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# **Case Study 3: Bangladesh Floods in Bangladesh: A Shift from Disaster Management Towards Disaster Preparedness**

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## **1 Introduction**

There has been an overwhelming understanding and acceptance by the vast majority of the scientific community that climate change is a reality, the impacts of which are likely to be far-reaching, affecting mostly the poor and vulnerable communities with least capacity and resource endowments. Mitigation and adaptation are two essential responses to long-term processes for addressing greenhouse gas (GHG) emissions and reduction of climate change impacts, respectively (Rahman and Mallick 2004). These will require greater levels of scientific understanding and technology transfer as well as social and humanitarian considerations and responses. However, local communities are adapting with the changes in and around them. The responses and knowledge of the local community to reduce impacts of floods and other natural disasters induced by climate change are to be valued while developing response strategies and measures for adaptation and mitigation at all levels.

Bangladesh is a poor country, which may face many impacts of climate change in the form of severe floods, cyclone, droughts, sea level rise and salinity affecting the population, their livelihoods, natural systems, agriculture, water supply and health. Possible sea level rise will affect the country by inundating one-tenth of the land area in the coastal belt, dislocating millions of people from their homes, occupations and livelihoods. The poor and marginal groups would be critically affected in this process (Department of Environment, GoB 1994). In the last two decades, Bangladesh has experienced four

devastating floods, which gives an early indication of increasing natural calamities as well as supporting the latest International Panel on Climate Change (IPCC) observation that frequency of extreme events like floods will increase in the future.

This case study focuses on recent floods that affected the country and the responses of the country to mitigate flood risk. It also describes how the Disaster Management Bureau (DMB) of the government of Bangladesh takes into consideration the real needs and priorities of the community while formulating and implementing programmes to enhance flood preparedness. The country report has been prepared based on both secondary and limited primary information collected from the field, including views of relevant and experienced people on the issues of community responses and the role of government agencies in relation to flood preparedness.

## **2 Climate change issues in Bangladesh: policy and institutions to address adaptation to climate change**

### **2.1 Location and geophysical conditions of the country**

Bangladesh is a low-lying deltaic country located between 20°34' to 26°38' north latitude and 88°01' to 92°42' east longitude. Geologically, it is a part of the Bengal Basin and is one of the largest deltas in the world formed mainly by the Ganges-Brahmaputra-Meghna river system. This forms a network of rivers

**Table 1: Key Country Facts of Bangladesh**

Issues/Criteria/Years	1994	1996	1998	2000	2002
Population (million)	111.4	122.0	126.0	131.1	135.7
Area (sq km)	147,570.00	147,570.00	147,570.00	147,570.00	147,570.00
Net land area used for agricultural purposes (km <sup>2</sup> )	77,428.56	78,513.12	79,889.05	81,345.92	80,224.94
Forest area (km <sup>2</sup> )	19,671.78	21,565.71	22,549.1	26,268.16	25,758.26
Population in absolute poverty (%)	48.4	35.6	NA	NA	28.0
Population density per km <sup>2</sup>	755	827	854	888	920
Urban population (million)	20.9	NA	NA	32.7	33.93
GNI <i>per capita</i> (US\$)	365	374	381	374	407
Structure of GDP (%)					
Agriculture	32.42	25.96	26.18	24.10	21.73
Industry	–	25.14	25.16	25.94	26.56
Services and others	–	49.07	48.67	49.96	51.71
Human Development Index (HDI)	146	–	–	138	145
Life expectancy at birth	58.0	58.9	60.8	61.5	62.1
Mortality rate under 5 years old per 1,000	–	–	–	83	73
Adult literacy rate (%)					
Total	32.4	35.32	–	41.3	45.3
Men	38.9	44.31	–	52.3	49.6
Women	25.5	25.84	–	29.9	40.8
Total GHG emissions (kiloton) projected in Bangladesh ALGAS study	72,000	NA	80,000	88,000	
CO <sub>2</sub> <i>per capita</i> (Mt)	NA	NA	NA	0.18	NA

Sources: BBS (2002); Economic Relations Division, GoB (2004); BCAS (1998).

with criss-crossing tributaries and distributaries: the country therefore can be treated as a series of islands. The total land area of Bangladesh is 147,570 sq km and consists mainly of low and flat land.

Broadly, the land area of the country is divided into three categories: floodplain, Pleistocene terrace and tertiary hills. About 65 per cent of the landmass is floodplain. The floodplain land comprises a succession of ridges and depressions (back swamps or old channels). The differences in the elevation between adjoining ridge tops and depressions range from less than 1 m on tidal floodplains, 1–3 m on the main river and estuarine floodplains and up to 5–6 m in the Sylhet Basin in the northeast. Only in the extreme northwest do the land elevations exceed 30 m above the mean sea level.

The climate of Bangladesh is characterised by high temperature, heavy rainfall, high humidity and marked seasonal variations, controlled primarily by summer and winter winds and partly by pre-monsoon and post-monsoon circulation. The

Southwest Monsoon originates over the Indian Ocean, and carries warm, moist and unstable air. The months of July, August and September are critical times for severe floods in Bangladesh. The mean annual rainfall is about 2,300 mm, but there exists a wide spatial and temporal distribution. Annual rainfall ranges from 1,200 mm in the extreme west to over 5,000 mm in the east and northeast (Alam and Murray 2005; Rashid 1991).

## 2.2 The socio-economic conditions and the development challenges of the country

Bangladesh is a developing country associated with a number of problems and challenges. It has a large growing population with a limited resource base. Besides the growing population, the country is faced with widespread poverty, political instability, poor governance and frequent natural disasters like flood, cyclones and droughts that badly affect the socio-economic development process. Currently, the country has a population of around 140 million

with an annual population growth rate of about 1.5 per cent. However, both the population growth rate and total fertility rate have declined in recent years (3.3 in 2001, down from 6.3 in the 1970s) implying that the country has achieved remarkable success in population control. The government agencies, media and social mobilisation by non-governmental organisations (NGOs) have played a key role behind this success. The country is densely populated with an average 920 people per sq km and an increasing number of (mainly poor) people migrating to the cities for employment and earning a livelihood: approximately 24 per cent of people live in cities and towns across the country (BBS 2002).

Economic growth performance has been relatively moderate with a *per capita* gross domestic product (GDP) growth of 2 per cent per annum. Gross national income (GNI) *per capita* shows a slow but increasing trend (US\$365 in 1994 and US\$407 in 2002). The contribution of agriculture to GDP was high in the recent past (22 per cent), with contributions from industry and services sectors gradually increasing. Despite the recent macroeconomic achievements, poverty is still an endemic problem in Bangladesh. According to recent Household Expenditure Survey of Bangladesh Bureau of Statistics (BBS 2002), about half of the population could be considered as poor, while a quarter of the population could be considered as extreme poor, who suffer from unemployment, underemployment, food insecurity, malnutrition and ill-health. Table 1 shows the basic socio-economic information of the country for the past few years.

In recognition of the importance of human resources in economic growth and social development, greater emphasis in the development budget was given to education and skills resulting in higher school enrolment, particularly in the primary level. The introduction of non-formal education and adult literacy undertaken both by government agencies and large NGO sectors has yielded great success. As a result, the adult literacy rate has increased to 45 per cent in 2002, from around 30 per cent in the early 1990s. Another great success has been achieved in providing safe drinking water in Bangladesh (though the presence of arsenic in groundwater poses a serious threat to the success) and access to sanitary latrines has been increased, resulting in declining incidences of waterborne and airborne diseases. The infant mortality rate has declined to 56 (per 1,000) in 2002, from 94 (per 1,000) in 1990 and life expectancy at birth

increased to 62 years in 2002 from 58 years in 1994. The overall Human Development Index (HDI) also shows a positive trend.

The physical environment of Bangladesh is diverse and complex. Both the traditional and modern systems of land use are very closely adapted to these heterogeneous conditions, which have important implications for the vulnerability and depletion of the natural resource base. Moreover, neither the physical environment nor the technologies available to utilise it remain static. For example, rapid and frequent natural changes are taking place in the river systems, but they are also subject to the influence of various human interventions. Thus, there are dynamic changes taking place in the hydrological system, which then influence land-use and production systems.

As a Least Developed Country (LDC), Bangladesh makes minimal contributions to global emission of GHGs through anthropogenic activities. The *per capita* GHG emission in Bangladesh was 0.189 metric tons in 2000 and the total annual GHG emission of the country has been calculated and projected as 88,000 kilotons by the Bangladesh Centre for Advanced Studies (BCAS) under the Bangladesh Asia Least-Cost Greenhouse Gas Abatement Strategy (ALGAS) study. At present, agriculture contributes to about 26 per cent of the total country GHG emission followed by industry at 16 per cent (Huq and Khondkar 2002).

### **Development challenges for Bangladesh**

Economic growth, poverty alleviation, population control, management of natural disasters and good governance are the key development challenges for Bangladesh. Natural disasters like frequent floods and cyclone, induced by climatic change, very often affect the development process. The government of Bangladesh and the NGOs in Bangladesh have identified poverty alleviation as the principal development goal with other immediate goals of human resources development, employment and income generation, and education for all. It is increasingly being recognised in Bangladesh, as in other parts of the world, that for development to be meaningful and sustainable over a longer period, environmental concerns must be integrated into all development activities. Further, development efforts need to be made considering the climatic events that have multiple interactions with development processes in the country.

**Table 2: Bangladesh Millennium Development Goals (MDGs) Status at a Glance**

Goals	Bangladesh targets	Indicator	Base year (2000)	Current status (in 2005)
1. Eradication of extreme poverty and hunger	Reduce proportion of people in extreme poverty by 2015	Proportion of people in poverty	28%	20%
2. Achieve universal primary education	Reduce primary school dropout rate from 38% to 0% by 2015	Rate of school enrolment	73%	82%
3. Promote gender equity and empower women	Eliminate gender disparity in primary and secondary education	Ratio of literate females to males	42.6%	55.7%
4. Reduce child mortality	Reduce under-5 mortality rate (deaths per 1,000 lives)	Mortality rate	94	56
5. Improve maternal health	Reduce maternal malnutrition to less than 20% by 2015	Proportion of mothers who are malnourished	–	45%
6. Combat HIV/AIDS, malaria and other diseases	Reduce by 50% the incidence of death by malaria	Death rate associated with malaria	–	1%
7. Ensure environmental sustainability	Halve by 2015 the proportion of people without access to drinking water and basic sanitation	Proportion of people having sustainable access to improved water sources	Urban Rural	82% 72%
8. Develop a global partnership for development	In cooperation with pharmaceutical companies, provide access to affordable and essential drugs	Population with access to essential drugs	–	80%

Source: GoB and UNDP (2005).

The government, led by the Economic Relation Division of the Ministry of Finance, prepared a National Strategy for Economic Growth, Poverty Reduction and Social Development in 2004, which is known as the Poverty Reduction Strategy Paper (PRSP). The PRSP emphasises the need for savings, investment and growth to improve socio-economic conditions of the poor (Economic Relations Division, GoB 2004). The PRSP is treated as the

long-term national development plan for Bangladesh and has recognised the vital link between development, environment and poverty.

However, the quick depletion of natural and environmental resources including land, water, fisheries, forests and biodiversity has made a number of people economically and socially destitute and more vulnerable to natural disasters. The degraded environment implies fewer resources are available,

increasing risk and unsustainability for the common people. Therefore, policies should strike a balance between existing livelihood requirements and sound environmental resource management, to ensure sustainability. The concerns, needs and priorities of people at high risk of natural disasters, poverty and eco-specific environmental degradation need to be incorporated in the Bangladesh PRSP.

Bangladesh is also committed to attain the targets embodied in the UN Millennium Development Goals (MDGs). The government assessed progress in achieving the targets by the year 2005, concluding that there has been good progress in five key areas including: reduction of poverty, decrease of infant mortality, increase of school enrolment, addressing child malnutrition and reduction of gender disparity. Table 2 gives some indications about the trend of progress.

However, despite the limited success, to achieve the main goal of halving poverty there is a need for strong economic growth with a focus on engaging poor and marginal groups of people in gainful economic activities, as well as protecting vulnerable groups through effective safety net programmes (Ahmed 2005).

### **2.3 Vulnerability of the country to climate change and mainstreaming climate change adaptation to development process**

As mentioned above, possible sea level rise would have pervasive deleterious effects in Bangladesh. In addition to this, the country has also already faced, in recent years, many severe floods, cyclones and a growing drought situation, particularly in north-western and western parts of the country. The floods of 2004, 1998 and 1988 were worst in terms of their intensity (water depth, destruction and duration) and impacts on lives and livelihoods of the people in Bangladesh. Experts feel that extreme climatic events, such as frequent and prolonged floods and devastating cyclones, may have strong links with the long-term climate change process. The General Circulation Model (GCM) experiments on Bangladesh suggest that the country will be highly susceptible to (1) increased flooding, both in terms of extent and frequency, (2) increased moisture stress during dry periods leading to increased drought both in terms of intensity and frequency, and (3) increased salinity intrusion during the low flow conditions (Ahmed and Alam 1998).

Higher intensity flood risk will be accentuated because of higher backwater effects at the confluence of large rivers, the latter phenomenon being significantly influenced by sea level rise. Under climate change scenarios, it is feared that about 18 per cent of current low-lying flooded areas will face higher levels of flooding, while about 12–16 per cent of new areas will become flood prone. Therefore, in a normal flood year, the extent of flooding may increase from 23 per cent to 39 per cent, while over two-thirds of the landmass of the country could be engulfed by flood in a catastrophic flood event.

Cyclones hit coastal Bangladesh very frequently: devastating cyclones occurred in 1970, 1991, 1998 and 2000. The cyclones of 1970 and 1991 were the worst, killing millions of people in the coastal districts. The north-western part of the country faces acute drought conditions under climate change (Rahman *et al.* 2001), thus increased water demand for irrigation could lead to increased withdrawal from already lean surface water systems leading to decrease in lean season flow in the rivers. The western part of the country will be particularly vulnerable due to increased moisture stress. Moreover, an additional quarter of a million hectares on top of 0.83 million ha will become saline affected, forcing farmers to grow crops of lesser economic return.

Over the last decade, a number of studies have been carried out to assess the impacts and vulnerability of Bangladesh to climate change and sea level rise,<sup>1</sup> with most studies identifying and assessing vulnerability of water, coastal zone, agriculture, infrastructure, forestry and health to climate change and sea level rise. Bangladesh has thus submitted the Initial National Communication to the United Nations Framework Convention on Climate Change (UNFCCC).

Growing recognition and incorporation, by both national and international agencies, of policy and strategy detailing the adverse impacts of climate change and extreme events on future development of Bangladesh can be seen as the beginning of mainstreaming adaptation to climate change. The next step would be integration of action into existing development programmes and activities. This is not an easy task: the shift from policy to action needs participation of, and cooperation from, various stakeholders (government policy makers, implementing agencies, development partners, private sector and communities).

**Table 3: Participation of Bangladesh in Climate Change-related Events and Key Studies**

Year	Events/Policy/Initiatives	Organisation/Author
1991	Cyclone, 91: An Environmental and Perceptual Study	Raana Haider, A. Atiq Rahman and Saleemul Huq
1992	Bangladesh participated in UNCED and became signatory of Rio de Janeiro Protocol	GoB
1994	Assessment of the Vulnerability of Coastal Areas to Climate Change and Sea Level Rise – A Pilot Study of Bangladesh	BCAS
1996	Climate Change Country Study Bangladesh under US Climate Change Study Programme	BCAS/BIDS/BUP
1998	Vulnerability and Adaptation to Climate Change of Bangladesh	Saleemul Huq
2000	An Overview of Bangladesh Vulnerability to Climate Change and National Adaptation Program for Action	BIDS, BUP
2003	Hosting of LDC Expert Group Meeting on Climate Change in Dhaka	GoB
2003	Reducing Vulnerability to Climate Change (RVCC) Project	CARE-Bangladesh, BCAS
2003	Participation in Assessment of Impact and Adaptation to Climate Change in Multiple Regions and Sections (AIACC) Regional Workshop	BCAS
2003	Mainstreaming Adaptation to Climate Change in Least Developed Countries (LDCs)	Saleemul Huq, Atiq Rahman, Mama Kpnotic, Youba Sokona and Hannah Reid
2004	Inception Workshop of National Action Plan to Climate Change	BCAS
2003	Participation in LDCs meeting on Adaptation to Climate Change	GoB
1992–2004	Participation in all COP Meetings	GoB, DoE, BIDS, BUP, BCAS

### The key events and initiatives addressing climate change

The Ministry of Environment and Forests (MoEF) is the focal point for the UNFCCC and coordinates climate-related activities in the country. Recently a Climate Change Cell has been established to address several issues including adaptation to climate change. A few cross-cutting capacity-building needs identified for adaptation include: (1) lack of public awareness (addressing this may be the most effective way to reduce vulnerability to climate change and increase the effectiveness of adaptation options); (2) need for inter-departmental coordination; and (3) need for regional collaboration (necessary for taking

into account the relevant sectors vulnerable to water within spatial and temporal contexts. Information sharing on watershed levels is found to be effective and essential). Thus, there is growing concern and awareness, but limited activism, in relation to climate change in Bangladesh. Table 3 demonstrates the climate change-related key activities, interaction, studies and events in Bangladesh.

Though poverty alleviation is the prime concern for Bangladesh and most of the ministries and government developments have incorporated the issues of poverty reduction in their strategies and programmes, the key policies also emphasise reduction of atmospheric concentrations of GHGs

for Bangladesh. Poverty alleviation is considered as both a goal and means for environmental conservation and natural resource management through involving poor and marginal groups in the process. It was first addressed for development in the fourth Five-Year Plan in early 1990s. The concerns of environmental conservation, sustainable uses of natural resources and energy efficiency received more emphasis in the fifth Five-Year Plan in mid-1990s.

In addition to the government sector, Bangladesh has a very active and thriving non-governmental sector and academic research institutions working in the area of environment and climate change. Institutions such as BCAS, Bangladesh University of Engineering and Technology (BUET) and Bangladesh Unnayan Parishad (BUP) have done extensive study and research works on climate change, GHG emissions and abatement options and adaptation strategies.

The priority areas for national development have direct and indirect links with environmental conservation, adaptation and reduction of GHG emissions and sectoral development has significant bearing on future GHG emissions in terms of sources and sequestration. The government is also supporting a few good projects at local levels involving community, civil society groups and NGOs. These include: Sustainable Environment Management Programmes (SEMP), Participatory Ecosystem Management, Community Environment Sanitation and Environmental Awareness and Advocacy at Grassroots. It is expected that these projects will improve resources management, promote sustainable development and build local capacity for climate change adaptation.

### **Climate change in national policies and programmes**

The National Environmental Management Action Plan (NEMAP) was prepared in 1995 and discussed climate change issues as a long-term environmental problem for Bangladesh. It was prepared by the MoEF involving all key stakeholders from national level to grassroots, where NGOs and professional groups like BCAS played key roles in voicing people's concerns and priorities. The NEMAP added a cautionary note on environmental damages that may result from structural flood control measures that could conflict with structural adaptation responses (such as the construction of barrages) highlighted under the national water policy (NWP) and other environmental

consequences such as migration and breeding of fish-stock. Similar to the NEMAP, other sectoral policies such as the National Land Use Policy (NLUP) did not make direct reference to climate change and adaptation. However, the NLUP aims to bring 25 per cent of the land under forest cover prioritising mangrove plantations and coastal green belts and the conservation of existing forest lands. These priorities are also echoed in the National Forest Policy (NFP) and could help reduce stress on ecosystems, thereby increasing their resilience to climate change impacts.

The MoEF is responsible for the planning and execution of all activities on environmental protection and management. It is the Global Environment Facility (GEF) and UNFCCC National Focal Point and thus executes the National Adaptation Programme of Action (NAPA) to address climate change issues. The NAPA is the first official initiative for mainstreaming adaptation to national policies and actions for addressing adverse impacts of, and reducing vulnerability to, climate change and climatic events. Currently, the NAPA process has undertaken consultations at different levels to formulate a country programme of action for adaptation suggesting immediate and urgent measures. Four government organisations and two independent research and policy institutes are undertaking the NAPA analytical process under six interactive themes, which are: agriculture and food security; water and disaster; livelihood and gender; biodiversity and forests, industry and infrastructure; and policy and institutions. It will identify policy and institutional frameworks to guide and coordinate adaptation initiatives, as well as building synergies with other multilateral environmental agreements and sustainable development programmes.

The NAPA process has involved a multi-disciplinary team of experts who work under a national steering committee. The process has included sectoral and stakeholder consultations at regional and grassroots levels identifying issues, stakes, vulnerability and responses for adaptation in addition to involving key government ministries and departments to formulate strategy and actions (Box 1).

## **3 Multiple actors in disaster preparedness and community adaptation to flood disaster**

### **3.1 Floods in Bangladesh**

The deltaic river systems of Bangladesh drain the run-off from a catchment area of about 1.7 million

**Box 1: Relevant Government Ministries and Department/Agencies Identified by the Bangladesh NAPA Which Could be Involved in Climate Change-related Issues in Bangladesh**

Ministry of Environment and Forest  
 Ministry of Agriculture  
 Ministry of Food, Disaster Management and Relief  
 Ministry of Fisheries and Livestock  
 Ministry of Land  
 Ministry of Planning  
 Ministry of Water Resources  
 Local Government Division, MOLGRD&C  
 Ministry of Civil Aviation and Tourism  
 Ministry of Chittagong Hill Tracts Affairs  
 Planning Commission  
 Bangladesh Water Development Board  
 Bangladesh Forest Research Institute

Bangladesh Bureau of Statistics Bangladesh  
 Meteorology Department  
 Disaster Management Bureau  
 Department of Environment  
 Department of Fisheries  
 Department of Agriculture Extension  
 Local Government Engineering Department  
 Space Research and Remote Sensing Organisation  
 Water Resources Planning Organisation  
 Bangladesh Agriculture Research Council  
 Bangladesh Institute of Development Studies  
 Institute of Water Modeling  
 Barind Multi-purpose Development Authority

sq km, 92.5 per cent of which is located outside the country. The estimated volume of water flowing through these river systems is about 1,500 billion cubic metres annually, with most flowing only during monsoon season (June–September). Normal flooding is a blessing for farmers, fishers and common people, but very often becomes a curse to the poor, women and marginal people in many parts of the country, damaging crops, trees, properties, lives and livelihoods when it exceeds normal acceptable limits (Rahman *et al.* 2004). There are four main types of flood: (1) monsoon floods (in June, July and August when the major rivers overflow, which cause the tributaries to back-up and prevent drainage of rainwater; (2) local flooding due to intense rainfall, which is sometimes associated with tropical cyclones; (3) flash floods in the eastern and northern rivers; and (4) localised floods from the sudden on-rush of water when embankments are breached.

The normal sequence of floods in a year starts with flash floods in the eastern regions caused by pre-monsoon storms in April and May, before the onset of the monsoon in June. The Meghna and the Jamuna normally reach their flood peaks during July and August, the Ganges during September, but the peaks coincide, on average every six years. When they do, as in 1988, they produce higher than normal flood levels with potentially devastating and prolonged flooding (such as in 1998 and 2004).

The experts predict that the country may face severe flooding every 5–7 years in the future, instead of the previous ten-year intervals.

The floods, which struck Bangladesh in 1987 and 1988, killed more than 3,000 people and inundated 40 per cent and 60 per cent of the country, respectively. They destroyed millions of homes, devastated crops on several million hectares of land, killed over 200,000 farm animals and caused enormous damage to the country's economic infrastructure. Direct capital losses were estimated at US\$1.8 billion with indirect economic losses potentially even higher. Apart from the reasons given above, other factors that reduce the water carrying capacity of drainage and river systems may be important: change in the base level of the rivers due to local sea level rise, inadequate sediment accumulation on floodplains, an increase in catchment area due to seismic and geotectonic activities in the region, riverbed narrowing due to siltation and damming, soil erosion, deforestation in upstream regions and the increase in the rate of snow pack melting in the Himalayas (Rahman *et al.* 2004).

**The flood of 1987**

The flood of 1987 differed in nature and origin being the result of heavy rainfall from July to September over northwest Bangladesh and part of India's West Bengal. It caused severe flooding in

**Table 4: Estimates of Losses and Damage in the Bangladesh Flood of 1988**

Area flooded (km <sup>2</sup> )	89,970
Average duration of floods (days)	34
Number of affected people	45,000,000
Number of deaths	2,379
Rice production lost (million tons)	2.00
Number of cattle lost	172,000
Roads damaged (km)	13,000
Embankments damaged (km)	1,990
Number of bridges and culverts damaged	1,160
Number of affected houses	7,200,000
Number of schools damaged	19,000

Source: Haggart *et al.* (1994).

many minor rivers in the northwest, aggravated by the highest flood peak ever recorded on the Ganges and exceptionally high floods on the Teesta. Flooding breached the Brahmaputra's right embankment causing catastrophic flooding in July–August in Bangladesh. Severely affected regions were the western side of the Brahmaputra, the area below the Brahmaputra–Ganges confluence and considerable areas north of Khulna. Paddy crop (*Aman*) was severely damaged (losses estimated at 0.8 million tonnes): more than 24 million people were homeless and starving.

#### The flood of 1988

The flood of 1988 was caused by intensive rainfall during the last ten days of August in north and northeast Bangladesh, India, Nepal and Bhutan. The 1988 flood peak on the Brahmaputra was the highest ever recorded with high water levels also on the Ganges. When the two peaks coincided, it had devastating effects downstream of the Brahmaputra–Ganges confluence. Large areas along the Brahmaputra, Ganges and Padma were flooded and many parts of the capital city Dhaka were inundated. Flooding in 1988 was more devastating than that of 1987: two-thirds of the country were submerged, directly affecting 45 million people in 40 of 64 districts. Over 2.5 million people in Dhaka were left stranded during the flood, living for weeks with inadequate food, drinking water, sanitation, shelter and healthcare. Unemployment meant dependence on relief goods from government,

voluntary organisations and NGOs (estimated losses and damages are shown in Table 4).

#### The prolonged flood of 1998

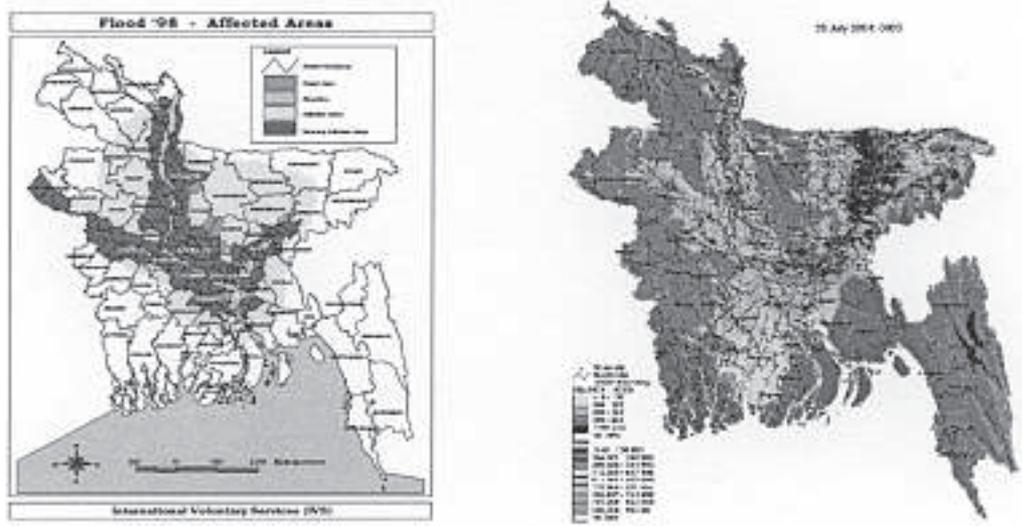
The flood of 1998 is considered as one of the longest and worst natural disasters ever experienced in Bangladesh, lasting a total of 65 days from early July to mid-September. Over 67 per cent of the landmass was flooded, displacing over 1 million people, damaging 16,000 km of roads and 4,500 km of embankment, and destroying 500,000 ha of cropland. Many households defaulted on their loans, became further indebted for rehabilitation of housing and experienced long-lasting unemployment and loss of purchasing power. Shortage of safe drinking water, water-related diseases and ill-health were also major problems. The prolonged flooding also affected the city and caused severe losses to business revenue through interruptions to government activities and commercial enterprise. In total, over 31 million people were affected (Rahman *et al.* 2004).

#### The flood of 2004

The flood of 2004 engulfed about half of the country with unprecedented inundation in terms of depth of water in many parts, particularly in northeastern and central regions. It continued for approximately three months, severely affecting lives, livelihoods, human settlement, employment, agriculture, fisheries, livestock, industries and all types of rural and part of urban infrastructures. The flood started in late June and the situation took a serious turn in mid-July due to heavy downpour in the country, coupled with the on-rush of flood waters from the upstream neighbouring countries through the three major river systems.

The flood water rolling down the rivers led to 45 districts being severely affected by the destructive flood, including affecting city lives, industry, trade and business in addition to rural life and infrastructure. Rural people experience normal floods every year, coping with flood impacts through various adaptive strategies and actions. However, urban people are not so aware of the extent and impacts of floods. The unprecedented floods of 2004 affected the city lives of many urban areas, causing extreme suffering to the poor (living in slums) and marginal groups. It caused dislocation, unemployment, lack of income, food insecurity and problems with drinking water, medicine and communication.

**Figure 1: Flood-affected Areas in September 1998 and July 2004**



Source: Reproduced by kind permission of GIS Division of BCAS.

### 3.2 The efforts for flood preparedness at various levels

Government agencies in Bangladesh, NGOs and local communities have undertaken various measures to mitigate impacts of floods on the people, economy and society. The concept of developing national preparedness to disasters like floods and cyclones (events to which Bangladesh is prone) evolved after the floods of 1988 and the devastating cyclone of 1991. The main argument behind this shift was that if people were well prepared for frequent disasters they would minimise their impacts, resulting in a reduced need for relief and rehabilitation. It was also strongly felt that if the disaster preparedness could be integrated in the socio-economic development process at household, community, regional and national levels, it will give long-term capacity to the community to mitigate risk and vulnerability to disasters.

The development thinkers, international development partners (such as UNDP, DFID, Oxfam GB, USAID, Care International, Caritas) and local NGOs, who are experienced in disaster management in Bangladesh, promoted the approach of capacity building and disaster preparedness. A few key policy planners and high government officials also favoured this new thinking and reflected this through the renaming of the Ministry of Relief and Rehabilitation

to the Ministry of Disaster Management and Relief. In 1993, the Ministry of Disaster Management then established the Disaster Management Bureau (DMB) and the government set up a national Council and various committees at national, district, *upzila* and union levels, for overall disaster management preparedness. The National Disaster Management Council reviews disaster management policies and programmes and is headed by the Prime Minister, as is the Inter-Ministerial Disaster Management Coordination Committee.

The NGOs in Bangladesh play a key role in poverty alleviation and empowerment of the poor and women through social mobilisation, capacity building, disaster preparedness and awareness raising at community levels (Box 2). The international development agencies (IDAs) working in Bangladesh also help the government and NGOs to develop approaches and institutional capacity for disaster management, providing resources and technical assistance to strengthen disaster preparedness and reduce vulnerability.

#### The NGO movement against the Flood Action Plan (FAP)

The calamities of the 1987 and 1988 floods raised fears and concerns that such flooding was to become the norm in Bangladesh. The donor communities

### Box 2: Bangladesh's Thriving NGO Sector

Bangladesh has probably the most active NGO sector in the developing world, with over 6,000 registered organisations. The country holds a few of the world's large NGOs with nationwide capacity and coverage and many more local NGOs providing services such as micro credit, social mobilisation, health, education, sanitation, water, agriculture and technical and consultancy services. There is also a greater recognition of the role and services by NGOs in Bangladesh and many developing countries are learning from the Bangladeshi NGO sector.

The NGOs working with poor and disadvantaged groups have created a new dimension of bottom-up development, contrasting sharply with the centralised, top-down approach, which has characterised so many government efforts. In the operational sense, some NGOs are supplementing the work or even competing with government agencies. The NGOs have developed and changed their approaches and strategies considering the needs of people and times, receiving both appreciation and criticisms.

The first approach adopted by NGOs was relief and welfare services in the early 1970s, which were sustained by external assistance but proved to be inadequate in the face of growing needs and were not sustainable.

In the second half of the 1970s, NGOs placed importance on rural development activities through a community-based approach involving the poor and their resources in income-generating activities for self-reliance and thus tried to evolve integrated rural development. In the 1980s and 1990s, some NGOs concentrated their efforts on changing rural social relationships and institutions through new institution building and promoting people's control and initiatives. The significance of NGOs' approach lies in their innovation, creativity, involvement and rich experience in micro-level planning. At their best, NGOs enjoy flexibility in operation and are in a much better position to understand local realities and people's needs.

The large NGOs in Bangladesh have developed wide-ranging programmes including information and education, income and employment-generating activities, training for community self-help works, the establishment of linkages among organisations, groups and activities and action research on community development. Many NGOs have the capability to integrate their approaches far more effectively with the specifics of local needs and opportunities, and in particular are able to work within the realities of local social structures. This in turn gives the NGOs the chance to target their efforts more effectively to specific disadvantaged groups, with women and landless households seen as particularly important in these efforts.

in Bangladesh soon dispatched teams of engineers and other consultants to study the problem. The results of the international concern was the creation of the Flood Action Plan (FAP), which suggested mainly structural solutions for floods, an ambitious attempt to control floods by putting embankments across the major rivers in Bangladesh. From the start of FAP, it came under fire from the development and environmental experts (Haggart *et al.* 1994) with NGOs and civil society groups criticising the structural interventions to control rivers and floodplains envisaged in FAP activities. They were very active to influence policy and decision-making processes to remove the anti-people and anti-environment nature of FAP through conducting study, consultation and advocacy and raising awareness among the general masses.

BCAS played a leading role in this respect (BCAS

1998): together with other like-minded groups it felt that the views of farmers, fishermen, women and the landless poor, who have the best firsthand knowledge of floods, were missing in the FAP process and documents. To help fill in this gap, BCAS and the Panos Institute (UK) mobilised a group of Bangladeshi journalists to take an independent look at existing flood-control projects and the potential impact of new ones in the future. The initiative used an influential book on FAP entitled *Rivers of Life* (Haggart *et al.* 1994) and, along with subsequent publications, successfully managed to influence public opinion and policy dialogues against structural approaches to flood control.

The Coalition of Environmental NGOs (CEN) and the Association of Development Agencies in Bangladesh (ADAB) organised a huge gathering in Dhaka called 'People's Conference on FAP' on

### Box 3: Comprehensive Disaster Management Programme (CDMP)

The Comprehensive Disaster Management Programme (CDMP) is a collaborative effort by the the Government of Bangladesh, UNDP and the Department for International Development (DFID) and a host of disaster management stakeholders to design a programme built upon critical lessons learned over the past decade. It was seen that the traditional disaster management model focusing on disaster relief and recovery has done little to redress rising levels of risk. Making an active shift from the tendency for unilateralism, a more holistic approach was undertaken by the Ministry of Disaster Management and Relief (MoDMR) to embrace processes of hazard identification and mitigation, community preparedness and integrated response efforts. Activities are planned within an all-risk management framework that seeks to raise the capacities of at-risk communities, while lowering their vulnerability to specific hazards. The CDMP aims at achieving these through the implementation of specific component strategies that transform emphasis from relief to risk reduction addressing mainstreaming of disaster management within development and investment programmes, strengthening of community institutional mechanisms, expanding preparedness programmes to cover existing and new hazards, implementing skill development programmes to raise the standard of disaster management efforts at all levels and studying the key urban risk management challenges.

The CDMP takes into consideration the vulnerability of the poor and common people due to climatic events like floods and cyclones and long-term climate change impacts. A Climate Change Cell was developed based on the needs for addressing future problems that Bangladesh may face with climatic changes, and was established at the Department of Environment under the Ministry of Environment and is linked to the CDMP. These entities are trying to improve understanding on how to expand and improve mitigation measures, preparedness and response across a broader range of hazards.

*Source: CDMP, Disaster Management Bureau, Dhaka*

27 November 1995, to hold open discussions about FAP with the ordinary people from the villages and towns. The conference was also attended by experts, journalists, donors of FAP projects, international NGOs, FAP consultants, national NGOs, representatives from government agencies, university teachers and, most importantly, people from FAP project-affected areas. It created huge pressure on the government and donor agencies and as a result, the government changed its approach to flood control through FAP activities. The NGO movement also influenced the subsequently formulated national water policy of Bangladesh to make it more people-oriented (Mallick 1995).

The NGOs and civil society groups always uphold the views of living with flood and increase people's capacity to reduce flood impact through flood preparedness. NGOs like Bangladesh Disaster Preparedness Centre (BDPC 2004), Caritas Bangladesh, BRAC, Care Bangladesh, Proshika and CEN work closely with the relevant government agencies to develop the country's capacity for disaster management in an integrated manner. However, integrated approaches to disaster management involving local knowledge are relatively new in Bangladesh's formal institutions

as previously, "disaster management" generally meant post-disaster relief and rehabilitation.

NGOs and community-based organisations appreciated the potential capacity of local communities to live with flood and other disasters, and have tried to enhance the coping mechanisms and survival techniques of the common people which have been practiced over hundreds of years. It is also felt that the socio-economic development of the poor, women and vulnerable groups can enhance their capacity to respond to disaster in a sustained way. In this light, Care Bangladesh and BCAS with a few local partner NGOs have undertaken a project to enhance people's capacity to reduce vulnerability to flood disaster. The Linking Climate Adaptation (LCA) Bangladesh case study includes people's experiences and their innovative activities to adapt to flood impacts during the 2004 flood from the project areas.

### 3.3 The Disaster Management Bureau (DMB): a shift from relief and rehabilitation to disaster preparedness

The Government of Bangladesh, led by the Ministry of Disaster Management and Relief, has undertaken various steps in the form of policy, strategy and programmes considering the concept of disaster

#### **Box 4: Community-based Flood Information System (CFIS)**

The local community needs flood information in their local context to take adequate preparedness at household and community levels. The existing flood information from the Flood Forecasting and Warning Centre (FFWC) is criticised by the local people for being not easily understandable and illegible to the local context. Considering this, the FFWC with CEGIS, BDPC and RTI of USA have initiated a pilot project in a few flood-prone areas of Bangladesh to build an interactive process of flood information collection and dissemination to various stakeholders: the Reducing Risk and Vulnerability to Floods through Community-based Flood Information System (CFIS).

The CFIS is learning from the community and trying to develop an effective model for local level flood warning and dissemination of information relating to monsoon floods in floodplains. The project generated useful flood information during the flood of 2004, proving helpful to the local community. The early learning of the project was shared in a national workshop on Options for Flood Risk and Damage Reduction in Bangladesh in September 2004. The Prime Minister appreciated the experience of the CFIS project and recommended the concerned agencies including the Disaster Management Bureau to replicate the model in flood-prone areas of the country.

*Source: BDPC (2004).*

management through mitigation, preparedness, recovery and rehabilitation. UNDP and UNICEF patronised and advocated to form a unit named Disaster Management Monitoring Unit in June 1992 to act as the policy-making department and coordinator for rehabilitation. It was thought that a simple unit was not enough for this remit, and thus the government set up the Disaster Management Bureau (DMB) under the Ministry of Disaster Management in 1993 to promote disaster prevention, mitigation and preparedness and provide guidelines, organise training and awareness for the concerned people and stakeholders to mitigate impacts of disasters. DMB sources explained that the reformulation process of the FAP was influenced by the civil society, environmental group and NGO activism: the FAP now had a component of rehabilitation, run under the Ministry of Relief and Rehabilitation. Key actors in the FAP process thought that disaster management was essential to address the disaster situation in Bangladesh, as it was seen that relief distribution alone was not enough for people to cope with disaster situations. There is also another set of governmental agencies to help the Ministry and Bureau: the Bangladesh Meteorological Department, Space and Remote Sensing Organization (SPARSO) and Flood Forecasting and Warning Centre (FFWC) of the Bangladesh Water Development Board (BWDB). Currently, DMB has focused on risk reduction through community mobilisation, capacity building and linking risk reduction with the socio-economic development of poor and vulnerable groups. The Ministry and DMB,

in association with NGOs and development partners, have undertaken various projects at community level including the Comprehensive Disaster Management Programme (CDMP) undertaken in conjunction with UNDP (Box 3).

It has been shown that transformation in policy and institutions takes time and requires true involvement and dedication. The transformation of DMB towards disaster preparedness from relief and rehabilitation, including undertaking programmes towards the new direction, has begun. But it has sometimes experienced two steps forward and one step back in the process of implementation. Body politics within the structure and process and vested groups create barriers against such transformation. Furthermore, ten years is not adequate time for the total transformation of a government institution in a least developed country like Bangladesh, where resource constraints, bureaucracy and poor governance create problems against institutional development. However, DMB has initiated change in its policy, strategy and programmes and a few of their projects are yielding some good results towards building capacity for disaster preparedness.

#### **3.4 The activities of DMB at grassroots Flood preparedness committees at different levels**

The DMB structure involves the National Disaster Management Council (headed by the Prime Minister) at union level, and committees including the Inter-ministerial Disaster Management Coordination Committee (IMDMCC; headed by

**Figure 2: Structure of the Disaster Management Committees at different levels**



the Minister of the Ministry of Disaster Management and Relief, MoDMR), which holds informal meetings with the Prime Minister for necessary direction if required. The national council and committees are responsible for policy formulation and coordination of disaster management at national, regional and local levels. The committees become active to address the disaster situation immediately. Interaction from the ministry to the union levels is very prompt and effective: management, good practice, coordination and mobilisation are effective among the committees and they respond quickly to communities.

The National Disaster Management Council (NDMC), comprised of 30 members and headed by the Prime Minister, is responsible for formulating policy regarding disaster management and guideline issuance. The IMDMCC implements policy and decisions of the NDMC, monitors the disaster-related plans for prevention, preparedness, emergency assistance and rehabilitation, keeps the council informed of progress and monitors the overall disaster preparedness programme, including ensuring that warning signals reach all concerned officials, agencies and mass media.

An experienced disaster management specialist is nominated by the Prime Minister to head the National Disaster Management Advisory Committee (NDMAC), which is comprised of 46 general

members and advises the NDMC, MoDMR and DMB. Figure 2 shows the structure of the disaster management committees.

### 3.5 Community responses to reduce flood impacts

People always try to cope with changing situations: during any disaster, resources and knowledge are pulled together to adapt to the situation. Natural disasters like floods very often inspire automatic responses, assistance and collective actions at various levels. People develop their own coping mechanisms and survival strategies over time through trial and error. These are based on their conventional and family wisdom and localised knowledge and are cost-effective and sustainable. Hence, consensus has grown among the development practitioners, policy makers, researchers and academics that due respect should be given to indigenous knowledge and local practices when planning and implementing programmes for sectors including disaster management (Mallick 1998). Key characteristics of such knowledge systems are that they are locally appropriate, flexible and socially responsible. It gives local perspectives and priority for risk reduction, resources management and development. Incorporating indigenous and local knowledge into the disaster preparedness and development process

can contribute to local empowerment and enhance process sustainability and intended results.

Local people of Bangladesh very often depend on local knowledge to cope with environmental problems and climatic events such as floods, cyclones, and droughts. They believe that floods have blessings as well as curses and have developed a range of strategies to cope with them. They divide floods into two types: *Borsha* (normal flooding due to monsoon rain) and *Bonna* (abnormal flooding due to heavy rainfall and up-stream flow). When people experience severe flood, they store food and essential goods to safer places, take measures to protect their houses and livelihood resources. They use their social capital and help each other in adopting common strategies to overcome their difficulties (Box 5).

#### 4 Key lessons and conclusions

Disasters like floods and cyclones are very common natural phenomena in Bangladesh. Key actors in disaster management and disaster preparedness, including DMB and NGOs, should work together with communities and vulnerable groups within the context of increased natural disasters induced by climate change. Consultations, review and analysis of recent experiences of collective actions and community mobilisation for mitigation of flood impacts have indicated that there is progressive change in government policy, strategies and programmes to include NGO involvement to increase people's capacity to live with floods and mitigate adverse impacts on lives and livelihoods. The CDMP could be a good initiative toward this end. However, people in relevant government departments as well as in NGOs lack proper understanding about linking enhanced natural disasters in Bangladesh to global climate change. Government agencies, particularly DMB, should take lead roles and greater responsibilities to initiate effective programmes at different levels.

People have developed their own coping strategies and resilience to live with floods and other natural disasters in Bangladesh. But local people require information, encouragement and support during disaster events from government and other actors, particularly NGOs. A few good experiences promote people's needs and priorities for achieving desired results. Prompt activism of local flood preparedness committees needs to be strengthened and linked effectively with regional and national actors. Contingency plans for local government to manage

flood disasters must be continuously supported by central government and other development agencies with resources, ideas and guidance.

All actors have many things to learn from the recent floods and community responses to improve strategies and actions at different levels. It is evident that local communities need local context flood information in a simple language before and during floods. They also need resource support to improve their agricultural and livelihood practices with adverse shifts in flooding patterns (long duration and greater depth of flood water) to increase local capacity and adaptation. The poor and marginal especially need preparedness information and resources support: flood preparedness needs to be integrated with livelihood promotion and the overall socio-economic development of communities.

Government agencies, NGOs and policy makers need to know the perspectives of local communities, impacts of floods and levels of vulnerability to improve information, knowledge, resources support and services. For this, there is a need for more 'action research' involving communities and scientists from different disciplines and greater awareness about integration of floods, other natural disasters and climatic events into the development process among key actors, and particularly, government agencies. For this, in turn, there is a need for skilled, dedicated and involved personnel in government institutions and structures to be continuously engaged in disaster management through preparedness and capacity building, particularly at the grassroots and community level.

The process of transformation in DMB towards disaster preparedness has started in the context of enhanced climatic events such as frequent devastating floods and possible climate change in Bangladesh. First, the transformation in the intuition has started with many actors behind the change; few of which are acting within the system, and many helping to bring about desired changes from outside. These include civil society groups, NGOs, researchers and international development partners working in Bangladesh but it is felt that successful institutional transformation in Bangladesh will take time. Government institutes like DMB sometimes lack information, resources and professional skills, hence NGOs and civil society groups provide assistance with ideas, information and skills to bring about necessary change in policies, strategies and programmes. Fortunately, Bangladesh has a very

### Box 5: BCAS-RVCC Experience with the Local Community

The Reducing Vulnerability to Climate Change (RVCC) Project is an initiative to learn from communities and enhance their capacity to reduce risks of floods and cyclones. The RVCC Project is working in six districts in southwestern Bangladesh: Bagerhat, Gopalganj, Jessore, Khulna, Narail and Satkhira, through partnerships with local organisations and communities. The goal of the project is to increase local community capacity to adapt to the adverse effects of climate change. The project raises awareness on climate change issues and adaptation to climatic as well as environmental changes that could be exacerbated by climate change. The project is training local partner organisations to work with 14 union *Parishads* (lowest tier of elected government) and community leaders to increase awareness on climate change impacts and to develop community-level adaptation strategies.

The BCAS component of RVCC has been working in the Gopalganj floodplains to understand the level of vulnerability of the local people to floods, and to improve local response strategies through awareness, flood preparedness and promotion of livelihoods in relation to flood impacts. During the devastating flood of 2004, the project staff observed the community responses and worked with them to reduce flood risk by mobilising communities with better flood preparedness efforts in project villages. It was learnt from field observations and consultations that the community took measures for protection of houses, agriculture, fisheries and livelihoods; to preserve food, water and fuel and cooking; to take care of children, women and older people. They share information about floods and possible impacts at community level and utilise social capital and networks to prepare for floods and consequently reduce vulnerability.

#### Protecting house and homestead

Protecting houses and homesteads from flood has been a key coping activity in flood-affected areas. Raising plinths and building houses on raised grounds are two common and essential community practices. This is very important, because houses are the primary shelter. However, responses differ across social categories: the rich take such measures regularly every year, while the poor very often lack resources to invest in houses and homesteads every year. However, the poor very often plant flood-tolerant trees and plants around their houses to protect them from flood impacts and erosion.

#### Agriculture, fisheries and livestock

People face huge loss in crops (*Aman* paddy and *Kharip* crops), fish and sometimes livestock due to devastating floods. If they are informed earlier about the possible nature and extent of flooding, then they can take measures. For example, they harvest *Aus* paddy, vegetables and other standing crops earlier if it is predicted that the crops may be submerged. The RVCC project is trying to re-introduce flood-tolerant deep water paddy in a few plots of the community. Fisheries are enhanced by floods but cultured fish sometimes escape ponds during severe floods. In 2004, fish from ponds were swept out, greatly disadvantaging fish farmers. However, innovative farmers raise embankments every year and sometimes implement nets and fences to protect fish. Communities also take various measures to protect their poultry birds and livestock. They use local material (like banana plants) for the construction of temporary platforms for the cattle and poultry birds. They also use local herbs and plants as indigenous techniques to prevent diseases in cattle and poultry.

#### Preservation of food, drinking water and fuel

Preparation of food becomes a serious problem during severe floods. Local people very often preserve dry foods and stock them for flood times. The rich take precautionary measures for the flood period but the poor and marginal people suffer from food insecurity during and after severe floods. As a response to the food crisis, they very often take less food (two meals instead of three) during flooding. The community also share food with the most vulnerable groups with friends and kin groups helping each other in addition to food assistance from the government and NGOs.

Access to safe drinking water also becomes very difficult during severe floods in Bangladesh. Safe sources are destroyed by high intensity floods and higher depths of water. People sometimes raise the platforms of hand tubewells before and during floods. They also try to collect drinking water from safe

### **Box 5: BCAS-RVCC Experience with the Local Community (cont.)**

sources, but communication becomes another problem and hence many of them collect rainwater and preserve it for weeks and months when sources are polluted. Boiling water before drinking also contributes to fuel crises during large floods; hence, many people preserve fuel for cooking before floods. They also prepare moveable stoves for cooking since cooking places are normally submerged during severe floods. The BCAS RVCC prepared and distributed a number of moveable and improved stoves among the affected community during flood 2004.

#### **Flood warning and information sharing**

Local communities need early flood warning and information (i.e. start of flood, depth and duration of flood water) so that they can make preparations to mitigate flood impact on their lives and livelihoods. Most local people get flood information from their neighbours, relatives and friends. Local people also use locally appropriate traditional knowledge (winds, clouds, rains etc.) to understand flood trends. They also receive flood information from radio, television and newspapers, but they do not depend on the news media because the information provided sometimes becomes irrelevant to their local contexts and is too technical to understand. However, local government and NGOs sometimes come up with useful flood information and provide assistance for food, shelter, clothes and medicines. The communities need advanced information in their local context so that they can harvest their crop, protect houses, fish and other support systems. Local government institutes such as the Union Council and NGOs can build up local flood-warning systems for both collection and dissemination of flood information at the right time with easy methods.

#### **Post flood activities: agriculture and livelihoods**

Communities often need support for house construction, rebuilding of communication and regeneration of agricultural activities and can be aided by local government and NGOs. The RVCC project helped communities to prepare seedbeds for seedlings and supported the poor and women with skill development training and resources for duck rearing and floating gardens.

active civil society and NGO sector, thus both government and NGOs help each other in various areas of development. Capacity in disaster management preparedness is an area which needs urgent collective action involving all actors. The collaboration of NGOs has already helped DMB to improve its policy and programmes. In a rapidly changing world, government institutes cannot adapt promptly, due to bureaucratic structures and function, whereas NGOs can help them with new ideas and approaches. Recent transformation in DMB was the result of such interaction between government organisations and NGOs. However, inter-agency coordination is to be enhanced and consensus created to build on policy and strategies as well as on issues of common concerns for collective activism.

It has also been evident from consultation with relevant people that DMB personnel have not been able to find links between disasters and climate change issues. Generally, it is felt that the MoEF

would deal with climate change issues and the NAPA process, and has also involved DMB in the formulation of national strategies in relation to climate change adaptation. In the context of frequent devastation from floods and cyclones induced by climate change, it has been strongly felt that besides disaster preparedness, structural measures for disaster management are required to mitigate impacts of disasters in Bangladesh. But structural measures such as rural infrastructure and flood shelters need to be designed in a participatory and socially inclusive way, so that poor and marginal groups can have access to these facilities. The government bodies and NGOs working in areas of disaster should have regular contingency plans to respond to the immediate needs of vulnerable groups to reduce suffering. Further, to reduce impacts of floods and other climatic events, there is a need for effective regional cooperation in terms of information sharing and regional capacity building, particularly with neighbouring countries.

## Notes

1. Noteworthy studies are (a) Vulnerability Assessment of Bangladesh to Climate Change and Sea Level Rise, (b) Climate Change Country Study Bangladesh under US Climate Change Study Programme, (c) Climate Change

and Adaptation Study for Achieving Sustainable Development in Bangladesh, and (d) Country Study on Bangladesh under Regional Study of Global Environmental Issues, Vulnerability and Adaptation to Climate Change, 1998.

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