



BANGLADESH
**WATER RESOURCE
AND CLIMATE CHANGE**

BANGLADESH:
Water Resource
and Climate Change



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Introduction

"Water occupies a central place to our culture, ethos, lives and livelihoods,"

- Prime Minister Sheikh Hasina

Bangladesh is located at the apex of the Bay of Bengal, bordered by India and Myanmar while being separated from Nepal and Bhutan by the narrow corridor. It is a low lying country with three of Asia's largest rivers, the Ganges the Brahmaputra and the Meghna, flowing through, forming the largest delta in the world. With a robust, growing economy and a population of over 170 million, it is the world's eighth-most populated country.

Bangladesh has seen a rapid development during the last decade with an economic growth rate of over 7%. The economic growth has been projected to escalate further in the future. Consequently, the demand for water is now at its peak with the growing industries and an expanding population, making it essential for the continued development. Bangladesh now faces extreme climatic variability and environmental challenges, which are expected to deteriorate further without strong collaborative efforts for adaption towards climate change impacts. The consequences are already evident in reduced water quality, increased salinity and threatened biodiversity. These problems arising from climate change, industrial and human activities results in adverse consequences for national growth.

These issues have raised concerns nationally and internationally, making effective water resource management essential to avoid future constraints on the national development. The national water resources now require efficient allocation and new age technology to ensure the wellbeing of the population, while sustaining a stable environment. This publication covers major achievements of Bangladesh in water resource management and reducing climate change impacts, as well as the emerging challenges ahead.

TABLE OF CONTENTS

1. Water Management and International Cooperation	5
2. Achievements in Water Resource Management	7
3. Climate Change Strategy and Water Security	10
4. Bangladesh Water Resource Management Plan	13
5. Climate Change Impact on Water Resources	15

1. Water Management and International Cooperation



BANGLADESH PRIME MINISTER ON THE UN WATER PANEL

Bangladesh government has sought comprehensive global efforts for water management, urging world leaders to prioritise the water issues in their policies and actions, laying out a seven-point agenda involving the scarce resource. Bangladesh has committed to playing its role and is in the process of charting out an appropriate policy on effective management of trans-boundary river water appropriate for a traditional life of the downstream deltaic country. The Prime Minister fears that water scarcity may intensify inequality within and among nations in view of growing population, rapid and unplanned industrialization and urbanization.

The premier stated that proper water management would not merely eliminate inequality in access to water resources, but would also help bring peace, stability and security to the society as water has been the roots of many tension and conflicts across the world.

Bangladesh Prime Minister Sheikh Hasina, a member of UN High Level Panel on Water (HLPW), laid out the seven-point agenda. The actions based on the proposed seven-point agenda are intended to support in attaining the goals adopted by the High Level Panel on Water during the UN General Assembly.

THE 7 POINT AGENDA STATED THE FOLLOWING

1. Water to be an integral part of any development endeavour at national, regional and global level.
2. Special focus on people or groups around the world facing difficulties to access safe drinking water and basic sanitation.

3. Resilience to water related disasters need to be urgently built as the climate vulnerable countries are intensely challenged.
4. Effective management of trans-boundary river water and equitable distribution receive more attention due to persistent water crisis.
5. Efforts to develop less water-intensive varieties of crops and water efficient technologies due to the vital role for agricultural development and ensuring food security.
6. Every country needs to share with each other Bangladesh's 'light-house initiatives' to further develop knowledge, capacity, skill and technique in terms of development and efficient use of water resources.
7. The necessity of a global fund on water for support research, innovation, technology transfer.

TRANS BOUNDARY WATER MANAGEMENT



India and Bangladesh share three major river systems, Ganges, Brahmaputra and Meghna, which, along with their tributaries, drain an area of about 1.75 million sq km with an average runoff of 1200 cu km and support over 620 million people. The Ganges basin supports half a billion people in Bangladesh, India and Nepal.

The Brahmaputra, with a drainage area of about 580,000 km square, flows through China, India, Bangladesh and Bhutan, travelling 2,880 km before draining into the Bay of Bengal. The river accounts for nearly 66 per cent of the surface water flow in

Bangladesh and 30 per cent of water resources as well as 40 per cent of hydropower potential in India. The river forms an important link as the only navigation channel between northeast India and Bangladesh. This basin is one of the richest ecological areas marked by great diversity in flora and fauna. The Meghna, originating in the Manipur Hills of northeast India, travels through India and Bangladesh.

In 1972, a 25-year Treaty of Friendship, Cooperation and Peace was signed between both the countries by which a Joint Rivers Commission (JRC) was formed. Subsequently, over the years, other agreements and Memorandum of Understanding were signed between the countries on different aspects and Joint Committees were set up on both sides for monitoring them. Bangladesh has been proactively involved in policy dialogues, seminars, workshops and conferences on water resource management and climate change impacts. The country has also made significant progress on collaborative efforts with the regional and international actors for efficient water sharing agreements.

Bangladesh showed the success of cooperation with neighbouring India two decades ago by striking a long-term agreement on the common Ganges Water. The sub-regional cooperation on waters among Bangladesh, Bhutan, India and Nepal is also on the right track. Bangladesh is also committed to ensuring safe drinking water for all and improved sanitation for its population by the year 2021.

2. Achievements in Water Resource Management



Following persistent endeavors of the last several years, Bangladesh has overcome the food deficit. With the aim of attaining food self-sufficiency, the government implemented different programs for construction of flood control embankment, excavation and re excavation of drainage canal, construction of necessary infrastructure and irrigation facilities.



All these activities have contributed to an additional production of 98,00,000 Metric Ton food grains every year. Along with irrigation, the implementation of 400 km river bank protection work during last three years has helped protect important towns and places of historic significances in different areas of the country.

To resolve issues with river bank erosion, siltation on river bed and water logging due to the climate change, a **15 year project of dredging and river management** has been undertaken.

Under Climate Change Trust Fund (CCTF), **10 areas of implementation were identified with hundreds of projects worth USD 97 million** are underway.

To promote the living standard of **20 million people of 7 districts in the northeast region**, a **20-year project has been undertaken** jointly by the government office, the local government institutions and private sectors. This includes excavation for local fish cultivation, increased production of rice and the reduction of environment degradation through plantation.

RURAL SANITATION PROGRAMME

The Bangladesh Government has taken a rural sanitation programme to implement the facilitation, construction and installation of twin pit latrine. It improves rural sanitation coverage and reduces infectious diseases in rural areas.

Bangladesh made a tremendous effort to ensure safe drinking water supplies to a vast majority of the population with bacteriologically safe tubewell water. This was considered as the largest population coverage by safe water supply in the region. Piped water supply is more common in urban areas while the rural areas obtain water supply primarily through handpump tubewells and other water points like pond sand filters, ring wells, and rainwater harvesting units. The other achievement with regards to water is that Bangladesh has successfully increased access of the bottom 40 percent of the population to basic water services, similar to the increase in the provision of sanitation facilities (General Economic Division 2015).

SANITATION COVERAGE

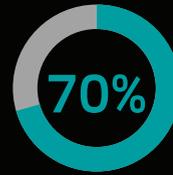
The reduction in open defecation has made Bangladesh the second South Asian country after Sri Lanka to effectively eradicate open air defecation from their system. The journey towards zero open defecation is integral to Bangladesh's development success story, and one that needs to be better understood to prepare for the upcoming challenges. From over 34 percent in 1990, less than 1 percent of the population now practice open defecation. The government led National Sanitation Campaign results in rapid progress of over 9 percent per year in sanitation coverage. More importantly, Bangladesh has successfully reduced the percentage of the severely disadvantaged population without access to basic sanitation facilities.



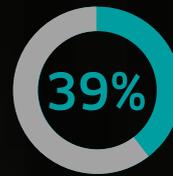
87% has access to improved water supply



98% has access to water points

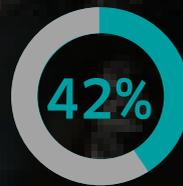


Sanitation Coverage Through Pit Latrines

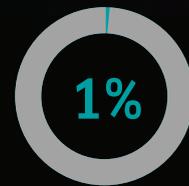


Sanitation Coverage Increased Since 1990

Open Defecation



2003



2015

3. Climate Change Strategy and Water Security

The Bangladesh Climate Change Strategy and Action Plan finalized in 2009 and now being implemented with contribution to the multi-donor Bangladesh Climate Change Resilience Fund. The plan is divided into six programme areas:

01 FOOD SECURITY, SOCIAL PROTECTION AND HEALTH IMPROVED

The Climate Change Action Plan aims to increase the resilience of vulnerable groups, including women and children, through scaling up of community-level adaptation, livelihood diversification, better access to basic services and social protection. It will also support activities such as the development and implementation of climate change resilient cropping, fisheries and livestock systems to ensure food security at household and national levels. The implementation of surveillance systems of existing and new disease risks, and actions to ensure health systems are geared to meet future demands.

02 DISASTER RISK MANAGEMENT ADDRESSED

The Action Plan supports activities to strengthen government, civil society and communities' capacity to manage natural disasters, and to ensure that appropriate policies, laws and regulations are in place. Bangladesh's early warning systems for cyclone, storm surge and flood will be upgraded to enable more accurate, short, medium and long term forecasts. Cyclone and flood shelters will be built.

03 RESILIENT INFRASTRUCTURE BUILT

Climate change resilient drinking water and sanitation programmes are being developed in areas at risk such as coastal areas, flood and drought-prone areas. Existing infrastructure are to be repaired and rehabilitated, with local communities involved in operation and maintenance. Urgently required infrastructure, such as coastal and river embankments, water management and drainage systems are in the process of being planned, designed and constructed to meet the changing conditions expected with climate change.

04 THE KNOWLEDGE BASE INCREASED

Climate change scenarios for Bangladesh will be modelled, as well as the hydrological impacts of climate change on the Ganges-Brahmaputra-Meghna system. The new models will guide the design of new infrastructure such as flood protection embankments. The impact of climate change on ecosystems and biodiversity, the macro-economy, key sectors, poverty, vulnerability and health will be researched. An International Centre for Adaptation, Research and Knowledge Management on Climate Change will be established to ensure that Bangladesh has access to the latest information, know-how and technologies from around the world.

05 DEVELOPMENT MADE LESS DEPENDENT ON CARBON

A strategic energy plan and investment portfolio is being developed to ensure national energy security, energy efficiency and lower greenhouse gas emissions; state-of-the-art technologies will be transferred to help Bangladesh follow a low-carbon development path. Energy and technology policies will also be reviewed, and incentives provided to promote the efficient production, consumption, distribution and use of energy.

The social forestry programme will be expanded on government and community lands including the 'greenbelt' coastal afforestation programme, which involves mangrove planting along the shoreline. Low-emission farming practices will be encouraged, and renewable off-grid energy systems deployed in scattered coastal settlements.



06 CAPACITIES BUILT AND INSTITUTIONS STRENGTHENED

Community-based adaptation programmes are now being established or strengthened in all disaster-prone parts of the country. Climate change will be mainstreamed in national, sectoral and spatial development planning, ensuring that actions that tackle impacts on vulnerable groups and women are prioritised in plans. The capacity of key government ministries and agencies will be strengthened to take forward climate change adaptation, and to undertake international and regional negotiations on climate change. The capacity of the government, civil society and the private sector to access carbon finance will also be built.

KEY ACHIEVEMENTS OF THE CLIMATE CHANGE STRATEGY

- 1 The construction of 61 new cyclone shelters under the Multipurpose Cyclone Shelter Construction Project (USD 25m), implemented by the Local Government Engineering Department, has been completed. The construction of 3 roads totalling 11.5 kilometres in the coastal districts has also been completed.
- 2 Signing of a grant agreement in February 2013 for the Climate Resilient Participatory Afforestation and Reforestation Project (USD 33.8m), to be implemented by the Forest Department. This project is designed to reduce forest degradation and increase forest coverage through participatory planning and monitoring, and will contribute to building the long-term resilience to climate change of selected communities in coastal and hilly areas. Seedling survival averaged 90% and health and growth of plantations has been satisfactory.
- 3 The Palli Karma-Sahayak Foundation (PKSF), a government-owned financing body, has been entrusted with the management of the Community Climate Change Programme (CCCCP, USD 12.5m). This program has been designed to enhance the capacity of selected communities to increase their resilience to the impacts of climate change. The program now funds 27 proposals worth a total of USD 787 million. Among these sub-projects, fourteen proposals target salinity-prone, eighteen target flood-prone, and nine target drought-prone areas. With government partnership, NGOs are now better addressing climate risks.



By 2015, block plantations in vast areas and 1,505 kilometers of strip plantations had been completed

- 4 The “Rural Electrification and Renewable Energy Development Project II” being implemented is a solar irrigation project that, promotes the use of solar irrigation pumps by farmers. An agreement was signed in September 2013 for a first tranche of USD 10m. This project is to be implemented by Infrastructure Development Company Ltd (IDCOL), a public sector company set up to bridge the financing gap for developing medium and large-scale infrastructure and renewable energy projects in Bangladesh. Around 300 solar irrigation pumps are to be financed from BCCRF, benefiting from 7,500 to 9,000 farmers
- 5 Apart from the approved investment projects, the governing bodies have also focused on the fourth pillar of Bangladesh Climate Change Strategy and Action Plan on Research and Knowledge Management. On this basis, the following areas have been identified and approved by the Management Committee for further analytical work including a) Climate change, b) Vulnerability, adaptation, potential costs of urban flooding c) Coastal zone in a changing climate: Ingress of salinity frontier d) Scaling up innovation in disaster risk management e) Eco-engineering, adaptation and innovations in flood risk mitigation.
- 6 A Results Framework has been developed for 2012-2017, in order to monitor and measure the objectives of the Bangladesh Climate Change Resilience Fund (BCCRF). It contains (i) a Results Roadmap (ii) the BCCRF Reporting Framework & (iii) a Results Measurement Guide.

4. Bangladesh Water Resource Management Plan



In order to achieve the purpose and objectives of Vision-2021, delta plan-2100 and 7th Five Year Plan committed by the present government, the Ministry of Water Resources of Bangladesh is working cordially toward an efficient national water resource management. Bangladesh is an agro based country and the major economic development contributes by this sector. Flood, excess rainfall, early flood, water logging, saline water intrusion, drought, lack of irrigation among other factors are the main constraints of agricultural production. The development of agricultural sector is largely depends on the development of the water resources sector. Ministry of Water Resources takes the instant steps to save Industries and commerce centre, town and cities, farmland and lands near territory from the river erosion. The goal is to ensure sustainable development through balanced and integrated management of water resources.

MINISTRY OF WATER RESOURCES STRATEGIC OBJECTIVES AND ACTIVITIES:

ENSURING BALANCED, INTEGRATED AND SUSTAINABLE MANAGEMENT OF WATER RESOURCES

- Excavation or re-excavation of canals, construction and maintenance of infrastructures to provide irrigation facilities to arable land to ensure balanced, integrated and sustainable management of water resources.
- Undertaking repair, modification, re-construction and development of existing embankment, infrastructures; construction and maintenance of new embankments, and forestation in coastal areas for flood control and protection of town from erosion.
- Construction and maintenance of flood control embankments to protect economically important areas, towns and establishments, human life, property and agricultural crops.
- Construction of cross dams in the coastal area in order to reclaim land from the sea and river. Distribution of reclaim land for the development of habitat and protection of costal wetland and the Sundarban from the salinity.

SOME OF THE MAJOR ACTIVITIES INCLUDE

- Formulate national policy for irrigation, flood control, removal of water logging, improvement of drainage systems, protection from river erosion, prevention of salinity and desertification and technical assistance;
- Execute all necessary actions for flood forecasting and warning, flood control infrastructures, identification of causes of flood and assessment of the damage done by flood;
- Conduct basic and applied researches on river basin management and development, flood control infrastructures and conduct hydrological survey for data collection;
- Mobilize international experts for flood control and development of water resources;
- Deal with the issues related to land conservation and reclamation, drainage and water logging; construction of water reservoirs, embankments and barrages;
- Carry out dredging to enhance the water conservation capacity of the rivers and protection against erosion.

SAFE MANAGEMENT FOR CLEAN WATER

- The government has initiated the National Environmental Management Action (NEMAP) project to integrate environment with the development in a policy framework. It provides a guideline for promoting effective management of resources, raising awareness among the people and improvement of environmental conditions and water quality.
- The Bangladesh Government has modified environmental acts, rules and laws to improve environmental condition. Environment court has already been established to take prompt legal action against environmental, specifically water pollution. The Department of Environment has also been empowered to punish the offenders of environmental rules.
- The Government has taken four strategies to mitigate the arsenic problem. These include a) immediate detection of the arsenic effected patients and ensure their proper treatment b) identify the arsenic contaminated tube wells, labelled them with red colour for danger ones and green with safe ones c) detect the reasons for arsenic contamination in soil water and find out the sources of safe drinking water and conduct health education campaigns and grow awareness among the people.

5. Climate Change Impact on Water Resources



Bangladesh experiences different types of natural disasters almost every year because of the global warming as well as climate change impacts, including:



Floods / flash floods:

Almost 80% of the total area of the country is prone to flooding



Salinity Intrusion:

Coastal belt along the Bay of Bengal experiences salinity problem



Extreme Temperature and Drought:

North and north-western regions of the country suffer the extreme temperature impacts



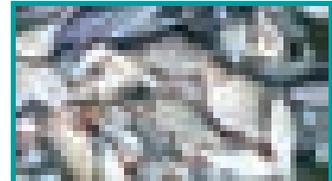
Cyclones and Storm Surges:

South and south-eastern parts of the country vulnerable to tropical cyclones in the recent years

AGRICULTURE AND FISHERIES

Bangladesh economy is highly reliant on agriculture, with two thirds of the population engaged (directly or indirectly) on agricultural activities. The adverse effects of climate change on agricultural production would have a devastating impact on the national economy. Additional impacts of climate change such as - extreme temperature, drought, and salinity intrusion also contribute to the declining crop yields in Bangladesh. Changes in the temperature and rainfall patterns have already affected crop production throughout the country while the available area for arable land continues to decline.

The salinity intrusion in the coastal area is creating serious implications for the coastal land traditionally used for rice production.



Fisheries sector contributing to **3.5% to the national GDP** faces adverse effects of climate change.

WATER RESOURCES AND HYDROLOGY

In a high density country like Bangladesh, the effects of climate change on the surface and ground water resources are often serious. Changes to water resources and hydrology can lead to adverse impact on the country's economy, where the population is highly dependent on the surface water for irrigation, fishery, industrial production, navigation and various other activities.

COASTAL AREAS

Salinity intrusion from the Bay of Bengal already penetrates 100 kilometers inside the country during the dry season while climate change in its gradual process is likely to further deteriorate the existing scenario. Since most of the country lays less than 10 meters above Sea level with almost 10% of the population of the country is living below 1-meter elevation - the entire coastal area is highly vulnerable to high tides and storm surges. Moreover, the Bay of Bengal is located at the tip of the north Indian Ocean, where severe cyclonic storms as well as long tidal waves are frequently generated, hitting the coast line with severe impacts because of the shallow, conical shape of the Bay near Bangladesh.



Bangladesh could lose up to **15% of its land area under the Sea water** with just 1-meter rise in the sea level.



30 million people living in the coastal areas of Bangladesh are at risk of becoming refugees because of Climate Change impacts.



Nearly **one fourth of the total population lives in the coastal areas** of Bangladesh prone to coastal floods and tidal surges, river-bank erosion, salinity and tropical cyclones.

FORESTRY & BIODIVERSITY

Bangladesh has a wide diversity of Ecosystems including Mangrove forests at the extreme south of the country. The “Sundarbans” a World Heritage, is the largest Mangrove Forest in the world, comprising of 10,000 square kilometers of land area along the Bay of Bengal. This area is home to a total of 425 identified species, the most significant one being the famous Royal Bengal Tiger. Therefore, it requires especial attention for protection against the effects of climate change which could potentially destroy the delicate ecosystem of the forest recourses in Bangladesh.



URBAN AREAS

Direct impacts may occur through the increased floods, drainage congestion and water logging as well as infrastructure damage during climate change induced natural disasters. The important urban sectors that suffered severely by the previous floods in Bangladesh include infrastructure, industry, trade, commerce and utility services. As a consequence, it hampered usual productivity during and after major floods and hence increased the vulnerability of the urban poor by manifolds.

EXTREME VULNERABILITY

A large percentage of the poor people living in the vulnerable areas are at high risk of becoming victims of natural disasters. Currently the necessary infrastructure and existing emergency shelters are inadequate for accommodating 100% of the people at risk. Such incident can lead national epidemics such as diseases, homelessness, and unemployment along with negative economic growth. In Bangladesh, women and children are especially vulnerable due to various socio- economic reasons.

CLIMATE CHANGE CHALLENGES: WATER AND ENVIRONMENT

Environmental pollution, especially those linked to the global climate change have emerged as big challenges to sustainable development of the country. Although significant progress was observed in, there is insufficient progress in the following areas such as climate change, drinking water crisis, river erosion, effective prevention of environmental disasters, pollution through industrial waste, consequences of rapid urbanisation, quality of underground water, arsenic pollution, weak solid waste management, insufficient clinical waste management, stagnation in waste management, river pollution, harmful impact of pesticides, gender context of climate change, hindrances to environmental research, children's health and environmental cleanliness, Sundarban's struggle for survival, environmental education. All these themes provide a glimpse into the present state of environmental challenges in the country.

FUTURE PROJECTION OF CLIMATE CHANGE IMPACTS IN BANGLADESH

1. Crop production & food security: Rainfall patterns are changed due to climate change – crops yields are expected to drop significantly. Crop production will decrease 30% in 2100. Production of rice & wheat will reduce 8.8%, and 32% within 2050 respectively.

2. Salinity: There are 13% areas are with salinity at Bagerhat, Khulna & Sathkhira, the southwestern coastal districts of Bangladesh at present, which will increase 16% in 2050 and 18% in 2100.

3. Coral Bleaching: Corals are vulnerable to thermal stress. If the sea surface temperature increases 1-3° C then corals bleaching will occur frequently.

4. Mangrove Forest: About 75% area of mangrove forest, Sundarban (60007 Sq. km) will submerge if the sea level will increase 45 cm. If the sea level rises 1 m then the islands of Bay of Bengal and whole Sundarban will be destroyed including its fauna & flora.

5. Fisheries: Death rate of shrimp's fingerlings will increase if the water temperature is more than 32°C (CEGIS). Diseases of fish may increase. Carps culture may reduce due to saline water intrusion in the ponds and open water bodies. Production of sweet water fish will shrink and extinct if the sea level rises.

6. Climate Refugee or Migration: In Bangladesh every year, rivers engulf enormous agriculture fields and homesteads, makes the peoples homeless. Those who have no way to live in the locality migrate to urban areas and live in slum with unhygienic conditions.



MAJOR IMPACTS OF WATER POLLUTION IN BANGLADESH



Adverse impacts on biodiversity

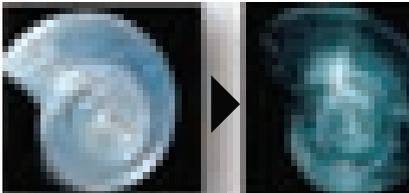


Effects on marine wildlife



Effects on coastal habitat

PROBABLE FUTURE IMPACTS



Ocean acidification increase could destroy all the coral reefs by as early as 2050

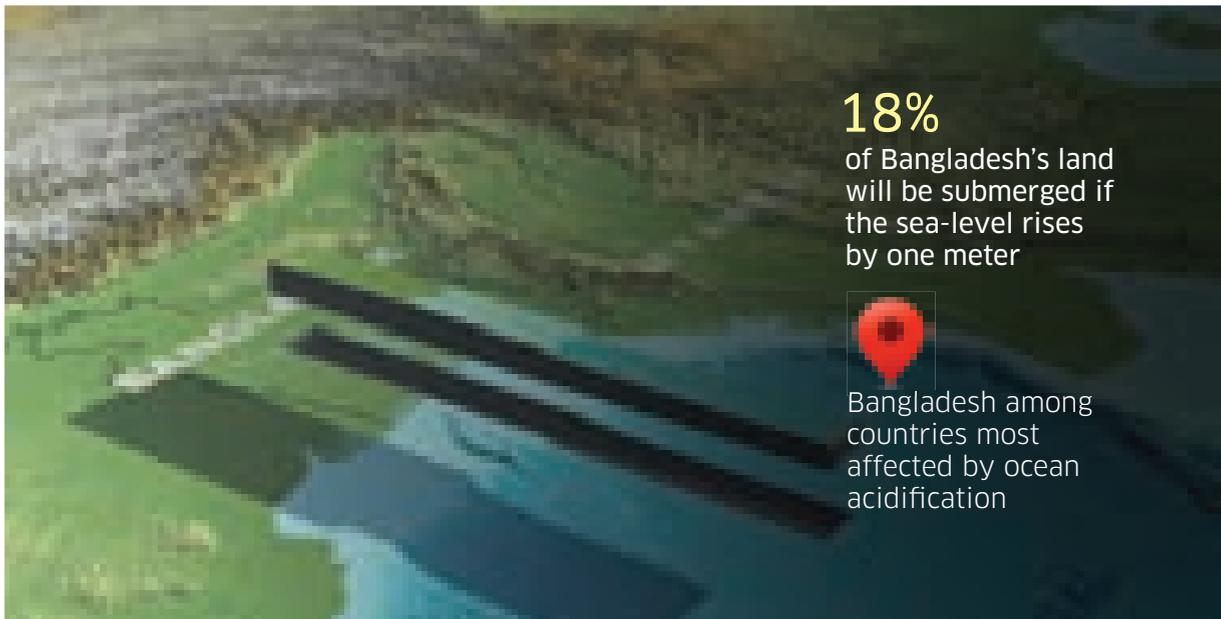


Worldwide reef fisheries which provide 9-12% of the world fish landings will collapse



Tourism related to reefs in different countries of the world would be stopped

In Bangladesh, coral communities are found only around St. Martin's Island, which is home to 66 recorded coral species. They are currently struggling with human pressure and high level of sedimentation, and in near future they are expected to face sea-level rise and increased temperature. If the coral reef disappears, around 86 species of coral reef associated fish recorded from St. Martin's Island would face extinction.

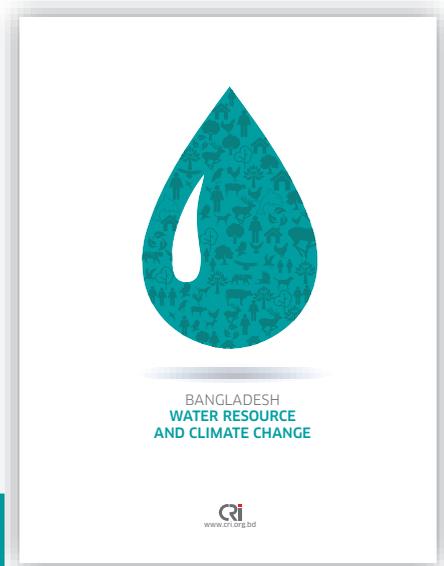


Conclusion

Bangladesh has seen extraordinary changes in terms of socioeconomic developments; while the impact of climate changes, pollution and the need for development of efficient water resource management was recognised in the 90s, the implementation process has relatively new agenda for the government and the development partners.

Since there is no short term solution to these issues, the only realistic action is to slow down greenhouse gas emission at a global level and adapt to the impacts of climate change in the national level. Thus, policy makers from all sectors urgently need to focus attention on the implications of climate change with the necessity of water resource management.

Progress towards adaptation to the impacts has already started, however the aspects of climate change and variability are already having a profound effect on the livelihoods of the people of Bangladesh. The country is at high risk of environmental problems, unmet demand for water alongside climate change impacts and hopes to work with the international leaders to resolve these problems in the near future.



“Bangladesh: Water Resource and Climate Change”
Published by Centre for Research and Information, January 2017

H 2, R 11(New), 32(Old), Mirpur Road, Dhanmondi, Dhaka- 1209,

Email: info@cri.org.bd

www.cri.org.bd

ISBN 978-984-91559-1-1

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