

URBAN DEVELOPMENT DIRECTORATE (UDD)

Ministry of Housing and Public Works

Government of the People's Republic of Bangladesh

National level policies for coastal region and formulate strategies for spatial plan of Payra-Kuakata

A.K.M. Saiful Islam

IWFM, BUET, Dhaka



1. Introduction

1.1 Background

The coastal area of Bangladesh covers about 20% of the country and more than 30% of the cultivable land. Bangladesh consists of 19 coastal districts along a coastline of 710 km. The coastal zone extends over 47,150 sq km area and has a population of 38.52 million (BBS, 2011). The coastal zone is quite distinct from the rest of the country and has been delineated based on three characteristics, namely level of tidal fluctuations; salinity condition (both surface and groundwater); and risks of the cyclone, storm surge, and tidal influence. The 19 coastal districts have been further divided into the interior (7 districts, 48 Upazilas) and exposed (12 districts, 99 Upazilas) zones, with regard to distance from the coast or the estuaries, under the Integrated Coastal Zone Management Project (ICZMP) of Water Resources Planning Organization (WARPO). The zone is characterized by a vast network of rivers and channels, enormous discharge of water with a huge amount of sediments, many islands, the Swatch of No Ground (underwater canyon located 45 km south of the Sundarbans in Bangladesh), shallow northern Bay of Bengal, strong tidal influence and wind actions, tropical cyclones, and storm surges.

The coastal zone of Bangladesh is the most vulnerable to climate change because of its geographic location, flat topography, high population density, high levels of poverty, and reliance of many livelihoods on climate-sensitive sectors, particularly agriculture, fisheries, and water resources. The average elevation of the southwest coastal zone ranges from 1 to 2 m, and in the southeast coastal zone, it is 4 to 5 m. The low elevation, active delta, and dynamic morphology play a significant part in its vulnerability to sea-level change. Sea level rise affects the coastal zone and its geometry in a number of ways, including inundation, erosion, and saltwater intrusion into the water table. The locations of selected 7 Upazilas under this study are shown in Figure 1.1.

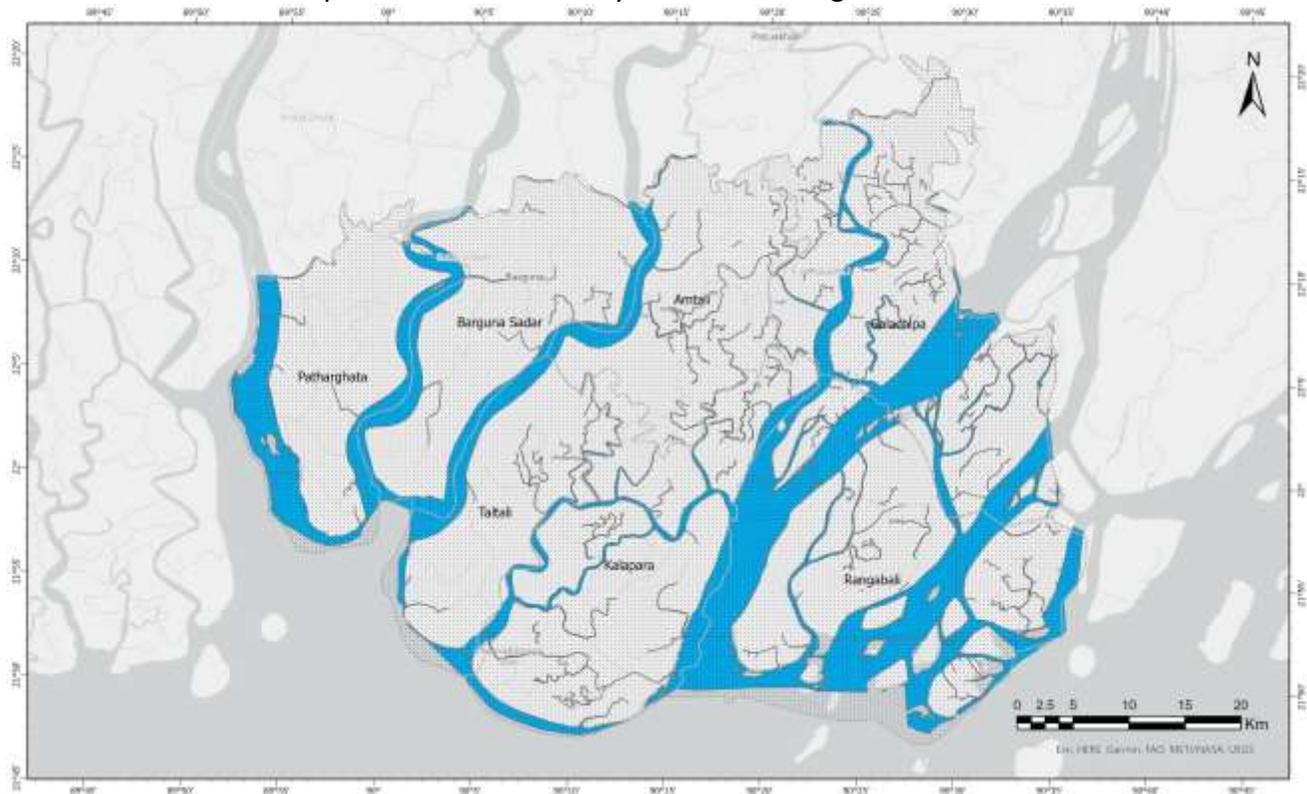


Figure 1.1: Map of the 7 Upazilas in the coastal region of Bangladesh.



Figure 1.2: River network in the study area.



Figure 1.3: Road network in the study area.

1.2 Climate Stressors

Bangladesh being a low-lying country at the head of the Bay of Bengal (BoB), is certainly not out of the threat list. Bangladesh is one of the most vulnerable countries to climate change-related impacts. It is due to the limited ability of the country to address disasters and a very large population. Brown et al. (2015) showed that the Ganges-Brahmaputra delta is extremely vulnerable to present rates of local sea-level rise (LSRL) to 2050, and more than 1 million people may have to be displaced. The risks from adverse climate change-induced sea-level rise will increase the risks to the already vulnerable population along the coast of Bangladesh. Bangladesh has faced numerous catastrophic severe cyclone events, especially in the last two decades, including Sidr, Fani, Mora, Aila, Rashmi, Roanu, Amphan, and others. In 2020, cyclone “Amphan” affected more than a million people in 26 districts (including the most severely affected districts of Satkhira, Bagerhat, and Patuakhali). The damage caused by the cyclone included more than 26 deaths; damage to 55,667 houses, 149,000 ha of agricultural lands, 1,80,500 hatcheries, a total of 150 km of embankments, 200 bridges, and culverts, and 100 km of roads, causing a total loss of BDT 11 billion (IFRC situation report, 2020). The decadal distribution of cyclones of different categories impacting Bangladesh illustrates the increase in category four cyclones in recent decades, which is partly linked to increased ocean temperature caused by global warming.

Table 1.1: Potential impacts and risk of global warming in the coastal region.

Climate Signal and Hazards Potential Impacts	Climate Signal and Hazards Potential Impacts
Excessive Rainfall	<ul style="list-style-type: none"> • Crop damage • Cultivation becomes less suitable due to waterlogged condition • Loss of cultivable lands • Changed cropping pattern
Extreme Heat	<ul style="list-style-type: none"> • Crop yield change/reduction • Pest infestation and diseases outbreak • Change the flowering pattern and phenological change
Cold Spell	<ul style="list-style-type: none"> • Crop damage • Phenological change • Pest and diseases
Frequent River Flood	<ul style="list-style-type: none"> • Crop damage • Loss of livelihoods
Severe Drought/Water Scarcity	<ul style="list-style-type: none"> • Irrigation water crisis • Less yield • Food crisis • Pest and diseases
Frequent Lightening	<ul style="list-style-type: none"> • Death of framers
Salinity Increase	<ul style="list-style-type: none"> • Crop damage of traditional varieties • Low yield • Less suitable irrigation water • Cropping pattern change • Limited scope of agriculture production • Loss of livelihoods • Internal displacement

Frequent Cyclones and Storm Surge	<ul style="list-style-type: none"> • Crop damage • Loss of livelihoods • Human death • Food and medicine crisis
Sea Level Rise	<ul style="list-style-type: none"> • Less availability of cultivable lands • Low yield of crops • Hampered food security

1.2.1 Sea Level Rise

Bangladesh has been experiencing a rising trend in sea level because of its geographic location and the nature of the delta. Recent estimation of sea-level rise by DoE (2020) indicated the rising trends at different locations of the coastal zone of Bangladesh. Between 1901 and 2010 sea level has risen at a rate of 1.7mm/year. From 1993 to 2010, tidal variation indicates a rise of 2.8 ± 0.8 mm/year, and it is further validated by satellite altimetry data with a rise of 3.2 ± 0.4 mm/year. Ocean warming is a global phenomenon due to climate change. The Bay of Bengal is also experiencing increasing sea surface temperature and subsequent changes in pH (Sridevi et al., 2021). A significant decreasing trend in pH is observed in the region near the Bangladesh coast during the winter and fall seasons. The sea surface temperature is showing an increasing trend during the spring and summer months.

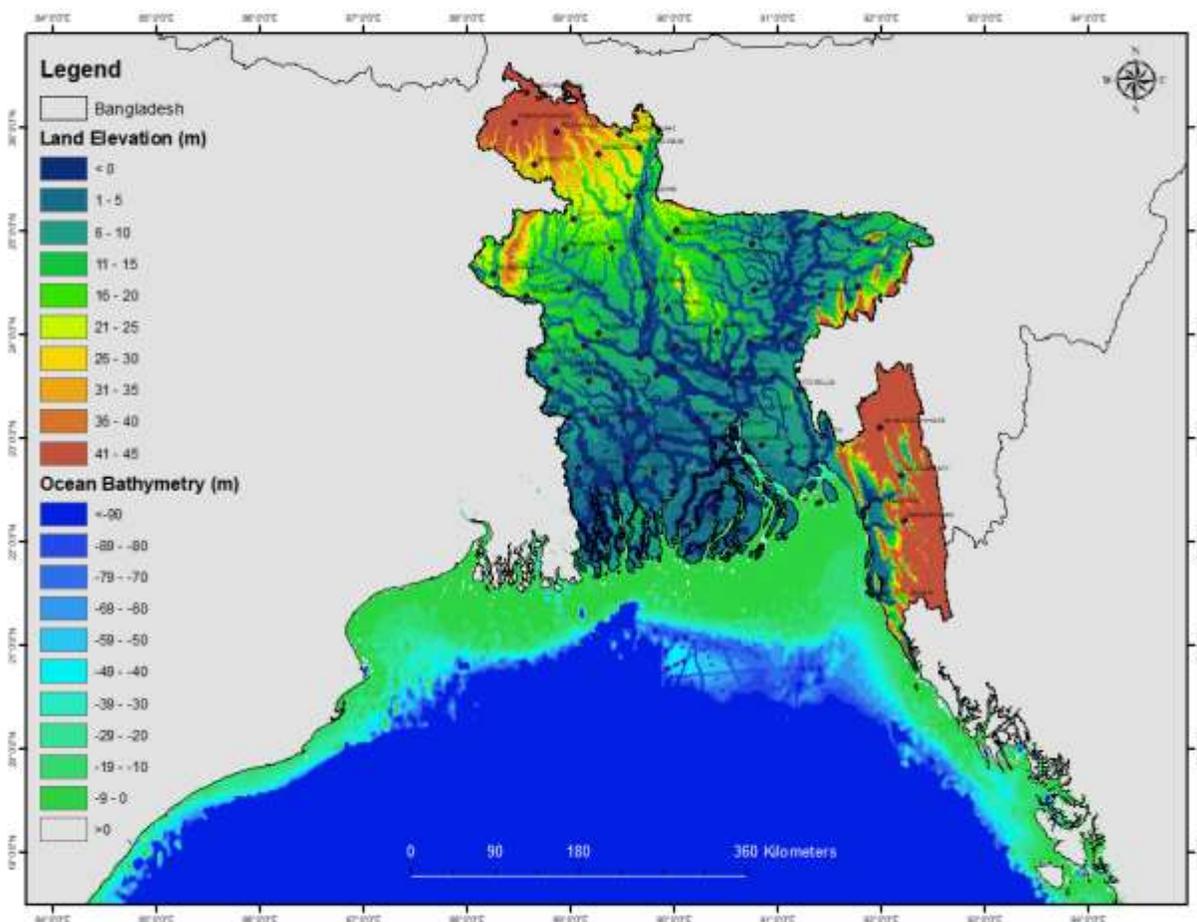


Figure 1.4: Topographic maps of the Coastal region and bathymetry of the ocean.

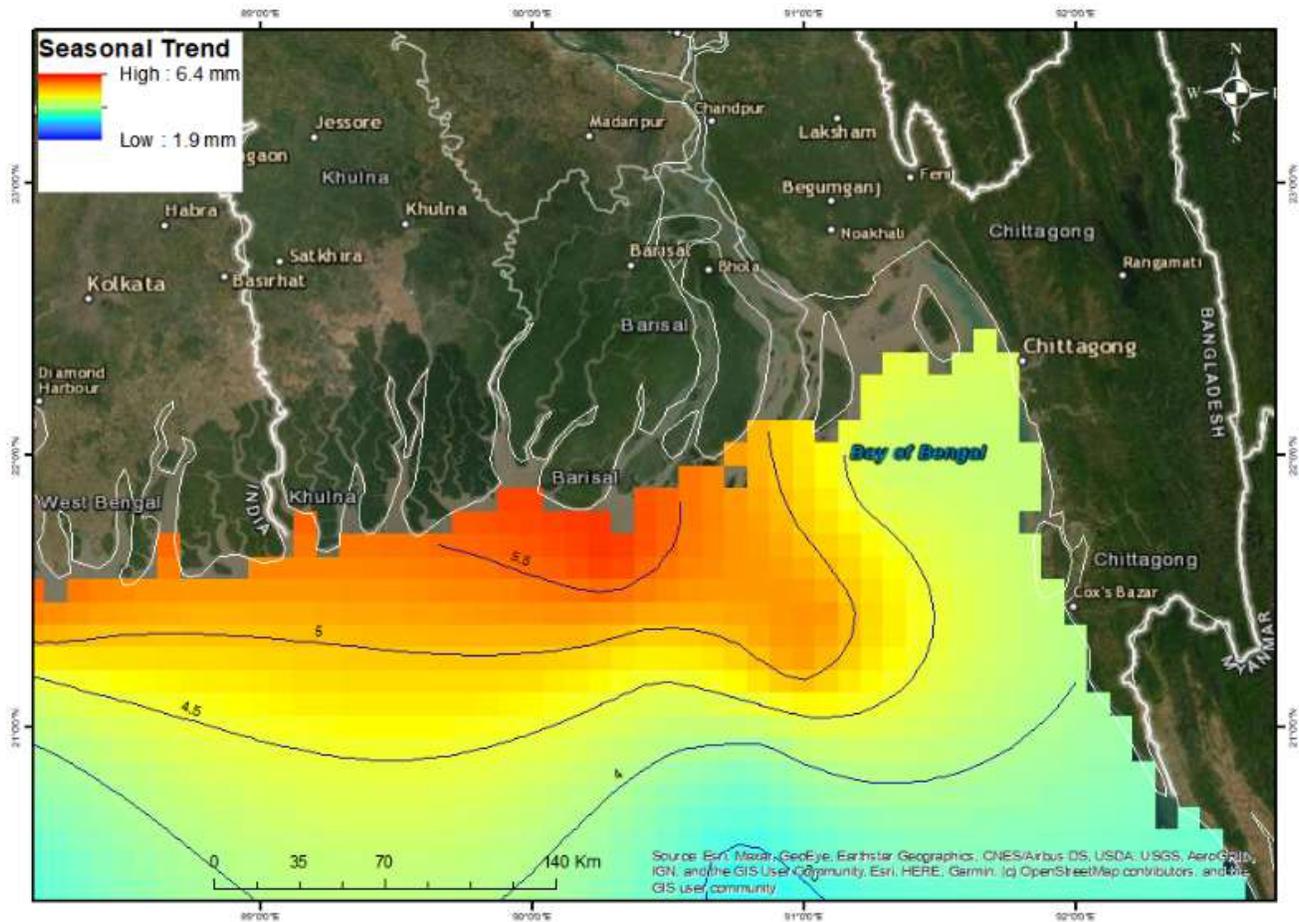


Figure 1.5: Observed sea level rise estimated using satellite altimetry data.

1.2.2 Cyclones

Cyclones are increasing in Bangladesh. From the historical trend analysis, it is observed that a severe cyclone strikes the country on average every three years. Twenty-one tropical cyclones (wind speed >117 km/hr) and severe cyclones (wind speed between 87 to 117 km/hr) struck the Bangladesh coast between 1960 and 2010 (MoEFCC, 2018). Of these, 33% happened in the pre-monsoon season, while the remaining 67% occurred in the post-monsoon season.

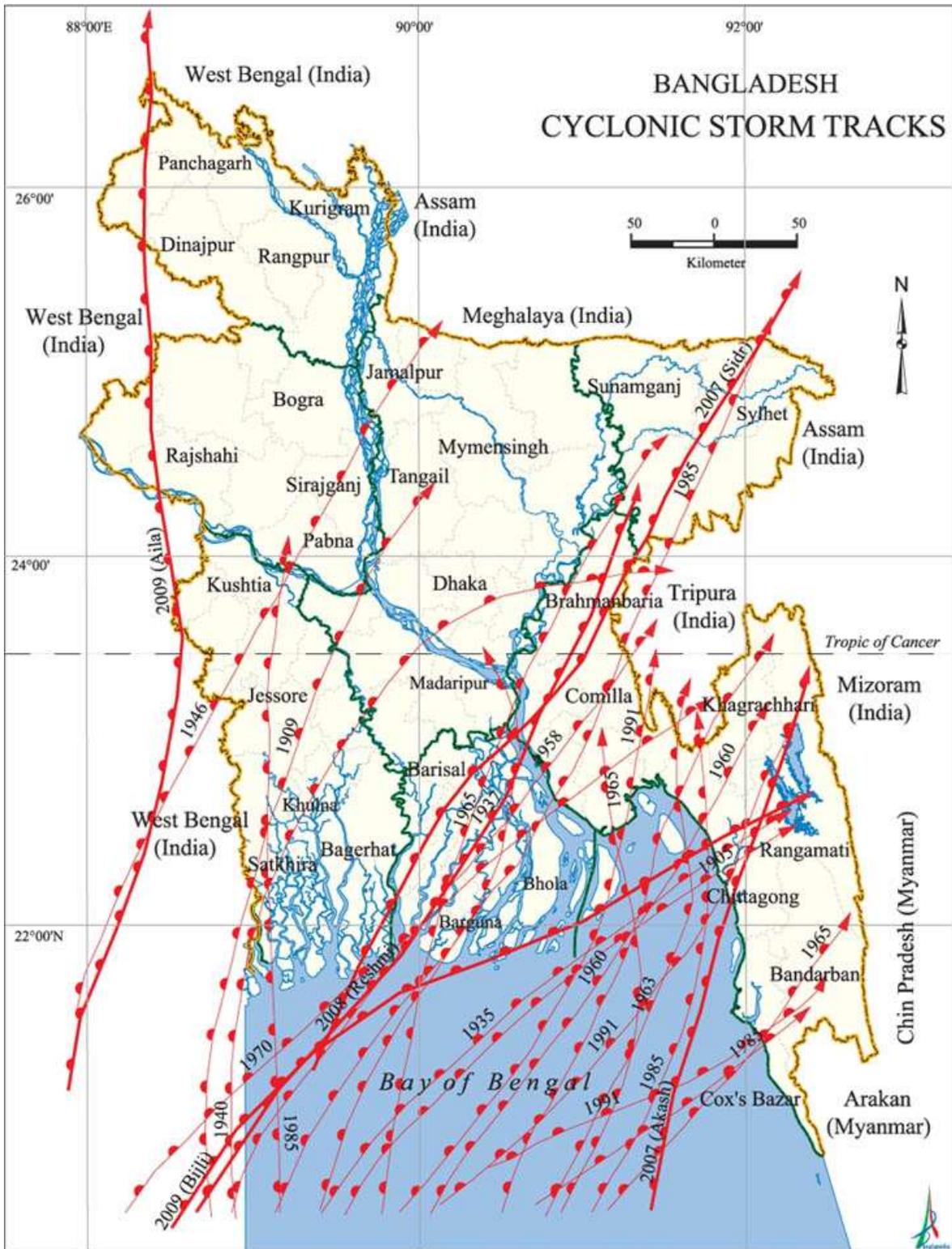


Figure 1.6: Track of historical major known cyclones in the Bay of Bengal (Banglapedia, 2022).

2. Review of the national policy, legal and regulatory framework

2.1 Relevant National Policies, Strategies, and Plans

2.1.1 National Environmental Policy, 1992

The Bangladesh National Environmental Policy, approved in May 1992, sets out the basic framework for environmental action together with a set of broad sectoral action guidelines. Key elements of the Policy are:

- Maintaining ecological balance and ensuring sustainable development of the country through protection and conservation of the environment
- Protecting the country from natural disasters
- Identifying and regulating all activities that pollute and destroy the environment
- Ensuring environment-friendly development in all sectors
- Ensuring sustainable and environmentally sound management of the natural resources
- Maintaining active association, as far as possible, with all international initiatives related to the environment. *The Environmental Policy of 1992*, amongst other policies, seeks to ensure that transport systems, including roads and inland waterways, do not pollute the environment or degrade resources. The Policy states that Environmental Impact Assessments (EIA) should be conducted before projects are undertaken.

2.1.2 National Environment Management Action Plan (NEMAP), 1995

The National Environmental Management Action Plan (NEMAP) is a wide-ranging and multi-faceted plan which builds on and extends the statements set out in the National Environmental Policy. NEMAP was developed to address issues and management requirements during the period 1995 to 2005 and set out the framework within which the recommendations of the National Conservation Strategy are to be implemented. NEMAP was developed based on the following broad objectives:

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

To this end, it has grouped all the relevant necessary actions under heads: institutional, sectoral, location-specific, and long-term issues. The *institutional* aspects reflect the need for inter-sectoral cooperation to tackle environmental problems that need new and appropriate institutional mechanisms at national and local levels. The *sectoral* aspects reflect the way the Ministries and agencies are organized and make it easier to identify the agency to carry out the recommended actions. The *location-specific* aspect focuses on particularly acute environmental problems at local levels that need to be addressed on a priority basis. The *long-term* issues include environmental

degradation to such a degree that it might become more serious and threatening than they seem to be if their cognizance is not immediately taken.

2.1.3 National Water Policy, 1999

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

2.1.4 National Livestock Development Policy, 2007

The National Livestock Development Policy (NLDP) has been prepared to address the key challenges and opportunities for comprehensive sustainable development of the livestock sub-sector by creating an enabling policy framework. As livestock is one of the key assets in the livelihoods of the program area, and protection of livestock from floods should be emphasized along with the security of human life. The proposed project interventions will contribute to the safety of livestock and thus increase livestock productivity in the program area.

2.1.5 Private Forest Policy 1994

The policy suggested for extended effort to bring about 20% of the country's land under the afforestation programs of the government and private sector by the year 2015 by accelerating the pace of the program through the coordinated efforts of the government and NGOs and active participation of the people in order to achieve self-reliance in forest products and maintenance of ecological balance. The policy viewed equitable distribution of benefits among the people, especially those whose livelihood depends on trees and forests, and people's participation in afforestation programs and incorporation of people's opinions and suggestions in the planning and decision-making process. The people-centered objectives of the policy are the creation of rural employment opportunities and expansion of forest-based rural development sectors; and the prevention of illegal occupation of forest lands and other forest offenses through people's participation. The policy statements envisage massive afforestation on marginal public lands through partnerships with local people and NGOs; afforestation of denuded/encroached reserved forests with an agroforestry model through the participation of people and NGOs; giving ownership of a certain amount of land to the tribal people through forest settlement processes; strengthening of the Forest Department; strengthening of educational, training and research facilities; and amendment of laws, rules and regulations relating to the forestry sector and if necessary, the promulgation of new laws and rules. Thus, over time the policy has shifted somewhat from total state control to a management regime involving local communities in specific categories of forests. The policy also encourages the private sector participation in afforestation.

2.1.6 National Policy for Safe Water Supply and Sanitation (1998)

The National Drinking Water Supply and Sanitation Policy (1998) goal is accessibility to all water and sanitation services within the shortest possible time at a price that is affordable to all. The Policy will be achieved through strategies formulated at various levels in consultation with the Ministry of Planning. Policy objectives are (i) to improve the standard of public health and (ii) to ensure an improved environment. Policies for rural and urban areas are presented separately as they differ in institutional aspects, content, and magnitude.

2.1.7 National Policy for Arsenic Mitigation (2004)

The National Policy for Arsenic Mitigation (2004) provides a guideline for mitigating the effect of arsenic on people and the environment in a realistic and sustainable way. It supplements the National Water Policy (1998) and the National Policy for Safe Water Supply and Sanitation (1998) in fulfilling national goals related to poverty alleviation, public health, and food security. The Policy states that access to safe water for drinking and cooking shall be ensured through the implementation of alternative water supply options in all arsenic-affected areas. Arsenic mitigation activities under the Policy will focus on public awareness, alternative arsenic safe water supply, diagnoses and management of patients, and capacity building. The national arsenic program is to encourage and promote research and development on the impact of arsenic on water supplies, health, food, and agriculture.¹²

2.1.8 National Adaptation Program of Action (NAPA)

In 2005, the Ministry of Environment and Forest (MoEF), the Government of the People's Republic of Bangladesh has, prepared the National Adaptation Program of Action (NAPA) for Bangladesh as a response to the decision of the Seventh Session of the Conference of the Parties (COP7) of the United Nations Framework Convention on Climate Change (UNFCCC). The basic approach to NAPA preparation was along with the sustainable development goals and objectives of the country, where it has recognized the necessity of addressing climate change and environmental issues and natural resource management. The NAPA is the beginning of a long journey to address adverse impacts of climate change, including variability and extreme events, and to promote sustainable development of the country. There are 15 adaptation strategies suggested to address the adverse effects of climate change. Among the 15 adaptation strategies, the following strategies are relevant for reducing climate change-induced vulnerability:

- Construction of flood shelters and information and assistance center to cope with enhanced recurrent floods in major floodplains
- Promotion of research on drought, flood, and saline tolerant varieties of crops to facilitate adaptation in the future.

This project broadly contributes toward achieving the aims and objectives of the climate change adaptation strategies.

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

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

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

This project will contribute toward achieving the objective of pillars such as (i), (ii), (iii), (iv), and (vi).

2.1.9 Bangladesh Delta Plan 2100 (BDP 2100).

In view of the long-term challenges presented by climate change and natural hazards, the Government has formulated a long-term Bangladesh Delta Plan 2100 (BDP 2100). It is essentially an adaptive techno-economic plan involving the interaction of water, land use, ecosystem, and climate change with development outcomes. Hence, hydrology plays a major role in delineating the planning regions for the preparation of the BDP 2100. Using the eight hydrological zones as the starting point, the focus has been sharpened on the magnitude of the natural hazard vulnerabilities facing each of the hydrological regions. This has led to a modified grouping of districts and areas facing similar risks of natural hazards and climate change. These groups are called "Hotspots" that simply define a broad grouping of districts and areas facing similar natural hazards and climate change risks. The BDP 2100 proposes 3 higher level national goals and 6 BDP 2100 specific goals that contribute to achieving these higher-level goals:

Goal 1: Eliminate extreme poverty by 2030;

Goal 2: Achieve upper-middle-income status by 2030; and

Goal 3: Being a Prosperous Country beyond 2041

Coastal Zone Hotspot

The Coastal Zone of Bangladesh will remain hazardous for coastal floods in the foreseeable future. Cyclones and accompanying storm surges will continue to develop in the Bay of Bengal, as well as high river discharges and monsoon precipitation will continuously put enormous pressure on the drainage capacity of the Coastal Delta. Besides possible future changes in discharge regimes or sea-level rise, the Coastal Zone will be under increasing pressure of socioeconomic change, with economic development and demographic changes as the main drivers. Strategies include:

- Combating storm surge and salinity intrusion through effective management of existing polders;
- Increase drainage capacity and reduce flood risks;
- Balancing water supply and demand for sustainable growth;
- Reclaim New Land in the Coastal Zone;
- Sundarbans Conservation; and
- Restoration of dead/low flowing rivers and basin-wide management of cross-boundary rivers for increasing supply of fresh water.

Tidal River Management (TRM)

TRM is an effective strategy for reducing water logging, increasing river navigability, and reclaiming land. In BDP 2100, it has been recommended to gain efficiency in TRM as well as its expansion to address these problems of the coastal zone.

2.2 National Environmental Laws

The key national policies, strategies, and plans relevant to environmental management are briefly discussed below.

2.2.1 The Environment Conservation Act, 1995 (subsequent amendments in 2000 and 2002)

The provisions of the Act authorize the Director General (DG) of the Department of Environment to undertake any activity he deems fit and necessary to conserve and enhance the quality of the environment and to control, prevent and mitigate the pollution. The main highlights of the Act are:

- Declaration of Ecologically Critical Areas;
- Obtaining Environmental Clearance Certificate;
- Regulation with respect to vehicles emitting smoke harmful to the environment;
- Regulation of development activities from an environmental perspective;
- Promulgation of standards for quality of air, water, noise, and soils for different areas and for different purposes;
- Promulgation of acceptable limits for discharging and emitting waste;
- Formulation of environmental guidelines relating to control and mitigation of environmental

pollution, conservation, and improvement of the environment

2.2.2 Bangladesh Environment Conservation Act (ECA), (Amendments) 2010

The ECA 1995 was amended in 2010, which provided clarification of defining wetlands as well as Ecologically Critical Areas and included many important environmental concerns such as conservation of wetlands, hill cutting, ship breaking, and hazardous waste disposal. This amendment empowered the government to enforce more penalties than before. Moreover, affected persons were given provision for putting objections or taking legal actions against the polluters or any entity creating nuisance to the affected person

2.2.3 Environment Conservation Rules, 1997 (subsequent amendments in 2002 and 2003)

The Environment Conservation Rules, 1997 are the first set of rules promulgated under the Environment Conservation Act, 1995. These Rules provide for, inter alia, the following:

- The National Environmental Quality Standards (EQS) for ambient air, surface water, groundwater, drinking water, industrial effluents, emissions, noise, and vehicular exhaust;
- Categorization of industries, development projects, and other activities based on actual (for existing industries/development projects/activities) and anticipated (for proposed industries/development projects/activities) pollution load;
- Procedure for obtaining environmental clearance;
- Requirement for undertaking IEE and EIA as well as formulating EMP according to categories of industries/development projects/activities;
- Procedure for damage-claim by persons affected or likely to be affected due to polluting activities or activities causing hindrance to normal civic life.

Depending upon the location, size, and severity of pollution loads, projects/activities have been classified in ECR, 1997 into four categories: Green, Orange A, Orange B, and Red, respectively, to nil, minor, medium, and severe impacts on important environmental components (IECs).

2.2.4 Bangladesh Environment Court Act, 2010

Bangladesh Environment Court Act, 2010 has been enacted to resolve the disputes and establish justice over environmental and social damage raised due to any development activities. This Act allows the government to take necessary legal action against any parties which creates environmental hazards/ damage to environmentally sensitive areas as well as human society. According to this Act, the government can take legal actions if any environmental problem occurs due to project interventions.

2.3 Other Relevant Acts, Laws, and Rules

2.3.1 Bangladesh Wildlife (Protection and Safety) Act, 2012

The Act protects 1,307 species of plants and animals, including 32 species of amphibian, 154 species of reptile, 113 species of mammal, 52 species of fish, 32 species of coral, 137 species of mollusk, 22 species of crustacean, 24 species of insect, six species of rodent, 41 species of plant and 13 species of orchid. Of these, eight amphibians, 58 reptiles, 41 birds, and 40 mammal species are listed as endangered in the IUCN Red Data Book (2000). The Act mandates:

- one to three years imprisonment, a fine of BDT 50,000 to 200,000, or both, for wildlife poaching, capturing, trapping, and trading, and for the purchase of wild animals, parts of wild animals, trophies, meat, or other products without a license.
- The Act mandates two to seven years imprisonment and BDT 100,000 to 1 million fine or both for killing an elephant or tiger; and 12 years plus BDT 1.5 million for repeat offenders.
- Five years imprisonment and BDT 200,000 fine for killing a cheetah, clouded cheetah, gibbon, sambar deer, crocodile, gaviel, whale, and dolphin.
- Two years imprisonment and BDT 200,000 fine for killing a wild bird or migratory bird.
- Empowers the Government to create an eco-park, safari park, botanical garden, or breeding ground on any state-owned forest land, land, or water body.
- Two years imprisonment for farming, woodcutting, burning, and construction on such reserves.

2.3.2 Bangladesh Wildlife (Preservation) Order (1973) and Act (1974)

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

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

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

2.3.3 Protection and Conservation of Fish Act (1950)

This Act provides power to the government to: make and apply rules to protect fisheries; prohibit or regulate the erection and use of fixed engines; and construct temporary or permanent weirs, dams, bunds, embankments, and other structures. The Act prohibits the destruction of fish by explosives, guns, and bows in inland or coastal areas; the destruction of fish by poisoning, pollution, or effluents. The Act prescribes the seasons during which fishing is allowed, prohibits fishing during spawning periods, and specifies officials having authority to detect breaches of this Act.

2.3.4 East-Bengal Protection and Fish Conservation Act (1950) and Amendments

The East-Bengal Protection and Fish Conservation Act (1950), as amended by the Protection and Conservation of Fish (Amendment) Ordinance (1982) and the Protection and Conservation of Fish (Amendment) Act (1995), provides for the protection and conservation of fish in inland waters of Bangladesh. These instruments define a relatively non-specific framework that simply provides a means for Government to introduce rules to protect inland waters, not in private ownership. Among other things, they sanction rule-making regarding the destruction of, or any attempt to destroy, fish by poisoning of water or depletion of fisheries by pollution, industrial effluent, or otherwise.

2.3.5 Protection and Conservation of Fish Rules (1985)

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

2.3.6 Forestry Acts

Systematic management of forests started in the 1860s after the establishment of a Forest Department in the Province of Bengal. To regulate activities within forests, rules and regulations have been formulated, amended, modified, and improved upon over the years. These rules and regulations are formulated based on long-existing acts and policies.

Forest legislation in Bangladesh dated to 1865, when the first Indian Forest Act was enacted. It provided for the protection of the tree, prevention of fires, and prohibition of cultivation and grazing in forest areas. Until a comprehensive Indian Forest Act was formulated in 1927, several acts and amendments covering forest administration in British India were enacted and were as follows: (a) Government Forest Act, 1865; (b) Forest Act, 1890; (c) Amending Act, 1891; (d) Indian Forest (Amendment) Act, 1901; (e) Indian Forest (Amendment) Act, 1911; (f) Repealing and Amending Act, 1914; (g) Indian Forest Amendment Act, 1918; and (h) Devolution Act, 1920.

The Forest Act of 1927, as amended with its related rules and regulations, is still the basic law

governing forests in Bangladesh. The emphasis of the Act is on the protection of reserved forests. Some important features of the Act are: (i) Under the purview of the Forest Act, all rights or claims over forestlands have been settled at the time of the reservation. The Act prohibits the grant of any new rights of any kind to individuals or communities; (ii) Any activity within the forest reserves is prohibited unless permitted by the Forest Department; (iii) Most of the violations may result in court cases where the minimum fine is Taka 2,000 and/or two month's rigorous imprisonment, and (iv) The Act empowers the Forest Department to regulate the use of watercourses within Reserve Forests.

2.3.7 Forest Act 1927 (Amendment 2000)

The Forest Act of 1927, as amended in 1989, has its roots in the Indian Forest Act of 1878. The Forest Act grants the government several basic powers, largely for the conservation and protection of government forests and limited powers for private forests. The 1927 version of the Act was amended in 1989 to extend authority over "any [Government-owned] land suitable for afforestation."

The Forest department is the main agency that implements the provisions of the Forest Act. The Act, however, does not specify any sort of institutional structure for the forest or other landholding agencies. It also does not set out any specific policy direction for managing the forests.

Most of the forest lands under the management of the forest department are areas declared to be reserved and protected forests under this Act. The Act empowers the government to regulate the felling, extraction, and transport of forest produce in the country.

2.3.8 Private Forest Act (PFA), 1959

The Private Forest Act of 1959 allows the Government to take over management of improperly managed private forest lands, private lands that can be afforested, and any land lying fallow for more than three years. The Private Forest Ordinance was originally enacted in 1945 as the Bengal Private Forest Act and was re-enacted by Bangladesh (then East Pakistan) in 1949 before being issued as an Act in 1959. These government-managed lands under this Act are called "vested forests." The Forest Department manages approximately 8,500 hectares in the country as "vested forests." This area is relatively small, but the area historically affected by this law is much larger.

PFA, 1959 empowers the government to require management plans for private forests and to assume control of private forests as vested forests. Government has broad powers to write rules regarding the use and protection of vested forests and apply rules to "controlled forests," which include all private forests subject to any requirement of the Act.

2.3.9 Embankment and Drainage Act, 1952

The East Bengal Act No. 1, 1953, was adopted by the People's Republic of Bangladesh by the Bangladesh Order (adaptation of Existing Laws), 1972 (President's Order No. 48 of 1972). The Act consolidates the laws relating to embankments and drainage, providing provision for the construction, maintenance, management, removal, and control of embankments and water courses for the better drainage of lands and for their protection from floods, and erosion, or other damage by water. The

specific Sections and Articles relevant to this project are mentioned below.

- Section 4 (1) of the Act states that the embankment, watercourse, towpath, earth, pathways, gates, berms, and hedges of the embankments shall vest in the Government of the Authority (BWDB).
- Section 56 (1) states that a person will be subject to a penalty (500 takas or imprisonment...if he erects, or causes or willfully permits to be erected, any new embankment, or any existing embankment, or obstructs or diverts, or causes or willfully permits to be obstructed or diverted, any watercourse.
- Section 15 allows for the engineer (engineer in charge of Divisional level BWDB) to construct new embankments or enlarge, lengthen or repair existing embankments.
- The other sections of the Act give powers and access to the Government or Authority or Engineers to commence necessary Project activities for land acquisition (through the Deputy Commissioner) and site clearing activities, including removal of trees or houses (if necessary).

2.3.10 Bangladesh Water Act, 2013

The recently published Water Act 2013 is based on the National Water Policy and designed for integrated development, management, extraction, distribution, usage, protection, and conservation of water resources in Bangladesh. In general, if one takes a critical look at the Act, the new law has provided the right framework for better management of water resources in the country. As per this Act, all forms of water (e.g., surface water, groundwater, seawater, rainwater, and atmospheric water) within the territory of Bangladesh belong to the government on behalf of the people. The private landowners will be able to use the surface water inside their property for all purposes in accordance with the Act. A worthwhile initiative is a requirement for permits/licenses for large-scale water withdrawal by individuals and organizations beyond domestic use. Without prior permission issued by the Executive Committee, no individuals or organizations will be allowed to extract, distribute, use, develop, protect, and conserve water resources, nor will they be allowed to build any structure that impedes the natural flow of rivers and creeks. However, the maximum amount of surface water or groundwater that can be withdrawn by individuals or organizations is not mentioned in the Act. Setting up a priority order for water usage in an area where the water resources are in critical condition is also a significant step.

2.3.11 Bangladesh Labor Act, 2006

The Bangladesh Labor Act, 2006 provides guidance on the employer's extent of responsibility and workmen's extent of the right to get compensation in case of injury by accident while working. Some of the relevant sections are:

- Section 150. Employer's Liability for Compensation: (1) If personal injury is caused to a workman by accident arising out of and in the course of his employment, his employer shall be liable to pay compensation in accordance with the provisions of this Act; and (2) Provided that the employer shall not be so liable - (a) in respect of any injury which does not result in

the total or partial disablement of the workman for a period exceeding three days; (b) in respect of any injury, not resulting in death or permanent total disablement, caused by an accident which is directly attributable to - (i) the workman having been at the time thereof under the influence of drink or drugs, or (ii) the willful disobedience of the workman to an order expressly given, or to a rule expressly framed, for the purpose of securing the safety of workmen, or (iii) the willful removal or disregard by the workman of any safety guard or other device which he knew to have been provided for the purpose of securing the safety of workmen.

- Section 151. (1) Amount of Compensation: Subject to the provisions of this Act, the amount of compensation shall be as follows, namely:- (a) where death results from the injury, an amount equal to fifty cents of the monthly wages of the deceased workman multiplied by the relevant factor; or an amount of fifty thousand takas, whichever is more; (b) where permanent disablement results from the injury an amount equal to sixty percent of the monthly wages of the injured workman multiplied by the relevant factor.

2.3.12 Bangladesh National Building Code, 2006

The Bangladesh National Building Code (BNBC) clearly sets out the constructional responsibilities according to which the relevant authority of a construction site shall adopt some precautionary measures to ensure the safety of the workmen. According to Section 1.2.1 of Chapter 1 of Part 7, "In a construction or demolition work, the terms of the contract between the owner and the contractor and between a consultant and the owner shall be clearly defined and put in writing." These, however, will not absolve the owner.

From any of his responsibilities under the various provisions of this Code and other applicable regulations and bye-laws. The terms of the contract between the owner and the contractor will determine the responsibilities and liabilities of either party in the concerned matters within the provisions of the relevant Acts and Codes (e.g.) the Employers' Liability Act, 1938, the Factories Act 1965, the Fatal Accident Act, 1955 and Workmen's Compensation Act 1923". (After the introduction of the Bangladesh Labor Act, 2006, these Acts have been repealed.)

The BNBC also stipulates the general duties of the employer to the public as well as workers. According to this section, "All equipment and safeguards required for the construction work such as the temporary stair, ladder, ramp, scaffold, hoist, runway, barricade, chute, lift shall be substantially constructed and erected so as not to create an unsafe situation for the workmen using them or the workmen and public passing under, on or near them."

The Code also clarifies the issue of safety of workmen during construction and, in relation to this, sets out the details about the different safety tools of specified standards. In relation to the health hazards of the workers during construction, this chapter describes the nature of the different health hazards that normally occur on the site during construction and, at the same time, specifies the specific measures to be taken to prevent such health hazards. According to this chapter, exhaust ventilation, use of protective devices, medical checkups, etc., are the measures to be taken by the

employer to ensure a healthy workplace for the workers.

To prevent workers from falling from heights, the Code sets out the detailed requirements for the formation and use of scaffolding. According to Section 3.9.2 of the same chapter, “every temporary floor opening shall either have railing of at least 900 mm height or shall be constantly attended”. Every floor hole shall be guarded by either a railing with toe board or a hinged cover. Alternatively, the hole may be constantly attended to or protected by a removable railing. Every stairway floor opening shall be guarded by a railing at least 900 mm high on the exposed sides except at the entrance to the stairway. Every ladderway floor opening or platform shall be guarded by a guard railing with toe board except at the entrance to the opening. Every open-sided floor or platform 1.2 meters or more above adjacent ground level shall be guarded by a railing on all open sides except where there is the entrance to a ramp, stairway, or fixed ladder, and the above precautions shall also be taken near the open edges of the floors and the roofs”.

2.4 Other Laws

There are several other laws and regulations applicable which are relevant for this project. These are presented in Table A.1 below.

Table A.1: Laws and Acts.

Act/Law/Ordinance	Brief description	Responsible Agency
The Vehicle Act (1927) and the Motor Vehicles Ordinance (1983)	Provides rules for exhaust emission, air and noise pollution, and road and traffic safety	Road Authority
Rules for Removal of Wrecks and Obstructions in inland Navigable Water Ways (1973)	Rules for removal of wrecks and obstructions	IBWTA
The Water Supply and Sanitation Act (1996)	Regulates the management and control of water supply and sanitation in urban areas.	MoLG, RD&C
The Ground Water Management Ordinance (1985)	Describes the management of groundwater resources and licensing of tube wells	Upazila Parishad
The Private Forests Ordinance (1959)	Deals with the conservation of private forests and afforestation of wastelands.	MoEF
The Antiquities Act (1968)	Describes the preservation of cultural heritage, historical monuments, and protected sites	

8.6 International Treaties Signed by GoB

Bangladesh has signed most international treaties, conventions, and protocols on the environment, pollution control, biodiversity conservation, and climate change, including the Ramsar Convention, the Bonn Convention on migratory birds, the Rio de Janeiro Convention on biodiversity conservation, the Kyoto Protocol and Paris Agreement on climate change. An overview of the relevant international treaties signed by GoB is shown in Table A.2.

Table A.2: Treaty or Convention and Responsible Agency.

Treaty	Year	Brief Description	Relevant Department
Protection of birds (Paris)	1950	Protection of birds in wild state	DoE/DoF
Ramsar Convention	1971	Protection of wetlands	DoE/DoF
Protocol Waterfowl Habitat	1982	Amendment of Ramsar Convention to protect specific habitats for waterfowl	DoE/DoF
World Cultural and Natural Heritage (Paris)	1972	Protection of major cultural and natural monuments	DoArch
CITES convention	1973	Ban and restrictions on international trade in endangered species of wild fauna and flora	DoE/DoF
Bonn Convention	1979	Conservation of migratory species of wild animals	DoE/DoF
Prevention and Control of Occupational hazards	1974	Protect workers against occupational exposure to carcinogenic substances and agents	MoH
Occupational hazards due to air pollution, noise & vibration (Geneva)	1977	Protect workers against occupational hazards in the working environment	MoH
Occupational safety and health in the working environment (Geneva)	1981	Prevent accidents and injury to health by minimizing hazards in the working environment	MoH
Occupational Health services	1985	To promote a safe and healthy working environment	MoH

Treaty	Year	Brief Description	Relevant Department
Convention on oil pollution damage (Brussels)	1969	Civil liability for oil pollution damage from ships	DoE/MoS
Civil liability on transport of dangerous goods (Geneva)	1989	Safe methods for transport of dangerous goods by road, railway and inland vessels	MoC
Safety in use of chemicals during work	1990	Occupational safety of use of chemicals in the workplace	DoE
Convention on oil pollution	1990	Legal framework and preparedness for control of oil pollution	DoE/MoS
Vienna convention	1985	Protection of ozone layer	DoE
London Protocol	1990	Control of global emissions that deplete the ozone layer	DoE
UN framework convention on climate change (Rio de Janeiro)	1992	Regulation of greenhouse gases emissions	DoE
Convention on Biological Diversity (Rio de Janeiro)	1992	Conservation of biodiversity, sustainable use of its components, and access to genetic resources	DoE
International Convention on Climate Changes (Kyoto Protocol)	1997	An international treaty on climate change and emission of greenhouse gases	DoE
Protocol on biological safety (Cartagena protocol)	2000	Biological safety in transport and use of genetically modified organisms	DoE
Paris Agreement	2016	International Agreement on climate change and greenhouse gases	DoE

8.6.1 Paris Agreement

The Paris Agreement is a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris on 12 December 2015 and entered into force on 4 November 2016. Its goal is to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels. To achieve this long-term temperature goal, countries aim to reach global peaking of greenhouse gas emissions as soon as possible to achieve a climate-neutral world by mid-century. The Paris Agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects.

Implementation of the Paris Agreement requires economic and social transformation based on the best available science. The Paris Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries. By 2020, countries submit their plans for climate action, known as [nationally determined contributions \(NDCs\)](https://unfccc.int/NDCREG) (<https://unfccc.int/NDCREG>).

Although climate change action needs to be massively increased to achieve the goals of the Paris Agreement, the years since its entry into force have already sparked low-carbon solutions and new markets. More and more countries, regions, cities, and companies are establishing carbon neutrality targets. Zero-carbon solutions are becoming competitive across economic sectors representing 25% of emissions. This trend is most noticeable in the power and transport sectors and has created many new business opportunities for early movers. By 2030, zero-carbon solutions could be competitive in sectors representing over 70% of global emissions.

8.7 IPCC's Sixth Assessment Report (AR6)

The sixth assessment report (AR6) of the United Nations Intergovernmental Panel on Climate Change (IPCC) recently published its Working Group 1 (WG1) report. The common regional changes in the ocean and coastal region are listed in the Report are-

- Marine heatwaves have become more frequent over the 20th century (*high confidence*) and are also projected to increase around the globe over the 21st century (*high confidence*).
- Anthropogenic warming is *very likely* to further decrease ocean oxygen concentrations, and this deoxygenation is projected to persist for thousands of years (*medium confidence*).
- It is *virtually certain* that the global mean sea level will continue to rise over the 21st century in response to the continued warming of the climate system, and this rise will continue to rise for centuries to millennia due to continuing deep-ocean heat uptake and mass loss from ice sheets (*high confidence*).
- Over the 21st century, the majority of coastal locations have a median projected regional sea-level rise within $\pm 20\%$ of the projected global mean sea level change (*medium confidence*).
- With the rising atmospheric CO₂ concentration, ocean acidification has increased globally over the past four decades (*virtually certain*).
- In the open ocean, acidification, changes in sea ice, and deoxygenation are detectable in many areas (*high confidence*).

- The surface of the Indian Ocean has warmed faster than the global average (*very high confidence*)

References

IPCC. (2021). Climate Change 2021: The Physical Science Basis. Contribution of the Working Group I to the Sixth Assessment Report.

Islam, S. A., Mohammed, K . et al. (2018). Future Floods in Bangladesh under 1.5°C, 2°C, and 4°C Global Warming Scenarios. Journal of Hydrologic Engineering 23(12):04018050. DOI: 10.1061/(ASCE)HE.1943-5584.0001705

Islam, S., Murshed, S.B, et al. (2014). Impact of Climate Change on Heavy Rainfall in Bangladesh. Institute of Water and Flood Management (IWFM), BUET.

MoEF. (2005). National Adaptation Programme of Action (NAPA). Dhaka: Ministry of Environment, Forest, Government of the People's Republic of Bangladesh.

MoEF. (2009). Bangladesh Climate Change Strategy and Action Plan 2009. Dhaka: Ministry of Environment, Forest, Government of the People's Republic of Bangladesh.