

## ANALYZING DISASTER RISK FACTORS OF CYCLONE SURVIVORS IN BANGLADESH

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### ABSTRACT

*Tropical cyclone causes enormous socio-economic, environmental and health burdens to vulnerable people residing in coastal regions in Bangladesh. Recent debates on climatic shifts and old fashioned disaster management models often referred as disaster preparedness and response have created an opportunity for framing concrete decisions to formulae national policy and advance adaptive capacity building in addressing climatic loss and damage. This paper discusses epidemiological, environmental and socio-economic risk factors in the post-cyclone phase in Bangladesh.*

**Keywords:** Cyclone, Cyclone Aila, Hyogo Framework for Action 2015, Morbidity, Mortality, Risk, Sidr, Tropical cyclone.

### INTRODUCTION

Tropical cyclone causes enormous socio-economic, environmental and health burdens to vulnerable people residing in coastal regions in Bangladesh. Recent debates on climatic shifts and old fashioned disaster management models often referred to disaster preparedness and response have created an opportunity for framing concrete decisions to formulae national policy and advance adaptive capacity building in addressing climatic loss and damage. Over the last few decades, climate change acted as a risk factor for developing cyclone related risks in this region. Extreme events have become more frequent or more severe in propagating a huge climate induced vulnerability and environmental health hazard. Bangladesh is one of the top ten nations mostly vulnerable to climate change (*German Watch Global Climate Risk Index [CRI]-2011*).

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Bangladesh has experienced numerous devastating tropical cyclones in recent years that have caused immense prolonged suffering to people and huge losses to property in south west coastal belts. During cyclonic catastrophe, people from coastal area seem to be more vulnerable in managing further disaster risk and crisis. Moreover, most of the climate induced people live in an extremely dynamic and challenging environment. Besides, there are threats of climate change and upstream land and water uses across the country (Mallick *et al.*, 2009). These threats affect almost every aspect of life and limit livelihood choices of the climate induced people.

The coastal zone of Bangladesh, an area covering 47,211 km<sup>2</sup> facing the Bay of Bengal or having proximity to the Bay, and the exclusive economic zone in the Bay, is generally perceived to be a zone of multiple vulnerabilities. Records of last 200 years show that at least 70 major cyclones hit the coastal belt of Bangladesh and during the last 35 years nearly 900,000 people died due to catastrophic cyclones (PDO-ICZMP 2004). Disasters cause serious damage to health facilities, water supplies and sewage systems. A variety of public health consequences related with tropical cyclones pose for indicating storm-induced mortality, morbidity, infectious diseases, psycho-social effects, disruption of healthcare services and damage to the health-care infrastructure in disaster prone areas. Threats of pure drinking water and sudden food crisis often reflect huge deficiency in nutritional status of child bearing mother and children in most crisis regions. A serious reduction in jobs and livelihoods tremendously make the cyclone affected people vulnerable to health outcomes and build back better. The unique natural setting of Bangladesh and the characteristics of tropical monsoon climate in South Asian subcontinent are greatly responsible for the cyclone hazards in the country. Of the 508 cyclones that have originated in the Bay of Bengal in the last 100 years, 17 percent have hit Bangladesh, amounting to a severe cyclone almost once every three years (Ahmed *et al.*, 2012). The main purpose of the paper focuses on identifying statistics related with human and property losses of tropical cyclone calamity and strengthening adaptation policies and practices to address people's vulnerability and their adaptive capacity for building Bangladesh resilient. In order to prepare a risk profile based on tropical cyclone, this study attempts to explore socio-economic, environmental and health burdens of cyclone affected people for the last three decades or more (1980-2015) in coastal Bangladesh.

## **METHODS**

Quantitative data had been used from International Disaster Database EM-DAT for addressing parameters like losses of livestock, damages to property, socio-economic and health impacts that occurred during cyclone in Bangladesh. This study had also employed a content analysis based on reviewing research reports, scientific studies, documentary and comprehensive books written on tropical cyclone based risk management. Content analysis method had been approached for measuring and scaling major variables related with tropical cyclone and its subsequent impact on humans and environmental health experienced in coastal Bangladesh. Analysis of collected data had been accomplished using frequencies, percentages and relevant descriptive statistics.

## RESULTS

### Statistics on Tropical Cyclone: Impacts and Burdens

Bangladesh has been placed as the top most disaster prone country ever reported in the international disaster database. More than 259 extreme natural events hit Bangladesh during the period 1991 to 2009. More than 80% of the disaster deaths occurred in 1991 in Bangladesh. In 1991, a total of 140,000 people had died in Bangladesh.

With regard to focusing on mortality directly, the two deadliest storms like Cyclone Gorky (Bangladesh, 1991; 138,987 deaths) [Table 1] and Cyclone Nargis (Myanmar, 2008; 138,366 deaths) accounted for two-thirds of cyclone deaths between 1980 and 2009. The next order of high mortality events with 15,121 deaths (Table 1) included a cyclone in Bangladesh (1985).

Statistics show that the recorded cyclone in 1993 was 8 while the frequency of cyclone event was reported to be 7 for 2000 and 2005, respectively. Findings of the study reveal that frequencies of cyclone events were not directly connected with increasing mortality in the study. Death rate was seen to be related with the severity of tropical cyclone in the database. Bangladesh is ranked as the top most tropical cyclone affected country both physically and environmentally. Furthermore, cyclone mortality concentrates on infrequent and extreme events across the country.

**Table 1: Storm Triggered Losses to Human [200+ deaths] and Property in Bangladesh**

Year	Events	Deaths	Affected	Injured	Homeless	Total affected
1981	3	1085	2000000	12000	25000	2037000
1983	4	685	5000	350	0	5350
1985	3	15121	1319000	2300	510000	1831300
1988	4	1064	8573860	200	2000000	10574060
1989	2	815	100000	4000	0	104000
1990	4	693	53870	700	4000	58570
1991	2	138987	15000000	139149	300000	15439149
1993	8	452	757500	5520	105000	868020
1995	4	753	2250000	1570	122000	2373570
1996	4	626	82600	36091	0	118691
1997	5	425	2792738	10664	1000000	3803402
1998	5	321	229440	804	0	230244
2001	4	238	26000	2750	0	28750
2004	4	239	1050	3150	14000	18200
2007	2	4275	8923259	55282	225	8978766

Epidemiological, environmental and socio-economic risk factors promote its respective newly introduced risk and health burdens. Multiple risk factors have been approached for addressing specific health, environmental and socio-economic burdens in Bangladesh.

**Table 2: Modelling of Risk Factors and Health Burdens in Cyclone-prone Bangladesh**

<b>Determinants</b>	<b>Risk factors</b>	<b>Health burdens</b>
<i>Epidemiological</i> Communicable disease	<ul style="list-style-type: none"> <li>▪ Cyclone related tidal surge</li> <li>▪ Flood</li> <li>▪ Contaminated water</li> <li>▪ Poor hygiene and sanitation</li> <li>▪ Proliferation of rodents</li> </ul>	<ul style="list-style-type: none"> <li>▪ Diarrhoea/Cholera</li> <li>▪ Hepatitis A</li> <li>▪ Hepatitis E</li> <li>▪ Leptospirosis</li> </ul>
<i>Epidemiological</i> Vector- borne diseases	<ul style="list-style-type: none"> <li>▪ Flooding</li> <li>▪ Heavy rainfall</li> <li>▪ Humidity</li> <li>▪ Solid waste disposal</li> <li>▪ Weakened health infrastructure</li> </ul>	<ul style="list-style-type: none"> <li>▪ Malaria outbreaks</li> <li>▪ Dengue transmission</li> </ul>
<i>Environmental</i>	<ul style="list-style-type: none"> <li>▪ Climate change</li> <li>▪ Melting ice</li> <li>▪ Rise of sea levels</li> </ul>	<ul style="list-style-type: none"> <li>▪ Intrusion of Saline water</li> <li>▪ Drinking water crisis</li> </ul>
<i>Socio-economic</i>	<ul style="list-style-type: none"> <li>▪ Threats of livelihood</li> <li>▪ Low income generating activity</li> <li>▪ Displacement</li> </ul>	<ul style="list-style-type: none"> <li>▪ Poverty</li> <li>▪ Unemployment</li> <li>▪ Shelter crisis</li> <li>▪ Infrastructure</li> </ul>

### **Exposure to Tropical Cyclone: Environmental Impacts and Vulnerability**

Since 1970, according to a statistics, about 39 million people have been displaced by major natural calamities like flood and cyclone in the country till 2009. There is a warning that about 6 to 8 million more people of Bangladesh could be displaced due to increase in global temperature and sea-level (*The Daily Star* 2011) rise by 2050. Climate change has placed wide-ranging effects on the environment, and on socio-economic and related sectors, including water resources, agriculture and food security, human health, terrestrial ecosystems and biodiversity and coastal zones. Changes in rainfall pattern are likely to lead to severe water shortages and/or flooding. Melting of glaciers can cause flooding and soil erosion.

### **Poverty, Livelihood Threats and Inadequate Economic Resilience**

Poverty is the greatest risk factor for making cyclone affected people unprotected to economic security. Poverty is the single most contributing factor for increasing vulnerabilities in coastal areas in low-lying countries like Bangladesh. In the backdrop of Indian oceanic region, the recurrent yearly tropical cyclone has made people more vulnerable to livelihood strategies and housing conditions over the past several decades. The food security needs,

relief and early recovery, are large and present a significant challenge for the Government of Bangladesh and its partners. According to the latest government official data (21 January 2008), the cyclone severely affected over 7.46 million people in twelve most affected districts. On the basis of UN rapid emergency assessment, 2.6 million people are found to be in need of life-saving assistance, including immediate food assistance (WHO 2006). Increasing disparities in living standards, scarcity of flow of capital and reduction in income generating activities have accentuated extreme poverty around the cyclone affected regions. However, cultural practices in such areas as land use, housing construction and traditional decision making processes affect the ability to prepare and to respond disaster. Disasters can trigger or encourage migration (*The Red Cross and Red Crescent Report, 2008*). Livelihood capacities based on local resources like agriculture, forest and fishing remain challenging for low income generating people and cyclone vulnerable people.

#### **Risk Management: Spotlight on Tropical Cyclone**

Modern society has become a risk society in the sense that it is increasingly occupied with debating, preventing and managing risks (Beck, 2006) that it itself has produced. If the climate changes irreversibly, if progress in human genetics makes irreversible interventions in human existence possible, if terrorist groups already have weapons of mass destruction available to them, then it is too late. Francois Ewald argues that the *logic of compensation* breaks down and is replaced by the *principle of precaution* through prevention where this new quality of 'threats to humanity' exists. Not only is prevention taking precedence over compensation, we are also trying to anticipate and prevent risks whose existence has not been proven. Rapid changes in climate situation usually aggravate a range of risk factors like intrusion of saline water, rise of sea level, over flooding, riverbed erosion and drought in low-lying country Bangladesh. Each people in coastal area seem to be under risk. They have to face several economic hardships, health hazards and outbreaks in emergency situation in disaster.

### **DISCUSSION**

#### **Mortality and Morbidity: Response to Tropical Cyclone**

Over the past several years, frequency of mortality and morbidity for cyclone has experienced a dramatic reduction in Bangladesh. Statistics on human and property losses recorded in the past years have decreased in comparison with those from current years of cyclones like *Aila* and *Sidr*. Advances in disaster risk reduction and risk mitigation based on tropical cyclone data have found preferably the lower rates of mortality and morbidity respectively.

#### **Socio-economic Risk Factors and Disaster Risk Mitigation**

Vulnerability, exposure, and hazard are considered as the key indicators attributed to determine disaster risk and efficacy of actions taken to manage the concerned risks. Risk reduction, risk transfer, and disaster management actions appropriately promote risk management initiatives in tropical cyclone affected area. In post cyclone periods, internal displacement makes people forced to look for temporary shelter in cyclone centers and government protected areas. The structure and housing capacity of these cyclone mitigation

shelters do not get priority for ensuring space enough for affected persons. Land management processes in Bangladesh usually encourage poor people to form scattered settlements in hazardous places instead of protected living habitats. Scattered settlements often demonstrate poor housing quality and people's vulnerability to the floods, storm surges and tidal waves based on tropical cyclone in affected areas. Women, children, elderly people, physically challenged persons and Internally Displaced Persons (IDPs) are considered physically and mentally unprotected to economic aspects impacted by cyclone in tropical country landlines. Vulnerability is greater among people in isolated and scattered settlements because of increased exclusion from information aimed at improving preparedness, disrupted traditional social networks and insufficient survival shelters to protect against sea surge.

In the coastal zone of Bangladesh, multiple structural measures like cyclone shelters, killas, coastal embankment, improving housing conditions and the like as well as non-structural measures like coastal afforestation, public awareness, community preparedness, local level contingency planning and social mobilization have been initiated to mitigate cyclonic risk factors and losses to natural disaster. After the devastating cyclone of 1970, GOB and other agencies undertook construction of multi-purpose cyclone shelters. Since then, the number of shelters has increased from 300 to 1275 through new constructions (GOB 2008). For managing and reducing coastal risks, these limited numbers of cyclone shelter and little awareness building program do not carry weight provided that elderly people, women and children remain more vulnerable to hazardous impacts.

#### **Health Hazard Management during Tropical Cyclone**

Effective disaster mitigation measures are vital to lifeline for coastal communities and potential affected people in Bangladesh. Natural disasters, particularly meteorological event such as cyclones affects vector-breeding sites and vector borne disease transmission. Initial flooding may wash away existing mosquito-breeding sites, while standing water caused by heavy rainfall or overflow of rivers can create new breeding sites. This situation brings result (with typically some weeks' delay) in an increase of the vector population and potential for disease transmission, depending on the local mosquito vector species and its preferred habitat.

#### **CONCLUSION**

Bangladesh is a tropical cyclone country. Targeted and implemented policies and actions towards disaster management in Bangladesh has advanced in a variety of layers of promoting overall development sector, but few improvements have been observed for the climate based cyclone vulnerable people in the coastal zones. Bangladesh is still struggling for making policies, setting priorities and implementing multiple projects in association with international community based on Hyogo Framework for Action 2015. Cyclone-related deaths are overwhelmingly caused by the initial traumatic impact of the event. Vector-borne diseases tremendously dominated in comparison with communicable and non-communicable diseases in post-cyclone periods in Bangladesh coastal belts. Cyclone preparedness plans response systems, appropriately focused on trauma and mass casualty management, should also take into account the health needs of the surviving cyclone affected populations.

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