

Global Climate Change: Impact on Agro-Sector of Bangladesh

NIRMAL CHANDRA BHAKTA¹

HASAN TAREQ KHAN

AMITABH CHAKRABORTY

Abstract

Bangladesh is one of the most climate vulnerable countries in the world and will become even more so as a result of climate change. Floods, tropical cyclones, storm surges and droughts are likely to become more frequent and severe in coming years. These changes will threaten the significant achievements that Bangladesh has made over the past 25 years in increasing income and reducing poverty. Not only this, it will also make it more difficult to achieve the Millennium Development Goals (MDGs). It is essential for us to be prepared for adapting to climate change and safeguard our future well-being. One thing must be mentioned that the most important sector of our economy, the agriculture sector, is in the most vulnerable position due to the effects of climate change.

Over the last 39 years, the Government of Bangladesh, with the support of development partners, has invested over 10 billion US\$ (at constant 2007 prices) to make the country less vulnerable to natural disasters. These investments include flood management schemes, coastal polders, cyclone and flood shelters, and the raising of roads and highways above the flood level. In addition, Governments at different times have developed state-of-the-art warning systems for floods, cyclones and storm surges and are still trying to expand the community-based disaster preparedness. Climate resilient varieties of rice and other crops have also been developed. The

¹. Authors are General Manager & Assistant Directors of Bangladesh Bank, respectively. Opinions expressed in the paper are their own, and in no way reflect the official position of Bangladesh Bank.

challenge Bangladesh now faces is to scale up these investments to create a suitable environment for economic and social development of the country and to secure the well-being of our people, especially the poorest and the most vulnerable groups, including women and children.

1. Introduction

The climate system is highly complex. It consists of 5 major components, namely- the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere along-with interaction between them. Whereas global climate change refers to any change in global climate over time and it may be due to natural variability or as a result of human activity. Bangladesh is gifted with a large area of fertile soil. Almost every region of the country is favorable for crop cultivation. Since independence, GDP has more than tripled in real terms, food production has increased three-fold, and the population growth rate has declined from 2.9% per annum (in 1974) to 1.4% per annum (in 2006). The country is now in a state to be called food-secure. Over last two decades, growth has accelerated and Bangladesh is on track to become a middle income country by 2020. In four out of the last five years the economy has grown at over 6%. Between 1991 and 2005, the percentage of people living in poverty declined from 59% to 40% and the country's Human Development Index (HDI) improved from 0.347 (in 1975) to 0.547 (in 2005). Child mortality has fallen substantially and gender parity in primary education can be said to have been achieved. Despite these successes, more than 50 million of our population still live in poverty. Most of these people live in remote or ecologically fragile part of the country, such as 'chars' and cyclone-prone coastal belts, which are especially vulnerable to natural disasters. In the recent PRSP (2009-2011), the Government of Bangladesh reaffirmed its commitments to the Millennium Development Goals (MDG) targets, including halving poverty and hunger by the year 2015, through a strategy of pro-poor growth and climate-resilient development. Climate change will severely challenge the country's ability to achieve the high rates of economic growth needed to sustain these reductions in poverty. In coming years it is predicted that there will be increasingly frequent natural disasters, which will disrupt the life of the nation and the economy.

2. Rationale of The Study

Bangladesh is one of the few countries, which are most vulnerable to climate change environmental hazards. This will cause frequent floods, tropical cyclones, storm surges and droughts in the country. Already, the climate global change has

caused a grave concern to the country's agriculture, irrigation, navigation, ecology, bio-diversity, environment and underground water levels. Rainfalls, floods, cyclones, droughts, cold and hot spells, sea and surface warming, water contamination, water and soil salinity, degradation of aquatic systems, silting and drying up of rivers, lowering of underground water levels are the effects of climate change, causing immense harm to our agriculture. Major part of our population depends on agriculture sector for their earning, directly or indirectly. So, the effects of the climate change on the agriculture sector of Bangladesh will obviously fall on these people. The present situation of climate change is causing rise in temperature, increase in CO₂ level, sea level rise etc., which are also considered as agricultural vulnerabilities as agriculture is strongly interrelated with climate factors. Governments of all countries most vulnerable to climate change risks should be prepared to face these challenges. The present research is initiated to examine the fuller impacts on Bangladesh of climate change and recommend measures, which are critical for facing the climate change situation.

3. Objectives of The Paper and Methodology

The objectives of this paper are:

- (a) To provide a view of Global scenario of climate change, including that in Bangladesh.
- (b) To provide some information regarding the **Global Climate Change: Impact on Agro-sector of Bangladesh** so that the interested stakeholders/people/Government can adequately address the existing and forthcoming impacts of climate change on the agriculture sector.

The paper is based on descriptive research. The authors have gathered and reviewed all available documents and reports on this issue in order to be able to make meaningful recommendations for the government and policy makers. Relevant data have been collected from related agencies, including Bangladesh Bureau of Statistics, Bangladesh Bank, Bangladesh Agricultural Research Center, Ministry of Agriculture, Ministry of Environment and Forestry, etc.

4. Global Climate Change: A Burning Issue for The Whole World

Global climate change being a real burning issue for whole world, a global summit, namely United Nations Climate Change Summit, 2009 was held in Copenhagen, Denmark. In 2008, the International Union for Conservation of Nature (IUCN) ranked a total of 130 countries on the basis of their *Environmental*

Treaty Ratification, i.e., total number of ratified environmental treaties by these countries was considered. The World Bank in their *World Development Indicators 2008* published a list of 130 countries considering their carbon di-oxide emission per capita in metric tons (in increasing order). The list reveals that some developed countries like UK, Japan, Russia, Singapore, Australia, Canada, and USA, and some major oil-producing countries like Saudi Arabia, Brunei, UAE, Kuwait, and Qatar are the highest emitter of CO₂. This means that the developed countries and a few high-income oil-exporting countries are emitting most of the CO₂ in the atmosphere and they are mainly responsible for this adverse situation of global climate change. But, ironically, countries like Bangladesh, Maldives, etc. which are least responsible for this global warming will face most of the suffering caused by this change.

For purpose of this paper, we consider the case of Bangladesh, a country which is least responsible for global warming but which will be drastically affected by global climate change. According to experts, climate change will cause an increase in CO₂ (carbon di-oxide), as a result of which both the global temperature and sea-level will rise abnormally. Also, the frequency of natural calamities like cyclones, floods, abnormally high/low rainfall, etc. will increase. As published in "The Independent" of 13/9/2009, excessive disintegration of ice during the period 2006-2008 caused the sea-level to rise by 0.2 inches. This is, in fact, a warning for us, a warning to being immediately conscious regarding protection of the global environment and to keep it suitable for living. To tell frankly, the industrially developed countries are mostly responsible for this. The 'green-house' gas produced by these countries has caused global warming and is responsible for frequent natural disasters worldwide. Climate change is a burning issue right at this moment, at least for a country like ours. It is causing suffering for billions of poor people around the world. A lot of activities are being undertaken regarding this matter. We could see that the present government is very much aware of this challenge, because it may have an impact on all spheres of life and society in Bangladesh. It is important to learn about the state of knowledge we have in climate change, about the causes and origins of climate change, about vulnerability and the most likely impacts of climate change, and the responses to climate change at international levels and at national levels in Bangladesh.

5. Agriculture is Strongly Interrelated With Climatic Factors

Agriculture is strongly interrelated with climatic factors. Agriculture vulnerabilities are the rise in temperature, and the increase in CO₂ level, sea level rise, etc. Experts observed that climate change will increase temperature, decrease

the availability of fresh water, scale up the sea-level, trigger glacial melting in the Himalayas, trigger the intensity and frequency of natural calamities and compel shifting of cropping zones in Bangladesh affecting the agriculture sector.

The climate of the country is strongly influenced by monsoon. Although it occupies 7% of the combined catchment area of the *Ganges-Brahmaputra-Meghna* river basin, the country has to drain out 92% of the flow into the Bay of Bengal. Too much water in the monsoon affects different sectors, livelihoods and food security. According to experts, monsoon rainfall will increase by 11% by 2030 and 27% by 2070. Also, the general rise in surface average temperature will increase to 1.3°C by 2030 and 2.6 °C by 2070. The number of rainy days will increase by about 20 days.

The implication of this climate change scenario is that about 18% of the currently low flooded areas will be susceptible to higher levels of flooding while about 12% to 16% new areas will be at risk from inundation. On an average about a quarter of the country's landmass is currently flood prone in a normal hydrological year, which may increase to 39 percent, while the frequency of a catastrophic flood (affecting over two-thirds of the landmass of the country) could increase under climate change scenarios. Prolonged flooding can effectively reduce overall the potential for HYV Aman production.

Again, during the post-monsoon to pre-monsoon cycle, rainfall diminishes while temperature increases. Low rainfall runoff reduces river flows; consequently salinity penetrates along the coastal rivers. A combination of increased temperature and reduced rainfall results in an increase in evapo-transpiration, detrimental to crop growth.

Under climate change scenario projections, already low rainfall in the dry season will be further diminished. However, winter and pre-monsoon temperatures will rise significantly. The resulting effect will be a sharp rise in evapo-transpiration. Diminishing rainfall will further reduce available flows in rivers. As a result, salinity will penetrate inland, restricting choice for the most preferred crops. Also, the lowering of rainfall runoff will either limit irrigation or put increased economic constraints on the already poor farmers. Production of wheat, HYV Aus and Boro might no longer be economically suitable under climate change. Increased surface temperature will lead to more carbon release from the topsoil, which in turn will reduce fertility of soils.

Increased water demand for irrigation will lead to increased withdrawal from the already lean surface water systems leading to a decrease in lean season flow in the

rivers. An additional quarter of a million hectare land will become affected by salinity, on top of the 3.05 million hectares already affected. This will force farmers to grow crops of economically lesser returns.

Effects on agriculture are loss of crop coverage and decrease in crop yields, enhanced land degradation, loss of soil productivity, more infestation of pests and diseases, soil salinity build-up, loss of agro-biodiversity, erosion of land mass, increased intensity of devastating floods, irrigation water scarcity and lack of quality water, threatened food security and deterioration of livelihood of the poor living in the fragile ecosystem, etc.

Temperature, which is one of the main factors of climate, is closely associated with agricultural production. In agriculture, rice production is affected by deviation in temperature. Climate change will increase the temperature, which will bring changes in rice farming activities and affect crop yields. Various studies indicate that a rise of 10°C to 20°C, in combination with lower solar radiation, causes sterility in rice spikelet, and high temperature was found to reduce yields of HYVs of Aus, Aman and Boro rice in all study locations and in all seasons in Bangladesh (Bangladesh National Adaptation Program of Action 2000). As temperature has an influence on plants, temperature change will modify rate of pollination and flower blooming, seed distribution, plant growth etc., as a result of which the production of rice, wheat, and maize will decrease. Climate change will act as a factor for sea level rise in the coastal regions of Bangladesh. This will cause an increase in salinity in water and soil in the coastal regions. Growth of standing crops (like rice, jute, sugarcane etc.) will be affected due to soil salinity, and this will limit overall crop production in the coastal regions as well as make the soil unsuitable for many potential crops.

It is feared that due to climate change, humidity, wind flow, and temperature in Bangladesh will change. These three climatic mechanisms, in changing conditions, cause an increase in insects, pests, diseases and microorganisms in agriculture, and accordingly, crop production will decrease. The production of potato, brinjal, lady's finger, tomato, cauliflower, sugarcane, groundnut, ginger, onion, garlic, banana, date, plum etc. will decrease. The increase of diseases, pests and insects will also affect transportation and storage of different crops and vegetables. Less rainfall during winter due to climate change will lead to a decrease in moisture content of the topsoil as well as less recharging of the ground water. Higher evaporation will cause drought-like conditions. In summer, increased precipitation will worsen the flood situation, which will have negative effect on agriculture production (Bangladesh State of the Environment, 2001).

Climate change will lead to extreme weather, which will increase the burning or destruction of crops. Due to climate change, occurrence of tornadoes, cyclones and hailstorms will be greater than before. It will hamper the total agriculture production. Bangladesh is an agro-economy-based developing country. There is no doubt that its agriculture will be badly affected by the climate change. Loss in agriculture would increase many social problems, and force the import of food, which will require spending of hard currency. Therefore, from now on, adaptation and awareness about the impact of climate change in agriculture, and many other sectors, are imperative for the development of Bangladesh. In this respect, the government, the people of Bangladesh, and international bodies will have to work together to face the climate change problem.

6. Present Affects of Climate Change- A Short Overview of Global Situation

The Climate Risk Index (CRI) was presented by the NGO Germanwatch, during the second day of UN Climate Change Summit, 2009 in Denmark. This index estimates that throughout the world, 6 lac people have died in 11,000 of natural disasters over the past 10 years. In 2008, there were 654 disasters worldwide, causing around 93,700 deaths and cost of damage worth US\$123 billion. As per information of International Rice Research Institute (IRRI), if the temperature rises by 1° C at night time, the production will fall by 10%. If the present situation continues, the production of paddy will decline by further 8% and the production of wheat by 32%. According to Germanwatch and Munich NatCat SERVICE, ten countries most affected from extreme weather events during the period 1990-2008 were: Bangladesh, Myanmar, Honduras, Vietnam, Nicaragua, Haiti, India, Dominican Republic, Philippines and China.

If we have a look through the recent events, we can see that the southern parts of USA, mainly in Texas and Florida, were hit by cyclones several times. Indonesia and Srilanka were badly hit by tsunami. Many people died in China because of huge floods and landslides. Many more unwanted natural calamities took place in different places of the world in the recent period.

Citing an Intergovernmental Panel on Climate Change (IPCC) report, which said that South Asia might experience a 30 percent drop in agricultural production by 2050, ActionAid said the slide was already evident. Food price volatility, which could be compounded by increasing climate change variability, is likely to be a serious problem for the foreseeable future, according to Action Aid. The report said that support for sustainable climate-resilient agriculture was key to enabling

farmers to increase food security and adapt. Meanwhile, in an effort to address this, farmers have taken to raising their vegetable beds, maintaining the soil's moisture by covering the seed beds (and the manure around plants) with straw and leaves to prevent excessive evaporation and erosion, and increasing the amount of organic material in the soil.

7. Effects of Global Climate Change on Agro-Sector of Bangladesh

Presently, climate change is affecting the country in many ways. For instance, rising sea levels are causing some agricultural land in coastal areas to become more saline, reducing both the quality and quantity of the produce available. In southern districts where land is only centimeters higher than the brackish estuarine water, large swathes of agricultural land are becoming arid. Crop yields are shrinking as a result of increased salinity due to rising water levels in the Bay of Bengal. Agronomists and agricultural experts now worry that the creeping salinity will engulf more and more land in this low-lying nation. Every year, production of paddy is 5 lac tons lower than the requirement.

Ghulam Mohammad Panaullah, former research director of the Bangladesh Rice Research Institute (BRRI) warned "The impact of climate change on agriculture is undeniable and will most certainly worsen if governments and donors fail to take appropriate steps right now". He also said that in coastal areas, cocoa nut and betel nut trees do not yield even half of what they did two decades ago, while banana groves are dying out in their hundreds. At the same time, vegetables sold in the urban markets of Dhaka, Khulna and Rajshahi are deemed tasteless and fetch low prices, compared to produce from salt-free regions. In a country where almost 80 percent of the populations live in rural areas, this is bad news. According to the World Bank, Bangladesh's agriculture sector accounts for about 22 percent of gross domestic product (GDP), with another 33 percent of GDP derived from the rural non-agriculture economy, which is also linked to agriculture. Around 54 percent of the rural population is employed in agriculture. According to our climate change experts and agricultural scientists, the variability of temperature and rainfall pattern in our country exhibits early signs of climate change. The country experienced 32% less rain than normal during the June-July period in 2008, the peak time for transplanting Aman paddy. If the pattern of rain and winter keeps changing due to global warming, there is no doubt that the country's agriculture sector will be hit the hardest.

Effects of climate change on the country's agriculture sector have not been assessed and mitigation efforts not determined precisely although extreme

weather events are taking their toll on Bangladesh's agriculture, heavily dependent on climate conditions. Almost all the sub-sectors of agriculture — crops, fisheries, livestock, water resources bio-diversity and livelihoods — are exposed to climate change effects, say experts on the basis of available research, forecasting the impacts in various ways and degrees at different parts of the country. Much delayed and less-than-average monsoon rain badly affects rice farming in Bangladesh almost every year and fears of flash floods either delay or make uncertain more than one crop. Climate change is likely to reduce agricultural productivity by at least 30 per cent in countries such as Bangladesh, one of the most vulnerable to global warming.

'The high incidence of poverty and heavy reliance of poor people on agriculture and natural resources increase their vulnerability to climate change,' observed the government's draft Climate Change Strategy and Action Plan. But, Bangladesh is yet to formulate and adopt detailed action plans to face the scourge of climate change in the coming years. The initiatives taken so far by the agriculture ministry, which deals with agriculture sector, are limited to literatures that touched on the ideas such as floating vegetable gardens and issues of agricultural research programs to develop high-yielding crop varieties, which are tolerant of salinity, droughts and floods.

Even with the best efforts to mitigate climate change, it is inevitable that poor farmers will be affected, noted a recent paper on 'Agriculture and Climate Change: An Agenda for Negotiation in Copenhagen' prepared by the International Food Policy Research Institute (IFPRI), though it could not predict exactly what would be the effects on agriculture. 'Water sources will become more variable, droughts and floods will stress agricultural systems, some coastal food-producing areas will be inundated by the seas, and food production will fall in some places in the interior,' read the IFPRI research paper.

According to the Global Climate Index (CRI), 2010 published on the edge of United Nations Climate Change Summit held in Copenhagen, natural disasters have caused the greatest loss of life in Bangladesh over the last decade than any other country of the world. An average of 8,241 people died each year in 244 instances of extreme weather conditions in Bangladesh with cost of damage to the tune of US\$2,189 million a year and loss of GDP by 1.81 percent.

Economic costs associated with natural disasters, including extreme weather events, have increased 14-fold in agriculture since the 1950s, an expert of the UN Food and Agriculture Organization told the World Climate Conference that was held in Geneva. The challenges of chronic and acute weather impacts need greater

attention at a time when agriculture has an increased role to play in the supply of food, animal feed, fiber and energy, said Alexander Mueller, an assistant director-general of the global body. Agriculture still is the principal livelihood of 70 per cent of the world's poor.

'Climate change is likely to deal severe blows to Bangladesh's agriculture. We don't know yet exactly what will be the adverse effects, especially on livelihoods,' said Khawaja M. Minnatullah, a climate change expert at the World Bank Dhaka office. He suggested that national programs on mitigation and adaptation of climate change targeting agriculture should focus on cropping in coastal areas, protection of the Sunderbans, salinity intrusion, droughts and fall in underground water level, environment in char and haor areas, and soil erosion in Chittagong Hill Tracts.

8. Some Important Reports

It would not be out of place to flash here some AFP news, published in the press worldwide, on the impact of climate change. One AFP News captioned **Over 100 icebergs drifting to New Zealand** (NEW ZEALAND), says that, more than 100, perhaps hundreds, of Antarctic icebergs were floating towards New Zealand and these were, as per the experts' opinion, the remains of a massive ice floe which split from Antarctic as sea and air temperature rise due to global warming. If the rise of temperature continues, this will occur many more times in the future. Environmental group WWF said that flooding in the world's most port cities caused by melting icecaps could cause up to 28 trillion US\$ in damage in 2050. Ulrike Saul, the In-charge of climate and energy for WWF, Switzerland, told that if the temperature rises between 0.5 to 2 degree Celsius between now and 2050, then it is possible that the sea level will rise by half-a-meter bringing major financial damages.

Another AFP news from Paris, captioned **Antarctic ice loss vaster, faster than thought**, reports that the East Antarctic ice-sheet, once seen as largely unaffected by global warming, has lost billions of tons of ice since 2006 and could boost sea levels in the future (as per a new study- Nature Geo-science published on Sunday, Nov. 22, 2009). Scientists are worried that rising global temperatures could trigger a rapid disintegration of West Antarctica, which holds enough frozen water to push up the global ocean watermark by about five meters. Many of these scientists said that even if heat trapping CO₂ emissions are curtailed, the ocean watermark is more likely to go up by nearly a meter, enough to render several small island nations unlivable and damage fertile deltas home to hundreds of millions.

9. Findings

Climate change is affecting the whole world, more or less. According to experts, 20% of Bangladesh's land will go under water within the next century. Already we are facing many natural calamities like flood, cyclone, drought, storm surge, heavy rain-fall, etc. A number of cyclones, including 'Sidr' on November 15, 2007 and 'Aila' in May, 2009, hit the country. Johan Harry, a world-famous journalist wrote a report in 'The Independent' (a British newspaper) regarding the vulnerability of Bangladesh to the climate change and environmental hazards. Mr. Harry wrote that there would be writing in the tomb-stone 'Bangladesh, 1972-2071: Born in blood, died in water'. Even seven Nobel-winning scientists of USA have expressed their worries about the vulnerability of countries like Bangladesh and Maldives.

Bangladesh Prime Minister has asked the international community to assist the country for facing these odds. Already, Bangladesh has on its own taken a 100 million US\$ program in this regard. The G-8 countries have decided to form a 200b US\$ fund for assisting the developing countries to face their food deficit caused by climate change. Anyway, whatever happens, we must fight the consequences of climate change that fall on our agriculture and other sectors. To face this, like other developing countries, we will need financial aid. In the Commonwealth Conference of November, 2009 a proposal was placed for 10 billion US\$ of aid to the poor countries for facing the climate change situation. More than 192 nations met in Copenhagen on 7-18th December of that year to hammer out a global climate deal to curb climate change and help poor countries like Bangladesh to cope with its consequences.

10. Conclusions and Recommendations

10.1 Conclusions

University of Texas professor Jianli Chen and colleagues analyzed nearly seven years of data on ocean-icesheet interaction in America. Covering the period up to January 2009, the data was collected by the twin GRACE satellites, which detected mass flows in the ocean and polar regions by measuring changes in Earth's gravity field. They found that

- West America dumped an average of 132 billion tons of ice into sea each year, give or take 26 billion tons.
- East Antarctica is likewise losing mass, mostly in coastal regions, at a rate of about 57 billion tons annually.

- Acceleration of ice loss in recent years over the entire Antarctic continent indicated that the continent would soon be contributing significantly more global sea level rise.

Another study published on November, 2009 in the journal *Nature* reported an upwardly-revised figure for Antarctic temperature during prior ‘inter-glacial’ warm periods such as our own that have occurred roughly every 1,00,000 years. During the last interglacial, which peaked some 1,28,000 years ago, called the Eemian Period, temperatures in the region were probably 6^o Celsius higher than today, which is about 3^o Celsius above previous estimates.

Experts in a seminar organized by the Institute of Water Modeling (IWM), a trust established by the Bangladesh government, said salinity in the water is apprehended to become 5-7 parts per thousand (ppt) by 2050, posing threats to food production. They said a 60 centimeter rise in the sea-level is apprehended in Bangladesh coastal zone by the same year that will submerge 18% of the nation’s landmass. They also said salinity will intrude more landmass especially during dry season due to sea-level rise.

The information mentioned above is enough to describe the effects of climate change. This will have a deep impact on agriculture. *Effects on agriculture are* loss of crop coverage and decrease in yield of crops, enhanced land degradation, loss of soil productivity, more infestation of pests and diseases, soil salinity build-up, loss of agro-biodiversity, erosion of land mass, increased intensity of devastating floods, irrigation water scarcity and lack of quality water, food insecurity and deterioration of livelihood of the poor living in the fragile ecosystem, etc. As an agriculture-based country we should consider these effects very seriously and take proper actions to face the challenges. After all, Bangladesh should not suffer for the fault of others who are responsible for global warming and climate change.

10.2 Recommendations

As a result of global climate change, mostly caused by the industrially developed countries, the major sector i.e., agro-sector of our economy will be adversely affected. So, following recommendations may be considered while formulating future policy on climate change and its impact on our agro-sector:

Measures recommended for paper reducing risks include local level planning, community based action plans, upgrading technology bases and innovations, motivation and capacity building, and in extreme cases, restructuring of agricultural production systems and cropping patterns.

Development and adoption of improved agricultural practices may be considered to increase agricultural output and ability of small and marginal farmers to adjust to the adverse effects of climate change.

Plans for ensuring augmented flow of fresh water in the major rivers in Bangladesh, the world's largest delta country, should be taken in consideration. This is vital for preventing salinity level and to shield the country's agriculture sector against climate change shocks. The positive sign is that the Bangladesh government, as part of its all-out efforts to check climate change-induced salinity intrusion, has decided to go for capital dredging in the country's major rivers.

Some policy options suggested by experts are fixing priorities keeping track of the vulnerability index, empowering local actions, forming local level coordinating body involving GO/NGO, and CBOs, activating local government institutions on climate change impact, generating fund for community operations, developing networks to reach those who have little or no access in the vulnerable areas.

An intensive international discussion should be initiated to claim compensation for countries, including Bangladesh, which are being adversely affected by global climate change.

Stricter restrictions over the use of non-disposable synthetic bags may be considered because these have a damaging effect of reducing fertility of agriculture land.

A Social and Environmental Management policy guideline and an Operational Manual for FI financed projects should be developed, consistent with Bangladesh Environmental and Social Assessment laws.

Bibliography

1. Govt. of Bangladesh (1998). *Fifth Five-Year Plan*, Planning commission, Dhaka.
2. Bangladesh Bureau of Statistics. *Statistical year book of Statistics: 1975 & 2007*.
3. Govt. of Bangladesh (2007) *Bangladesh Economic Survey, 2007*, Ministry of Finance.
4. *Bangladesh Climate Change Policy, 2008* Ministry of Environment & Forests
5. People's Daily On-line via Xinhua, Tuesday, November 17, 2009
6. "Food production loss from climate change", M. Abdul Latif Mandal, *The Daily Star*, December 03, 2009
7. *The Travel & Tourism Competitiveness Report 2009* (c) World Economic Forum
8. Wikipedia.
9. Internet.