Disaster Preparedness in Bangladesh

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Introduction

The CEPSA program's research on disaster preparedness in South Asia focuses on understanding the current status of preparedness initiatives and the political economic incentives underlying these outcomes. This research uses case studies and quantitative analyses to investigate why national and sub-national governments invest—or do not invest—in efforts to reduce the risk of, and prepare for, natural hazards.

This research brief summarizes the findings of a detailed case analysis on Bangladesh, a country faced with severe threats from a wide range of natural hazards, risks that are only expected to increase in severity with the continued climate change. In this study, we consider three main topics: the history and character of natural hazards in Bangladesh; the current status of preparedness initiatives, with particular attention to progress on the priorities laid out by the Hyogo Framework for Actions; and evaluation of potential explanations for these outcomes. We conclude with a set of policy recommendations for the Bangladeshi government, based on the findings of the study.

Bangladesh's Experience with Natural Hazards

Bangladesh is often cited as one of the countries with the greatest risk of being affected by climate change and natural disasters. In 2013, the Intergovernmental Panel on Climate Change (IPCC) ranked Bangladesh as the most 'climate vulnerable country' in the world,[1] while Maplecraft's Climate Change Vulnerability Index (CVI) estimates Bangladesh to be at 'extreme risk' from the impacts of climate change by 2025.[2]

A number of demographic and geographic factors contribute to Bangladesh's climate and natural hazard sensitivity. The country is one of the most densely populated in the world, constituting 147,570 square kilometers of area with a total population of nearly 163 million.[3] Over 80 percent of Bangladesh is floodplains, situated at the Ganges Delta with numerous tributaries flowing into the Bay of Bengal. These characteristics increase the risks associated with intense rain and cyclonic events, placing large portions of the population at risk. In contrast to flood-prone areas, the northwestern region is subject to drought conditions. Finally, a subduction zone underneath Bangladesh has recently been identified as placing the country at increased risk of earthquakes in the future. The combination of these dynamics has historically led to significant natural disasters in Bangladesh, with the expectation that these natural hazard events will continue into the future.

Floods

As a result of its geographical location, Bangladesh is prone to annual flooding, primarily during the monsoon months of June through September. Heavy annual rainfall inundates nearly 18 percent of the country. This precipitation is important in sustaining the agricultural industry by depositing sediments brought by the resulting floodwaters. Unfortunately, during the 1987 flood, nearly 40 percent of land was under water because of heavy rain, recording it as one of the most catastrophic events in Bangladesh's history.[4] 880 lives were lost and 500,000 people were displaced, accounting for nearly US $1 billion in damage. In 1988, before the country could recover from the past year's floods, it was hit by a more catastrophic flood, displacing over 5 million people and costing US $450 million in damages.

Cyclones

Bangladesh has a long history of tropical cyclones, and the government estimates a severe cyclone in the coastal areas once every three years. The land area is less than 7 meters above sea level, and a study has shown that high tides in Bangladesh are rising 10 times faster than the global average.[5] Cyclones are most common in the southwest parts of the country with the lowest-lying villages in the river deltas of the Bay of Bengal.

In addition to displacing large numbers of people, cyclones have an adverse effect on the agricultural sector. During Cyclone Marian in 1991, 247,000 tons

of cereal crops and 35,000 tons of vegetable, tubers and other crops were lost.[6] Damage to coastal embankments, high salinity in some areas and a shortage of tools, seeds, and fertilizers made the prospects for rice crop bleak in the months following the cyclone. The port city of Chittagong suffered heavy damage and the port itself was left in shambles. The cost of reconstruction and rehabilitation was estimated at US $1.78 billion by a UN task force that investigated the cyclone's impact.

Drought

The northwestern regions of Bangladesh are primarily affected by droughts, historically occurring annually between mid-September and mid-November. The most intense droughts have affected about 53 percent of the population with widespread damage to agricultural crops. Increased summer drying and shortage of water lead to more incidents of illnesses among children, increases in crop pests and diseases, increased energy demand, and excessive heat stress among livestock. Climate scientists estimate the dry seasons will be more prolonged by 2020 as a result of climate change, turning existing drought-affected areas into severely drought prone areas.[7]

Landslides

Although landslides contributed to only 0.14 percent of the damage caused by natural disasters between

Table 1 - Summary of Major Recent Natural Hazard Events

Month/Year	Event Type	Damage Caused
1987	Flood	40% of land underwater, 880 deaths, 500,000 people displaced, ~$1 billion in damages
1988	Flood	60% of land underwater, 5 million people displaced, $450 million in damages
1989	Drought	
1994	Drought	
1998	Flood	75% of land underwater, ~1,000 deaths, 30 million people displaced
2000	Drought	
2004	Flood	66% of land underwater
May 2007	Cyclone	14 deaths and damages amounting to US$ 982 million
June 2007	Landslide	128 deaths, >8,000 displaced
Nov 2007	Cyclone	3,500 deaths and severe damage to households/livestock
Oct 2008	Cyclone	15 deaths and thousands of homes destroyed
Apr 2009	Cyclone	0 deaths and some agricultural lands destroyed
May 2009	Cyclone	150 deaths, 200,000 houses destroyed and crop losses
May 2013	Cyclone	17 deaths and 1.3 million people displaced; crop losses amounting to US$ 5.14 million
Jul 2015	Cyclone	132 deaths, 510,000 houses destroyed and over 667,221 acres of land damaged
2016	Flood	64 deaths, 3.2 million people affected
May 2016	Cyclone	26 deaths, 40,000 homesteads destroyed and severe damage to live-stock, fish and shrimp farms
Aug 2016	Cyclone	0 deaths and some agricultural lands damaged
May 2017	Cyclone	9 deaths, 500,000 people displaced and 20,000 homes destroyed

2009 and 2014, they are increasingly concerning for the government because of climate change and excessive rainfall.[8] Physio-geographically, only 18 percent of Bangladesh is hilly and tract area, almost all of which is concentrated in the southeast region of the country, namely Chittagong division. Experts have attributed weak structure, rampant deforestation, and indiscriminate use of land to frequent and fatal landslides in the region.[9]

Earthquakes

Recent research estimated that a huge earthquake might be building beneath Bangladesh as a result of a subduction zone.[10] Scientists have discovered evidence of increasing strain in the two tectonic plates that underlie the delta that have been building for at least 400 years. The anticipated earthquake is likely to be larger than 8.2 in magnitude, with the potential to affect at least 140 million people in the region. This subduction zone is an extension of the same tectonic boundary that caused the 2004 Indian Ocean undersea quake and 2015 Nepal quake (killing 8,000 people).

Disaster Preparedness in Bangladesh

Bangladesh has several bodies to address disaster preparedness, risk reduction and response. The Ministry of Disaster Management and Relief was formed in 1972 and went through several changes before becoming the leading authority on determining the policies and allocation of budget on disaster-related efforts. Under the leadership of the Prime Minister, the Ministry of Disaster Management and Relief also organizes the National Disaster Management Council (NDMC) that has representatives from the various institutions at national and local levels to tackle natural disasters in the country. The National Disaster Management Regulatory Framework (NDMRF)—including the National Disaster Management Act, Policy, and Plan; the Standing Order on Disaster, and the Guidelines for Government at all Levels—provides a set of procedures for disaster preparedness, risk reduction, and response. The framework was developed with the intent to mainstream risk reduction efforts within government, NGO, and private sector activities, thereby placing it on par with the framework for poverty reduction.

In practice, the Government of Bangladesh has implemented disaster preparedness and risk reduction through the lens of poverty alleviation. Therefore, much of the country's efforts in tackling natural disasters rest heavily on the economic empowerment of its population and social safety net programs.

Specific initiatives have emerged directly in response to historical hazard events. The 1988 flood led to the government of Bangladesh heavily investing in infrastructure and poverty alleviation with a firm belief that general population would become more resilient against floods and other natural disasters if they were economically empowered. In 2004, the government established a cross-sectoral council to reduce flood risks in the country. In addition to the Ministry of Disaster Management and Department of Disaster Management, 900 representatives from all ministries, international aid organizations, NGOs, private sector and sub-national government bodies participated in the formulation of an extensive risk reduction plan. The recommendations outlined in the plan not only address floods, but also a range of natural disasters known regularly to affect the country.

With regard to cyclones, the government sought support of several international aid agencies that led to the formation of joint task forces to build stronger early warning systems, more cyclone shelters, coastal embankments and a more widespread community volunteers to support rehabilitation efforts. More recent experience with earthquakes has also encouraged the government to increase preparedness in this area, which is expected to be addressed in the next Standing Order on Disasters.

Progress on the Hyogo Framework for Action

Though the government is now pushing forward on the goals laid out in the more recent Framework for

Disaster Risk Reduction, much of its past strategy and implementation has been in accordance with the Hyogo Framework for Action. We use this latter framework to provide a more rigorous evaluation of preparedness efforts to date.

Priority 1: Ensure that disaster risk reduction is a national and local priority with a strong basis for implementation

In practice the budget and resource distribution for preparedness activities are determined by NDMC, and implemented through local government and institutional bodies. As a result, emphasis has been placed primarily on infrastructure instead of community awareness and capacity building. In addition to a top-down approach, the National Disaster Management Regulatory Framework does not account for government bodies outside of the traditional hierarchy of institutions. For example, almost all cyclone shelters in Bangladesh are primary schools built on raised ground, that effectively makes the shelters as much as a budgetary concern for Ministry of Education as it is for Ministry of Disaster Management and Relief. In the aftermath of the tornado in 2013 in Brahmanbaria, the ministries discussed an integrated plan that should include members of all ministries, however it is yet to be formulated. Field research showed that the NDMC budget is insufficient for managing large-scale disaster rehabilitation and will require a shared fund between national government bodies in order to reconstruct, for example, buildings, schools and roads.

In addition, there is a lack of integration between the United Nations (UN), the Government of Bangladesh and local NGOs. In principle, the government, supported by the World Bank and Asian Development Bank, leads infrastructural projects, the UN leads development initiatives, and local NGOs take charge of voluntary efforts. In reality, though, the UN, given its history in assisting Bangladesh immediately after independence, plays an authoritative role in shaping disaster management polices with the central government. The government in turn, and as a result of being heavily politicized, fails to engage local elected public officials, NGOs, and civil society organizations in the process. The participation of NGOs and civil society organizations in policymaking has not been institutionalized; they are only involved when decisions have already been made in order to implement them. Consequently, disaster management has been tied primarily to development indicators determined by the government and the UN thus far and focused entirely on response, rather than preparation.

Priority 2: Identify, assess and monitor disaster risks and enhance early warning

Bangladesh's early warning system has improved significantly in recent years. In addition to technological advancements, the current early warning system involves a wide network of local volunteers and community radio to disseminate info. In 2015, the government also announced plans to expand a satellite-based forecasting and warning system developed by SERVIR to aid in improving lead time for flood warnings. The system relies on the Jason-2 satellite and was successfully able to forecast the flooding eight days in advance at nine locations of the Ganges and Brahmaputra River Basins in 2014.[11] The Cyclone Preparedness Program has invested heavily in training over 65,000 volunteers and building capacity at local level with support from Red Cross International and USAID. There is also reliance on local knowledge and community to disseminate information.

Priority 3: Use knowledge, innovation and education to build a culture of safety and resilience at all levels

In the aftermath of the catastrophic floods in 1988 and cyclone in 1991, the Government of Bangladesh has included disaster preparedness and information on early warning systems in the national curriculum of the country. Primary schools are often built as cyclone shelters, providing children and young adults with awareness from an early age about safety and resilience. There are several community interventions spearheaded by local NGOs and international agencies that work towards improving community awareness on natural disasters.

Bangladesh also has a long and successful track record in using local knowledge to develop community-driven interventions and innovations to tackle its socioeconomic hazards. For example, water is being desalinized using rainwater and solar technology, southern regions are promoting 'floating agriculture', locals are investing towards housing on raised ground, and afforestation of tall trees is preventing more deaths by lightning strikes. At the same time, the government is also investing heavily in developing a multi-hazard disaster map that will inform policymakers about the most vulnerable areas and subsequent disaster management plans.

Priority 4: Reduce the underlying risk factors

While the government is investing heavily in infrastructure and mapping of natural disasters, there seems to be lack of efforts in tackling underlying factors that contribute towards them. Landslides, for example, have been more frequent in recent years as a result of rampant deforestation and agriculture in hilly areas. Uncontrolled urbanization is contributing towards increasing risks of fatalities and widespread damage during earthquakes. This accounts for the government's negligence in addressing institutional and human resource challenges within the various verticals that are concerned with disaster management in the country.[12] Corruption and misallocation of funds are associated with an inability to develop preventive measures instead of responsive ones.

Priority 5: Strengthen disaster preparedness for response at all levels

The government relies on local NGOs, civil society organizations, and international agencies in building capacity of communities and providing emergency relief. In spite of these efforts, central decisionmaking has limited the impact of training programs at local levels. There is only one Disaster Relief and Rehabilitation Officer (DRRO) appointed at each district, who is in-charge of both preparing and responding to emergencies, and does not have the necessary resources to do so effectively. What is encouraging, however, is the government's initiative in developing thorough Standing Orders on Disasters (SOD) that provide clear guidelines on the role of different parties in the event of a major natural disaster. The guidelines are robust in the sense that they emphasize collaboration and situation-based response, and are updated annually to reflect new challenges.

Incentives for Disaster Preparedness

The discussion to this point suggests that Bangladesh has a substantial disaster preparedness program in place, but that there remain limitations to the design and implementation of these efforts. Here, we consider a set of hypotheses for why governments may, or may not, invest in disaster preparedness efforts, and examine their applicability in the case of Bangladesh.

Moral Hazard: If governments anticipate that other actors will spend on preparedness or response, they will spend less on preparedness.

Bangladesh has a long history with the World Bank as well as the United Nations. As a result of these long-term relationships, a significant proportion of government spending on disaster management is dependent on international aid. The Annual Development Program (ADP), for example, is the basic instrument for the implementation of plans and programs for national development based on the estimates and proposals placed forward by various ministries. A significant share of the ADP has been funded through external sources.[13]

At the same time, the National Plan for Disaster Management takes into account the role of the national budget in funding infrastructural projects and capacity building of the locals[14]. In recent years, the dependency on international aid has substantially decreased and disaster management plans are jointly funded through national budget allocations and ADP. This suggests that moral hazard related to support from international actors has planned limited to no role in the incentive structure of the Bangladeshi government.

In contrast, the government relies substantially on the domestic military to manage emergency situations, often expanding to military response in low-risk natural disasters. This overreliance on the military suggests and alternative form of domestic moral hazard, in which the government has limited incentives to spend on resilience initiatives, when it can instead rely on military response. This combination of dynamics may help to explain certain inconsistencies in government preparedness efforts.

Perceived Risk: If a government perceives the risk of a disaster is high, they will invest more in preparedness.

Although traditionally the Government of Bangladesh has adopted a response-centric approach, it is increasingly investing in preparedness. Behavior related to recent preparedness initiatives for earthquakes, as well as increased attention to cyclone preparedness, suggest that the government is prepared to invest more in preparedness efforts if the perceived risk is high.

Political Development and Electoral Incentives

Hypothesis 1: If a government is more developed in terms of the quality of its politicians and the quality and independence of its bureaucrats, then it will prepare better for natural disasters.

Hypothesis 2: If a government perceives disaster preparedness to be electorally beneficial, then it will spend more on preparedness.

Bangladesh has a comprehensive, structured framework for disaster management, which is implemented by the bureaucracy. However, the centralized nature of this policy design, and the bureaucratic nature of its implementation, highlight potential conflicts between the incentives of differing government actors at the local level. Specifically, an excess of independence within the bureaucracy can have adverse effects on building community resilience, via its effects on the perceived role of elected officials. In the Bangladesh case, a government employee, as opposed to an elected public official, acts as the local gatekeeper and key implementer of decisions made by the central government. This effectively disincentivizes elected local public officials from following through their commitment to work with communities to tackle disasters, participate in training programs, and understate the catastrophic impact of natural disasters on the most vulnerable communities. Thus, because locally elected officials cannot claim credit for implementing preparedness initiatives, they do not offer support that would facilitate improved implementation in coordination with the bureaucracy.

Civil Society: Levels of disaster preparedness may be higher with a stronger civil society presence in general and, in particular, when there are more disaster-oriented NGOs on the ground.

Civil society in Bangladesh plays an important role in disaster preparedness, both through its own efforts and via the pressure it places on the government. For example, BRAC, the world's largest NGO, initiated a dedicated department, the Disaster Management and Climate Change Program, to address ongoing challenges for disaster management. The program has played a significant role in not only ensuring food security and emergency relief after a disaster, but also spearheading several innovation initiatives such as using solar energy to desalinize water in preparing the community to become resilient against natural hazards. As a mouthpiece for the public, civil society groups have offered important critiques of past government efforts, including the government's response-centric approach in the aftermath of Cyclones Sidr and Aila. This response to encourage the government to change its strategies and invest more towards building cyclone shelters, adopting advanced technologies for better estimates and early warning systems.

Policy Recommendations

In conclusion, we offer four policy recommendations, aimed at the Government of Bangladesh, and informed by the analyses reported here and the broader research project. We suggest that the government needs to:

1. ***Invest more in building institutional capacity within the public sector, in particular at the local level***

   Empowering elected local officials through training and participation in national level policy decisions, will help the government to achieve its goal of more resilient communities. An extensive evaluation of the government's internal capacity in addressing different kinds of natural hazards will be the first step towards achieving this policy recommendation.

2. ***Engage in more in community capacity building to reduce reliance on international actors and the military***

   Overreliance on the military and cash disbursement programs supported by international organizations have led to a more response-centric approach in disaster management. In order to achieve the priorities set by the Sendai Framework, the government now needs to shift its attention to local NGOs and civil societies to collaboratively develop and implement nationwide programs and awareness campaigns on a number of natural disasters.

3. ***Support technological advancements to improve early warning systems and evaluation of perceived risk of disasters***

   Although the government has made some strides in adopting more advanced technologies to provide flood warnings well ahead of time, similar initiatives need to be taken in developing tools and resources to develop more robust early warning estimates for a range of natural disasters. These efforts can build on local innovations to provide large amounts of data for more accurate estimations of incoming hazards.

4. ***Make a significant shift from response to preparedness***

   The recent investment in preparing for earthquakes and cyclones was widely lauded in both private and public sectors, and calls for similar investment in floods, landslides and other natural disasters. This is particularly important because preparedness addresses a number of underlying factors that increase the risks of damage caused by a natural hazard, such as unplanned urbanization, rampant deforestation and lack of institutional capacity at local level.

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