Temporal and Geographical Analysis of Disasters: Bangladesh Context

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Abstract

Temporal and geographical analysis of disasters in Bangladesh was the aim of this study. The collected data showed that, during 1998 to 2017, Bangladesh had experienced various disasters and flood was the most occurring events at that time. The data also showed that, among the disasters which occurred during last twenty years, about 46.26% was flood and flash flood followed by 31.34% was tropical cyclone/storm, 10.44% was landslide, 7.46% was cold wave, 2.98% was tornado and 1.49% was heat wave. Floods mostly occurred in the month of June and July and affect the northern part of this country and most of the flash flood occurred in the month of June and frequently affected the Haor areas. May was the most cyclone occurring month which affected the coastal zone, mangrove area, inshore and offshore. The data again showed that, the June, July and August was the landslide occurring month in Bangladesh and affected the hilly areas of the country. The secondary sources were used for conducting this study.

Keywords: Disaaster, floods, hazards, risk, vulnerable, Bangladesh

Introduction

Bangladesh is a disaster prone country. On an average every year this country is being striked by disasters. These disasters are: floods, flash floods, cyclones, storm surges, droughts, landslides, tornadoes, cold wave, heat wave etc. The disaster do not come alone, it carries some sort of vulnerability, risk and associate risks. Due to the consequences of climate change, various types of disasters strike the country. Some of the disasters hit whole country, some have regional consequences and some of the disasters have local effect. For example, the flood of 1998 was a devastating event covered 52 districts, out of 64. Consequently, all over the country had to face various types of social, economic and other health related problems. Another issue is cyclone; the super cyclone '*Sidr*' which hit the southern coastal region of this country which had very severe impact on the local community. It caused loss of live, damage of property and degradation of environment. Finally, people of this region may remain helpless, homeless and shelter less. Flash flood is another disastrous event that occurs suddenly in Bangladesh. The northern and eastern Haor [Haor is bowl-shaped large tectonic depression. It receives surface runoff water by rivers and khals and consequently a haor becomes very extensive water body in the monsoon and dries up mostly in the post-monsoon period. In Bangladesh Haors are found mainly in greater Sylhet and greater Mymensingh regions. During monsoon a Haor is a vast stretch of turbulent water. The word Haor is a corrupt form of the Sanskrit word Sagar (sea). In Sylhet and northeast Mymensingh, the

people pronounce the Bangla letter 'm' (sa) as 'n' (ha), and sometimes 'M' (ga) as 'n' (ha). Thus sagar is sounded haor (Banglapedia: National Encyclopedia of Bangladesh] and low-lying areas of the Bangladesh are flooded due to heavy rainfall in upstream areas in India and make a devastating situation for this region. For example, the flash flood 2017 was the worst event in the recent year which covered the Haor and low-lying areas of the northeast region of this country. Landslide is hydro-geological phenomenon in Bangladesh. The hilly areas like greater Chattagram (Chittagong Hill Tracts and Chattagram) and Sylhet regions are more vulnerable to landslide. Unplanned use of hilly regions, heavy rainfall in that particular area are the factors behind landside. Cold wave damages property and disrupts the livelihood of the people of the Northern and the Northwestern regions of Bangladesh. These all disasters cause death of lives, damage to property, make socio-economic and environmental imbalance. The objective of the present study is the temporal and geographical analysis of disasters in Bangladesh from the past 20 years (1998-2017).

Material and Methods

This study grabs data from different reports, journals, periodicals, proceedings, books and other related documents. A set checklist was used to collect data from the related secondary data sources. The reports of government's organizations, NGOs, scholarly article in newspapers and other related documents were the secondary data sources for this study. For the collection of data, OCHA Situation Report, OCHA Relief Web, Government of Bangladesh, Foreign Ministry Flood 98 Site, CNN News, IFRC, AFP, Reuters, Reuters Alertnet, BBC News, The Hindu, The New Nation, IRIN News, IFRC, Bangladesh Sangbad Sangstha, Xinhua, NIRAPAD, Yahoo Asia News, Independent-bangladesh.com, SwissInfo and UNDP sources were carefully observed and studied. The collected data was recorded, processed, analyzed, interpreted and discussed according the objective of the study.

Conceptual Framework

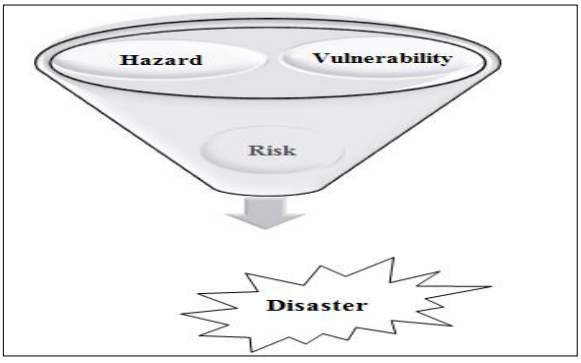

Figure 1: Conceptual framework of disaster

The above **Figure 1** shows that the disaster is the fusion of hazard, vulnerability and risk. Hazards always exist in our entire environment. The floods, cyclones, droughts, storm surges

etc. are the most known hazards, which have an impact on the human beings and environment. When these existing hazards strike on vulnerable individual, community and the society with risk and associate risks, then this event is called *'disaster'*.

Hazard

Any kind of events or occurrences that has the potential for causing injury to any kind of life or damage to property or the environment is called ***hazard***. The event's magnitude, probability of its occurrence and the extent and severity of its impact may vary by time and space. The effects of these types of occurrence can be estimated. Hazard could be defined as a dangerous phenomenon or human activity or condition that may cause loss of life, injury to health, damage of property, loss of livelihoods and services related to daily lives, social and economic disturbance or ecological impairment. For example, a cyclone that surges over an uninhabited island does not result in a disaster; however, it would be a disaster if it hit the populated coast of Bangladesh and causes extensive loss of lives and property

Abarquez and Murshed (2004) provided a concise definition of hazard. They defined a hazard as: A*ny phenomenon, substance or situation, which has the potential to cause disruption or damage to infrastructure and services, people, their property and their environment.*

Obviously *hazard* is a threat and source of danger, which has the probability to cause harm to people (death, wound, infections and mental and physical hassle) and human activity (economic, financial, social, political, educational), property (damage to property, economic loss of society) and environment (disruption of ecology, loss of flora and fauna, pollution of environment and finally loss of bio-diversity).Those elements of the physical environment, harmful to man and caused by forces extraneous to him (Burton *et al.,* 1978)

Vulnerability

Lack of capacity to cope with any kind of adverse effects of climatic events such as floods, cyclones, earthquakes, droughts, saline water intrusion, volcanic eruptions, tornadoes etc. are called vulnerability or susceptibility. IPCC TAR (2001) defined vulnerability as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and adaptive capacity.

The definition of IPCC based on the adverse effects of climatic or natural events which smartly avoid the human activities such as technological events and chronic events. The famine is often an adverse effect of human acts and it depends on socio-economic condition of people not likely related to climate change issues. ***Vulnerability*** is the degree to which the exposure unit is susceptible to harm due to exposure to a perturbation or stress, and the ability (or lack thereof) of the exposure unit to cope, recover, or fundamentally adapt (become a new system or become extinct. It can also be considered as the underlying exposure to damaging shocks, perturbation or stress, rather than the probability or projected incidence of those shocks themselves (UNDP, 2005).

Vulnerability refers to the magnitude of harm that would result from a particular hazardous event. The concept recognizes, for example the different sub-types of a receptor may differ in their sensitivity to a particular level of hazard. Therefore climate vulnerability defines the extent to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. It depends not only on a system's sensitivity but also on its adaptive capacity. Hence arctic alpine flora or the elderly may be more vulnerable to climate change than other components of our flora or population (UKCIP 2003).

Definitions of vulnerability range from a focus on physical exposure (Mitchell 1999; Schneider and Chen 1980; Barth and Titus 1984), to measures of socio economic status and access to resources (Susman, Paul O'Keefe, and Wisner, B. 1983; Timmerman 1981; Cannon *et. al* 1994) to sociological investigations of the differential ability of groups to resist harm and to recover afterwards (Drabek 1986; Bolin 1982; Quarentelli 1992), to discussions of how the hazard of place concatenates with social profiles (Dowing 1991; Cutter 1996).

Risk

Generally risk is the probability of hazard occurrence in a certain magnitude. The chance of something to happen that will have an impact on objectives. A risk is often specified in terms of an event or circumstance and the consequences that may flow from it. Risk is measured in terms of a combination of the consequences of an event and their likelihood. Risk is the probability that negative consequences may arise when hazards interact with vulnerable areas, people, property and environment.

Risk can also be considered as the combination of an event, its likelihood, and its consequences-i.e., risk equals the probability of climate hazard multiplied by a given system's vulnerability. Douglas (1992) pointed out that: *"Risk' is the probability of an event combined with the magnitude of the losses and gains that it will entail. However, our political discourse debases the word. From a complex attempt to reduce uncertainty it has become a decorative flourish on the word 'danger".*

Risk may be defined as the likely consequences (damage, loss, etc.) that may result from the impact of an event on exposures (values at risk) with specific event related vulnerabilities. Risk may be considered with the combination of hazard, vulnerability and exposure. An event resulting in unacceptable consequences may be considered a high-risk event even if the probability of occurrence is low.

Disaster

As an extreme physical phenomenon or a geophysical event that disrupts economic activities, affects livelihood systems and finally disturbs the development by the spatial interactions between hazards, vulnerability and risk. However, Degg (1992) described, "natural disasters result from spatial interaction between a hazardous environmental process (i.e., an extreme physical phenomenon such as an earthquake) and a population that is sensitive to that process and likely to experience human and/or economic loss from it". Disasters disrupt "normal" life,

affect livelihood systems, and halt individual and/or community functions at least temporarily. Disasters often erase decades of development in a matter of minutes and push an affected community and/or nation years back in its quest for development. For example, the 2004 Indian Ocean tsunami caused a 20-year setback in the development of Maldives, an island nation off the coast of India (Coppola, 2007).

Any event that disrupt seriously of a community functioning or a society causing casualties of human and other lives, damages property, economic losses and environmental degradation that the affected community or society do not cope with their own capacity and they need the assistance from outside. On the basis of social perspective (Kreps, 2001) defined "Disasters are non-routine events in societies or their larger subsystems (e.g., regions and communities) that involve conjunctions of physical conditions with social definitions of human harm and social disruption."

As an event disaster, it affects the society or community and physical environment directly that has some secondary impact on society, economy and environment causing property damage, economic losses and environmental pollution: By supporting the above statement Tierney *et al.,* (2001) noted that:

Direct effects include the deaths, injuries, and physical damage and destruction that are caused by the impact of the disaster agent itself. Research has recently begun to emphasize the importance of secondary disaster impacts, such as fires or hazardous materials released that are triggered by earthquakes and environmental pollution resulting from flooding. These kinds of occurrences can produce significant impacts and losses over and above those caused by the primary disaster agent. A distinction can also be made between direct and secondary impacts and the indirect losses resulting from disasters. Those losses include "ripple effects" resulting from disruption in the flow of goods and services, unemployment, business interruption, and decline in level of economic activity and productivity.

However, the United Nations Center for Human Settlements (UNCHS) provided a holistic framework for natural disasters, in terms of creation, effects, outcomes, and responses:

[A] natural disaster could be defined as the interaction between a natural hazard, generated in most cases from a sudden and unexpected natural event, and vulnerable conditions which cause severe losses to man and his environment (built and natural). These losses create suffering and chaos in the normal patterns of life, which lead to socio-economic, cultural and sometimes, political disruption. Such a situation requires outside intervention at international and national levels in addition to individual and communal responses (UNCHS, 1994).

Results and Discussion

Frequently occurring disasters in Bangladesh

The **Figure 2** shows that among the disasters occurred last 20 years in Bangladesh, about 46.26% was flood and flash flood followed by 31.34% was tropical cyclone/storm, 10.44% was landslide, 7.46% was cold wave, 2.98% was tornado and 1.49% was heat wave.

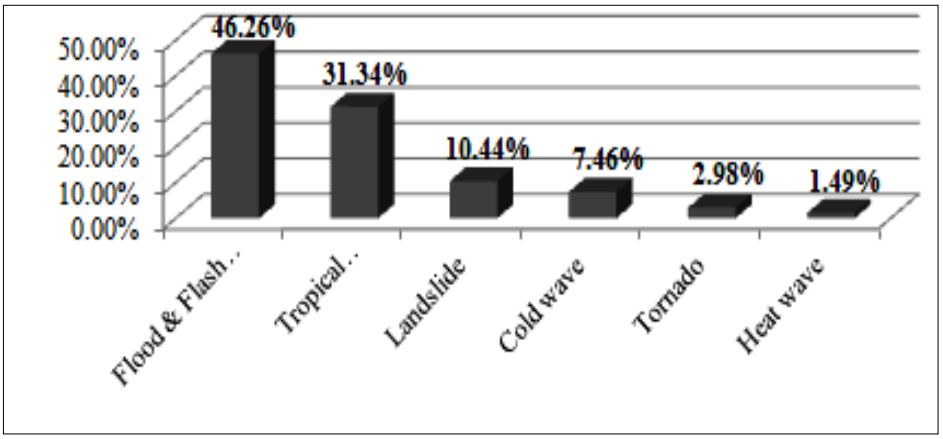

Figure 2: Percentage Distribution of Frequently Occurring Disasters in last 20 years (1998-2017) in Bangladesh [Source: Field Study, 2018]

Monsoon Floods

The above **Figure 3** shows that last 20 years (1998-2017), the month of both June and July was the most flood occurring period in Bangladesh. Separately, about 30% flood occurred in these two month followed by 16% flood did hit in September, 12% flood did affect in August, 8% flood occurred in October and 4% flood occurred in May.

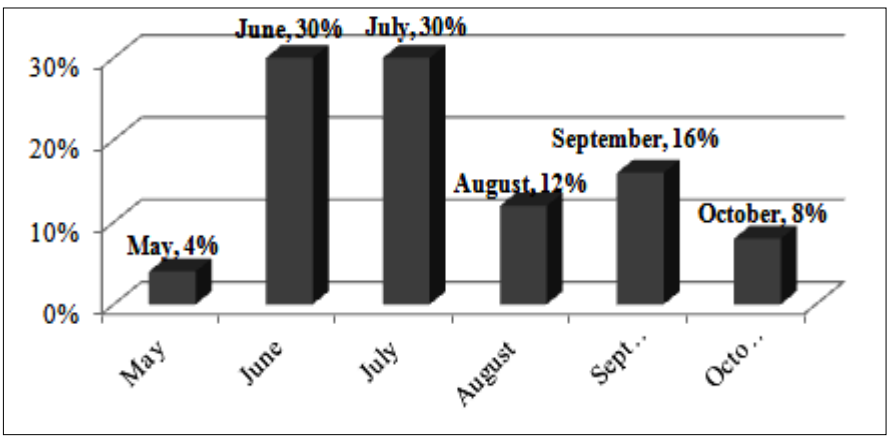

Figure 3: Percentage distribution of 20 (1998-2017) Years Flood occurring Month in Bangladesh [Data collected from OCHA Situation Report No.1 Jul.17, 1998; Government of Bangladesh, Foreign Ministry Flood 98 Site] [**Source: Field study, 2018]**

Most of the flood did affect the northern part of Bangladesh, for instance, the flood of 2002, 2004, 2005 and 2007. On the other hand, the flood of 2003 and 2004 did affect the northwestern part of Bangladesh. The flood of 1998 did affect 52 districts of this country out of 64. On the other hand, the flood of 2014 did affect 6 districts in the northern part of the country. Nine districts in the northwest of the country were affected by flooding. The flood of 2000 did affect only the Sandwip Island (**Table 1**).

Table 1: Flood affected areas and related effects in Bangladesh in last 20 years (1998-2017)

Disaster Name	Month and Year	Related effects	Affected areas
Flood	August, 1998	--	52 districts out of 64
Flood	June 24, 2000	Landslide	Chittagong and in the neighboring areas of Cowkbazar, Mirzapool, Katalganj, Rahmatganj, Chaktai, Halishahr, Bakalia, Chandgaon, Pahartoli, Hathazari, Patiya, Satkania and Keranirhat.
Flood	September, 2000	Erosion	Sandwip island
Flood	June 20, 2002	--	--
Flood	July 3, 2002	Landslide	Northern and southern part of Bangladesh
Flood	July 10, 2002	--	Northern and western part of Bangladesh
Flood	July 30, 2002	--	--
Flood	August 12, 2002	--	Coastal island
Flood	June 23, 2003	Mudslides and storms	Southeastern parts of Bangladesh
Flood	September 18, 2003	--	Northwestern districts of Rajshahi, Chapai Nawabganj, Pabna and Kushtia
Flood	June 27, 2004	--	Northern part of Bangladesh
Flood	September 13, 2004	--	--
Flood	September 22, 2004	--	Southwestern part of Bangladesh
Flood	October 15, 2004	--	Northwest part of Bangladesh
Flood	May 27, 2005	--	Northern part of Bangladesh
Flood	July 19, 2005	--	--
Flood	October 7, 2005	--	Northern part of Bangladesh
Flood	July 31, 2007	--	Northern part of Bangladesh
Flood	June 20, 2008	Erosion	--
Flood	July 18, 2008	Landslide	Chittagong and Cox's Bazar
Flood	June 26, 2012	Landslide	Different districts of Chittagong and Sylhet division of Bangladesh
Flood	August 25, 2014	--	Six districts in the northern part of the country have been affected.
Flood	June 17, 2015	--	Nine districts in the northwest of the country are experiencing flooding.
Flood	July 31, 2016	--	--

Source: Field study, 2018 (Note: Data collected from OCHA Situation Report No.1 Jul.17, 1998; Government of Bangladesh, Foreign Ministry Flood 98 Site; IFRC 2014/09/15; Bangladesh Sangbad Sangstha 2014/08/25; ECHO 2016/08/02; Xinhua 2016/07/31.)

Flash Floods

Last twenty years (1998-2017) data on flash flood shows that most of the flash flood (55%) occurred in the month of June. On the other hand, discretely, 15% flash flood occurred in the month of March, July and August (**Figure 4**). Most of the flash flood did affect the Haor areas of Northeast part of Bangladesh. Only the flash flood of 2015 did affect the southern part of Bangladesh specially the Cox's Bazar, Chittagong, Bandarban, Jessore and Feni (**Table 2**).

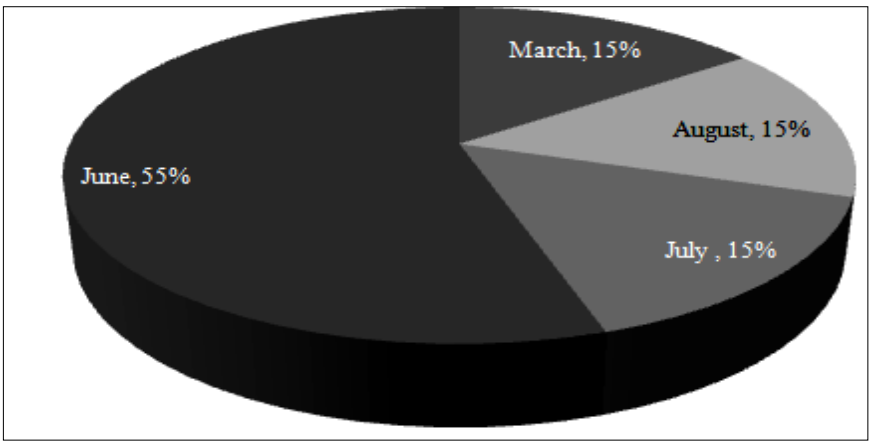

Figure 4: Percentage distribution of 20 (1998-2017) Years Flash Flood occurring Month in Bangladesh [Data collected from CNN News 2001/06/07; CNN report 2001/08/26; Reuters Alertnet 2003/06/14; IFRC 2010/06/28; Government of Bangladesh 2015/07/29; NIRAPAD 2017/05/03**][Source: Field study, 2018]**

Table 2: Flash Flood affected areas and related effects in Bangladesh in last 20 years (1998-2017)

Disaster Name	Month and Year	Related effects	Affected areas
Flash Flood	June 6, 2001	--	--
Flash Flood	August 26, 2001	--	--
Flash Flood	June 14, 2003	--	Northeast part of Bangladesh
Flash Flood	June 2, 2006	--	--
Flash Flood	June 29, 2010	--	The north eastern and northern districts of Bangladesh
Flash Flood	July 28, 2015	--	The southern part of Bangladesh specially the Cox's Bazar, Chittagong, Bandarban, Jessore and Feni.
Flash Flood	March 28, 2017	--	Haors and low-lying areas of the northeast of Bangladesh.

Source: Field study, 2018 (Note: Data collected from CNN News 2001/06/07; CNN report 2001/08/26; Reuters Alertnet 2003/06/14; IFRC 2010/06/28; Government of Bangladesh 2015/07/29; NIRAPAD 2017/05/03.)

Tropical cyclone/ storm

The following **Figure 5** shows that most of the tropical cyclone/storm (32%) occurred in May in last twenty years. On the other hand, 23% tropical cyclone/storm occurred in March followed by 10% occurred separately in April, September and November and 5% occurred separately in February, June and October. Most of the cyclone did hit the southern part of the country. The coastal zone, mangrove area, inshore and offshore area severely affected by tropical cyclone/storm. Some storm did hit different areas of the country. Such as, the northern district of Gaibanda was slapped by storm in 2005 on March. In 2010, storm did flap the areas of Dinajpur, Rangpur, Nilphamari, Lalmonirhat, Kurigram and Nawabganj district (**Table 3**).

Table 3: Tropical cyclone/Storm affected areas and related effects in Bangladesh in last 20 years (1998-2017)

Disaster Name	Month and Year	Related effects	Affected areas
Tropical Cyclone/Storm	November 22, 1998	--	Southwest coastline in Bangladesh
Tropical Cyclone/Storm	May 3, 2002	--	Patuakhali
Tropical Cyclone/Storm	May 24, 2002	--	-
Tropical Cyclone/Storm	March 14, 2003	--	--
Tropical Cyclone/Storm	February 19, 2005	--	--
Tropical Cyclone/Storm	March 25, 2005	--	The northern district of Gaibandha
Tropical Cyclone/Storm	May 5, 2005	--	--
Tropical Cyclone/Storm	September 20, 2005	--	Bay of Bengal
Tropical Cyclone/Storm	March 5, 2006	--	Sundarbans mangrove forest
Tropical Cyclone/Storm	March 23, 2007	--	Southern island district
Tropical Cyclone/Storm	May 14, 2007	--	--
Tropical Cyclone/Storm	November 15, 2007		A dozen coastal districts of Bangladesh as a severe cyclone Sidr
Tropical Cyclone/Storm	March 24, 2008	--	--
Tropical Cyclone/Storm	September 17, 2008	--	Bay of Bengal
Tropical Cyclone/Storm	October 27, 2008	--	Southern part of Bangladesh
Tropical Cyclone/Storm	May 25, 2009	--	--
Tropical Cyclone/Storm	April 14, 2010	--	Dinajpur, Rangpur, Nilphamari, Lalmonirhat and Kurigram
Tropical Cyclone/Storm	May 25, 2010	--	Nawabganj district
Tropical Cyclone/Storm	June 8, 2010	--	North-east Bangladesh
Tropical Cyclone/Storm	May 16, 2013	--	Patuakhali district
Tropical Cyclone/Storm	April 5, 2017	--	Bogra district

Source: Field study, 2018

(Note: Data collected from OCHA Situation Report No.1, 11/1998; IFRC 23 Nov 1998; BBC News 2002/05/04; Rerters Alertnet 2002/05/24; BBC news 2002/05/25; IFRC 2010/04/21; Reuters AlertNet 2010/05/25; BBC news 2010/06/08; Government of Bangladesh, 2013/05/20; Reuters 2015/04/06; UNOCHA 2016/05/30.)

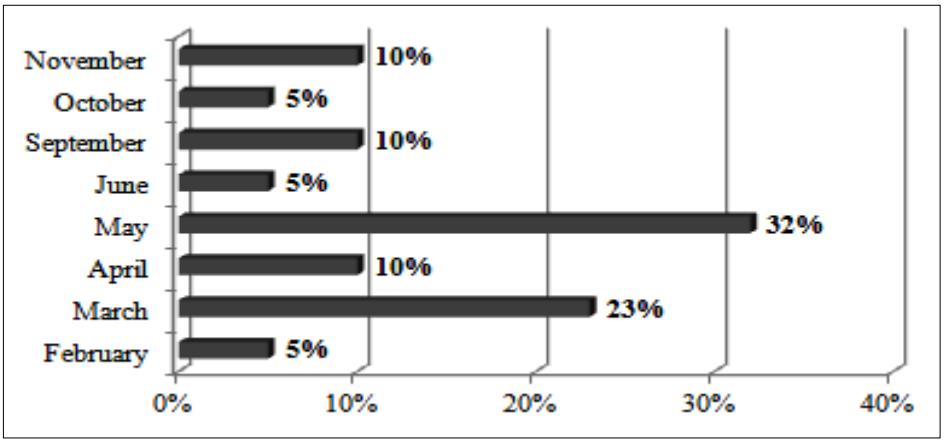

Figure 5: Percentage distribution of 20 (1998-2017) Years Tropical/Storm occurring Month in Bangladesh [Data collected from OCHA Situation Report No.1, 11/1998; IFRC 23 Nov 1998; BBC News 2002/05/04; Rerters Alertnet 2002/05/24; BBC news 2002/05/25] [Source: Field study, 2018]

Tornadoes

Northern part of the country was very vulnerable to tornadoes. **Table 4** shows that this country was experienced by tornadoes in 2004 and 2005

Table 4: Percentage distribution of 20 (1998-2017) Years Tornadoes occurring Month in Bangladesh [Data collected from OCHA Relief Web, 2004/04/16; BBC News 2005/03/22; independentbangladesh.com 2005/06/02**]**

Disaster Name	Month and Year	Related effects	Affected areas
Tornado	April 15, 2004	--	Northern Bangladesh
Tornado	March 20, 2005	--	Gaibandha and Rangpur districts in northern Bangladesh
Tornado	June 1, 2005	--	--

Source: Field study, 2018

Cold wave

The **Figure 6** shows that December and January was the most cold wave occurring month in Bangladesh. About 80% cold wave occurred in January and rest 20% occurred in December. Most of the cold wave covered all over the country but northern and Sub-Hymalayan areas were harshly attacked by cold wave in 2010 and 2013 (**Table 5)**.

Table 5: Cold Wave affected areas and related effects in Bangladesh in last 20 years (1998-2017)

Disaster Name	Month and Year	Related effects	Affected areas
Cold Wave	December 23, 2002	--	Nationwide
Cold Wave	January 12, 2003	--	Nationwide
Cold Wave	January 6, 2010	--	Northern and southwest part Bangladesh
Cold Wave	January 7, 2011	--	Nationwide
Cold Wave	January 10, 2013	--	Northern districts of the sub-Himalayan regions of Bangladesh

Source: Field study, 2018 (Note: Data collected from OCHA Situation Report No.1 2003/01/09; CNN News 2003/01/15; UNDP 2010/01/06; NIRAPAD 2011/01/19; AFP 2013/01/10.)

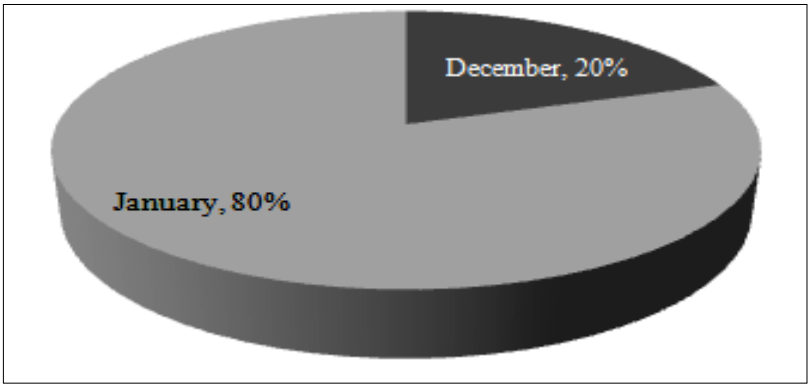

Figure 6: Percentage distribution of 20 (1998-2017) Years Cold Wave occurring Month in Bangladesh [Data collected from OCHA Situation Report No.1 2003/01/09; CNN News 2003/01/15; UNDP 2010/01/06; NIRAPAD 2011/01/19; AFP 2013/01/10.**] [Source: Field study, 2018]**

Heat wave:

Due to heat wave during the twenty years (1998- 2017), there was no severe disaster record in this region (Bangladesh)

Landslide

Figure 7 shows that June, July and August were the landslide occurring month in Bangladesh. The same 43% landslide occurred separately in June and July month. On the other hand, rest 14% landslide occurred in August. In 2000, landslide occurred due to torrential rains produced flash floods in the city of Chittagong and in the neighboring areas of Cowkbazar, Mirzapool, Katalganj, Rahmatganj, Chaktai, Halishahr, Bakalia, Chandgaon, Pahartoli, Hathazari, Patiya, Satkania and Keranirhat. In 2003, monsoon downpours caused flooding and landslides that killed people and left people trapped in their homes in parts of northern and southern

Bangladesh. In 2008, people were killed, injured and feared trapped under the rubble of collapsed houses in landslides. In 2009, torrential rains triggered landslides and flash floods. In 2010, landslides triggered by heavy rain in southeast Bangladesh (**Table 6**).

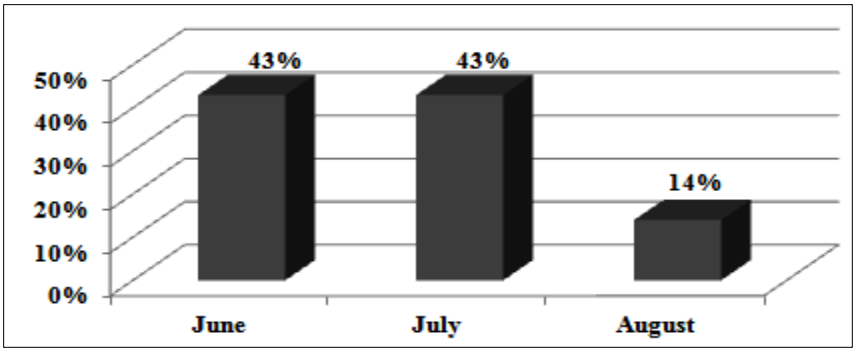

Figure 7: Percentage distribution of 20 (1998-2017) Years Landslide occurring Month in Bangladesh [Data collected from IFRC 2000/07/02; AFP 2000/05/30; OCHA Situation Report No. 2 2000/06/29; BBC news 2002/07/10; Reuters News, 2002/07/09] [**Source: Field study, 2018]**

Table 6: Landslide affected areas and related effects in Bangladesh in last 20 years (1998-2017)

Disaster Name	Month and Year	Related effects	Affected areas
Landslide	June 24, 2000		Torrential rains produced flash floods in the city of Chittagong and in the neighbouring areas of Cowkbazar, Mirzapool, Katalganj, Rahmatganj, Chaktai, Halishahr, Bakalia, Chandgaon, Pahartoli, Hathazari, Patiya, Satkania and Keranirhat
Landslide	July 3, 2003		Monsoon downpours caused flooding and landslides that killed eight people and left some 100,000 people trapped in their homes in parts of northern and southern Bangladesh
Landslide	August 18, 2008	--	Bangladesh, at least 14 people were killed, a dozen injured and 10 others feared trapped under the rubble of collapsed houses in landslides
Landslide	July 4, 2009	--	Torrential rains triggered landslides and flash floods killing six people and stranding half a million in their homes in Bangladesh
Landslide	June 15, 2010	--	Landslides triggered by heavy rain in southeast Bangladesh buried dozens of houses
Landslide	July 1, 2011		Batali Hill in Chittagong, in southeastern Bangladesh.
Landslide	June 26, 2012	--	Chitttagong and Sylhet division of Bangladesh

Source: Field study, 2018 (Note: Data collected from IFRC 2000/07/02; AFP 2000/05/30; OCHA Situation Report No. 2 2000/06/29; BBC news 2002/07/10; Reuters News, 2002/07/09; SwissInfo 2009/07/04; BBC news 2010/06/15; AFP 2011/07/04; Government of Bangladesh 2015/07/29.)

Conclusion

Flood was the most occurring disaster in Bangladesh and then the cyclone was the second highest occurring which shows in the result. Landslide, flash flood, cold wave and tornado also occurred in last twenty years in Bangladesh. The month of both June and July was the most flood occurring period and most of the flood did affect the northern part of Bangladesh. Last twenty years (1998-2017) data on flash flood shows that most of the flash flood (55%) occurred in the month of June. Most of the flash flood did affect the Haor areas of Northeast part. The data shows that most of the tropical cyclone/storm (32%) occurred in May in last twenty years. The coastal zone, mangrove area, inshore and offshore area got severely affected by tropical cyclone/storm. Some storm did hit different areas of the country. The June, July and August month were the landslide occurring month in Bangladesh. Mainly landslide occurred due to torrential rains produced flash floods in the hilly areas of the country. Temporal and geographical analysis of disasters in any country is very important for better management of disaster's impact. Effective and well organized data management on disasters helps to take future initiatives for the better planning of disaster management.

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