

Adverse Effects of Climate Change in Bangladesh: its Physiological and Economic Impacts

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ABSTRACT

Rapid changing of climate, the effects of greenhouse and global warming, is an alarming situation of the global map with its adverse effects, sending several countries under the waves. Unfortunately, Bangladesh stands at the peak of climate attacks. The land, water, and weather are being enormously affected by this outbreak of climatic changes. The dangers will intensify, if the precautionary measure is not taken immediately. However, to offset the grave concerns of unintended climatic changes in Bangladesh, there is no any significant initiative is taken. The changes will put its adverse impact on the socio- economic conditions of the country, putting the next generation on the line. Some ominous signs are already there for the concerned to respond with the required amount of fervor.

Key Words: Greenhouse effect, Salinity, Sea level rise, Riverbank erosions, Mangrove forest, Adverse

JEL Classification Code: F64

INTRODUCTION

The world's temperature has been changing as the world gets warmer day by day due to GHG and CFC emissions from human activities. This unbeatable fact is now highly accepted, but even though a few who refuse to accept evidence of human causation of recent observed warnings. Climate is simply the weather that is dominant in a specific region; the term climate includes temperature, rainfall, wind patterns, rate of precipitation, and how close the country to the equator. Land pattern, global air and sea-level, green area, global temperatures, and other factors influence the climate of the country, which causes the local weather. Naturally, the earth's climate has always varied. In the past, the air cycles vary in the earth's orbit around the solar-system, sunspot activity or volcanic eruptions; snow falling, etc have altered the climate. However, enormous changes have been very gradual over a time frame; nevertheless, they are still blamed for the extinction of the "Terrible Lizards or Dinosaurs". But nowadays, different pollution, e.g.: Air, water, soil, deforestation, and littering lifestyles, directly affect the climate of the earth on a regular basis. Due to human activities the Earth's temperature is rising at a much higher rate than it did in the past.

Scientific believed that human activities were the foremost reason to change the climate (Depledge & Lamb, 2005). At this time, when the first effects of human induced climate changes were discovered, the changes were so few that it did not seem like a big issue. However, by 1988, when the Intergovernmental Panel on Climate Change (IPCC) formed, the dangerous consequences of climate change became prominent (Houghton, 2007).

METHODOLOGY

The study was conducted in Chittagong District, officially known as Chattogram district is a district located in the south-eastern region of Bangladesh. It is a part of the Chittagong Division. The data was collected in 2017/18 and lasted for about 6 months. The three most vulnerable coastal districts, namely, Feni, Laksmipur and, Chittagong were selected. The administration of Bangladesh divided into several hierarchal units and these units are division, Zila, Upazila, and union.

- 21 May 2016: Cyclone Roanu made landfall near Chittagong, killing 26 people in Bangladesh. It has wind speeds up to 100 km/hour. Around 40,000 homesteads and business Houses were damaged. Food storage, seasonal crops were destroyed and huge amount of Livestock, including fish and shrimp farms swept away.
- 20 August 2016: The remnants of Tropical Storm Dianmu affected Bangladesh, no damage or death reported.
- 29–31 May 2017: Cyclone Mora with wind speeds up to 110 km/hour, made landfall near Chittagong. A total of 500,000 people managed to move out of coastal areas before the storm made landfall on 31 May. A multitude of tropical cyclone warnings and watches issued for much of southern Bangladesh and the districts of Northeast India. Strong winds and storm surge battered buildings and destroyed farmlands across Chittagong, Cox's Bazar, and Rangamati, with at least 20,000 houses damaged in refugee camps for Rohingya Muslims displaced by conflict in neighboring Myanmar. As of 31 May, eighteen people reported to killed across Bangladesh, mostly due to falling trees and drowning.
- 4 May 2019: Cyclone Fani made landfall near Puri, Odisha, in India and moved into Bangladesh. It killed 17 people in ten villages of Bangladesh. It destroyed about 63,000 ha (160,000 acres) of farmland in 35 Upzilas of the country; the agricultural loss was at 385 million (US\$4.6 million). Total damage in Bangladesh was up to 5.37 billion (US\$63.6 million).
- Several government and NGOs worked in the affected areas. For each focus group discussion (FGD) with the literate people, a maximum of 20 persons, one from each organization working in the affected area, selected. Numerous FGDs conducted in each area. Open-ended questions used to collect the data. The interview guide was there for a smooth transition. The interview guide applied a questioner sessions like what the changes they have observed before and after the cyclones are, how they survived.

The qualitative data collected by using a focus group discussion (FGD) in two groups.

Group 1 : It consists of literate people from Upazila and union level (a union on average has 20,000 people). The target participants were I with NGO staff, teachers, researchers, social workers, community leaders, and local government officers.

Group 2 : It consists of members of the local community, which included general people, including the author of this research.

In the second phase, codes were developed from the data to identify vital points. After the group discussions, main points refined to capture the concealed meaning. In phase three, the researcher reviewed and refined the emerged themes. The researcher visualized all extracted data for each factor and made sure that the collected data was appropriate to the facts. A thematic database prepared at the last stage is analysis.

CLIMATE CHANGE, THE GREENHOUSE EFFECT, AND GLOBAL WARMING

The Greenhouse Effect is a natural process through which various gases and water vapor in the atmosphere affects the earth's climate. It is so named because it acts as a glass greenhouse for plants by preventing the incoming heat from the sun from leaving and cause the warming of the earth just as the inside of a greenhouse warms. The Greenhouse Effect can also liken to being under a blanket in the sunshine; the body under the layer will heat up and it will keep the heat from escaping causing warming.

The earth's climate is run by this nonstop flow of thermal energy from the sun, mainly in the form of visible light and heat. About 30% is instantly gets back into space, but rest 70% reach down through the atmosphere to the earth's surface.

In comparison-, the earth is fairly low temperate than the sun, it does not give out energy directly as visible light. Instead, it emits heat in the form of infrared rays. Greenhouse gases in the atmosphere obstruct this infrared radiation from escaping directly from the surface to space (Williams, 2002). Since the beginning of the industrial revolution around 1750, one of these greenhouse gases, CO₂, has increased by over 30% and is now at a higher concentration in the atmosphere than it has been for decades. These changes mainly occur by burning fossil fuels (Houghton, 2005). These are emitted through factories, motor vehicles; and other greenhouse gases such as nitrous oxide and methane that are also produced by human activity are thickening the Ozone layer. It increases the earth's temperature and named "Global Warming" (Williams, 2002). It's thought for the last 40 years that human activity also a vital cause of changing the earth's climate. To establish this believe, the Intergovernmental Panel on Climate Change (IPCC) was set up by the World Meteorological Organization and the United Nations Environment programmer, producing its first assessment report in 1990 (Depledge & Lamb, 2005). Hundreds of scientists from a different region around the world review thousands of published scientific articles that include research using advanced mathematical modeling to predict future changes, as well as research monitoring historical and recent changes in climate to produce the IPCC assessments.

However, the work of the IPCC is backed by the worldwide scientific community, as well as endorsed by all major world governments (Houghton, 2005). IPCC predictions from their Fourth Assessment Report reveal that for the next twenty years warming at a rate of 0.2 °C per decade expected. While by the year 2100, best estimates predict between a 1.8 °C and 4 °C rise in average global temperature, although it could be as high as 6.4 °C (Alley et al. 2007). How high exactly depends on whether action taken to stop greenhouse gas pollution now or if very few action taken as at present. However, if a recent strategy followed, it can be expected that average global temperatures will rise by 1-3°C within the next 50 years (Stern, 2006).

Global warming is the biggest threat to human food supply as well to sustain. Around 12% of the world's population is already starving, but if the temperature rises by only 2 to 3°C, it will rise the people at risk of mortality due to lack of food supply, suspected, by 20 - 200 million throughout the world. Once temperatures increase by 3°C, 250 - 550 million people

may be at risk mostly in Africa and Asia, where the declines in harvest are largest, dependence on agriculture highest, and spending power most limited (Stern, 2006). Warming may induce sudden shifts in regional weather patterns such as the monsoon rains in South Asia or the El Niño phenomenon - changes that would have severe consequences for water availability and flooding in tropical regions and threaten the livelihoods of millions of people (Stern, 2006).

CLIMATE CHANGE AND ITS IMPACT IN BANGLADESH

The effects of climate change are highly remarkable in Bangladesh. According to the research, compared to recent temperatures, temperature could increase to 2.7° C higher than the current level by 2100, causing high humid summer and warmer winters. The rainfall could increase to 10% at the same time, changing drastically usual rainfall patterns (Ahmed, 2006). The seawater rise would cause more havoc as predicted that by 2100 the level would increase by 85 cm from the present level, submerging an enormous portion of land with saltwater. Frequent and severe floods, frequent storms, several natural disasters may approach which, leads to destroying lives, destroying landscapes, and deforestation.

Table 1: Climate Change outbreak in Bangladesh at a Glance

Crop production and Food availability	Rainfall patterns changed due to climate change - crop yields expected to reduce In gross. Crop production will decrease 30% in 2100. Production of paddy will decrease by 47% within the next 30 years.
Salinity	There are 13% areas are salinity at Magura, Mongla & Sathkhira, the south-western coastal districts of Bangladesh at present which will increase 16% in 2050 and 18% by 2100.
Coral reef	Corals are sensitive to the heat waves. If the Sea surface temperature increases 1-3° C then the coral reef will be in threat.
Mangrove Forest	About 75% area of mangrove forest, Sundarbans (60007 Sq. km) will submerge if the sea level will increase 45 cm. If the sea-level rises 1 m, then the islands of the Bay of Bengal and whole Sundarbans will be destroyed, including its nature & wildlife.
Aquatic lives	<ol style="list-style-type: none"> 1. The death rate of marine lives will increase if the water temperature is more than 32°C (CEGIS). 2. Diseases of fish may increase. 3. Production of crops may decrease due to saline water intrusion in the ponds and open water bodies. 4. Production of sweet water fish will narrow and be extinct if the sea level rises.
Health	<ol style="list-style-type: none"> 1. Flood water is non-potable water. It increases cholera, diarrhea, typhoid etc. 2. Frequent droughts and decreasing food production. 3. Increasing significant malnutrition. 4. More air pollution. 5. Breathing difficulty. 6. Rise of temperature leads an increase in pest and pathogen that will increase malaria, diarrhea, dengue, etc. 7. Decrease physical mobility and resulting in diabetes, psychosocial stress, and death rate increased. 8. High salinity in water will affect human health including, high

	blood pressure and kidney malfunction.
Increasing refugee	Every year, many people become homeless due to natural disasters. Those who lost their shelter, they tend to live in slums with unhygienic conditions.
Rise of Sea- level	If the sea level rises, the following dangers will observe: 1. Scarcity of potable water. 2. Agricultural production will change.
Increase rate of evaporation and heavy precipitation	Global average water evaporation and precipitation projected to increase during the 21st century.
Biodiversity	If the global temperature rises by 2°C, 30% of all land species will be at risk, which resulting in extinction of some species each year.

According to the above discussion, we can save Bangladesh from approaching disasters in both animal and plant kingdom. We should take all the discussed issues in account to reduce the threats.

BANGLADESH IS IN THREAT OF UPCOMING CLIMATIC CHANGES

Bangladesh is one of the top 10 nations who are most vulnerable to climate change. By the end of the century, as the US government's NASA space agency puts it, Bangladesh is set to disappear under the waves. The International Panel on Climate Change (IPCC) predicts that by 2050 Bangladesh is on course to lose 17% of its land and 30% of its food production with the result of poverty-increase (Planetizen, 2008). Bangladesh has already begun to feel the pangs of climate change as flood periods have become longer and the cyclones, droughts and other natural disasters, that hit the country cause higher devastation and adverse effect the country's agriculture and land, and challenges water resources, occupational dislocations, food, health, energy and urban planning.

The Healthy Center for Climate Prediction and Research (HCCPR) estimates that sea level in Bangladesh will rise about 40 cm (15 inches) by 2080 (Streatfield, 2008). Now, the water level increases by at least 5.6 mm a year at Hiron point, 1.4 mm at Cox's Bazar and 2.9 mm at Khepupara, which was cited by Bangladesh Water Development Board 2008 as data of 2008 (ANN, 2010). The climate models suggest that temperature will increase in Bangladesh during all seasons by approximately 1.0 to 15°C by 2030 (Kafiluddin, 2005). However, the Prime Minister of Bangladesh went on to warn that one-meter rise in the sea level would submerge a quarter of Bangladesh's land body (News Today, 2011).

Table 2: Alarming situation in Bangladesh due to a rapid change in climate

Type	Effect
Conflicting in seasons	There are six seasons in Bangladesh that are not approaching on its time due to climate change. Summer & rainy seasons are progressive, whereas winter season duration is shortened. No Autumn and foggy seasons are there, and there is no flavor of Spring season.
Infrastructures	In Bangladesh, several natural disasters have occurred over the period from 2010 to 2018 and Bangladesh lost US\$ 590 crore in agriculture and infrastructure sectors.
Ground water quality	About 830,000 hector cultivable land has been damaged due to saline water intrusion from the coastal area.

degradation	
Drought	About 21.8 tons of paddies damaged due to the drought from 2009 to 1915.
Flood	Rice including other crops damaged due to flood over the period from 2005 to 2016.

ECOLOGICAL DISASTER

The mangrove forests of the Sundarbans, the Bengal tiger, and hundreds of bird species are in threat of being extinct soon (Daily Star, 2011a). Bangladesh and its neighbor countries share important ecological treasures, such as the mangrove forests of Sundarbans and hill forests on Bangladesh's north and eastern border. These forests are very rich in different kinds of plants and animals where many ethnic minorities live. It is, thus, the joint responsibility of Bangladesh and its surrounded countries to preserve bio diversity of this sector. By doing so, they can also protect the rights of the ethnic minorities who have been living there for long (New Age, 2011a).

The salinity of river water and soil in Bangladesh's low-lying southwest coastal region is increasing over time and will aggravate further with sea-level rise in a changing climate. The increase in salinity will reduce the Sunderbans' Major species Sundri, its highest-value timber species, and increase saline-tolerant species gewa, goran, keora, etc.

It also reduces many freshwater fish species. Hence it leads to depriving the poor of their main source of protein, and will keep impacting the overall incomes of families

Southwest coastal areas of Bangladesh are already facing increasing salinity, especially between mid-October and May. Laboratory analyses of water and soil samples show an increase of salinity over time in these areas. Climate change also plays a vital role in sea-level rise and will result in river and soil salinization.

Recent World Bank studies predict the progressive salinization of water and soil in a changing climate will significantly impact the UNESCO World Heritage Site Sundarbans' fragile ecosystem and affect the surrounding people. Increased water salinity will alter the aquatic ecosystem and the mangrove forest, along with prominent shortages of water for drinking and irrigation in the southwest coastal area, while soil salinization is likely to lead to a significant decline in the output of high-yielding-variety rice.

ESTIMATED IMPACTS OF INCREASING SALINITY FROM CLIMATE CHANGE ON SUNDARBANS

Climate change and its adverse effect will put significant effects for the recent and future management of the Sundarbans as well as the forest-dependent living organisms.

To assess impacts of salinization on mangrove species and the fish habitats, recent World Bank studies used state-of-the-art salinity profiles of the region, high-resolution vegetation maps, and information on the availability of fish.

Vegetative changes in Sunderbans:

The study predicts significant losses for goran, gewa, and keora, etc. species in Sundarbans decreasing over time due to natural reason such as "top-dying-disease" which has killed millions of trees since 1970. Climate change is keeping its curse of this depletion of Sundri stock through increased salinity. The analysis compared the different salinity tolerance ranges for 14 different dominant mangrove species detected in 2013 satellite images of Sundarbans to predict salinity for alternative scenarios of climate change by 2050.

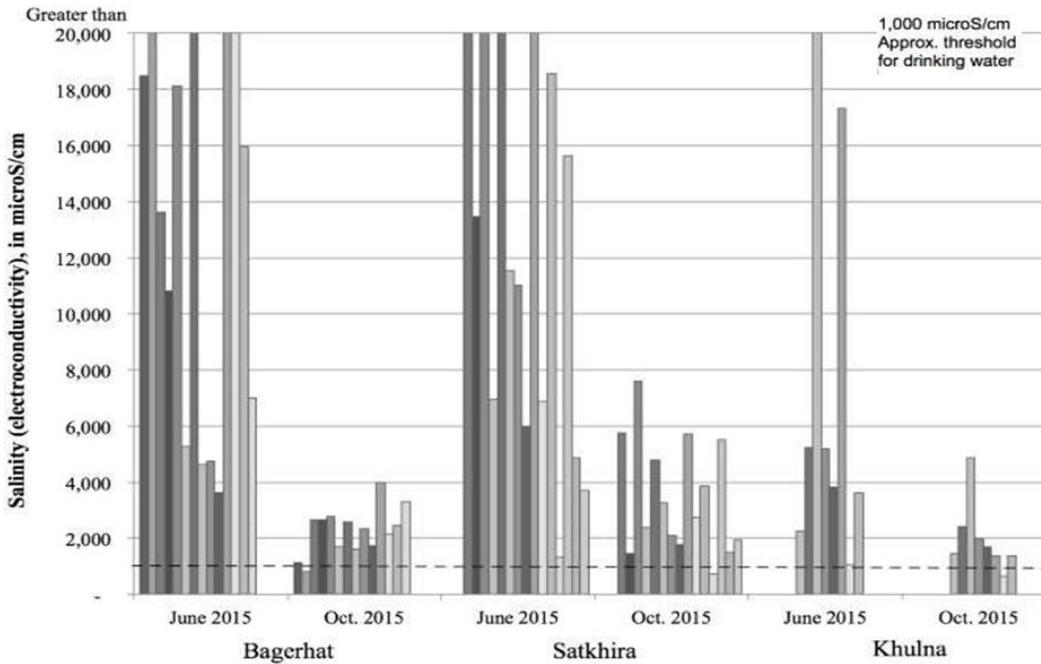


Figure 1: Changes in salinity between the time period 2015 June to October in the river water of the coastal area

Scarcity of aquatic species:

Increasing salinity leads to decreasing of all marine lives. It affects the reproduction of these species. The analysis shows the salinity tolerance range of 70 fish species typically found in the region with expected location- specific water salinity resulting from climate change by 2050.



Figure 2: Sundarban

Physiological Hazards

Climate change threatens to undermine Bangladesh’s significant achievements in the health sector. The country profile should use to base policies and practices to protect human health from climate change”, Dr. N. Paranietharan, WHO Representative to Bangladesh, said. WHO, along with the Bangladesh Ministry of Health and Family Welfare (MoHFW), Secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and a range of partners, worked to develop the country’s profile, which provides evidence on the links between climate change and human health?

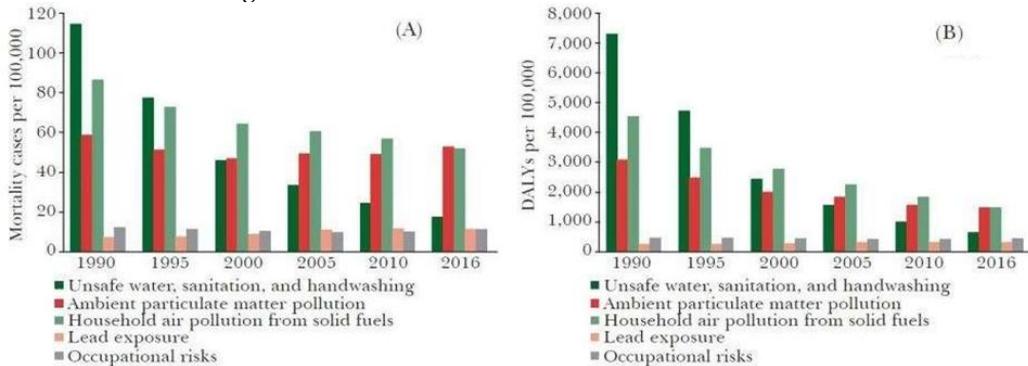


Figure 3: Evolution of Mortality and Disability attributed to environmental risks in Bangladesh over time

Health issues should receive due priority in climate change programs along with adequate involvement of the decision-makers in the health adaptation process, Dr. Paranietharan said. WHO called for government action to conduct evaluations of health implications in climate change mitigation policies? Exclusive national action for climate change issues also needs to be developed, utilizing a rights-based approach and taking action to mainstream gender so that impacts of climate change on the health of women and children are addressed.

Vast resources also required for building climate-resilient health care facilities.

Though Bangladesh has been taking initiatives to implement health adaptation programs including a national assessment of climate change impacts, vulnerability and adaptation for health, and to build technical capacity, the country profile identifies additional opportunities for action.

Global warming has significant effects on human health. Mosquito-borne diseases like malaria can be a threat because of warmer weather. Infectious disease like dengue fever caused by dengue virus can be another consequence of hot, humid weather condition. According to ICDDR (International Centre for Diarrheal Disease Research), climate change will make the people of Bangladesh more vulnerable to diseases like Cholera, dengue, cardiovascular and respiratory illnesses, and malnutrition because of reduction of food production. Due to extreme heat exposure, in April (2018) throughout the country which triggered illness, mainly viral infections and gastro enteric disorders.

Climate change also has negativity on mental health. According to the Psychologist, global climate change has substantial negative affect on mental health and well-being. The main victims are the vulnerable populations and those with pre-existing prolonged mental illness.

Apart from the above- stated consequences of global warming, Bangladesh may face adequate climate abnormalities like an unpredictable weather patterns, seasonal irregularities, food, and water insecurity, etc.

GLOBAL WARMING AND HOW BANGLADESH BATTLES TO FACE THE CHALLENGES



Figure 4: Flood affected area

The preparation of Bangladesh to fight against the challenges of global warming, though not enough, cannot be overlooked.

The first step, we should reduce the use of fossil fuels. The rapid transformation of the existing energy systems and infrastructure is a slow process too. However, we are not using the natural climate solutions that already available to us. For instance, we should be willing to use them if we want to limit warming to less than 1.5⁰ C.



Figure 5: Drought Area

Our lands enriched with an untapped opportunity – both in storing carbon and helps reducing carbon emissions. Our forests, grasslands, and wetlands are the key to natural climate solutions, and can help address climate change in the following ways:

- Reducing CFC gas emissions
- Reusing additional carbon dioxide from the atmosphere
- Improving biodiversity.

Scientists, Justin Adams (Justin Adams, 2012) in new study produced by the Nature Conservancy, have addressed the most promising ways to mitigate climate change. These are what we call “natural climate solutions”: the conservation, restoration, and improved management of land, to increase carbon storage in landscapes worldwide.

Secondly, it also emphasized reforestation, as an estimated 4.9 billion acres of land has been deforested or destroyed globally. According to their study, the world could capture 3 G tons of CO₂ / year. Thirdly, it has highlighted agricultural reform, as the food sector is a key contributor to climate change estimated emissions, and which will keep positive outcome on soil health and deforestation.

We have a single nature-based climate mitigation opportunity, and that is reforestation. Also addition, reforestation provides cleaner water, cleaner air, flood control, and more fertile soils, not to mention wood products and yield of crops.

Bangladesh Rice Research Institute is working to devise salt-tolerant strains of food crops, especially in the paddy field. Scientists (Ali et al., 2014) from BRRI are also in progress to introduce to breed a Gene on the rice chromosome that adapts salinity tolerance at the seedling stage—into different varieties of rice. The institute is also developing water cycle technology to capture rain water during the monsoon, when soil salinity is lesser. This stored water can be used for irrigating rice during the drought.

In 2009, The United Nations Development Program (UNDP) had introduced ‘Community-based Adaptation to Climate Change through Coastal Afforestation (CBACC)’ in the coastal areas of Bangladesh. This program is an example of drawing together climate change adaptation and economic development through 9,000 hectares of mangrove afforestation.

Later, in 2016, UNDP initiated the ‘Integrating Community-based Adaptation into Afforestation and Reforestation (ICBA-AR)’ program to reduce the vulnerability of communities to the adverse impacts of climate change. With the help of the Bangladesh Forest Department, this project aims to reforest 650 hectares of degraded mangroves with 12 different species to enhance the resilience of mangrove through diversification.

In order to resolve climatic issues, such as the ones described above, the FFF (Fish-Fruit-Forest) model implemented in Bangladesh. This model provides agricultural, fisheries, livestock and innovative livelihood to support the underprivileged people.

Bangladesh has also taken adaptation initiatives to grow crops in flood- prone areas. A single example of this adaptation activity is the ‘floating bed agriculture,’ where harvest and vegetables can be grown on floating platforms during the inundation of land. To reducing Vulnerability of climate Change (RVCC) was the first project of its kind on Community Based Adaptation (CBA) to climate change.

The GoB (Government of Bangladesh) is appealing for more aid from the first world countries to help Bangladesh adapt and avoid calamity. With the help of the development partners and

the World Bank, the Government of Bangladesh (GoB) established the Bangladesh Climate Change Resilience Fund (BCCRF) in May, 2010. This fund is enabling the GoB to channel in over US\$ 188 million to millions of Bangladeshis to fight the effects of climate change. GoB has another fund called the Bangladesh Climate Change Trust Fund to address the climate change effects. It has allocated US\$ 350 million from its own resources for the last five years consecutively from 2009 to 2013.

The GoB is also trying to introduce clean energy sources instead of conventional sources that are responsible for emitting GHGs. It has already targeted 5% of the total electricity generation from renewable sources by 2015, of which 500 MW will be from solar. Along with this, the GoB established a huge project to generating electricity by nuclear energy at Ruppur and Matarbari, Cox's bazar. These projects will help significantly to the reduction of carbon emission in the atmosphere. In this regard, the following measures recommended:

- Decrease in Carbon emitting activities. High tax and punishment imposed to whom; those are not following the rules and regulations.
- Uses of AC should be discouraged and should seek natural solutions.
- Illegal deforestation should be banned and should encourage for reforestation both nationally and voluntarily.
- Encourage using Eco friendly transportation, and local the government should impose low or NO tax for such transportation.
- The government should reduce duty or incentive on the import of all the energy-efficient products.
- Should implement extensively alternative power sources e.g.: solar/wind/ Hydroelectric etc.

Table 3: Major natural disaster in Bangladesh and their adverse effects

Year	Affected area	Loss of lives	Speed/ Height of tide	Influence of El Niño and La Niño
1963	Chittagong, Noakhali, Cox's Bazar	11520	10' -20'	Active El Niño
1970	Whole coastal area	5000	Gusty wind with 220 km	Active La Niño
1985	Chittagong, Noakhali, Cox's Bazar	11069	10' -15'	Active La Niño
1991	Whole coastal area	150000	Gusty wind with 225 km	Active El Niño
1997	Chittagong	15000	Gusty wind with 224 km	velocity Active El Niño
2008	Coastal areas	12000	3332 Gusty wind with 220 to 230 Km	Active La Niño

CLIMATE CHANGE AND HUMAN HEALTH – RISKS IN BANGLADESH

Health impacts of extremes climatic factors are an urgent determinant of various vector-borne diseases, many enteric illnesses, and certain water-related diseases. Relationships between year-to-year variations in climate and infectious diseases are most evident where climate variations marked and in vulnerable populations. The El Niño phenomenon provides an analog for understanding the future impacts of global climate change on infectious diseases.

Extreme climate events expected to become more frequent with climate change. These disruptive events have a huge impact on undeveloped countries. The two categories of climatic extremes are:

Simple extremes of climatic statistical ranges, such as very low or very high temperatures
 Complex events: droughts, floods, or hurricanes

The Pacific-based El Niño- Southern Oscillation (ENSO), an approximately semi-decadal cycle, influences much of the world’s regional weather patterns. Climate change is likely to increase the frequency and amplitude of El Niño. It illustrates well how climatic extremes can affect human health.

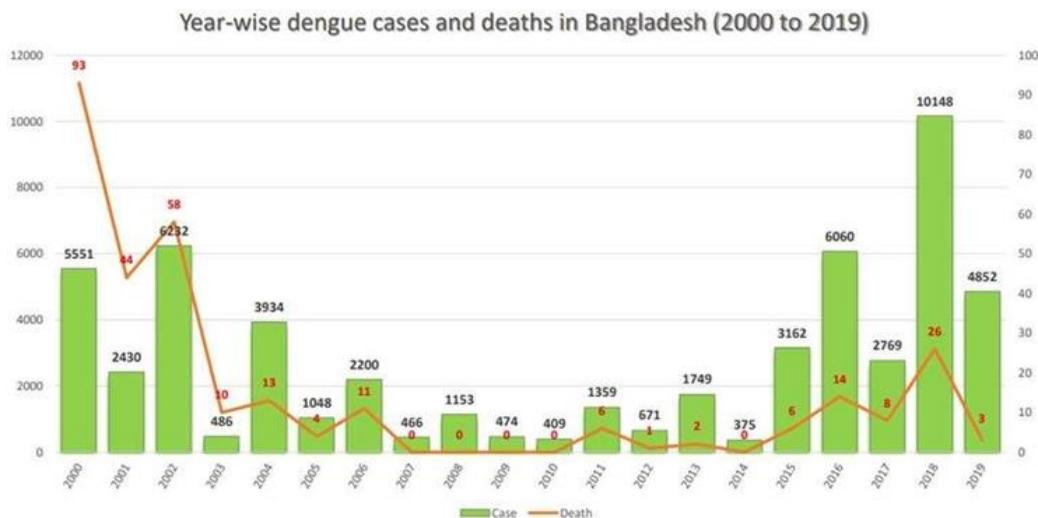


Figure 6: Dengue cases and death in Bangladesh

Climate change increases the mosquitoes, which spread malaria and viral diseases such as dengue and Chikungunya fever. Mosquitoes need access to shallow water to reproduce, and the adults need humid conditions for viability. Warmer temperatures enhance vector breeding and reduce the pathogen’s maturation period within the vector organism. However, very warm and dry conditions can reduce mosquito survival.

Malaria and Dengue are two most common illnesses in tropical and subtropical regions. Due to lack of protection, immunity, and weather condition, these diseases often reach to the alarming situation.

Dengue is the most important viral disease of humans, occurring in tropical and subtropical regions, particularly urban settings. ENSO affects dengue occurrence by causing changes in household water storage practices and in surface water pooling. Between 2015 and 2019, the annual number of dengue epidemics in the South Pacific positively correlated with La Niña conditions (i.e., warmer and wetter).

People in Bangladesh have been made vulnerable to increased risk of diseases, such as cholera, dengue, cardiovascular, respiratory diseases, and malnutrition due to food scarcity and reduction in food production (ICDDR, 2011) due to climate change. In 2030, the estimated risk of diarrhea will be up to 10% higher in some regions than if no climate change occurred (Kafiluddin, 2005). National Centre in HIV Epidemiology and Clinical Research,

NCHECR of Australia, warns that climate change will also lead to lack of nutrition, putting people with perilous immune systems at more risk of dying of HIV, as well as contracting and transmitting new and unusual infections (Daily Star, 2010).

The threat of prolonged flooding will also decrease the space available for the cultivation of crops and farming of animals, which eventually will lead humans and animals in migration to urban areas, and beyond. Which will bring further pressure on our densely-populated country, more and more people will be living in slums and accelerate urbanization, which, in turn, will result in strong competition between Urban people for access to social and economic opportunities (ICDDR, 2011) and, increase crime, which will lead to a social instability (Daily Star, 2011b). Between 35 and 77 million of the 165 million Bangladeshis, are at risk of drinking contaminated water. According to the British medical journal "The Lancet," up to 77 million people have been exposed to arsenic that can cause 200,000 to 270,000 deaths from cancer and more unpredictable rainfall in the Ganges-Brahmaputra- Meghna system during the monsoon, and increased melting of the Himalayan glaciers. International Federation of the Red Cross and Red Crescent Societies in 2000 identified river erosion as the alarming concern for Bangladesh (New Age, 2011c).

RISING ON SEA LEVEL: THE VITAL CONCERN

Bangladesh's coastal region witnessed a dramatic sea-level rise over the last three decades. The ensuing sea-water intrusion is giving rise to salinity in coastal drinking water with severe health consequences for the neighboring populations (Daily Star, 2011b). About 53% of Bangladesh's coastal areas are now affected by salinity. Millions people of Bangladesh is threatened by riverbank erosion and severe droughts (Daily Star, 2011c). During the current century, climate change increases the risk of more recurrent and severe floods through higher river flows, resulting from high and more unpredictable rainfall in the Ganges-Brahmaputra-Meghna system during the monsoon and increased melting of the Himalayan glaciers. International Federation of the Red Cross and Red Crescent Societies in 2000 identified river erosion as the largest concern for Bangladesh (New Age, 2011c).

Table 4: Disaster risk period in Bangladesh

Type of calamity	Period
Flood	June to September
Excessive rainfall	July to October
Tornado	March to June
Cyclone	April to May and October to November
Flood with tide	April to May and October to November
Cold wave	December to February
Drought	March to May

The International Panel on Climate Change (Stocker, 2001), reports that groundwater, crop soils, and many rivers are likely to become increasingly saline from higher tidal waves and storm surges as a result of climate change effects. Bangladesh's salinity intrusion threatens larger future incursion, for numerous reasons.

These include reduced freshwater flows into the Padma River caused by the Farakka Barrage; climate change-induced decreases of dry season rainfall, stronger and more frequent cyclones and sea-level rise, and intensified saltwater shrimp farming (Daily Star, 2011b). The resultant salinity will affect crops and need shifts to alternative land use (Streatfield, 2008).

RECOMMEND POLICY FOR PREVENTION

In the UN Conference on Climate Change held from 28 November to 9 December 2011 in Durban, South Africa, Bangladesh emphasized the urgency of establishing the adaptation fund body as a means of getting quick and direct access to the fund from 2012 (Helal-uz-Zaman and Islam, 2012). According to BCCSAP 2009 approval, we should follow the strategy and examine which are the urgent tasks that need to be taken up and may be completed by and large within the next few years. Under the following sub-heads the policy recommendation may be categorized. Government of Bangladesh, in 2009 recommended taking actions under each sub-heads.

Research and Knowledge Management: Actions under this title may include:

- National center for research, knowledge management, and training
- Climate change modeling and their impacts
- Preparatory studies for adaption against sea-level rise (SLR).

Decrease the amount of Carbon level:

- Encourage in Renewable energies using.
- Established Waste management plants
- Reforestation
- Using the expansion of energy-saving devices or appliances
- Improving echo friendly transportation

Disaster Management:

- The following steps need to apply for disaster management:
- Disasters warning
- Public awareness
- The growing job market for the victims.

CONCLUSION

This article has discussed the effects of global warming in Bangladesh and its initiatives to lower the after effect both in Health and Economic sector. Bangladesh received the climate change initiative award 'Lighthouse Activities 2013' for its outstanding contribution to climate change adaptation. It has shown its urgency to move towards the green sources of energy. At the end of November 2013, about 2,677,896 solar home systems (SHS) s installed which mainly covered rural areas. The GoB has taken different initiatives to face the challenges of global warming. Becoming a developing country, it cannot manage the required funds for this. The developed countries of the world should come forward to help the underdeveloped countries in these aspects. Moreover, NGOs, the GoB, and the civil society should act together to raise awareness among the mass people about global warming, its mitigation, and adaptation techniques.

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