

CLIMATE CHANGE AND DISASTER MANAGEMENT IN BANGLADESH

INFORMATION BRIEF



Photo: Zahid Hasan

KEY POINTS

- Bangladesh is generally a disaster prone country.
- The frequency of disaster will increase as an impact of climate change hampering development.
- The government has taken comprehensive disaster management programs to battle climate change.

INTRODUCTION

Bangladesh is highly susceptible to varying climate changes. It is a country where three major rivers converge, a country largely made up of low lying flood plains and that is the statistical focus of the cyclone generating Bay of Bengal (BoB). The past has demonstrated how devastating major climatic events can be. Storms, such as Cyclone Gorky (1991) - which killed more than 130,000 people and left 10 million people homeless - demonstrate the extreme severity of these events. Although events like these are the extreme examples, there are numerous other impacts regionally across a number of sectors. It is widely accepted in the scientific community that climatic events such as these will increase globally. This paper aims to address how these climatic impacts will affect Bangladesh.

The Government of Bangladesh (GoB) has invested more than \$10 billion over the last 35 years to make the country resilient to cope with the recurrent climatic events. Disaster management strategies have been developed over times that are both practical and effective. Any country susceptible to similar events due to these climatic impacts can learn from these models and strategies.

IMPACTS OF CLIMATE CHANGE

During the 20th century the average global temperature has risen by 0.8°C over land and 0.5°C at sea. It is widely agreed by the scientific community that human activities are altering our climate system and that the temperature is on the rise. The impacts predicted by the United Nations Intergovernmental Panel on Climate Change (IPCC) are as follows: in general, there will be an increase in frequency, intensity and magnitude of extreme weather patterns, the

intrusion of freshwater reserves in coastal areas and the rise of sea levels.¹

Many of the impacts of climate change will reinforce the environmental, socio-economic and demographic stresses already faced by Bangladesh. Climate change is likely to result in:

Increased Flooding

Precipitation extremes will result in increased flooding, both because of the increase in monsoon rains, and due to the increased incidences of flash floods induced by erratic precipitation regimes.

Coastal flooding is a major impact of sea level rise. This is higher in Bangladesh because of the effects of tectonic subsidence.² Sea level rise is also associated with increased riverside flooding, because it causes more backwater effect of the Ganges-Brahmaputra-Meghna Rivers along the delta.³

This will result in increased drainage congestion due to higher water levels, which will be exacerbated by other factors associated with climate change such as siltation of estuary branches in line with increased surface runoff, and higher riverbed levels.⁴

Higher temperatures will result in increased glacier melt, increasing runoff from the neighbouring Himalayas into the Ganges and Brahmaputra rivers. The recent Intergovernmental Panel on Climate Change IPCC Fourth Assessment Report (FAR) states that glaciers in the Himalayas are receding faster than in any other part of the world, and this can be attributed primarily to global warming.⁵

Increased Vulnerability to Cyclone and Storm surges

There is evidence of a 5-10 percent increase in intensity (wind speed) that would contribute to enhanced storm

¹ Intergovernmental Panel on Climate Change (IPCC). (2007). *Climate Change: Impacts, Adaptation and Vulnerability*. IPCC Working Group II Report, Chapter 19.

² Huq, S. (2001). Climate Change and Bangladesh. *Science*, (294): p. 1617.

³ Agrawala, S., Ota, T., Ahmed, A. U., Smith, J. and Aalst, M.V. (2003). *Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sundarbans 2003*. Organisation for Economic Co-operation and Development (OECD).

⁴ Policy Department Economy and Science, DG Internal Policies, European Parliament Climate Change Impacts and Responses in Bangladesh, 2008. <http://www.europarl.europa.eu/activities/committees/studies/download.do?file=19195>

⁵ Cruz, R.V., Harasawa, H., Lal, M., Wu, S., Anokhin, Y., Punsalmaa, B., Honda, Y., Jafari, M., Li, C., and Huu Ninh, N. (2007). 'Asia'. In: M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 469-506. Cambridge University Press, Cambridge, UK.

surges and coastal flooding, and also project a 20 per cent increase in intensity of associated precipitation that would contribute to flooding.³ Cyclonic winds are likely to increase in intensity because of the positive correlation with temperature rise in sea surface. In November 2007, for example, the tropical cyclone SIDR, with a 100 mile long front covering the breadth of the country and with winds up to 240 km per hour, hit Bangladesh. This was noted to be an unusual occurrence given the intensity and timing of the storm, particularly the fact that it occurred in the same year as two recurrent floods.⁶ The IPCC FAR has identified that climate change will be associated with greater precipitation extremes, which includes more intense monsoon rainfall.¹

Increased Droughts

Climate change will exacerbate drought in Bangladesh both in terms of intensity and frequency, higher mean temperatures and potentially reduced dry season precipitation. Monsoon rains produce 80% of Bangladesh's annual precipitation, and when this is reduced, drought is a significant problem; between 1960 and 1991, a total of 19 droughts occurred in Bangladesh.³

The Southwest and Northwest regions are particularly susceptible to drought. Greater precipitation extremes associated with climate change also mean less rainfall in the dry season, which will increase water stress on those areas that already experience water shortages, particularly in the winter months. This will be worse for those areas that depend on glacial melt water for their main dry-season water supply, as glaciers recede with rising temperatures.

Decreased Availability of Fresh Water

The availability of freshwater will be reduced by increased intrusion of salinity into fresh water sources during the low flow conditions. In the coastal regions this is brought about by sea level rise resulting in saline

water intrusion in the estuaries and into the groundwater. The effects are exacerbated by greater evaporation of freshwater as temperatures increase, coupled with a greater demand for fresh water in times of water stress.⁷

Greater Temperature Extremes

Climate change is associated with warmer summers and colder winters. Temperatures in Bangladesh have increased about 1°C in May and 0.5 °C in November between 1985 and 1998, and further temperature increases are expected. However, although the overall climate is warming, temperature extremes are increasing, and winter temperatures as low as 5°C have been recorded in January 2007, reportedly the lowest in 38 years.¹

RESULTANT IMPACTS AND ECONOMIC LOSSES

The impacts of climate change on Bangladesh have significant implications for its economic development, social welfare and culture. These impacts will be discussed for different sectors, in terms of "human dimensions" of climate change.¹

Agriculture

The economy of Bangladesh is based on agriculture, with two thirds of the population engaged in or indirectly relying on agricultural activities. Agriculture is one of the most climate sensitive sectors,⁸ since changes in temperature, rainfall patterns, and increased likelihood of extreme events such as droughts and floods, determine the crop yields. Although an increase in CO₂ levels could moderately increase temperature which may result in an increase in crop production through carbon fertilization, modelling studies suggest that increasing frequency of crop loss due to extreme events, such as droughts and heavy precipitation, may overcome any benefits of moderate temperature increases.⁹

⁶ Sayeed, S.K. (2007). Climate change and Bangladesh: A perspective on where we are. The Daily Star. Dhaka.

⁷ S.M. Mahbubur Rahman, Institute for Water Modelling, Bangladesh. Water infrastructure responses to climate change. Presentation delivered at "Economic Approaches to Climate Change and Poverty: a workshop for economic policy makers and researchers in Bangladesh", 13-14 October 2009, Dhaka, Bangladesh.

⁸ Cline, W.R. (2007). Global Warming and Agriculture. Impact Estimates by Country. Washington DC: Centre for Global Development and the Peterson Institute for International Economics.

⁹ Easterling, W.E., Aggarwal, P.K., Batima, P., Brander, K.M., Erda, L., Howden, S.M., Kirilenko, A., Morton, J., Soussana, J.F., Schmidhuber, J. and Tubiello, F.N. (2007). 'Food, fibre and forest products'. In: M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability*, Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, pp. 273-313. Cambridge University Press, Cambridge, UK.

Forestry and Biodiversity

Bangladesh has a diverse range of forest ecosystems, including bamboo, freshwater swamp forests and mangroves. The Sundarbans of Bangladesh, a world heritage site, is the single largest mangrove area in the world, comprising an area of 57,700 hectare and housing one of the richest natural gene pools. A total of 425 species have been identified in the Sundarbans, the most notable of which is the Royal Bengal Tiger, which is endemic to the area.

Climate change will have a detrimental impact on all of the forest ecosystems in Bangladesh, and the Sundarbans are likely to be the worst affected.¹⁰ The changes in temperature and water will result in direct pressure on many climate-sensitive species, and cause increased erosion and deterioration of soil quality in upland forested areas.

Increased rainfall intensity will cause enhanced erosion in upstream and cause sedimentation. The Sundarbans also offer subsistence to around 3.5 million inhabitants that live in and around the forest boundary. The inundation and intruding salinity is already interrupting traditional practices in the Sundarbans.

Health

Climate change affects health directly and indirectly. The direct impacts of climate change on human health occur through extreme events, for example the floods in Bangladesh in 2004 caused 800 deaths, while the recent cyclone Cidr, affected more than 8.5 million people, causing more than 3,500 deaths.⁶

Climate change will also affect the distribution of climate sensitive diseases. Malaria is a frequently cited example, because its prevalence increases with the warmer, wetter climates. Incidences of malaria have increased dramatically in Bangladesh over the last 30 years, and it is now a major public health problem, with 14.7 million people in Bangladesh classified as being at high risk for catching the disease.¹¹

MANAGING CLIMATIC HAZARDS

Bangladesh benefits from a long history of designing and implementing various types of adaptation activities (both policies and capital investment) especially for floods and cyclones. Over the last three decades, the GoB has invested over \$10 billion (at constant 2007 prices) to make the country more climate resilient and less vulnerable to natural disasters.¹² Since the 1970s, the GoB with the support of development partners has invested in:

- Flood management and irrigation schemes to raise agricultural productivity in low lying areas;
- Flood protection and drainage in urban areas;
- Coastal embankment projects to prevent tidal flooding and incursions of saline water;
- Multi-purpose cyclone shelters;
- Disaster management, response and recovery projects;
- Irrigation schemes to enable dry season crop;
- Agriculture research programs to develop saline, drought and flood tolerant, high yielding crop varieties; and
- Coastal 'greenbelt' (afforestation) projects.

Recognizing the 'urgent and immediate' vulnerability of its development objectives to climate change, GoB prepared the National Adaptation Programme of Action (NAPA) in 2005. This was followed by the preparation of the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009, by the Ministry of Environment and Forest in consultation with all relevant stakeholders. The BCCSAP has been the main basis for the Government's efforts to combat climate change over a 10-year program to build the capacity and resilience of Bangladesh. The plan envisions a financing need of about \$5 billion during the first 5 years through 2014.

¹⁰ Rahman, A. and Alam, M. (2003). 'Mainstreaming Adaptation to Climate Change in Least Developed Countries (LDCs): Bangladesh Country Case Study'. IIED Working Paper, (2).

¹¹ Reid, H. and Sims, A. (2007). *Up in smoke? Asia and the Pacific*. Up in Smoke Working Group on Climate Change and Development. p. 92.

¹² World Bank. (2009). 'Bangladesh: Economics of Adaptation to Climate Change Study'. <http://beta.worldbank.org/content/bangladesh-economics-adaptation-climate-change-study>.

POLICY AND INSTITUTIONAL FRAMEWORK

Within the South Asian region Bangladesh is well known for its disaster management policy and framework. Being the most disaster-prone country within South Asia, Bangladesh is the first to have a separate Disaster Management Bureau (DMB) since 1993. The country has a good number of institutional structures to achieve technical monitoring, capacity building, preparedness and response. The Ministry of Food and Disaster Management is responsible for coordinating national disaster management efforts across all agencies. In 2004 MoFDM launched the Comprehensive Disaster Management Programme (CDMP), (currently in its second phase), to facilitate reform of the disaster management approach by expanding its focus from reactive emergency response to proactive risk reduction.

A National Disaster Management Policy will be formulated to define the national perspective on disaster risk reduction and emergency management, and to describe the strategic framework, and national principles of disaster management in Bangladesh. It will be of strategic in nature and will describe the broad national objectives, and strategies in disaster management.

The National Plan for Disaster Management (2010-2015) has recently been approved from the National Disaster Management Council. It has been prepared aiming at reducing vulnerability of the poor to natural, environmental and human-induced disaster to a manageable and acceptable level. The plan has been developed in line with the government mission taking into consideration the Hyogo Framework for Action 2005-2015 and adopting the SAARC Framework on disaster management.

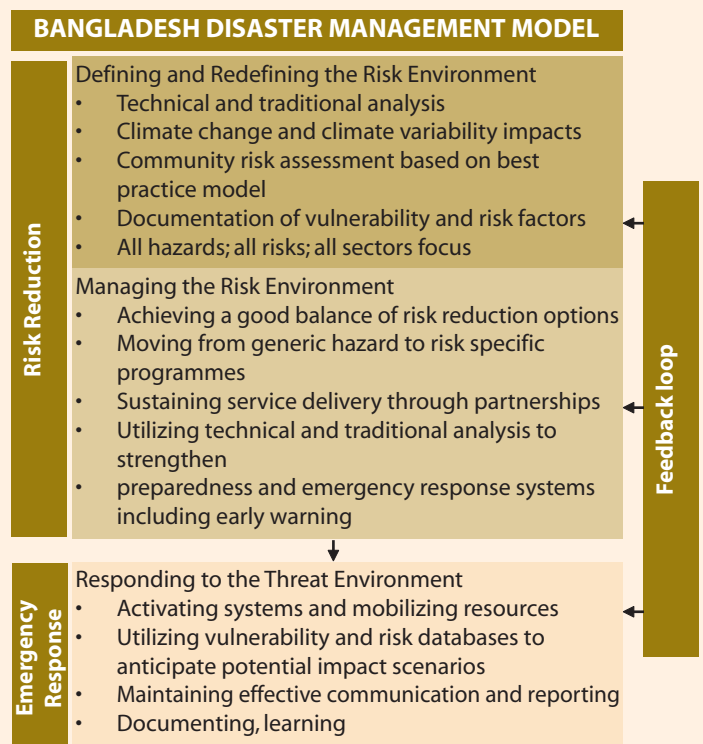
The scope of the plan includes natural and man-made disasters including climate change with a view to identify when, where and in what frequency these threats are likely to occur. Accordingly the plan takes into consideration of impacts projected by IPCC on Bangladesh:

- Production of rice and wheat might drop by 8 percent and 32 percent respectively by the year 2050.
- Increasing salinity of the groundwater as well as surface water resources.
- Sea level rise as a direct impact of global warming and 1,000 square kilometers of

cultivated land and sea product culturing area is likely to become salt marsh.

- Projected sea-level rise could flood the residence of millions of people living in the low-lying areas such as in Bangladesh.
- Global burden (mortality and morbidity) of diarrhoea and malnutrition attributable to climate-change are already the largest in Bangladesh.
- Land degradation, shortfalls in food production, rural poverty and urban unrest.

In order to tackle the current and future challenges, the plan formulated a disaster management model as follows:



The key targets, actions and outcomes to be achieved by 2015 under the National Plan for Disaster Management are organized under seven strategic goals as follows:

1.0 Professionalizing the disaster management system: through establishing a regulatory framework, professional development and through training.

2.0 Mainstreaming Disaster Risk Reduction and Climate Change adaptation: incorporation of risk reduction and climate change adaptation principles

and practices into all development programmes and policies, sectoral policies and plans and in NGO programmes and plans.

3.0 Strengthening Institutional Mechanisms:

Capacity building of DMCs at all levels, institutionalize national training capacity, including monitoring.

4.0 Empowering Communities At Risk: uniform CRA guideline to identify community and household level risks, formulate adaptation action planning, strengthen community and household level capacity and bring communities under social safety nets.

5.0 Expanding Risk Reduction Programming across hazards and sectors: Update hazard maps, develop climate change scenarios and associated hazard risks, establish an Integrated Approach, preparedness, hazard and risk specific capacity building program, prediction and monitoring.

6.0 Strengthening Emergency Response Systems:

Strengthen and improve an all hazard early warning systems, dissemination through a National Disaster Management Information Centre with an internet connection with all the 64 Districts and high risk Upazila DMCs, establish Community Alerting System, establish and improve Search and Rescue Mechanism, develop and establish emergency response plans and develop and establish post disaster recovery and reconstruction mechanism.

7.0 Developing and strengthening regional and global Networks:

Establish public and private partnerships for disaster risk reduction and support regional and global initiatives.

The Standing Orders on Disaster (SOD) is another critical component of disaster management framework in the country. It describes the detailed roles and responsibilities of committees, Ministries and other

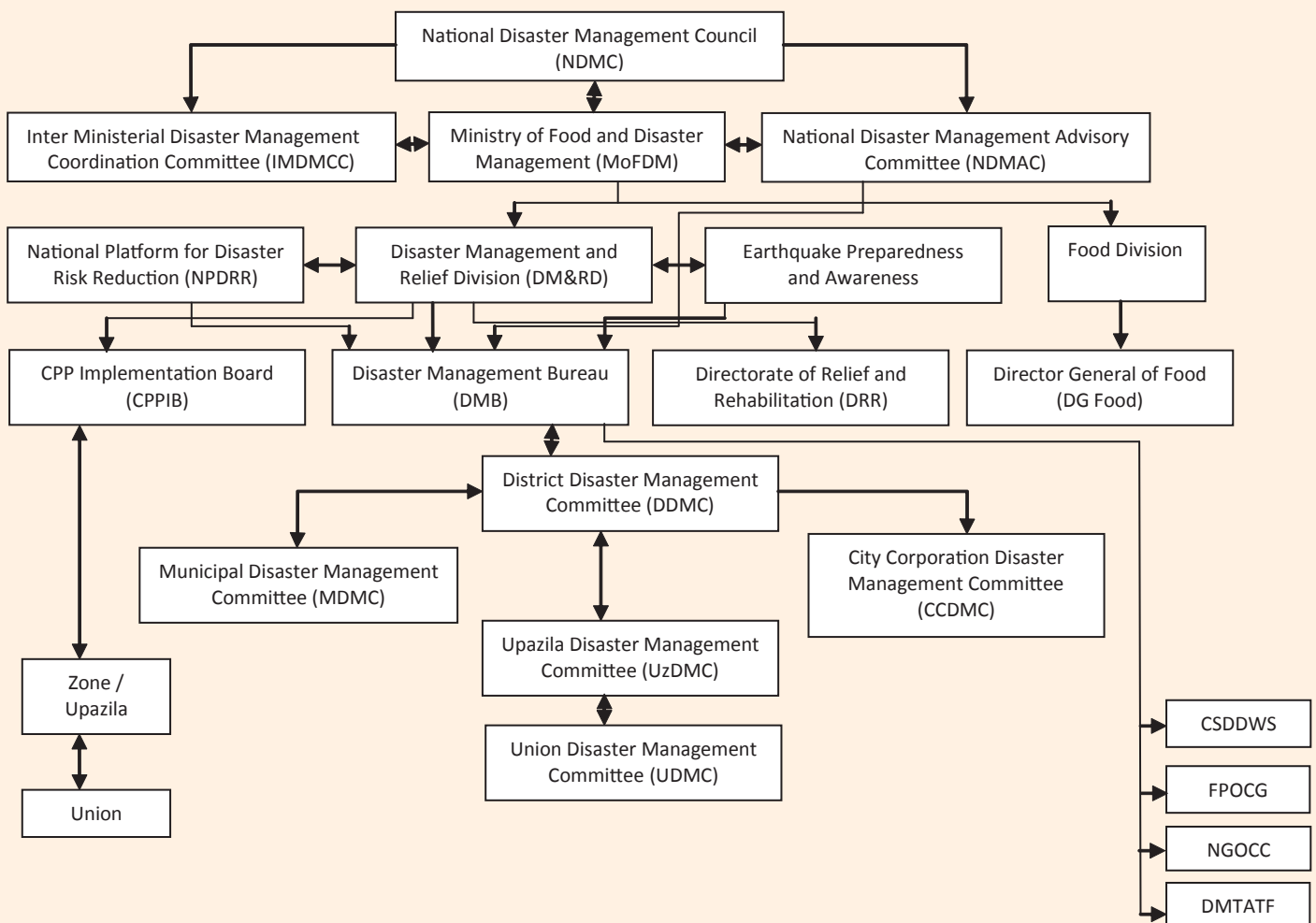


Figure 1: Disaster management Institutions in Bangladesh

organizations in disaster risk reduction and emergency management, and establishes the necessary actions required in implementing Bangladesh's Disaster Management Model. The Standing Orders have been prepared with the objective of making the concerned persons understand their duties and responsibilities regarding disaster management at all levels, and accomplishing them. All Ministries, Divisions/Departments and Agencies shall prepare their own Action Plans in respect of their responsibilities under the Standing Orders for efficient implementation. The National Disaster Management Council (NDMC) and Inter-Ministerial Disaster Management Coordination Committee (IMDMCC) will ensure coordination of disaster related activities at the National level. Coordination at District, Thana and Union levels will be done by the respective District, Thana and Union Disaster Management Committees. The Disaster Management Bureau will render all assistance to them by facilitating the process. The institutions involved in disaster management in Bangladesh are shown in figure 1.

In addition to SOD, guidelines for Government at all levels are developed as best practice models, and are used to assist Ministries, NGOs, disaster management committees and civil society in implementing disaster risk management. Guidelines will include, among others, - Disaster Impact and Risk Assessment Guideline, Local Disaster Risk Reduction Fund Management Guidelines, Community Risk Assessment Guidelines etc. The regulatory framework is shown in Figure 2.

FINANCING DISASTER

The Government has decided to constitute a fund called the "National Disaster Response and Recovery Fund" from its own resources and donations from home and abroad. The fund shall be used for response, relief and recovery. The Government will constitute another fund called the "National Risk Reduction Fund" for projects which are designed for the purpose of prevention, mitigation and preparedness. Relevant Ministries/ Divisions/ Directorates and departments will make provisions in its annual budget to fund the activities and programmes set out in the Disaster Risk Reduction component of its Sectoral Development Plans.

At the field level, Disaster Management Committees at the district, upazila, union, city corporation and paurashava levels will constitute its Disaster Management Fund to implement programmes and activities as set out in Disaster Management Plans. This fund will make up of the following:

- a) contribution from the government;
- b) contribution from local government; and
- c) local donation.

The government will formulate guideline for operating the fund. The Government has also decided to use 34% the Bangladesh Climate Change Trust Fund for emergency relief operations.

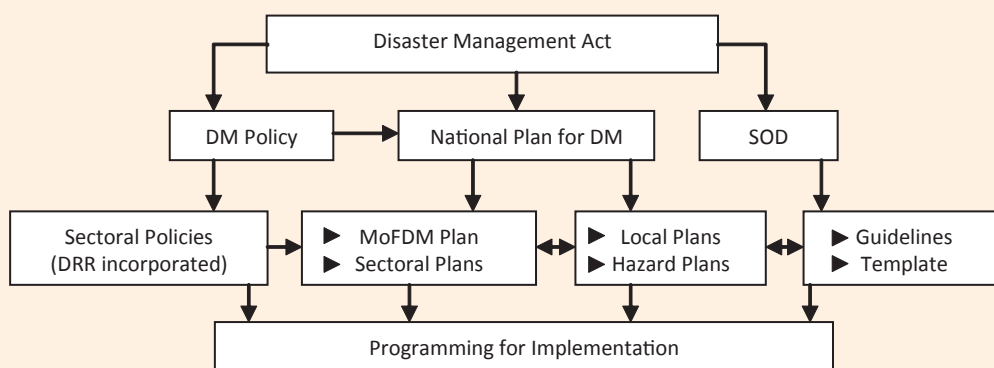


Figure 2: Regulatory framework in implementing disaster risk management.

CONCLUSION AND RECOMENDATIONS

Climate change and natural disasters should be dealt with mutually and not in isolation. Disaster mitigation and preparedness are necessary for a sustainable growth of Bangladesh. Bangladesh has so far done well in disaster management. Disaster and climate change are increasingly being considered as a development constraint; hence, mainstreaming them into the development policy and into practice are pertinent in the current context. DRR and climate change are two threats that positively reinforce each other. This is

particularly relevant to communities living in Bangladesh, living in fragile ecosystems. Disaster management tools can be used effectively to understand the threats being faced by communities living in that area, in a way that preparedness and adaptation methods can be devised accordingly. Non-structural mitigation measures such as policy, management plans, community disaster preparedness training advocacy and public awareness must be given a high priority; this would require an integration of structural mitigation with non-structural measures.



Ministry of Environment and Forests
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