

DISASTERS IN BANGLADESH: MITIGATION AND MANAGEMENT

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Abstract

This paper examines the nature, intensity, vulnerability and consequences of various types of disasters and also explores the trends of different types of disasters viz. cyclone, flood, tornados and nor'-wester, earthquakes, landslides, riverbank erosion, drought, famine, fire, building collapse etc. In this study qualitative research methodology was used and content analysis and historical method were employed as method of data collection. It reveals that the cyclone of 1876, 1919, 1961, 1963, 1965, 1970, 1985, 1988, 1991, 2007 and 2009 were severe in nature. From 1970 to 1998, there were 38 severe devastative cyclones in the context of destruction and loss of lives or economy. Among them the cyclone of 1970 are the worst and remarkable for the causes of death and the lowest death is included in the cyclone of 2015 during the last 55 years. The most remarkable or catastrophic floods in recent years in Bangladesh that occurred in 1954, 1955, 1974, 1984, 1987, 1988, 1993, 1998, 1999, 2000 and 2007 have been very destructive and caused serious threat to lives and/or economy. The tornadoes of 1969, 1974, 1977 and 1989 are noteworthy. Droughts occurred in Bangladesh 24 times between 1949 and 1991. Very severe droughts hit the country in 1951, 1957, 1958, 1961, 1972, 1975, 1979, 1981, 1982, 1984, 1989 and 1995. The famine year of 1770, 1943 and 1974 were recorded as the most catastrophic in nature. The historical records show the some major earthquakes in Bangladesh like 1548 in Sylhet and Chittagong, 1762 of Chittagong, 1897 of Mymensingh, Dhaka and Rajshahi and the recent major earthquakes of 1997 in Chittagong. Due to heavy rainfall recently landslide has emerged as a major hazard, particularly after the Chittagong Landslide 2007. Riverbank erosion is also an endemic and recurrent natural hazard in Bangladesh. Occurrence of fire incidents is one of the notable human induced disasters in Bangladesh. It also reveals that incidents of

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building collapse have increased significantly throughout the country. It can be concluded that the vulnerability of people to disasters is exaggerating day by day and policy formulation on disaster management is an utmost need.

Keywords: Disaster, Cyclone, Flood, Tornado, Earthquake, Landslide, Famine, Drought, Fire, River bank erosion, Building collapse, Vulnerability, Mitigation

Introduction

The term 'Disaster' can be more easily conceptualized than they can be defined. It is defined differently by different scholars: to some 'disaster' is a summative concept' or a 'sponge word'. Burton et al. (1978) defined that disaster is a 'collective stress situation', while Quarantelli, and Dynes (1977) identified it with 'social crisis period'. The term 'disaster' originates from the French word 'disastre', implies 'des' (bad or evil sense) and aster (star). It is defined as a crisis, which strips the capacity of society to manage disaster, which if not tackled results in the colossal loss of life and property. The literary meaning of disaster is an occurrence causing widespread destruction and distress; a catastrophe. A disaster is present when need exceeds resources. Disaster = Need > Resources. According to Palli (2009) a disaster is usually defined as a serious disruption of the functioning of society, causing widespread human, material or environmental losses, which exceed the ability of the affected society to cope using only its own resources (Sharma & Sharma, 2009). Disaster is a severe, relatively sudden and unexpected disruption of normal structural arrangements within a social system over which the system has no firm control. According to Turner (1978) 'disaster may also be viewed as a significant departure from normal experience for a particular time and place'. Disaster is also viewed as a mental construct imposed upon experience. So, the concept of disaster based on the number of deaths, the value of property destroyed or the decreased in per capita income does not suffice for comprehensive understanding of its whole range of meaning. The symbolic component requires knowledge of the sense of vulnerability, the adequacy of available explanation and the society's imagery of death and destruction (Barkun, 1977).

Bangladesh is a disaster-prone country of an area of about 147,570 km² with population near about 160 million. The geographical setting and meteorological characteristics has made the country vulnerable to different geo-hazards and hydro-meteorological hazards/disasters. The major disasters concerned in the country are floods, cyclones, droughts, tidal surges, tornadoes, nor'-wester, earthquakes, river erosion, fire, infrastructure collapse, arsenic contamination of ground water, water logging, water and soil salinity, cold wave, building collapse, epidemic and various forms of pollution etc.

These events are termed as disasters when they adversely affect the entire environment, including human beings, shelters and the resources essential for livelihoods. Bangladesh is a low-lying deltaic and riverine country in South Asia. Most of the country is covered with flat alluvial soil, yet there are hills in the southeast part. Bangladesh has a tropical monsoon climate characterized by wide seasonal variations in rainfall, high temperatures, and high humidity. Three major seasons are generally recognized: a hot, muggy summer from March to June; a hot, humid and rainy monsoon season from July to November; and a warm-hot, dry winter from December to February. The weather system is not always favourable. Due to this adverse weather system, Bangladesh becomes the worst victim of natural calamities/disasters like tropical cyclone, tidal bore, flood, tornado, river bank erosion, earthquake etc occur in Bangladesh that causing colossal loss of lives and properties. A large number of poor people are to live in vulnerable areas of the southern coastal belt of Bangladesh. The vulnerability is so deplorable or miserable that they have to go and settle in the newly accreted land in the Bay of Bengal and its surrounding areas which is frequently hit by tidal surge or devastating cyclone. The adverse impacts of all the natural hazards affecting socio-economic condition need to be reduced for sustainable development. Realization of this reality, the Government of Bangladesh has undertaken a lot of plans and programs for disaster reduction through disaster management.

Bangladesh is recognised as one of the most disaster prone countries of the world and has been suffering from natural and manmade disasters. The present study is conducted to find out some factors related to disasters. The study (i) elucidates the nature, intensity, trends, causes and consequences, severity and vulnerability of different types of disaster in Bangladesh from last five decades to the present day (ii) explores the disaster risks, challenges and vulnerabilities of disaster affected people and (iii) find out how to cope with or adapt or manage against various disasters confronted with and disaster risk reduction and mitigation and (iv) suggests policy formulations or recommendations of disaster management as utmost need.

Materials and Methods

The qualitative research methodology was used and content analysis and historical method were employed as method of data collection this study. This study is completed mainly on the basis of Content Analysis, where secondary data were the predominant source of information. Content analysis is a method of social research which aims at analyzing the content of texts, pictures, films and other forms of verbal, visual or written communication in qualitative forms. Historical method was employed as a method of data collection to depict and compare the vulnerable, hazardous and challenging situation of various disasters in Bangladesh. Data were drawn from relevant books journal, articles, archival records, formal studies and reports, public documents,

newspapers, internet websites etc. The study also considers possible ways to address or mitigate the vulnerable or destitute situation of disastrous people or various disasters.

Results and Discussion

Major Disasters in Bangladesh: An Overview

Bangladesh has a long history of natural disasters (Table 1). Between 1980 and 2008, it experienced 219 natural disasters causing over US\$16 billion in total damage (UNDP, 2006). The country is exposed to various disasters due to climate change. The geographical location, land characteristics, multiplicity of rivers and the monsoon climate render Bangladesh highly vulnerable to natural hazards. The coastal morphology of Bangladesh influences the impact of natural hazards on the area. Bangladesh suffers from different types of disasters such as floods, cyclones, storm surge, river bank erosion, earthquake, drought, salinity intrusion, fire and tsunami. Cyclones and floods particularly caused massive damages. Cyclones occurred in 1970, 1991, 2007 and 2009 and killed 364,000, 136,000, 3,363 and 190 respectively.

Table 1. Major disasters over last 25 years in Bangladesh.

<i>Year</i>	<i>Disaster</i>	<i>Death toll</i>
1985	Cyclone	11069
1987	Flood	1657
1988	Flood	1708
1988	Cyclone	5704
1989	Drought	800
1991	Cyclone	138,882
1996	Tornado	545
1997	Cyclone	550
1998	Flood	918
1999	Flood	15
2000	Flood	36
2003	Flood	104
2004	Flood	747
2007	Cyclone (Sidr)	3363
2009	Cyclone (Aila)	190

Source: Disaster Management Bureau, 2010

Cyclone

Cyclone and storm-surges are common annual or recurrent events during the pre-monsoon and retreating monsoon periods along the coastal belt of Bangladesh (Table 2). The term cyclone is derived from the Greek word 'kyklos' meaning coil of snakes. Technically, a cyclone is an area of low pressure where strong winds blow around a centre in anticlockwise direction in the northern hemisphere and clockwise direction in the southern hemisphere (Choudhury, 2009). Cyclones, sometimes associated with storm surge have been a cause of concern for Bangladesh. During the period 1891-98, approximately 178 severe cyclones with wind speeds of more than 87 kilometres per hour (km/h) formed in the Bay of Bengal, causing extensive loss of life and destruction of property. From 1970-98, there was 38 severe devastating cyclones. The severe cyclone of 12 November 1970 took a toll of 500,000 human lives and put property damages to more than one billion USD. Nearly 90% of the marine fisheries suffered heavy losses. It was estimated that about 46,000 inland fishermen operating in the cyclone affected region lost their lives (Choudhury, 2009). The April 1991 cyclone inflicted a material damage was about USD 2.4 billion and human casualties numbered around 140,000. Considering the fact that this cyclone was more fearsome than the 1970 cyclone and the population in the coastal area nearly doubled during the past twenty years, casualty of 500,000 people in 1970 would have corresponded to a death figure of a million lives this time (Choudhury, 2009). In addition, storm surge is an unusual rise in sea water associated with a tropical cyclone originating in the Bay of Bengal and also brings severe devastation in coastal belt. The cyclone of 1876, 1919, 1961, 1963, 1965, 1970 and 1991 were severe in nature.

Cyclone Sidr (Table 2) hit the coastal areas on 15 November 2007 with winds of 250 km/h and a five meter sea surge, killing more than 3,300 people. Millions of people were affected, injured 55,282, approximately one million tones of rice crop were lost, and by January 2008 nearly 500,000 people were estimated still to be living in temporary accommodation. In Bangladesh, nearly 4,641,060 people are exposed in areas under the threat of cyclones with ranking at 6th among the 89 countries analysed (Hassan, 2016).

Cyclone Aila hit the Bangladesh on Monday 25 May 2009 and has produced substantial damage across areas of southern Bangladesh. It caused 190 immediate deaths, injuries to 7,103 people and more than 500,000 people to become homeless. The total damage was USD 270 million.

In 2013, the numbers of such coastal cyclonic events were quite few compared to previous years. The cyclone *Mahasen* made landfall on 16th May 2013 as a pre-monsoon type cyclonic event. The cyclone affected 8 coastal districts that including Chittagong, Bhola, Barguna, Pirojpur, Noakhali, Patuakhali, Satkhira and Laxmipur; 386,221 people

251 unions of 42 upazilas of these 8 districts were affected by the cyclone. The devastating consequences of the cyclone included death of 17 people and 102 injuries; also, 14,828 houses were fully and 44,182 were partly damaged (Government of Bangladesh, 2014).

Table 2. Major cyclones that hit the Bangladesh Coast.

<i>Date</i>	<i>Maximum wind speed (km/h)</i>	<i>Storm surge height (metres)</i>	<i>Death toll</i>
30 October 1960	210	4.6- 6.1	5149
28 May 1963	203	4.2-5.2	11520
11 May 1965	161	3.7-7.6	19,279
15 December 1965	217	2.4-3.6	873
01 October 1966	139	6.0-6.7	850
12 November 1970	224	6.0-10.0	300,000
25 May 1985	154	3.0-4.6	11,069
29 April 1991	225	6.0-7.6	138,882
19 May 1997	232	3.1-4.6	155
15 November 2007 (Sidr)	223	6.1-7.6	3363
25 May 2009, (Aila)	92	4.0-4.6	190
16 May 2013 (Mahasen)	-	-	17

Source: Bangladesh Meteorological Department 2014

Flood

Flood is a perennial problem or recurrent event of Bangladesh. Almost every year there is flood in one or other part of the country. Floods are the most significant natural hazard in the country causing extensive damage to human life and property. It usually occurs during the monsoon season. The geographical setting and meteorological characteristics has made the country vulnerable to different geo-hazards and hydro-meteorological hazards/disasters. Thus the country is frequently flooded. There have been many destructive floods in Bangladesh, including very severe floods of 1987, 1988 and 1998 (Tables 3 & 4). The 1988 flood set a new record for flooded area, while 1998 flood was unprecedented with its long duration. The flood damage potential in Bangladesh.

There are two types of floods which occur in Bangladesh: annual floods (*barsha*) that inundate up to 20% of the land area; and low frequency floods of high magnitude that inundate more than 35% of the area (*bonna*). The most catastrophic floods in recent years in Bangladesh that occurred in 1954, 1955, 1974, 1984, 1987, 1988, 1993, 1998, 1999, 2000 and 2007 for most flooding area or land. They have been called very destructive and caused serious threat to lives and economy (Choudhury, 2009). In the context of human exposure in flood hazard zones, nearly 19,279,960 people are present in these zones and Bangladesh ranks 1st among 162 nations (Hassan, 2016).

In 2013, the country experienced normal flooding incidents in July and September. On the onset of monsoon in July, a wider part of north Bengal and part of central region along the river Brahmaputra were affected. Furthermore, the north-western part of the country was flooded; although the area affected by flood was high, the duration was relatively low. In the south-western part of the country, particularly in Satkhira and Khulna districts, floods were prolonged due to poor drainage conditions, especially in Kobodak Haribhanga and Shibsra river catchment areas. At Jhikorgacha of the Kobodak River, the water flow was above the danger level for consecutive 120 days; nine people were killed and about 28,000 families were affected (Government of the People's Republic of Bangladesh, 2014).

During the last 20 years from 1987 to 2007, according to deceased or death toll in near about two thousand of human casualties are seen in the flood of 1988 which are the worst and severity in nature. Followed by that year, the year of 1987 it was the second highest of mortality for the causes of flood. Among the periods of those last 20 years the people are dead the least figures. It is prevalent that, there were many destructive floods in Bangladesh, including very severe floods of 1974, 1987, 1988 and 1998. During the last 60 years from the 1954 to onwards, the 1988 flood set was a new record for flooded area, while 1998 flood was unprecedented with its long duration.

Table 3. Major floods in Bangladesh.

<i>Year</i>	<i>Death</i>
1987	1657
1988	1708
1998	918
2004	747
2007	800

Source: Disaster Management Bureau, 2008

Table 4. Area affected by flood in Bangladesh.

<i>Year</i>	<i>Area (thousand sq. km.)</i>	<i>% area flooded</i>	<i>Year</i>	<i>Area (thousand sq. km.)</i>	<i>% area flooded</i>	<i>Year</i>	<i>Area (thousand sq. km.)</i>	<i>% area flooded</i>
1954	36.4	24.66	1970	42.0	28.46	1985	11.3	7.65
1955	49.9	33.81	1971	35.8	24.25	1986	3.1	2.11
1956	35.1	23.78	1972	20.5	13.89	1987	56.6	38.35
1960	28.2	19.10	1973	29.4	19.92	1988	81.8	55.43
1961	28.4	19.24	1974	52.0	35.23	1989	6.1	4.13
1962	36.9	25.01	1975	16.4	11.11	1990	3.5	2.37
1963	42.5	28.79	1976	27.9	18.91	1991	28.6	19.38
1964	30.7	20.81	1977	12.3	8.34	1992	2.0	1.35
1965	28.2	19.11	1978	10.8	7.32	1993	28.7	19.44
1966	33.0	22.36	1980	32.5	22.02	1994	0.42	0.28
1967	25.3	17.14	1982	3.1	2.11	1998	85.0	57.60
1968	36.9	25.06	1983	11.0	7.45	2007	62.3	42.22
1969	41.0	27.78	1984	27.9	18.91			

Source: Choudhury, 2009

Tornados and Nor'-Wester

The two transitional periods between southwest and northeast monsoons over the Indian sub-continent are characterized by local severe storms. The transitional periods are usually referred to as pre-monsoon (March-May), and post-monsoon (October-November). It is the pre-monsoon period when most of the abnormal rainfall or drought conditions frequently occur in different parts of Bangladesh (Table 5). Also there are severe local seasonal storms, popularly known as Nor'westers (kalbaishakhi), because they come mostly from north westerly direction. When the speed exceeds 100 miles per hour, they are termed as tornadoes which also occur quite frequently in Bangladesh (Choudhury, 2009). Severe Nor'westers is generally associated with tornadoes. Tornadoes are embedded within a mother thundercloud, and moves along the direction of the squall of the mother storm. Nor'westers come mainly from the north westerly direction (and hence the name) and like tornadoes are land based. They are very common

phenomena in Bangladesh during late Chaitra and Baishak months and are known in Bengali as kalbaishaki (Choudhury, 2009). The frequency of devastating Nor'westers usually reaches the maximum in April, while a few occur in May, and the minimum in March. Tornadoes in Bangladesh occur mostly during March-June and in the afternoon. The weather is very humid and oppressive before the occurrence of a tornado. A tornado can cause tremendous destruction. Houses are damaged, trees are uprooted, crops are damaged and making a havoc of everything in its way. Nor'westers and tornadoes are more frequent in the afternoon.

Table 5. Major devastating nor'westers and tornadoes.

<i>Date</i>	<i>Location</i>
14 April 1969	Demra (Dhaka)
17 April 1973	Manikganj (Dhaka)
11 April 1974	Bogra
10 April 1976	Faridpur
09 May 1976	Narayanganj
01 April 1977	Faridpur
26 April 1989	Saturia (Manikganj)
14 May 1993	Southern Bangladesh
30 May 1996	Tangail
04 May 2003	Brahmanbaria
21 March 2005	Gaibandha

Source: Choudhury, 2009 and web sources.

The Showalter Stability Index (SSI) and the Total Total Stability Index (TTSI) also give some indication of the formation of nor'westers and tornadoes but it is difficult to pinpoint the place, time and severity of a tornado occurrence. Tornadoes of 14 April, 1969; 11 April, 1974; 01 April, 1977 and 26 April, 1989 are noteworthy. A total number of 5 Tornado incidents were reported in the year 2013. These were Brahmanbaria Tornado on 22nd March, Natore and Naogaon Tornadoes on 1st April, Jessore Tornado on 25th May and Gopalganj Tornado on 10th June. Among these, the Brahmanbaria Tornado was particularly catastrophic in nature; it passed through 6 unions of 2 upazilas

of Brahmanbaria District. More than 15 villages were affected by the super Tornado, and a total of 34 people were killed and 388 were injured. Although the Natore Tornado had no death toll, 479 households were heavily and 809 households were partially affected. At Naogaon, 2 people died and 26 were injured. A total of 340 households were heavily and 3830 households were partially affected (Government of the People's Republic of Bangladesh, 2014).

Drought

Drought is another severe natural phenomenon which at some intervals occurs in Bangladesh and causes disastrous crop failures. It is difficult to define the term drought precisely and hence any definition is rather subjective. It simply means lack of water and may be defined as lack of sufficient water to meet requirements (Choudhury, 2009). In 1979 the country was hit by a severe drought, which was termed by many as the worst in the recent past. Every year parts of Bangladesh experience drought when rainfall is normally low. In the country about 2.7 million hectares of agricultural land is severely drought prone causing hardship to poor agricultural laborers and others. Usually severe drought occurs in the north-western and south-western region of the country. A study has shown that milder droughts occur in Bangladesh after an interval of 5-10 years. The years of 1950, 1951, 1957, 1958, 1966, 1967, 1972 and 1979 were years of less rainfall in Bangladesh (Choudhury, 2009). Droughts occurred in Bangladesh 24 times between 1949 and 1991. The periods of 1951, 1957, 1958, 1961, 1972, 1975, 1979, 1981, 1982, 1984, 1989 and 1995 drought are remarkable due to the severity. Bangladesh experiences two major spells of drought: Kharif (June/July to October) especially in the highlands of the Barind tract and Rabi and Pre Kharif (January to May) due to dry days and low soil moisture. In Bangladesh nearly 642,277 people are exposed in areas under the threat of drought with ranking at 63rd among the 184 countries analysed (Government of the People's Republic of Bangladesh, 2014). Droughts of 1957 and 1972 were of severe in nature.

Famine

A study on Bangladesh monsoon rainfall has shown that in general there is decrease in rainfall in El Nino years in all the seasons- pre monsoon, the monsoon and the post monsoon. It is remarkable that the great Bengal famine year of 1770 when about one third of the population of Bengal was wiped out was an El Nino year. Another great famine occurred in Bengal in 1943 which was also an El Niño year. Millions of people died in the great famines in 1770 and 1943 of the then undivided Bengal. The years 1940-

41 were El Nino year. Another famine syndrome that occurred in newly emerged Bangladesh in 1974. The years 1972-73 were El Nino years which continued in the early 1974 and during monsoon months la Nina appeared when again there was the recurrence of a great flood. Perhaps a combination of all these depleted the food stock and the famine syndrome of 1974 occurred (Choudhury, 2009).

Earthquake

The historical seismic data of Bangladesh and adjoining areas indicate that Bangladesh is vulnerable to earthquake hazard (Table 6). Bangladesh, as a whole, lies in the earthquake zone of which two-third comes under major and moderate fault. In fact, highly seismic belts and fault zones border Bangladesh to its east, northeast and north. These fault zones were instrumental to cause some of the world's severest earthquake in the past. In the earthquake zoning map of 1993, 26 percent of Bangladesh falls in high risk, 38 percent moderate and 36 percent in low risk zone in terms of earthquake vulnerability. The historical records show that there have been some major earthquakes in Bangladesh. The 1548 earthquake had affected Sylhet and Chittagong with reports of ground rupture and hydrological changes. The 1897 Great India earthquake had caused extensive damage to parts of Mymensingh, Dhaka and Rajshahi. Among the recent major earthquakes, the 1997 Chittagong earthquake caused extensive damage to the adjacent areas. Nowadays, Earthquake is felt throughout the country frequently.

Due to its close proximity to tectonically active plate boundaries, Bangladesh is prone to earthquake. The country has experienced numerous large earthquakes in the past 200 years. In Bangladesh a good number of cities and towns with construction boom of high rise building and infrastructural facilities are at high vulnerability due to earthquake hazard. This vulnerability has become all the more alarming because of the existing dense population in urban as well as rural areas. In 2013, Bangladesh Meteorological Department (BMD) has recorded 16 earthquake tremors with a magnitude ranging from 3.3 to 5.9 Richter Scale (RS) in and around Bangladesh border areas. The earthquake of January 9, 2013 had a magnitude of 5.9 RS and was felt throughout the country. The epicentre was 495 km from Dhaka city and was located near Bangladesh-Myanmar border area. There was no report of any casualties or damages (Government of Bangladesh, 2014). In the context of human exposure in seismically hazardous zones, nearly 1,330,958 people are present in these zones and Bangladesh ranks 17th among 153 nations in 2013. Similarly, the modelled amount of GDP in seismically hazardous zones puts Bangladesh 42nd among 153 countries (Hassan, 2016).

Table 6. List of major earthquakes in Bangladesh.

<i>Date</i>	<i>Name</i>	<i>Richter</i>	<i>Epicentre Distance from Dhaka (km)</i>	<i>Epicentre Distance from Sylhet (km)</i>	<i>Epicentre Distance from Chittagong (km)</i>
10 Jan 1869	Cachar Quake	7.5	250	70	280
14 Jul 1885	Bengal Quake	7.0	170	220	350
12 Jun 1897	Great Indian Quake	8.7	230	80	340
8 Jul 1918	Srimongal Quake	7.6	150	60	200
2 Jul 1930	Dhubri Quake	7.1	250	275	415
15 Jan 1934	Bihar-Nepal Quake	8.3	510	530	580
15 Aug 1950	Assam Quake	8.5	780	580	540
21 Nov 1997	Chittagong Earthquake	6.1	-	-	-
26 Jan 2001	Bhuj Earthquake	7.9	-	-	-
27 July 2003	Chittagong Rangamati	5.9	-	-	-
9 Jan 2013	Bangladesh Myanmar	5.9	495	-	-

Source: Choudhury, 2009 and web sources

Landslides

Landslides occur almost every year in every regions of the world. In the past, landslide was not considered a major hazard in Bangladesh. However, recently landslide has emerged as a major hazard, particularly after the Chittagong Landslide 2007 (Table 7). Due to heavy rainfall during 10 -11 June 2007, landslides and collapsed walls caused widespread damages in six areas of Chittagong city and in different Upazilas of the District. 50 mm of rainfall was recorded from 12:00 AM on 10 June 2007 to 6:00 AM on 11 June 2007, and 315mm of rainfall was recorded from 6:00am to 2:00 PM on 11 June 2007. More than 120 people have been reported dead due to Chittagong landslide.

Table 7. Recent major landslides in Bangladesh.

<i>Year</i>	<i>Location</i>	<i>Death</i>
2013	Lalkhan, Chittagong	2
2012	Chittagong, Cox's Bazar, Bandarban	122
2010	Cox's Bazar	96
2008	Chittagong	11
2007	Chittagong	127

Source: Web source, 2016

River Bank Erosions

River bank erosion is an endemic and recurrent natural hazard in Bangladesh. When rivers enter the mature stage (as in the case with the three mighty rivers, Ganges, Brahmaputra and Meghna) they become sluggish and meander or braid. These oscillations cause massive riverbank erosion. Every year, millions of people are affected by erosion that destroys standing crops, farmland and homestead land. It is estimated that about 5% of the total floodplain area of Bangladesh is directly affected by erosion. Some researchers have reported that bank erosion is taking place in about 94 out of 489 upazillas of the country.

A few other researchers have identified 56 upazillas with incidence of erosion. At present, bank erosion and flood hazards in nearly 100 upazillas have become almost a regular feature. Of these, 35 are severely affected. Thus, River bank erosion in Bangladesh is no less dangerous than other sudden and devastating calamities. Due to river bank erosion losses occur slowly and gradually. Though losses are slow and gradual, they are more destructive and far-reaching than other sudden and devastating calamities. This is an ongoing disaster and there is no specific indicator to measure the extent of damage. So the extent of damage caused by river erosion in most cases is based on various reports/information. Needless to say whatever the difference in ascertaining the extent of damage river erosion causes huge loss of property throughout the year. According to "World Disaster Report 2001" published by IFRC every year about 10,00,000 people are affected by river erosion and 9,000 hectare cultivable lands are banished in river. Among these only a few affected people are able to find new shelters while others become homeless for uncertain period. The effects of river erosion are long-

term. It takes a few decades to make up the losses, which a family has incurred by river erosion. There has been little progress, however, for improving the lives of erosion-affected people due to resource constraint.

Out of 489 upazilas of Bangladesh, 94 upazilas were affected by river erosion in 2013, of which 35 were severe in nature. Some important erosion affected areas includes Sirajgong, Aricha, Mawa, Chandpur, Rangpur, Dhanut upazila of Bogra district; also, 13 unions of river side upazilas Chilmari upazila of Kurigram district, Bhuapur and Mirzapur upazila of Tangail district, Chouhali upazila of Sirajgong hard point, Daulatpur upazila of Manikgang, Biyani Bazar upazila of Sylhet, Chandpur sadar upazila, Sonargoan upazila of Narayangonj, Madaripur sadar upazila, Goalando and Pangsha upazila of Rajbari, Daulatpur upazila of Kushtia, Dumuria and Koira upazila of Khulna were affected (Government of Bangladesh, 2014).

Cold Wave

Cold wave hit/struck the country during the first week of January, affecting more than 20 districts including Panchagarh, Thakurgaon, Dinajpur, Nilphamari, Lalmonirhat, Rangpur, Kurigram, Gaibandha, Bogra, Joypurhat, Naogaon, Nawabganj, Rajshahi, Natore, Sirajganj, Pabna and Mymensing in the north, Moulvibazar in the east and few districts in the south namely Kushtia, Jessore, Faridpur and Madaripur. More than 50% of populations living in those districts were affected and 80 people were killed, many of them were children. During the cold wave of 2013, the temperature of Saidpur dropped down to 3 degrees Celsius, the lowest records in Bangladesh since 1968 (Disaster Report, 2013).

Fire

Fire is one of the notable human induced disasters in Bangladesh. Every year, hundreds of people die and many are injured due to fire accidents. In 2013, a total number of 8868 fire incidents took place throughout the country and most of them occurred in Dhaka and Chittagong. Secondary data from newspapers shows that in 2013 the number of death occurred due to fire hazard were 65 and 191 people were injured (Government of the People's Republic of Bangladesh, 2014).

Building Collapse

Incidents of building collapse have increased significantly throughout the country. A total of 7 buildings collapsed during 2013 killing 1,135 people. However, the

collapse of Rana Plaza on April 24, 2013 was the most tragic industrial accident in the history of Bangladesh; it killed 1,135 people, leaving 2,500 people injured. Immediately after the incident, a rescue operation was initiated under the guidance of Bangladesh Army in association with Bangladesh Navy, Fire Service, BGB and Police. In addition, many volunteers took part in the rescue activities. One of the important aspects of the rescue operation was the stimulus participation of volunteers of different age and groups. Around 1,000 volunteer from Dhaka, Keraniganj and Narayanganj took part in the rescue operation (Government of the People's Republic of Bangladesh, 2014).

Other Disasters

Besides the above-mentioned hazards, other significant disasters in Bangladesh are arsenic contamination, salinity intrusion, drought, water logging and landslides. The south-western coastal belt of Bangladesh is suffering from salinity intrusion and water logging for ages. There is also the case of drought in north-western part. Arsenic contamination of ground water is also a cause of prolonged suffering for most part of the country. However, there was only one incident of land slide in 2013 at Lalkhan Bazar, Chittagong City on 28th July. In total 2 women were killed in the incident (Government of the People's Republic of Bangladesh, 2014).

Disaster Management in Bangladesh

A huge number of poor people are to dwell in the vulnerable areas of the southern part of Bangladesh. The vulnerability is so miserable that they have to go and settle in the newly accreted land in the Bay of Bengal and its surrounding areas which is occasionally hit by tidal bore or devastating cyclone. On realization of this reality, the Government of Bangladesh, the Ministry of Disaster Management and Relief (MoDMR) is mandated to formulate policies, prepare plans, and monitor and coordinate all aspects of disaster activities through disaster management. The Government of Bangladesh has undertaken a lot of plans and programs for disaster reduction through disaster management. Management largely means preparing for, mitigating and managing all activities that can reduce impact, save lives, recover normalcy, and rehabilitate communities (The Commonwealth of Learning, 2004). Disaster management is the process of forming common objectives and common values in order to encourage stakeholders to plan for and deal with potential and actual disasters (Pearce).

The process of emergency management is a cycle of four phases for each event shown in Fig. 1.

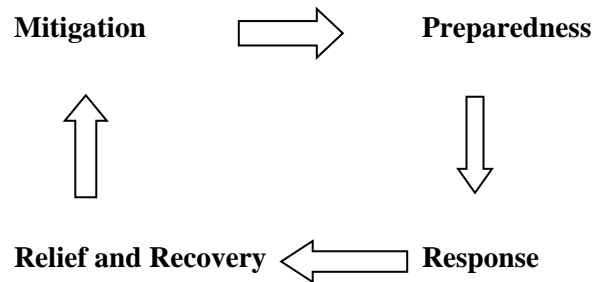


Fig. 1. The process of emergency management cycle.

The four phases can be thought of as a cycle shown here. This cycle would occur with each event.

Mitigation

Mitigation is the use of strategies to reduce risks prior to, during, and post disaster. It is related to short-term and long-term measures; for example, preventing or reducing risk to property or lives by improving the inherent capacities of people and strengths of habitats, infrastructure, and critical facilities (Commonwealth of Learning, 2004).

Mitigation, sometimes called prevention or risk reduction, is often considered the “cornerstone of disaster management”. While the three other components of the disaster management cycle (preparedness, response, and recovery) are performed either in reaction to hazards or in anticipation of their consequences, mitigation measures seek to reduce the likelihood or consequences of hazard risk before a disaster ever occurs.

Types of Mitigation: Structural and Nonstructural

The mitigation measures are grouped into two primary categories: structural and nonstructural. These two categories are described in detail below.

Structural Mitigation Measures

Structural mitigation is defined as a risk reduction effort performed through the construction or altering of the physical environment through the application of engineered solutions. Structural mitigation measures are those that involve or dictate the necessity for some form of construction, engineering, or other mechanical changes or

improvements aimed at reducing hazard risk likelihood or consequence. They often are considered attempts at “man controlling nature” when applied to natural disasters. Structural measures are generally expensive and include a full range of regulation, compliance, enforcement, inspection, maintenance, and renewal issues (Coppola, 2007).

The general structural mitigation groups to be described are:

- Resistant construction
- Building codes and regulatory measures
- Relocation
- Structural modification
- Construction of community shelters
- Construction of barrier, deflection, or retention systems
- Detection systems
- Physical modification
- Treatment systems
- Redundancy in life safety infrastructure

Nonstructural Mitigation Measures

Nonstructural mitigation, as defined previously, generally involves a reduction in the likelihood or consequence of risk through modifications in human behavior or natural processes, without requiring the use of engineered structures. Nonstructural mitigation techniques are often considered mechanisms where “man adapts to nature.” They tend to be less costly and fairly easy for communities with few financial or technological resources to implement.

The following section describes several of the various categories into which nonstructural mitigation measures may be grouped, and provides several examples of each:

- Regulatory measures
- Community awareness and education programs
- Nonstructural physical modifications
- Environmental control
- Behavioral modification

State of Preparedness

Preparedness means minimizing the adverse effects of a hazard through precautionary actions and measures. It entails a series of actions to ensure speedy, effective, and efficient organization and delivery of relief and related responses following the onset of sudden disaster (The Commonwealth of Learning, 2004). Preparedness normally refers to building an emergency response capability before disasters occur, to facilitate effective and efficient response (Mileti).

Response

Actions taken immediately before (warning phase), during, and after a disaster can help save lives, minimize damage to property, and enhance effectiveness of recovery (Mileti). Response could therefore be defined as 'actions and capability to react to the sudden onset of a disaster under stress, uncertainty, various constraints, and limited resources'. Timing is very crucial during the response period.

State of Relief and Recovery

Action taken immediately following a disaster or during the slow onset of a severe impact require exceptional measures to save and sustain the lives of survivors and meet their basic needs until normalcy is restored. These measures involve fulfilling basic needs of shelter, protection, water, food, and medical attention. This phase could form a part of the response period as well as recovery period (The Commonwealth of Learning, 2004).

Recovery is also a post-disaster phase where actions are taken to return the situation to normal, which, depending upon the intensity of disaster and the magnitude of its impacts, may take a long time. Recovery in the long term would essentially mean rehabilitation, restoration of economic activities, livelihoods, infrastructure services, basic living conditions, medical treatments, and reconstruction of damaged properties and shelters (The Commonwealth of Learning, 2004).

General Scenario of Disaster Management in Bangladesh

Bangladesh became a pioneer among least developed countries in prioritizing disaster risk reduction in national fiscal planning. With assistance from the Comprehensive Disaster Management Programme, Bangladesh adopted a general risk reduction model that encouraged national stakeholders to consider existing disaster risks as well as the risks of projected climate extremes in building national and community resilience. A series of inter-related institutions, at both national and sub-national levels

have been created for disaster management. The Government of Bangladesh, the Ministry of Disaster Management and Relief (MoDMR) now divides as the Ministry of Disaster Management and the Ministry of Relief Distribution formulate policies, prepare plans, and monitor and coordinate all aspects of disaster activities. The field level activities of MoDMR are carried out by two subordinate offices e.g. the Department of Disaster Management (DDM) and Cyclone Preparedness Programme (CPP), While DDM is responsible for dissemination of all information on natural disasters, including flood information at community level, flood preparedness, awareness raising and capacity building activities, and also is responsible for conducting relief and rehabilitating operations with the help of district and upazila administrations.

The Government of Bangladesh has taken a number of significant steps during the last few years for building up institutional arrangements from national to the union levels for effective and systematic disaster management and facilitating mitigation to the sufferings of disaster victims in Bangladesh. To maintain proper coordination amongst the concerned Ministries, departments, line agencies, Local Government Body (LGD) and community people, and also to ensure their proper functioning to mitigate sufferings of the people, the GoB has formulated a set of mechanisms for Council and Committees from national (top-down approach) to the grass-root levels.

The high powered National Disaster Management Council (NDMC) and Inter Ministerial Disaster Management Co-ordination Committee (IMDMCC) developed as effective bodies to promote and coordinate risk-reduction, preparedness activities and mitigation measures, meet twice and four times a year respectively. While NDMC formulates and reviews disaster management policies and issues directives to all concerned, the IMDMCC plays key role in implementing the directives maintaining inter-Ministerial coordination, supervising the services of the Armed Forces as well as NGOs working in the field of disaster management in the country. Under the mechanism there exists a well-established organization named Directorate of Relief and Rehabilitation (DRR) within the administrative control of the MoDMR where in Emergency Operation Centre (EOC) is located. The DRR acts during post-disaster emergency situation and operates relief activities for distribution to remote field levels under the supervision and guidance of the Ministry of Disaster Management & Relief (MoDMR) / IMDMCC. The MoDMR has a small dynamic professional unit known as Disaster Management Bureau (DMB) to perform specialist functions and ensure coordination with line departments/agencies and NGOs by convening meetings of Disaster Management Training and Public Awareness Building Task Force (DMTATF), Focal Point Operational Co-ordination Group on Disaster Management (FPOCG), NGO

Co-ordination Committee on Disaster Management (NGOCC) and Committee for Speedy Dissemination of Disaster Related Warning Signals (CSDDWS) every three months regularly.

The Comprehensive Disaster Management Programme (CDMP) is established to support the disaster management activities of relevant organizations as well as MoDMR.

Community-Based Disaster Management in Bangladesh

As the Government alone cannot and will not properly manage and handle all types of disasters with its machinery, so the policy makers, experts and professionals require active participation by the people in any region of a country. In line with this philosophy, involving local level people, leaders and community to provide necessary services and logistics to their victims during and after disaster has been encouraged both in the developed and developing countries. And in recognition to this philosophy a new approach of managing disasters has been evolved known as Community-Based Approach (CBA) which emphasises the total participation of all people facing any hazard or disaster and makes sure to render all possible services to the community. This approach in Bangladesh is being popularized gradually.

The Government of Bangladesh initiated a community based disaster management project "Support to Comprehensive Disaster Management" in 1993 with overall goal to reduce the human, economic and environmental costs of disaster in Bangladesh. The program includes development of Local Disaster Action Plan (LDAP) to increase the capacities of the households and local communities in the highly disaster prone areas, organize quite good number of training and awareness campaign at local level to sensitize and mobilize community people and to cope with cyclones, floods and other potentially disaster situations and/or in the overall risk management system. Total 900 numbers of LDAPs had been developed as of today.

The Government of Bangladesh has initiated a good number of programmes and activities for disaster preparedness. Under the project "The Rights-based Planning & Monitoring: Disaster Preparedness" 112 training programmes have been completed in 2002 and 119 training programmes have been completed in 2003 covering the disaster-prone districts and sub-districts (Government of Bangladesh, 2003).

Many individual communities have their own/indigenous coping system to face the disasters. In the year 2003, Disaster Management Bureau (DMB) organized 06 (six) workshops for Community Leaders on disaster preparedness & indigenous knowledge on coping mechanism (Government of Bangladesh, 2003).

Comprehensive Disaster Management Program- CDMP

Accordingly, in mid 1999 the Government of Bangladesh (GoB) together with UNDP and other development partners agreed to address the issue of risk reduction in a more comprehensive programmatic approach. CDMP has been designed to adopt an umbrella programme approach that encompasses all aspects of risk management and in so doing facilitates to move from a single agency response and relief strategy to a whole of government holistic strategy that addresses the issue of community vulnerability. CDMP has the main focus on Capacity Building, Partnership Development, Community Empowerment, Research & Information Management and Response Management.

Over 60,000 government officials were trained in emergency response. Cooperation with civil society and volunteer organizations has mobilized an even greater pool of knowledgeable first responders. With UNDP support, national institutions have become proactive, using early warning systems and mitigation strategies. UNDP support and advocacy has helped empower civil society organizations to work for change.

DMB's Activities relating to Earthquake

Very recently there has been noticeable attitudinal change amongst the policy makers and disaster managers. While implementing the project 'Support to Disaster Management: BGD/92/002' DMB was assigned by IMDMCC in its meeting on 29 January, 2001 to prepare inventory of available rescue equipment in the municipal cities and towns to be used in the event of possible earthquake and promote earthquake awareness programmes as part of public motivation.

Organized two national level workshops on earthquake on 23 December, 1997 and 18 May, 2000 participated by the experts in the field and representatives of different Ministries, departments/agencies and NGOs.

Arranged a meeting of the representatives of City Corporations and Pauroshavas of high vulnerable areas on 20 August, 2000.

Prepared a voluminous inventory of equipment and machineries available in different organizations/agencies, which could be used for disaster response and rescue operations in the event of an earthquake emergency.

Prepared a comprehensive training module on earthquake.

Prepared and published a Handbook on Earthquake for public awareness with UNICEF assistance.

Published and distributed Bengali Calendar and leaflets depicting points for public awareness about earthquake risk.

Sought the list of volunteers of relevant City Corporations and Pauroshavas with proposal to train their leaders on earthquake preparedness.

Disaster Management Practice in Bangladesh

GoB gives equal importance to both structural as well as non-structural mitigation measures.

Structural Mitigation Measures

As part of structural measures, the GoB with its own and external resources has so far constructed 2,085 cyclone shelters and 200 flood shelters for evacuation of people exposed to impending cyclone as well as flood. Following colossal floods in the 1980s, Bangladesh developed a flood action plan and established disaster-focused institutions such as the Flood Forecasting Warning Centre (FAP-10) in the country with the help of Danish Hydraulic Institute to reduce vulnerability and developed policy and planning guidelines. In addition, during the last four decades 482 small, medium and large water and flood control projects have been implemented. Of these, more than 400 projects were implemented after liberation war in 1971. Through these projects, about 8,200 km. long flood protection embankment, drainage channels of total length 3,400 km. and 9,000 sluice gates and regulators on different rivers and canals as safety measures against inundation by tidal waves, storm-surges and flooding have been constructed.

About 3,931 km. long coastal embankment to protect coastal land from inundation by tidal waves and storm-surges, and drainage channels of total length 4,774 km. have so far been constructed.

Non- Structural Mitigation Measures

For non-structural mitigation GoB has given emphasis on

- Legislation & Policy
- Training and Public Awareness

As part of training and public awareness nearly 45,000 people related to disaster have been trained through 721 courses/workshops/seminars. As part of public awareness activities, booklets containing information about cyclone, flood, earthquake etc. and calendar, posters depicting disaster points have been regularly printed and distributed up

to the grass-root levels. To raise awareness among the students on various hazards/ disaster management, a chapter on disaster management has been included in the educational curricula from classes V to XII. In addition, there exists Cyclone Preparedness Program (CPP) which plays very useful role during cyclone.

Conclusions

Bangladesh is one of the disaster prone countries of the world with extremely limited resources. Its real development is not possible without the integration of disaster mitigation programs. Among them, cyclone and flood are devastating, recurrent and severe in nature due to the damage of houses, property, losses of life and injuries. Cyclone, tornado and nor'-wester occurs in April-May and though cyclone occurs in October-November. Due to the heavy rainfall, landslide occurs in July-August in Chitagong Hill Tracts (CHT) and flood occurs in all over the country in the same period. Bangladesh is striving hard to establish an elaborate and experienced disaster management system from national to community level (top down approach) to mitigate the effects of disasters. The most significant measure of Bangladesh's success is the dramatic reduction in lives lost to natural disasters. The Government of Bangladesh (GoB) has, therefore, taken as a whole commitment towards reduction of human, economic and environmental costs of disasters by enhancing overall disaster management capacity. Being aware of the limitations and the vulnerability of the country to natural disaster, the GoB has been making continuous efforts to make Bangladesh a part of safer world in the 21st century and share techniques with other countries to mitigate and adapt disasters. Efforts have been continuing for optimum coordination and best utilization of resources along-with ensuring community involvement so that they are aware of what they can do for protecting their lives and properties against disasters. During the last few years, GoB has taken a number of significant steps to build up institutional arrangement from national to the union levels for effective and systematic disaster preparedness in Bangladesh.

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