

BANGLADESH CLIMATE CHANGE FACTSHEET



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BACKGROUND and DEFINITIONS

NIDOS members requested information sheets on the impact of climate change on a number of countries where NIDOS members work. This factsheet is one of these and, as with the others, covers the key climate impacts in the country, what the government there is trying to do in terms of climate adaptation measures and what other agencies including NGOs and NIDOS members are also doing. The following outlines briefly the current international approach to supporting Southern governments with Climate Adaptation programmes and the international context for climate change campaigns.



The United Nations Framework Convention on Climate Change (UNFCCC), which came into force in 1994, established the first intergovernmental framework aiming to tackle climate change. This treaty ensures that member states work collaboratively in order to develop initiatives that not only reduce negative impacts associated with climate change, but also build capacity to cope with effects of increasing temperatures. The *Kyoto Protocol*, enforced in 2005, enshrined this commitment in legislation and presented legally binding targets which imposed requirements for ratified member states to reduce green house gas (GHG) emissions. The commitment period for the Kyoto Protocol ends in 2012. <http://unfccc.int/2860.php>

National Adaptation Programmes of Action (NAPA) <http://www.napa-pana.org> In order to help developing nations plan for tackling the effects of climate change, the UN established NAPAs. NAPAs build the capacity of developing nations to identify priority actions required for effective adaptation to climate change. The aim of NAPAs is to decrease developing nation's climate change adaptation costs and climate change vulnerability more generally.

Next steps – Copenhagen At a UN Conference of Parties in Bali 2007, ratified member states made the crucial decision to begin new negotiations aiming to establish tougher targets on reducing GHG emissions and ensure that ratified member states fulfil obligations. Negotiations were reviewed in Poznan, Poland, in 2008 and will conclude in **Copenhagen, Denmark, on December 7th – 18th 2009** and should strengthen global ambitions and commitments to cut GHG emissions and also include mechanisms enabling developing countries to have low carbon development that does not undermine efforts to tackle poverty. Many NGOs are currently campaigning to ensure that Government commitments represent more than just fine words, but instead represent firm action.

CLIMATE CHANGE IN BANGLADESH

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<http://www.oecd.org/dataoecd/46/55/21055658.pdf>

AND:

BANGLADESH NATIONAL ADAPTATION PROGRAMME OF ACTION (NAPA)

<http://unfccc.int/resource/docs/napa/ban01.pdf>

4. Key impacts and vulnerabilities

This section summarizes the potential impacts of climate change on key sectors in Bangladesh. Information is drawn from the Country Study (BCAS and DOE, undated), the World Bank study (World Bank 2000), Huq et al. (1999), and other sources where available including the NAPA. Sectors are listed in order of the subjective assessment of their relative vulnerability to climate change.

The vulnerability of Bangladesh to climate change is the result of a complex interrelationship among biophysical, social, economic and technological characteristics of the country. Many anticipated adverse impacts of climate change including sea level rise, higher temperatures, more monsoon rain and run-off, potentially reduced dry season precipitation, and an increase in cyclone intensity would in fact aggravate many of the existing stresses that already pose a serious impediment to the process of economic development of Bangladesh. The climate change policy, particularly adaptation thus becomes a part and parcel of the development policies of the country.

4.1 Water resources

Water related impacts of climate change will likely be the most critical for Bangladesh – largely related to coastal and riverine flooding (see http://www.tyndall.ac.uk/publications/working_papers/wp63.pdf), but also enhanced possibility of winter (dry season) drought in certain areas.

4.1.1 Flooding

The effects of increased flooding resulting from climate change will be the greatest problem faced by Bangladesh. Both coastal flooding (from sea and river water), and inland flooding (river/rain water) are expected to increase. Flooding in Bangladesh is a regular feature and has numerous adverse effects, including loss of life through drowning, increased prevalence of disease, and destruction of property. This is because much of Bangladesh is located on a floodplain of three major rivers and their numerous tributaries. One-fifth of the country is flooded every year, and in extreme years, two-thirds of the country can be inundated (Mirza, 2002). This vulnerability to flooding is exacerbated by the fact that Bangladesh is also a low-lying deltaic nation exposed to storm surges from the Bay of Bengal. There has been a trend in recent decades of much higher inter-annual variation in the areas flooded.

The 1998 flood

The 1998 flood, one of the worst in recent memory, is an example of how vulnerable Bangladesh is to flooding. The flood was the result of three factors: 1) heavy rainfall and snowmelt in India and Nepal, 2) a 20% increase in rainfall in Bangladesh in its major rivers (the Ganges and Brahmaputra) and more than double rainfall in the Meghna, and 3) elevated tides in the Bay of Bengal from the monsoon. The third factor did not contribute to runoff, but the elevated tides blocked outflow of the swollen rivers into the Bay of Bengal. The flood inundated close to 100,000 km² of land (see Figure 5). More than 30 million Bangladeshis were displaced, with 20 million rendered homeless. Hundreds of people were killed directly by the floods, and several hundred thousand cases of diarrhea were confirmed.

Looking into the future, climate change is likely to exacerbate flooding for a number of reasons, including the following:

- **Increased glacier melt.** Higher temperatures will result in more glacial melt, increasing runoff from the neighbouring Himalayas into the Ganges and Brahmaputra rivers. Given the altitude of the mountains and the enormous size of the glaciers, this problem will most likely continue over the century. The problem could be of even greater concern as there is evidence to show that temperatures in the Himalayas (where the glaciers are located) are rising at higher rates, thereby contributing to enhanced snow melt.
- **Increased precipitation.** While this is not certain, the climate models tend to show increased precipitation, particularly during the monsoon season. For example, Mirza and Dixit (1997) found that a 2 °C warming with a 10% increase in precipitation (close to the mean GCM projection for 2100 June-July- August) would increase runoff in the Ganges, Brahmaputra, and Meghna rivers by 19%, 13%, and 11%, respectively. Climate Change modelling using the General Circulation Model (GCM) for Bangladesh is predicting a steady increase in temperature over the years, more droughts in winter and in contrast significant rises in monsoon rains in the summer, of 12% by 2030 and 27% by 2075. (Ahmed et, al., 1999)
- **Sea level rise.** Sea level rise will result in coastal flooding both under ambient conditions (given the low elevations of the coast), and even more so in the event of storm surges. It will also indirectly cause riverine flooding by causing more backing up of the Ganges-Brahmaputra-Meghna rivers along the delta.
- **Increased intensity of cyclone winds and precipitation:** Intergovernmental Panel on Climate Change concludes that there is evidence of a 5-10% increase in intensity (wind-speed) that would contribute to enhanced storm surges and coastal flooding. IPCC also projects a 20-20% increase in intensity of associated rainfall that would contribute to (rain-water) flooding both in the coast and inland as the cyclone makes landfall. These estimates however are for tropical cyclones in general and are not location specific. Assuming a positive correlation between sea surface temperature and tropical cyclone intensity, Ali (1996) calculated the effect of a repeat of the 1991 cyclone with a 2 °C increase (which causes a 10% increase in wind speed) and a 0.3 m sea level rise. He estimated that this would result in a 1.5 m higher storm surge that would inundate 20% more land than the storm surge from the 1991 cyclone.

4.1.2 Drought

It is also possible – though considerably more uncertain - that drought could increase under climate change. Drought is a recurring problem in Bangladesh: 19 occurred between 1960 and 1991. Drought is typically caused when the monsoon rains, which normally produce 80% of Bangladesh's annual precipitation, are significantly reduced. The southwest and northwest regions of the country are most vulnerable to drought. The estimates from the climate models do not yield a clear picture of how droughts will change. The estimated changes in precipitation are not significant. The models tend to show increased monsoon precipitation and annual precipitation, which could mean fewer droughts. But, a number of climate models estimate decreased annual precipitation, and the models tend to show reduced precipitation in the winter months. So the possibility of increased droughts in winter cannot be ruled out.

4.1.3 Salination of land and drinking water

Much of the future vulnerability due to climate change will not necessarily add any new climate related hazards to the already well known ones of floods, droughts and cyclones, but will enhance both the frequency as well as intensity of such climatic events in future. Particularly, the areas prone to the floods, cyclones and salinity intrusion all may increase in future. The climate related hazards will in turn be compounded by other factors including land use patterns, water management and control of river flows upstream.

Sedimentation and river bed rise

Some of the major rivers' beds may rise with more sedimentation. This will compound the impact of sea level rise upstream from the sea. Sea level rise, coastal flooding and increased salinity moving further inland up rivers will impact on drinking water availability and on useful agricultural land.

4.2 Coastal resources

4.2.1 Ecosystems

One of the likely adverse impacts of climate change is the loss of the Sundarbans which are the coastal mangroves that straddle the coasts of western Bangladesh and neighboring India. If the Sundarbans are lost, the habitat for several valuable species would also be lost. A 45 cm sea level rise would inundate 75% of the Sundarbans, and 67 cm sea level rise could inundate all of the system. Extrapolating from this information, Smith et al. (1998) calculated that a 25 cm sea level rise would result in a 40% mangrove loss. It is not certain whether there will be many adverse effects on the Sundarbans with a sea level rise of a few tens of centimeters, although salinity could increase substantially in many areas. Even if barriers to migration such as physical structures could be moved, it is unlikely that inland migration would make up for losses of mangroves from inundation.

4.2.2 Coastal infrastructure

A 1 m rise in sea level would inundate 18% of Bangladesh's total land, directly threatening 11% of the country's population with inundation (based on current population distribution). In addition, the backwater and increased river flow from sea level rise could affect 60% of the country's population (Karim and Rahman, 1995; Bijlsma, 1996). Nonetheless, such a rise in sea level is quite probable over many centuries (Church et al., 2001).

Inundation of such a large portion of the country could present major challenges in terms of loss of income and displaced populations. Huq et al. (1995) estimated that 11% of the country's population lives in the area threatened by a 1 m sea level rise. The area around Dhaka is quite dense, but there are also pockets of population density in the Khulna region, which is most vulnerable to sea level rise. More people would be at risk from flooding from coastal storms. In addition, the major port of Mongla would be at risk, as would one-eighth of the country's agricultural land and 8,000 km of roads (Huq et al., 1995).

At present, Bangladesh is too poor to be able to adapt to such a rise in sea level. The costs of protection would be substantial. Huq et al. (1995) estimate that 4,800 km of existing coastal defences would need upgrading and an additional 4,000 km of new defences would be needed. These protection measures would cost up to 1 billion US\$ (Huq et al., 1995). The most vulnerable part of Bangladesh, the Khulna region, lies along the country's southwestern coast. With the exception of the hilly Chittagong area and the northwestern part of the country, most of the country is less than 10 m above sea level. In the long run, sea level rise could displace tens of millions of people. To resettle 13 million people, Debove (2003) estimates it would cost US\$ 13 billion. However since this is a gradual and a long-run problem, it is less urgent than other risks that may become acute over coming decades rather than toward the end of the century.

4.3 Human health

The combination of higher temperatures and potential increased summer rain and flooding could create the conditions for greater intensity or spread of many infectious diseases, such as cholera, diarrhoea, dysentery, malaria and typhoid. However, increased risk to human health from increased flooding and cyclones seems most likely. Changes in infectious disease are less certain. The causes of outbreaks of infectious disease are quite complex and often do not have a simple relationship with increasing temperature or change in precipitation. It is not clear if the magnitude of the change in health risks resulting from climate change will be significant compared to current risks. It is also not clear if increased health risk will be apparent in the next few decades. On the whole climate change is expected to present some increased risks to human health in Bangladesh, especially in light of the poor state of the country's public health infrastructure. Life expectancy is only 61 years, and 61% of children are malnourished (World Bank, 2002). Perhaps more illustrative of this point, though, is the US\$12 per person per year that the Bangladeshi government spends on health, well below the US\$21 spent in low income countries in general (World Bank, 2002). Effects on agriculture and food security will lead to increased malnutrition.

4.4 Agriculture

With over 35% of Bangladeshis suffering from malnourishment (Lal et al., 2001), the threat of increased hunger from reduction in agricultural production would suggest the inclusion of agriculture as one of the major vulnerabilities facing the country. Although some studies (e.g., Karim et al., 1996) show crop yields potentially increasing at a few degrees Celsius increase in temperature.

Reducing precipitation in winter would have a negative effect on yields. Other changes such as effects on crop pest and disease incidence could also reduce crop yields.

However the biggest threat to agriculture over the course of the 21st century and beyond will be sea level rise which will threaten hundreds of thousands if not more than a million hectares of agricultural land (Huq et al., 1995). For example, Islam et al. (undated) estimated that in eastern Bangladesh alone 14,000 tons of grain production would be lost to sea level rise in 2030 and 252,000 tons would be lost by 2075 (current agricultural production for the country is 30 million tons; WRI, 2001). Threatening the richest and most productive region of the country, sea level rise could have dramatic consequences for the Bangladeshi economy. A recent study estimates that a GDP decrease in the range of 28% to 57% could result from a 1m sea level rise (Debove, 2003). Increased flooding from glacial melt, more intense monsoons, or more intense cyclones could also adversely affect agriculture in the near term by periodically inundating much agricultural land or creating permanent waterlogging. Finally, Habibullah et al. (undated) estimated that several hundred thousand tons of grain production could be lost as a result of increased salinization from sea level rise.

4.5 Livelihoods

Climate change is expected to have major physical impacts on agriculture, industry, infrastructure, disaster, health and energy and consequently on people's livelihood in terms of employment, income and consumption (including food security). These mean a poorer Bangladesh compared to a situation without climate change and lower level of development. One can safely assume that the poor will suffer much more disproportionately than the non-poor and more so in the coastal and rural areas than elsewhere. It is clear that the most vulnerable groups within each community are the poorest amongst them and even within the poor groups the most vulnerable are the women, children, elderly and the sick. It is therefore quite likely that the adverse impacts from climate change will fall disproportionately on these most vulnerable groups within the country as a whole as well as within each vulnerable region of the country. Therefore any attempt to adapt to or cope with the adverse impacts of climate change will need to have special emphasis on protecting and helping these most vulnerable groups.

Summary

Climate and Related Elements	Critical Vulnerable Areas	Most Impacted Sectors
Temperature rise and drought	<ul style="list-style-type: none"> • North-west 	<ul style="list-style-type: none"> • Agriculture (crop, livestock, fisheries) • Water • Energy • Health
Sea Level Rise and Salinity Intrusion	<ul style="list-style-type: none"> • Coastal Area • Island 	<ul style="list-style-type: none"> • Agriculture (crop, fisheries, livestock) • Water (water logging, drinking water, urban) • Human settlement • Energy • Health
Floods	<ul style="list-style-type: none"> • Central Region • North East Region • Char land 	<ul style="list-style-type: none"> • Agriculture (crop, fisheries, livestock) • Water (urban, industry) • Infrastructure • Human settlement • Health • Disaster • Energy
Cyclone and Storm Surge ¹	<ul style="list-style-type: none"> • Coastal and Marine Zone 	<ul style="list-style-type: none"> • Marine Fishing • Infrastructure • Human settlement • Life and property
Drainage congestion	<ul style="list-style-type: none"> • Coastal Area • Urban • South West 	<ul style="list-style-type: none"> • Water (Navigation) • Agriculture (crop)

¹ Frequency of formation of cyclone in the Bay resulted in frequent return of fishermen from the deep sea

GOVERNMENT OF BANGLADESH INFORMATION

Government of Bangladesh portal

Site giving the contact details of all ministries. Each Ministry has a “Climate Cell” in an effort to mainstream action on climate change.

http://www.bangladesh.gov.bd/index.php?option=com_frontpage&Itemid=1

Government of Bangladesh Initiatives on Climate Change 2005 Bangladesh NAPA

<http://napa-pana.org/?q=en/node/6>

<http://unfccc.int/resource/docs/napa/ban01.pdf>

Bangladesh Climate Change Strategy and Action Plan 2008

<http://www.moef.gov.bd/moef.pdf>

Bangladesh Climate Change Impacts and Vulnerability, Published by Climate Change Cell of Department of the Environment

http://www.preventionweb.net/files/574_10370.pdf

JOURNAL ARTICLES ON CLIMATE CHANGE IN BANGLADESH

Climate Change Makes Refugees in Bangladesh, Part 1 of 2, Scientific American, March 2009

<http://www.scientificamerican.com/article.cfm?id=climate-change-refugees-bangladesh>

How Climate Change Is Making Refugees in Bangladesh Part 2 of 2, Scientific American, March 2009

<http://www.scientificamerican.com/article.cfm?id=climate-change-bangladesh2>

How Bangladesh Is Preparing for Climate Change, Scientific American, March 2009

<http://www.scientificamerican.com/article.cfm?id=bangladesh-prepares-for-climate>

INFORMATION FROM UK BASED NGOS

Oxfam’s recent report *The Right to Survive* has revealed a 54 per cent increase in people affected by climate disasters by 2015, a staggering 375 million people, unless action is taken now. With Bangladesh already struggling to cope, this increase could overwhelm emergency responses and dwarf the international community’s ability to respond quickly and effectively.

Flooding, cyclones and droughts are already hitting poor communities in Asia hard, together with hotter temperatures, erratic rains and disrupted planting seasons. In Bangladesh, frequent flooding has been aggravated above normal levels, last year alone affecting over nine million people. In India floods have waterlogged acres of land, destroying crops and overwhelming drainage and irrigation systems. Likewise, communities in the South Punjab in Pakistan are facing increasing problems due to flooding and aid groups in the region are predicting increasing losses of land and safe water.

<http://www.oxfam.org/en/policy/right-to-survive-report>

ADAPTATION PROJECTS

A Stitch in Time: Lessons for Climate Change Adaptation from the AIACC Project

Assessments of Impacts and Adaptations to Climate Change (AIACC) is a global initiative developed in collaboration with the UNEP/WMO Intergovernmental Panel on Climate Change (IPCC) and funded by the Global Environment Facility to advance scientific understanding of climate change vulnerabilities

and adaptation options in developing countries

http://www.aiaccproject.org/working_papers/Working%20Papers/AIACC_WP48_Leary_etal.pdf

Norwegian Church Aid

Climate change measures don't necessarily have to be something new. In this case it is about improving and strengthening existing activities to make them durable to increased pressure from climatic change. They are very concrete and relevant measures that are extremely helpful for the vulnerable communities in the Char areas – the Bangladeshi name for a mobile sandbank in the river system - e.g. plinth raising, homestead gardening, elevations of water pumps (meaning that the height of a house/homestead, garden, water pump and compost pit is height adjusted or built up to sustain a flood), village disaster management committees, rice seed banks, short-duration-rice production and rice cultivation with fish as pest control.

<http://www.reliefweb.int/rw/rwb.nsf/db900SID/MUMA-7PR7L8?OpenDocument>

Climate variability and change: Adaptation to drought in Bangladesh

A resource book and training guide from the Food and Agriculture Organisation

http://www.fao.org/NR/clim/abst/clim_070901_en.htm

Community based adaptation (CBA) exchange

CBA-X is a shared online resource designed to bring together and grow the CBA community. It provides a site for the exchange of up-to-date information about community-based adaptation, including news, events, case-studies, tools, policy resources, and videos.

<http://community.eldis.org/cbax/>

List of adaptation projects on International Union for Conservation of Nature

UCN Bangladesh Country Office, working in association with its members, partners, commission members and volunteer scientists at home and abroad aims to have an environmentally sensitized, educated, conscious and willing society capable of conserving and managing its natural resources judiciously and sustainably. Through its multi-layered focus and areas of intervention, IUCN Bangladesh strives for a just society where natural resources and nature-based social issues including livelihoods are sustainable.

<http://www.iucnbd.org/ongoingprojects.html>

Community Based Adaptation to Climate Change Bulletin

Published by the International Institute for Sustainable Development (IISD) in collaboration with IIED The workshop aimed to share the latest developments in community-based adaptation programmes, priorities and solutions with a view to integrating the lessons into national and international development programmes.

<http://www.iisd.ca/download/pdf/sd/ymbvol135num1e.pdf>

Rainwater Harvesting: An Adaptation Option in Bangladesh

<http://www.youtube.com/watch?v=e3bB0kGe1VI&feature=related>

Floating crop gardens in Bangladesh

<http://www.youtube.com/watch?v=xzt4cMFzLyw&feature=related>

River erosion in Bangladesh

<http://www.youtube.com/watch?v=T7sS0u4j3MM&feature=related>

River erosion project, Gaibandha, Bangladesh

<http://www.youtube.com/watch?v=jG2nyEgTVjM&feature=related>

NIDOS MEMBERS WORKING ON CLIMATE CHANGE IN BANGLADESH

Organisation

IIED

Mission Aviation Fellowship

Save the Children Scotland

Islamic Relief UK

IVS GB

Concern Worldwide

VSO

Tearfund

Christian Aid

British Red Cross

The Leprosy Mission

Oxfam GB

Challenges Worldwide

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