. বিদ্যমান এবং চলমান দুর্যোগ ব্যবস্থাপনা PPPs (নীতি, পরিকল্পনা এবং কর্মসূচি) কি জাতীয়/আন্তর্জাতিক নির্দেশিকা অনুসরণ করে?
১৬. দুর্যোগ ব্যবস্থাপনা নীতি, পরিকল্পনা এবং কর্মসূচি কি বিদ্যমান এবং বিবর্তিত বিপদের সাথে সামঞ্জস্যপূর্ণ?
১৭. দুর্যোগ ব্যবস্থাপনার জন্য বিদ্যমান/চলমান পিপিপিগুলি কি দুর্বল গোষ্ঠীকে বিবেচনা করে (যেমন সাইক্লোন শেল্টারে মহিলাদের জন্য আলাদা কক্ষ, প্রতিবন্ধীদের জন্য র্যাম্প ইত্যাদি)
১৮. দুর্যোগকালীন সময়ে (পরিকল্পনা, সাড়াদান এবং পুনরুদ্ধার) জাতীয়/আন্তর্জাতিক থেকে স্থানীয় পর্যায়ের স্টেকহোল্ডারদের মধ্যে পর্যাপ্ত সমন্বয়/সহযোগিতা বিদ্যমান আছে কি?
১৯. নিরীক্ষণ, পূর্বাভাস এবং সতর্কতা ব্যবস্থা কি ঝুঁকি এবং দুর্বলতা কমাতে পর্যাপ্ত? এবং তারা কি জাতীয় এবং আঞ্চলিক প্রাথমিক সতর্কতা ব্যবস্থার সাথে যুক্ত?
২০. দুর্যোগ ব্যবস্থাপনা সম্পর্কিত পিপিপিগুলো কি কমিউনিটি স্তরে নেওয়া হয়েছে (অর্থাৎ সম্প্রদায়-ভিত্তিক দুর্যোগ ব্যবস্থাপনা)? এবং তারা কি জাতীয় দুর্যোগ ব্যবস্থাপনা নীতির সাথে যুক্ত?

২১. বহু-বিপদ ঝুঁকিগুলো কি (যেমন সাইক্লোন এর সাথে জলোচ্ছাস) নীতি এবং সামগ্রিক ব্যবস্থাপনার ক্ষেত্রে বিবেচনা করা হয়?
২২. দুর্যোগে ব্যবস্থাপনার ক্ষেত্রে বিদ্যমান সমস্যা
২৩. ঘূর্ণিঝড় (যেমন সাইক্লোন শেল্টারের সংখ্যা, দূরত্ব, ক্ষমতা ইত্যাদি)-
২৪. জলোচ্ছাস-বাধ
২৫. নদীভাঙ্গন (যেমন বাঁধ, উচ্চতা, উপচে পড়া ইত্যাদি)-
২৬. লবণাক্ততা (যেমন নিষ্কাশন, সেচ ইত্যাদি)-
২৭. অন্যান্য (যদি থাকে)

মৎস্য ও জলজ পালন

২৮. মৎস্যখাতের উপর নদী খনন কি কি প্রভাব ফেলতে পারে? খননকৃত মাটির ব্যবস্থাপনা কি হওয়া উচিত?
২৯. জাহাজ থেকে নির্গত বর্জ্য (প্লাস্টিক/পলিথিন, তৈল, গ্রীজ, বীলজ ওয়াটার) এর ব্যবস্থাপনা কি হওয়া উচিত?
৩০. উপকূলীয় বাঁধ নির্মাণ মৎস্যখাতের উপর কি কি প্রভাব ফেলতে পারে? মাছের চলাচল সুবিধার্থে (নদী থেকে খাল বা খাল থেকে নদী) স্লুইস গেটের আকার-আকৃতি (dimension) কেমন হওয়া উচিত?
৩১. শিল্পায়নের বর্জ্য (তরল ও কঠিন বর্জ্য) মৎস্যখাতে কি প্রভাব ফেলতে পারে এবং এর ব্যবস্থাপনা কি হওয়া উচিত?
৩২. ইলিশের অভয়ারণ্য এবং এর ডিম ছাড়ার অঞ্চল সমূহের ব্যবস্থাপনা কেমন হওয়া উচিত?
৩৩. মৎস্য আইন ও বিধান, শিপ ব্রেকিং এবং দূষণ সংক্রান্ত অন্যান্য আইন এর বাতবায়ন কেমন হওয়া উচিত?
৩৪. উন্নয়ন প্রকল্প বাস্তবায়নে মৎস্য অফিসের সাথে সমন্বয়ের আঙ্গিক কেমন হওয়া উচিত?

পর্যটন উন্নয়ন ইস্যু

৩৫. এই অঞ্চলের পর্যটন সম্পর্কে স্থানীয় জনগণের কী ধারণা?
৩৬. এই অঞ্চলের পর্যটন আকর্ষণগুলো কি দিন দিন অবনতি হচ্ছে?
৩৭. কিভাবে এ অঞ্চলের পর্যটন কর্মকাণ্ডে স্থানীয় জনগণকে আরো সম্পৃক্ত করা যায়?
৩৮. এই অঞ্চলের পর্যটন খাতের সুবিধার্থে স্থানীয় জনগণ এবং স্থানীয় পর্যটন সেবাদাতাদের মধ্যে সম্পর্ক কেমন?
৩৯. এই অঞ্চলে পর্যটন বিপণনের বর্তমান অবস্থা কী?
৪০. কীভাবে এই অঞ্চলে পর্যটন বিপণন উন্নত করা যায়?
৪১. এই অঞ্চলে পর্যটনের উপযুক্ত মৌসুম কোনটি? অফ-পিক এবং পিক সিজনে পর্যটকের সংখ্যার পার্থক্য কেমন হয়ে থাকে?
৪২. কীভাবে এই অঞ্চলের পর্যটকদের নিয়ন্ত্রণ ও পরিচালনা করবেন?
৪৩. বর্তমানে, এই অঞ্চলের পর্যটন থেকে প্রধানত কারা উপকৃত হয়?
৪৪. ক্ষুদ্র ও স্থানীয় ব্যবসায়ীরা পর্যটন খাত থেকে কিভাবে আরও সুবিধা পেতে পারে? এ ব্যাপারে স্থানীয় কর্তৃপক্ষের কি ভূমিকা হওয়া উচিত?
৪৫. এই এলাকায় ট্যুরিস্ট পুলিশের ভূমিকা কী? কিভাবে তাদের কর্মক্ষমতা আরও উন্নত করা যায়?
৪৬. আরও আত্মবিশ্বাসী এবং দক্ষ পর্যটন কর্মী বাহিনী গড়ে তোলার জন্য এই অঞ্চলে একটি পর্যটন প্রশিক্ষণ কেন্দ্রের প্রয়োজন আছে কি?
৪৭. এই অঞ্চলের পর্যটন বিকাশের সুবিধার্থে স্থানীয় জনগণের কোন মৌলিক চাহিদাগুলি প্রথমে পূরণ করতে হবে?
৪৮. এই অঞ্চলের নারীরা কীভাবে পর্যটন খাতের মাধ্যমে উপকৃত হচ্ছেন? এই খাতের মাধ্যমে কীভাবে তাদের আরও ক্ষমতায়ন করা যায়?

৪৯. এই অঞ্চলের পর্যটন খাত কাদের দ্বারা পরিচালিত হয়?
৫০. কীভাবে এই অঞ্চলের পর্যটন খাতকে আরও উন্নত করা যায় (সমস্যা ও পরামর্শ)?

ভূমি ব্যবহার, নগর এবং অবকাঠামোগত সমস্যা

৫১. চর এলাকার বর্তমান ভূমি ব্যবহার সমূহ কি কি?
৫২. অভিবাসনের মূল কারণগুলো কি কি?
৫৩. PKCP জোনে অভিবাসনের হার কত?
৫৪. দুর্যোগের সময়ে ব্যবহৃত যানবহন কি কি?
৫৫. উপজেলা ও জেলা শহরের মধ্যে যোগাযোগের উপায় কি?
৫৬. জেলা ও উপজেলা শহরের মধ্যে যোগাযোগ রক্ষা করার জন্য ভবিষ্যতে কেমন ব্যবস্থা দরকার?
৫৭. PKCP জোনের উন্নয়নের জন্য ভবিষ্যতে কি কি সুযোগ সুবিধা বৃদ্ধি করতে হবে?

কৃষি বিষয়

৫৮. ভূমির ব্যবহারের পরিবর্তন; কৃষি জমি ব্যবহার করে কলকারখানা, অবকাঠামো, আবাসন ইত্যাদি তৈরি করা।
৫৯. কৃষি জমি তে শস্য চাষ না মাছ চাষ লাভবান হবে?
৬০. কৃষি জমির জলাবদ্ধতা (প্রাকৃতিক কারণ বা মনুষ্য সৃষ্ট কারণ);
৬১. লবনাক্ত এলাকার পরিমাণ বৃদ্ধি পাওয়া এবং লবনাক্ততার তীব্রতা বৃদ্ধি পাওয়া;
৬২. কৃষি যান্ত্রিকীকরণের স্বল্পতা; ফসল বোনা/ রোপণ এর সময় কৃষি শ্রমিক এর অভাব;
৬৩. জলবায়ু জনিত দুর্যোগ এর পরিমাণ / তীব্রতা বৃদ্ধি ।

জল সম্পদ এবং নদী রূপবিদ্যা

৬৪. জোয়ারের কারণে সৃষ্ট প্লাবণ/বন্যাঃ বন্যার তীব্রতা এবং আক্রান্ত এলাকার তথ্যাদি।
৬৫. লবনাক্ততাঃ লবনাক্ত জলের অনুপ্রবেশ এবং তার প্রভাব
৬৬. ভূমি ডেবে যাওয়া (অবনমন)/জমি বসে যাওয়াঃ জমি ডেবে যাবার প্রবণতা কেমন? এর প্রতিকারের জন্য কি ব্যবস্থা নেওয়া যায়?
৬৭. জলাবদ্ধতাঃ জলাবদ্ধতার প্রবণতা বা সমস্যা কেমন? (কারণ, তীব্রতা এবং সাম্ভাব্য সমাধান)
৬৮. নদী ভাঙ্গনঃ নদী ভাঙ্গনের প্রবণতা এবং তীব্রতা কেমন? ভাঙ্গনপ্রবণ এলাকায় কোনো নিজস্বঃ জমি আছে কিনা?
৬৯. পলি জমা/ নদী ভরাটঃ খাল ও নদী ভরাটের প্রবণতা, প্রভাব এবং সাম্ভাব্য সমাধান সমূহ কি কি?
৭০. ঝড় এবং ঘূর্ণিঝড়ঃ ঝড় এবং ঘূর্ণিঝড়ের তীব্রতা, প্রভাব এবং উচ্চতা কেমন?
৭১. ভূগর্ভস্থ জলঃ ভূগর্ভস্থ জলের প্রাপ্যতা কেমন? জল সংগ্রহের জন্য তৈরী বোরহালের গভীরতা কি হবে? প্রাপ্ত জলের লবনাক্ততা, আয়রন ও আর্সেনিকের উপস্থিতি কেমন হতে পারে?
৭২. স্ট্রাকচার সমূহের অবস্থান এবং তা সংক্রান্ত তথ্যাদি লিপিবদ্ধ করুন।
৭৩. নদীভাঙ্গন এর ঝুঁকিযুক্ত এলাকার অবস্থান লিপিবদ্ধ করুন
৭৪. নদীতীর এবং নদীভাঙ্গন রোধের জন্য গৃহীত পদক্ষেপ সমূহ কি কি?

পরিবেশগত সমস্যা

৭৫. কঠিন বর্জ্য: উৎস (গৃহস্থালি, বাজার, গ্রামীণ, শহুরে অঞ্চল এবং পৌরসভা গ্রামীণ ও শহুরে এলাকা), ব্যবস্থাপনার জন্য জনশক্তি এবং পর্যাপ্ততা। দীর্ঘমেয়াদী ব্যবস্থাপনা জন্য ভবিষ্যত উদ্যোগ।
৭৬. তরল বর্জ্য: উৎস (গৃহস্থালি, বাজার, গ্রামীণ, শহুরে অঞ্চল এবং পৌরসভা গ্রামীণ ও শহুরে এলাকা), ব্যবস্থাপনার জন্য জনশক্তি এবং পর্যাপ্ততা। দীর্ঘমেয়াদী ব্যবস্থাপনা জন্য ভবিষ্যত উদ্যোগ।
৭৭. পয়টন থেকে বর্জ্য: উৎস, প্রকারভেদ এবং পরিমাণ, ব্যবস্থাপনা, পরিবেশের উপর প্রভাব, ব্যবস্থাপনার ভবিষ্যৎ পদক্ষেপ।
৭৮. লবনাক্ততা: লবনাক্ততার অবস্থা এবং কারণ, বাস্তুসংস্থান, ভূগর্ভস্থ পানি এবং কৃষিতে লবনাক্ততার প্রভাব।
৭৯. শব্দ দূষণ: অবস্থা, বাস্তুসংস্থান এবং মানব জাতির উপর প্রভাব, নিরসনের উপায়।
৮০. বাস্তুতন্ত্রের বিভক্তিকরণ: প্রাকৃতিক এবং ম্যানগ্রোভ বাগান অবৈধ দখল, উপদ্রব এবং ক্ষতি। নদী এবং জলাভূমির ক্ষতি, অবৈধ দখল এবং পরিবর্তন। নদী এবং খাল খননের ফলে প্রকৃতির এবং মানুষের আর্থ সামাজিক অবস্থার উপর প্রভাব।
৮১. বাস্তুতন্ত্রের পরিষেবার ক্ষতি: বাস্তুতন্ত্রের পরিষেবার প্রকারভেদ, ক্ষতির কারণ, অর্থনীতির উপর প্রভাব, বিকল্প পরিষেবা, ক্ষতি কমানোর উদ্যোগ এবং ভবিষ্যৎ পরিকল্পনা।
৮২. বাস্তুসংস্থানের ক্ষতি: অবস্থা, কারণ, প্রভাব, হুমকি এবং নিরসনের উপায়।
৮৩. বন্য প্রাণী এবং পরিযায়ী পাখীদের আবাসস্থলের উপর বিভিন্ন উপদ্রব।
৮৪. আক্রমণাত্মক বৈদেশিক প্রজাতি: প্রবর্তনের প্রবণতা, এর পিছনের কারণ এবং দেশিও গাছপালা এবং পশুপাখির উপর প্রভাব
৮৫. আক্রমণাত্মক বৈদেশিক প্রজাতি: প্রবর্তনের প্রবণতা, এর পিছনের কারণ এবং দেশিও গাছপালা এবং পশুপাখির উপর প্রভাব