



Disaster and Human Security Management

Project Paper

“Comparative Study of Major Cyclones in Bangladesh to Understand the Policy Loopholes”

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Contributions

This paper was completed with the cumulative contribution of Lubaba Mubashirah, Marwa Tasnim and Md. Shohanur Rahman Prodhan. In this study the part of introduction chapter, literature review, findings and conclusion chapter were done with the collective effort of three of the members of this group.

The cyclone policy evaluation and policy analysis chapters were done by Lubaba Mubashirah. Md. Shohanur Rahman Prodhan contributed on the theoretical framework and chronological evolution of cyclone chapters. The cyclone evaluation and human dimension of cyclones analysis chapters were done by Marwa Tasnim.

Abstract

Cyclone has always been a frequent disaster for Bangladesh due to its geographical location and tropical climate. To combat cyclone this country has taken many measures starting from broad policies to root level programs and projects. The purpose of this study is to understand the evolution of the cyclone management policies and programs that are available in Bangladesh and do a thorough analysis of these policies and programs to understand their positive and negative aspects. A major focus of the study is to figure out the history of cyclones, its damages and the effects in Bangladesh. This paper works on the human dimension of the cyclone affects by doing a comparative study of three cyclones that occurred in three different decades; Cyclone Gorky (1991), Cyclone Sidr (2007) and Cyclone Roanu (2016); to understand the implementation of the policies and programs on human lives. This study is based on qualitative data analysis method. The data collected is mostly secondary data as the policies and history behind these policies need analytical study and does not require primary data or much quantitative analysis. This study aims to contribute further knowledge on cyclone management policies and programs, their effects in the localities of Bangladesh and their efficiency in field by studying the history of cyclone events. This study shows that the implementation of the cyclone policies and programs has effects on reducing loss of human lives but fails to reduce the environmental loss and other damages. It also finds that the policies and programs fail to reflect upon the climate change and environmental factors. This study can help us to understand the view and approaches of the overall cyclone management policies and programs in Bangladesh and have specific knowledge on the research gaps surrounding this subject.

Keywords: Cyclone, Disaster Management, Policy, Shortcomings, Implementations

Abbreviation

BBS	Bangladesh Bureau of Statistics
BRCS	Bangladesh Red Crescent Society
CC	Climate Change
CCA	Climate Change Adaptation
CDMP	Community-based Disaster Management Planning
CPP	Cyclone Preparedness Program
DM Act	Disaster Management Act
DRR	Disaster Risk Reduction
GDP	Gross Domestic Product
MoDMR	Ministry of Disaster Management and Relief
NELD	Non-Economic Loss and Damage
SOC	Standing Order on Cyclone
SOD	Standing Order on Disaster
UN	United Nation
UNHCR	United Nation High Commissioner for Refugees

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Chapter 01: Introduction

1.1. Preamble

Bangladesh is a large and heavily densely populated country in South Asia, which has a population density of 1,115.62 people per square kilometer and is currently ranked 10th in the world (World Population Review, 2018). The geographical location makes the country vulnerable for tropical cyclones and other hazards. An increasing number of natural disasters such as floods, storms, and tropical cyclones, always keep the coastal people in a worst condition (Jahan, 2012). The coastline of Bangladesh is of 734 km involving coastal and island communities of about 50 million people, nearly one-third of the total population of Bangladesh (Bangladesh Bureau Of Statistics (BBS), 2015). The huge population density along with the geographical condition and climatic condition makes Bangladesh very vulnerable to disasters like cyclone. Cyclone is considered one of the major disasters in Bangladesh due to its history of severe cyclones and major losses of lives. At least 12 major tropical cyclones hit the country from 1965 to 2016, leaving 479,490 people dead. According to the Ministry of Disaster Management and Relief, Bangladesh was one of the worst sufferers of cyclones in terms of casualties (Dhaka Tribune, 2017).

There have been many policies and programs regarding cyclone management in Bangladesh. After the 1970's Bhola cyclone which killed almost 0.3 million people the Cyclone Preparedness Program (1973) and Cyclone Code (1985) was established which was an amendment of the code of 1970. Following this approach, the Government of Bangladesh and organizations related to disaster management took many other initiatives that resulted in modern cyclone management policies which are currently supporting the cyclone management in Bangladesh. The CPP stated that the government has their own disaster management policies and they own objectives in line with government policies. The recent policies, as outlined by the CPP, include educating school children, religious leaders and village leaders (Bisson, 2012). Though the frequency and intensity of cyclones is increasing, the Government of Bangladesh and the organizations related to disaster management are working towards making the people of the country resilient to cyclones and minimize the losses.

1.2. Background of the Study

Tropical cyclones or hurricanes are common within latitude 30° north and south. These intense storms move across shallow shelf seas; the water is being piled-up along the coast as a surge. In most cases the mixture of these effects creates most dreadful effects in the coastal regions - a gradual rise in the regional sea level produces enhanced landward penetration of surges and storm waves (Khan, 2013). Bangladesh suffers due to cyclones almost every year which causes severe damages to life, property and jeopardizes the development activities. The vulnerability of Bangladesh to climate change is due to a number of hydro-geological and socio-economic factors: (a) its geographical location; (b) its flat deltaic topography with very low elevation; (c) its extreme climate variability that is governed by monsoon; (d) its high population density and poverty incidence; and (e) its majority of population being dependent on crop agriculture which is highly influenced by climate variability and change (Bangladesh Bureau Of Statistics (BBS), 2015).

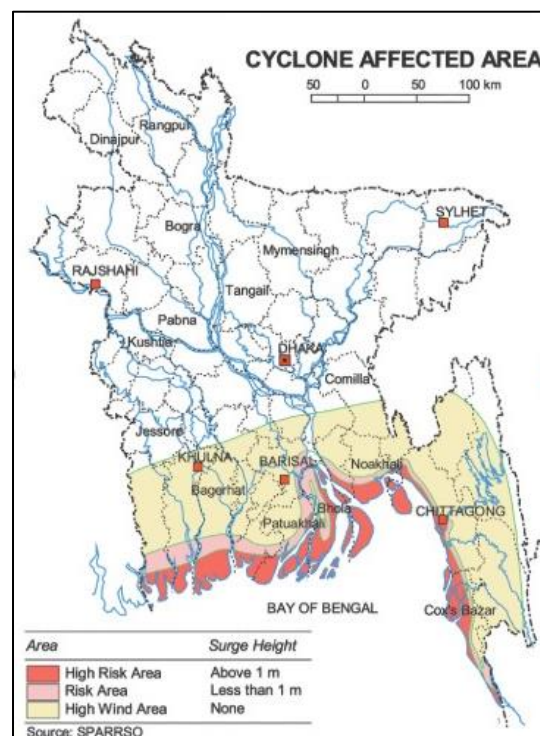


Figure 1.1: Cyclone prone areas of Bangladesh (Source: Climate Change Cell, 2006)

The coastal regions of Bangladesh are subject to damaging cyclones almost every year. They generally occur in early summer (April-May) or late rainy season (October-November). Cyclones originate from low atmospheric pressures over the Bay of Bengal (Khan, 2013). Among the

world's deadliest 35 cyclones 18 of them originated in Bay of Bengal and caused havoc in Bangladesh. The 1970's Bhola cyclone is considered as the deadliest cyclone of the history of the world (Weather Underground, 2018).

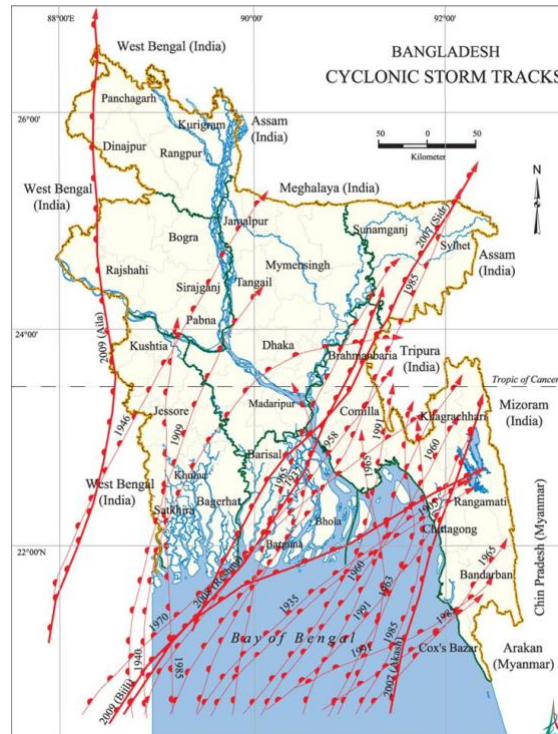


Figure 1.2: Cyclone tracts in Bangladesh (Source: Banglapedia)

1.3. Problem Statement

The paper intends to show the comparative study on human dimension of cyclone affects. Three cyclones from three different decades are chosen for this study. Depending on the intensity and effects on the locality these three cyclones are selected: a) Cyclone Gorky (1991); b) Cyclone Sidr (2007); c) Cyclone Roanu (2016). The analysis of the study is done on human dimensions which includes amount of death, affected people and households, evacuation etc. It focuses on the change of the effects of cyclone due to policy changes and other initiatives taken by the Government of Bangladesh and organizations related to disaster management in Bangladesh through the comparative study.

This paper focuses on evaluating the policies that are regarding cyclone management in the national policies and plans for disaster management. From 1970 to 2018 there have been several

public policies and plans for disaster management in Bangladesh. There are separate sections and plans for cyclone management in these policies.

This paper aims to focus on the implementation and the governing process of these policies to contextualize the condition of those in Bangladesh. The paper intends to represent the part of cyclone management system in Bangladesh and the gradual development process of this sector. It analyses the existing policies that includes cyclone and identifies the loopholes of cyclone management system of Bangladesh.

1.4. Literature Review

The focus of this study is on two directions of cyclone study. Firstly, it focuses on the cyclones evolution in Bangladesh and the impacts it had on this country and the people. Secondly, the policies and programs to mitigate cyclone and the actions and approaches taken to reduce the damage on the human dimension of cyclone is discussed in this paper. Literature for these two objectives are discussed in this chapter.

1.4.1. Cyclones and its impact on Bangladesh

Bangladesh is one of the most disaster-prone country in the world. Most of the disasters are meteorological and hydrological in nature, including cyclones and associated storm surges, thunderstorms/tornadoes/hailstorms, floods, droughts, heat waves, cold waves, landslides, earthquakes and tsunamis. Within the last 30 years Bangladesh has been hit by more than 100 cyclones (Ahsan, et al., 2011). Some of the most renowned cyclones of Bangladesh are: The Great Backerganj Cyclone of 1876, the Worst Killer Cyclone of November 1970, the Urichar Cyclone in May 1985, the Killer Cyclone of April 1991, the floods of 1954, 1987, 1988, the Historic Flood of 1998; Demra Tornado of 1969, Manikganj Tornado of 1974, Madaripur Tornado of 1977, Saturia Tornado of 1989, Louhajong Tornado of 1995, and Tangail Tornado of 1996, super cyclone Sidr (2007) etc. These events that have significantly impacted the people of Bangladesh. The complex coastline of Bangladesh extends for about 710 km along the continental shelf and its coastal waters are characterized by shallow bathymetry. The Bay of Bengal forms a funnel shape towards the Meghna estuary that significantly enhances storm surges and cyclones which are

known as being some of the highest in the world. (Habib, et al., 2012) The occurrence of cyclones is one of the most frequent disasters that occur in Bangladesh. And it leads to the vulnerability of the coastal area of this country.

The entire coast of Bangladesh is vulnerable to deadly tropical cyclones and they are associated with storm surges because of its low elevation above sea level, a relatively shallow continental shelf in the Bay of Bengal along the edges of the gently sloping Ganges–Brahmaputra delta and high densities of impoverished coastal settlements. An average of 16 tropical cyclones develop in the Bay of Bengal each year, with particular concentration in two periods: April–May and October–December. Not all of these cyclones strike the coast of Bangladesh with deadly force. (Paul, et al., 2010)

The government of Bangladesh along side other organizations such as Bangladesh Red Crescent Society (BRCS), World Meteorological Organization (WMO), CARE Bangladesh etc. have been trying to reduce the vulnerabilities of cyclones and take many developmental projects to do so. But the development perceived in the past were like service delivery and inspired by a limited and externally inspired understanding of development. In many cases it provided an excuse for going ahead and to act disregarding the impact on these people with the argument that they will be able to cope or not. The concept of “vulnerability” expresses the multidimensionality of disasters by focusing attention onto the complete social system, environmental situation between the intersections of nature and culture of the individual or the group in general. The modern integrative approach to vulnerability comes from the disaster community and is set out in the Hyogo Framework 2005-2015 and adopted by the UN in 2005. It is defined here as “the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.” (Mallick, et al., 2011) This was reflected by the impact on cyclone Gorky and cyclone Sidr approaches. This will be the main area of study to understand the cyclones and the approaches taken by the related authorities to overcome a cyclone hazard.

1.4.2. Policies and Programs regarding Cyclone

According to Amin et al, International organizations such as IPCC (2007) and Clime Asia (2009) have identified Bangladesh as the sixth most vulnerable country to floods and the most vulnerable

countries to tropical cyclones compared to other developing countries. Due to the geographical location and climate of Bangladesh the severity and frequency of disasters like cyclone has always been high. But the measures for such a frequent disaster has not been very up to date in either governmental sector or technological sector. The approach towards cyclone management did not change before 1990s. (Al-Amin et al, 2013)

According to Tiffany Bisson, there have been marked changes in national disaster management policies. The Disaster Management Bureau indicated that from the early 1970s, the government developed the cyclone code 1985, an amendment of the code of 1970. This code is one of the oldest measures of cyclone mitigation in Bangladesh and both the public and government are bound to follow it. After the 1991 cyclone the national government realized a unique department needed to be created for disaster management planning, policies and management and created the Disaster Management Bureau. In 1994 the Bureau drafted the national Disaster Management Policy and the CDMP drafted the Disaster Management Act. Although the Act has been drafted, it is still waiting for approval by parliament. The Standing Order on Disaster (SOD) was completed in 1997, detailing the responsibilities of each level of government during a disaster risk. The SOD has the force of an Act and mandates all disaster responses. There is also a National Disaster Management Plan and a Local Disaster Action plan. Every upazilla and union is believed to have a copy which details “who is responsible for each thing”. The DMB stated that the SOD is in response to the government’s desire to reduce the effects of disasters. The government wants to “reduce the life/property loss of disasters and bring it to a tolerable level”. The UNDP and CDMP also named the SOD as a main policy that has been adopted. When asked about cyclone policy, the Meteorological Department stated that it was not their concern, but did state that cyclones were the biggest weather event in Bangladesh. This sums up the evolution of disaster management system in Bangladesh. How the approaches and management system changed according to the events took place has been reported in this paper. (Bisson, 2012)

According to Andrew E. Collins and Edris Alam women and children are affected more despite the modification of traditional hierarchies during cyclone periods. Their work recommends that disaster reduction programmes encourage cyclone mitigation while being aware of localized realities, endogenous risk analyses and coping. Adaptation of affected communities as active survivors rather than helpless victims. The statement of the people who experienced cyclone in

1991, people like Edris Alam the reporter himself is that location and pattern of settlement are the most important factors determining people's vulnerability to a tropical cyclone on the Bangladesh coast. Due to inappropriate land management systems there can be more vulnerability. With the enactment of the 1984 Land Reform Ordinance, the Office of the Deputy Commissioner (the head of district level administration) finally approved all allocation and settlement matters, following a series of procedural steps. But for various mismanagement and political forces the poor were ultimately landless and had to lease in their vulnerable state in exchange of cash. The lack of transport infrastructure is a factor working for increasing vulnerability also. The report also says due to late responses to warnings and complex decision-making process the vulnerability increases. The appropriate local responses would be long-term adaptation through house design and tree planting. For example, the inhabitants of Urir Char have raised the height of the plinths on average to around eight feet above the level of cropland. The paper states the findings highlight three underlying vulnerabilities to cyclone disasters: hazard risk perceptions; pre-cyclone decisions whether to go to cyclone shelters; and inadequate land management policies in the coastal areas of the country. (Alam E, 2010)

In the paper "Cyclone Aila and the Southwestern Coastal Zone of Bangladesh: In the Context of Vulnerability" it was mentioned that the policies of the governmental Organizations (GO) and NGOs were not strong enough and they were so weak in some extent that they failed to protect the coastal zone and their people and asset from the impact of cyclone Aila. This paper also tried to explore the factors which were behind the delayed reconstruction work in the disaster-stricken districts and also tried to find out some suitable policy to recover the current situation within a short period of time. Most importantly this paper tried to formulated some recovery policy. In this paper, it was suggested that "Build Back Better" can be a better strategy in case of cyclone for the coastal area and it was also focused that the post-disaster period can be used as a window of opportunity which can benefit both humans and nature if well-planned, collaborative, sustainable recovery efforts are implemented. This paper also advised on the fact that Government should focus more on Macro-level planning and consensus building. By including these factors in the national policy, the policy makers will find it much easier to focus on the certain field which needs more assistance and this also emphasized on this paper.

According to “Cyclone Shelter Construction, Maintenance and Management Policy 2011” cyclone shelters are buildings that are constructed on RCC pillar and the ground floor of this has to be kept open for free flow of tidal surges. The design will be prepared in way that it can withstand the heavy gusty and squally wind. For the location selection shelters must be proximity to vulnerable communities and within 1.5 km distance. The locations can be considered using GIS. In this policy the headquarters of district, upazilla and municipalities should not be considered for construction of shelters. Three designs are given for the cyclone shelters in this policy. In design-1 the area is 275-300 square meter per floor and it is for 1000 person per floor. And in design 2 the area is 220-230 square meter per floor and it is for 800 persons per floor. In design-3 there’s 200 square meters per floor and the design is for 750 persons per floor. Few facts are strictly said here such as the plinth level must be fixed at least 3 feet above the highest level of tidal surges. Based on the situation in different areas, the structural designs have to be prepared taking into consideration of the tidal surges from 6 feet to 20 feet high and the wind speed of at least 260 km per hour. But there is no indication of which area has to follow what instructions. The policy gives the guidelines in generals but in on specific terms. It also states that ‘Bangladesh National Building Code’ should be followed but which codes are to be followed is not mentioned properly. The maintenance of the shelters and responsibilities of local DMC are briefly described. The repair, maintenance and sale or abandoning the shelter is included in the policy too. The management committee is well formed and shown on the policy. The paper showed the blue print of the shelters for better understanding which is very effective in the field work. (Cyclone Shelter Construction, Maintenance and Management Guideline, 2011)

According to the research of Bishawhit Mallick, Bayes Ahmed and Joachim Vogt the total damage and losses caused by Cyclone Sidr was calculated to be US\$ 1.7 billion. Aila affected about 4.8 million people. Although improved early warning system is now available in Bangladesh many people still don’t know how to interpret the warnings. Study shows that 78% received warning 6 hours before the cyclone but 1/3 of the people were not able to understand the warning message. “Nur Mia of Majer Char village at Sharankhola upazila said, “what does it mean by signal 6, signal 7, signal 8 or extreme signal 10? I do not know, all are the same to me—when should I go back home? It was very difficult to understand.” The existence of an effective early warning system is important in order for the local inhabitants to take preparations before the cyclone strikes. From the survey results, it was found that approx. 75% of the respondents got the warning in time, but

only 30% of them took necessary measures, e.g., 53% of them tied-up their roofs with a tree and the remaining respondents kept food in safer places. However, the timing of the alert is critical for adequate preparation. Field data show that 77.6% of the respondents were not in a position to take any measures to prepare, as they received a warning only 6 hours before the cyclone made landfall.” But facing the struggle and rebuilding after a disaster gives the opportunity to initiate development programs. It helps to learn new skills and strengthen community leadership. But it also seen that the victims also became dependent on micro-credits and loans which can be a setback for them. (Bishawjit Mallick, 2017)

In recent decades, government agencies, non-governmental organizations (NGOs) and local communities in Bangladesh have undertaken various measures to mitigate the impacts of natural disasters, including floods and cyclones, on the people, economy and society. The concept of developing national preparedness, as opposed to post-event response, to disasters like floods and cyclones evolved after the floods of 1988 and the devastating cyclone of 1991. The main argument behind this shift was that if people were well prepared for frequent disasters, they would minimize their impacts, resulting in a reduced need for relief and rehabilitation. It was also strongly felt by the public institutions that if disaster preparedness could be integrated in the socio-economic development process at household, community, regional and national levels, it would build the long-term capacity of the community to mitigate risk and vulnerability to disasters. (Haque & Uddin, 2013)

According to this, after the events of 1988 and 1991 the government realized that human lives can be saved if the system that they were following in the past decades were changed. The approaches taken before this were mostly depended on the relief and rehabilitation programs. There was not much space for people to take precautionary steps. Specially the policies and programs organized for combating cyclone and other disasters were “post-disaster” activities. Thus, many lives were lost. These two events had a long-term effect on the whole approach of disaster management in Bangladesh. The paradigm shift of thoughts and approaches regarding disaster changed after this.

1.5. Research Gap

This chapter introduces the identification of the research gap that helps in formulating the research question as the starting point for further analysis.

There have been studies about policies regarding disasters and related aspects but relating the existing policies with a particular disaster like cyclone has not been studied. There are studies focusing flood, regarding policies and management. Cyclone on the other hand despite being frequent and devastating has been overlooked in the studies. The effectiveness of the policies over this aspect is also absent in this area. The relation among the existing policies and environment or climate change context also adaptation for climate change can be another aspect to study on.

1.6. Research Question

The overall objective of this paper is to understand the changes in approaches regarding cyclone management in Bangladesh. For this this paper investigates on three different cyclones affects and different policy approaches taken by Government and organizations for understanding the loopholes of them. Thus, it leads this paper to have two different research questions. Those are:

- 1) What are the effects of cyclones on human dimension of the cyclone affected areas of Bangladesh?
- 2) What are the policies and programs regarding cyclone management in Bangladesh and understanding the loopholes of them?

The research methodology of this study has been selected on the basis of the research questions. During the research, qualitative methodology was utilized. Silverman (2001) points out that the data chosen in qualitative method does not necessarily have to be representative but rather, it is the kind of information from the data that needs to be representative (Silverman, 2001).

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Chapter 02: Data and Methods

2.1. Introduction

This chapter focuses on explaining the methods used for this paper and the data and information collected. The data regarding the cyclones and their human dimension is explained in this chapter. The policy regarded cyclones are extracted here also. It elaborates the policy evaluation of cyclone management throughout the time.

2.2. Conceptual Framework

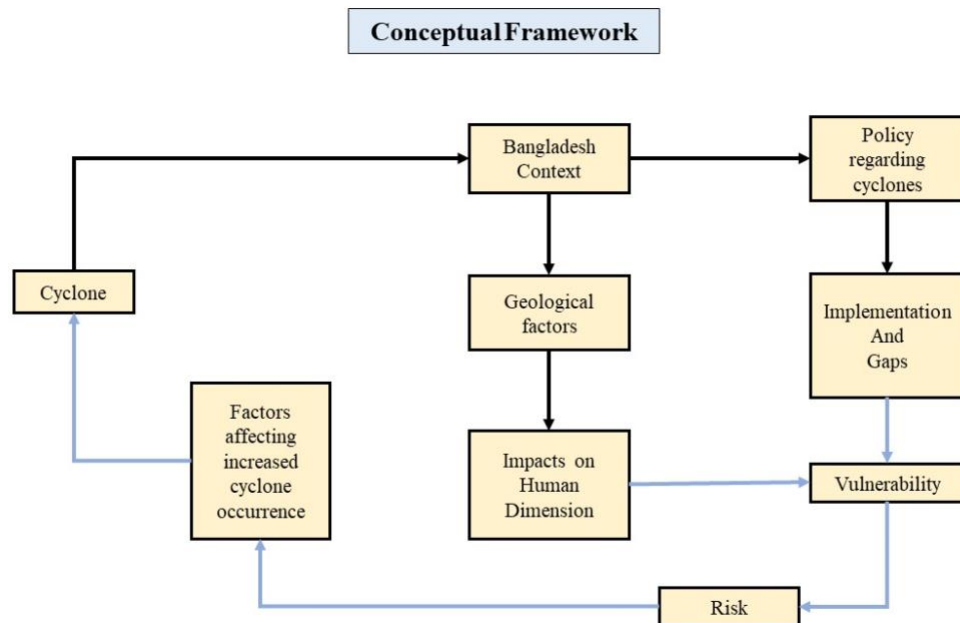


Figure 2.1: Conceptual Framework

Cyclone is a tropical storm or atmospheric turbulence which involves circular motion of the wind. Due to Bangladesh's geological condition, it gets affected by cyclone every year. There are various factors which influences the increased occurrence rate of cyclone in this region. As the risk of cyclone is increasing, Bangladesh has taken various necessary steps to cope with the situation. Government of Bangladesh has prepared several action plans and policies to adapt with the cyclone

scenario. These actions, policies and the adverse effect of cyclones affect the local people in different dimensions.

2.3. Methodology

This paper is concerned about the human dimension of cyclones and public policies and legislations regarding cyclone management in Bangladesh. Due to the nature of this research it has a qualitative and thematic analysis process.

This Study firstly analyzes the cyclone Gorky, Sidr and Roanu's human dimension data which includes amount of death, injured, evacuated population, affected population etc. to analyze this data thematic analysis method is used. Braun and Clarke (2006) define thematic analysis as, "A method for identifying, analyzing and reporting patterns within data." (Braun, et al., 2015). Thus, this process is chosen for analyzing the damage and loss data of the three cyclones.

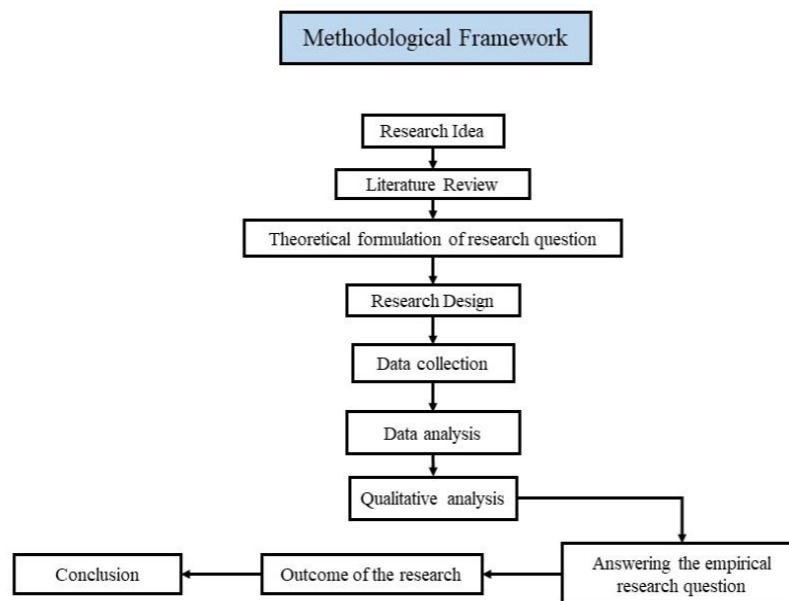


Figure 2.2: Methodological Framework

This study also aims to identify the available cyclone management policies and programs that are available from 1970 to 2018 in Bangladesh and analyze them to figure out gaps that are within the knowledge of this research area. Thus, the descriptive qualitative method of analysis was chosen. This paper focuses on cyclone among many other disasters it has also thematic analysis process that categorizes a single type of disasters policy, program and planning.

The method of data collection is secondary data collection as the data and information needed for this research has been taken from books, archives, articles, journals, internet, e-books, newspapers, government documents etc. After the collection and analysis of the data, the results of this paper can be interpreted through answering the research questions.

2.4. Cyclone Data

This chapter describes the three cyclones incident chosen for this research. The aim of this chapter is to give the information of human dimension of cyclones to give a broad idea of the disasters occurred. The chosen cyclones are from three different decades, starting from cyclone Gorky which was in 1991 (1990-1999); Cyclone Sidr of 2007 (2000-2009); and Cyclone Roanu of 2016 (2011-2018). The purpose for choosing three of three decades is to understand the effects of cyclones on human dimension over three decades.

2.4.1. Chronological Evolution of Cyclones in Bangladesh

The evolution of cyclones in Bangladesh is shown in a chart along with the casualties and affected areas from 1970 to 2018. Here, w= Wind Speed s= Surge height t= Tidal height. This chart is made by compiling information from various sources.

Table 2.1: The intensity scale of cyclones in South-Asia.

Intensity	Wind Speed
Depression	Winds up to 62 km/h
Cyclonic Storm	Winds from 63-87 km/h
Severe Cyclonic Storm	Winds from 88-118 km/h
Severe Cyclonic Storm of Hurricane Intensity	Winds above 118 km/h

Source: (Khan, 2013)

Table 2.2: Chronological evolution of cyclones with their intensities and amount of approximate loss and damages.

SL No	Year	Affected Area	Nature of Occurrence	Loss and Damage (Approximate)
1	1970, May 5-7	Chittagong-Teknaf coast (landfall at Cox's Bazar)	Cyclonic storm, w=148 km/h, s=2.3m and t=0.2m.	18 people killed
2	1970, November	Khulna-Chittagong coast (landfall at Hatia)	Most severe cyclonic storm, w=222 km/h, s=5.5m and t=2.1m.	300,000 lives lost and innumerable animals were killed, widespread damage to crops and properties
3	1971, May 7-8	Meghna estuary	Cyclonic storm, w=80 km/h	Damage data not available
4	1971, November 5-6	Chittagong coast (landfall near Chittagong)	Cyclonic storm, w=105 km/h, s=2.1m and t=0.0m	Damage data not available
5	1971, November 28-30	Sunderban coast	Cyclonic storm, w=110 km/h, s=1.0m and t=0.0m.	11,000 people killed
6	1973, November 16-18	Chittagong coast	Cyclonic storm, w=165 km/h, s=3.5m and t=1.0m.	Damage data not available
7	1973, December 6-9	Sunderban-Patuakhali coast (landfall at Sunderban)	Severe cyclonic storm, w=122 km/h and s=4.5m	183 people killed
8	1974, August 13-15	Khulna coast	Cyclonic storm, w=80 km/h, s=2.5m and t=1.7m.	Damage data not available
9	1974, November 24-28	Cox's Bazar-Chittagong-off shore Islands (landfall at Chittagong)	Severe cyclonic storm, w=161 km/h, s=3.1m and t=0.2m.	20 people killed
10	1975, May 9-12	Sunderban-Bhola-Chittagong coast	Severe cyclonic storm, w=110 km/h.	5 people killed
11	1976, October 19-20	Meghna estuary	Cyclonic storm, w=105 km/h, tide plus surge at Companygonj was 3.5m.	Damage data not available

12	1977, May 9-12	Sunderban-chittagong coast (landfall at Sunderban)	Cyclonic storm, w=113 km/h, s=0.6m and t=0.7m.	Damage data not available
13	1978, September 30 to October 3	Sunderban khulna coast	Cyclonic storm, w=74 km/h	Damage data not available
14	1983, October 15	Chittagong-Feni coast (landfall near Chittagong)	Cyclonic storm, w=122 km/h.	43 persons were killed, 1000 fishermen missing and 20% aman crops destroyed
15	1983, November 9	Chittagong-Teknaf coast (landfall between Chittagong and Cox's Bazar	Severe cyclonic storm, w=136 km/h, s=2.5m.	300 fishermen with 50 boats missing; 2000 houses, 22 institutions destroyed
16	1985 May 24-25	Noakhali-Cox's Bazar coast (landfall at Sandwip)	Severe cyclonic storm, w=154 km/h, s=3.2m and t=1.8m.	11,069 people killed, 94,379 houses damaged, 64 km road and 390 km embankment damaged
17	1986, November 9	Barguna-Chittagong coast	Cyclonic storm, w=110 km/h	14 lives lost and huge damage to crops and properties
18	1988, November 29	Sunderban	Severe cyclonic storm, w=160 km/h, s=3.5m and t=1.5m.	5,708 people killed and 6,000 missing; 65,000 cattle were lost
19	1990, October 7-8	Barguna-Noakhali coast	Cyclonic storm, w=2m	150 fishermen with 16 mechanized boats missing
20	1991, April 29	Patuakhali-Cox's Bazar coast (landfall north of Chittagong)	Most severe cyclonic storm, w=235 km/h, s=5.8m and t=1.7m.	150,000 people killed, 70,000 cattle killed, crops were damaged. 60 million taka economic damage.

21	1991, May 31 – June 2	Patuakhali-Barisal-Noakhali- Chittagong coast	Severe Cyclone, w=110 km/h, s=1.9m	Many people missing and cattle died.
22	1994, April 29 – May 3	Cox's Bazar Coast	Most severe cyclonic Storm, w= 210 km/h.	400 people dead and 8,000 cattle died.
23	1995, November 21-25	Cox's Bazar Coast	Most severe cyclonic storm, w= 210 km/h	650 people and 17,000 cattle died.
24	1997, May16-19	Chittagong – Cox's Bazar- Noakhali – Bhola Coast area	Most severe cyclonic storm, w= 225 km/h, s= 3.05 m	126 people died.
25	1997, September 25-27	Chittagong – Cox's Bazar- Noakhali – Bhola Coast area	Severe Cyclone, s= 1.83m – 3.05m	Damage data Not Available
26	1998, May 16-20	Chittagong, Cox's Bazar, Noakhali Coast Area	Severe Cyclonic Storm, w= 150 km/h, s=1.83m – 2.44m	Damage data not available
27	1998, November 19-22	Khulna-Barisal-Patuakhali coast area	Cyclonic Storm, w= 90km/h, s=1.22m- 2.44m	Damage data not available
28	2007, May 14-15	Chittagong area	Severe Cyclone, w= 120 km/h	14 people killed, damage about 982 million US dollar
29	2007, November 15-17	Bangladesh	Most severe cyclonic storm, w= 260 km/h, s= 5m	3,500 death, 1.7 million US dollar economic damage
30	2008, October 26-27	Barisal	Cyclonic storm, w= 85 km/h	15 people killed
31	2009, April 19-21	Chittagong and Cox's Bazar coastal area	Cyclonic storm, w= 90 km/h	200,000 people evacuated
32	2009, May 27-29	Bagerhat, Pirojpur, Barisal, Patuakhali, Bhola, Laksmipur, Noakhali, Feni, Chittagong and Cox's Bazar	Cyclonic storm, w= 120km/h, s= 3.04m – 3.94m	150 deaths, 18.85 billion taka economic loss.
33	2013, May 16-17	Patuakhali, Barguna	Cyclonic storm, w= 85 km/h	17 people dead, 5.14 million US dollar economic loss.
34	2015, July 29	Chittagong coastal area	Cyclonic storm, w= 75 km/h	39 killed and 510,000 houses destroyed

35	2016, May 21	Chittagong	Cyclonic storm, w= 102 km/h	26 dead and 40,000 houses destroyed
36	2016, August 20	Tropical storm	n/a	Damage data not available
37	2017, May 29-31	Chittagong, Rangamati, Cox's Bazar	Cyclonic storm, w= 110 km/h	18 dead and 20,000 houses damaged

(Source: Banglapedia, T.S.Murty et al., 1986; Khalil, M.G., 1992; and Murty, T.S. and El-Sabh, M.I., 1992, Khan. S.R., 2013)

2.4.2. Cyclone Gorky (1991)

Bangladesh has traditionally been one of nature's favorite targets: tornadoes, cyclones, and monsoons occur with alarming regularity. Bangladesh contains the world's second largest deltaic region (exceeded only by the Amazon Basin). The confluence of the Ganges, Brahmaputra, and Magma rivers, coupled with runoff from the Himalayas, deposits nearly 45 million tons of silt annually. This tremendously fertile region supports over 120 million people. Damage from natural disasters is often severe, mainly due to the low terrain, the high density of the population, shoddy housing, and a poorly developed infrastructure. Environmental devastation, especially deforestation in the Himalayas, exacerbates the problem. Simultaneous processes of soil erosion and accretion result in the rise of the sea bed in the Ganges estuary and the emergence of new islands; channels constantly change. These factors all impact tidal surge intensity, greatly increasing the danger of flooding (McCarthy, 1994)

On April 30, 1991, Cyclone Marian also known as cyclone Gorky swept across the southeastern coast of Bangladesh, lashing the area with winds up to 210 kilometers per hour and gusts up to 235 per hour. A storm surge of over six meters submerged coastal areas and small offshore islands, causing massive loss of life and destruction. Approximately 13.4 million people lived in the affected areas and as sea waters receded and more bodies were uncovered, the death toll rose to almost 139,000, with an equal number of injured (USAid, 1992).

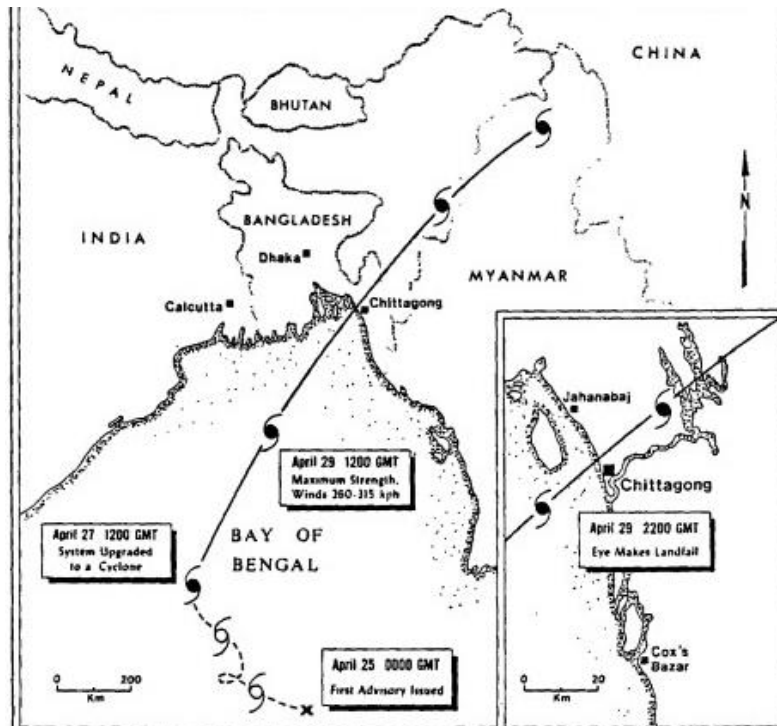


Figure 2.3: Path of Tropical Cyclone Gorky in coast of Bangladesh (Source: Haque, E., 1992)

The cyclone also drove a 6 m high storm surge that impacted the districts of Chittagong, Cox's Bazar, Barisal, Noakhali, Patuakhali, Barguna and Kutubdia. Although 2 million people were evacuated from coastal regions, the death toll was high due to the majority of residents in the Chittagong region receiving little warning of the impending cyclone (International Recovery Platform, 2013). On Kutubdia, an offshore island with a pre-cyclone population of 110,000 people, more than 20,000 died. Many of the storm's survivors remained marooned without shelter or in overcrowded temporary shelters for days after the storm. Continuing rain and rough seas hampered relief efforts. The lack of a safe water supply and proper sanitation caused a dramatic rise in the incidence of diarrhea and dysentery, with as many as 2,000 associated deaths during the first three weeks following the cyclone (USAid, 1992).

Infrastructure destruction was widespread. Over 1 million homes were destroyed or damaged. Bangladesh's major port, Chittagong, was severely damaged and was nonoperational for several days. Damaged /sunken ships, many of them belonging to the Bangladeshi Navy, blocked the port. An embankment around Chittagong stretching 17 KM in length failed in the area of the airport and

the water supply was disrupted.' Several key bridges, including the main bridge over the Karnaphuli River north of Chittagong, were washed out or otherwise damaged. Throughout the storm-affected area, sea walls collapsed, jetties disappeared, dirt roads were flooded, buildings were ravaged, and the transportation infrastructure was virtually destroyed (McCarthy, 1994).

2.4.3. Cyclone Sidr (2007)

On 15 November 2007, Cyclone Sidr struck the south-west coast of Bangladesh with winds up to 240 kilometers per hour. The category 4 storm was accompanied by tidal waves up to five meters high and surges up to 6 meters in some areas, breaching coastal and river embankments, flooding low-lying areas and causing extensive physical destruction. High winds and floods also caused damage to housing, roads, bridges, and other infrastructure. Electricity and communications were knocked out, and roads and waterways became impassable. Drinking water was contaminated by debris and many sources were inundated with saline water from tidal surges, and sanitation infrastructure was destroyed (Government of Bangladesh; International Development Community, 2008). Drinking water became saline and was contaminated by wastes. Around one million households near the southwest coast were severely affected and another 1.3 million were impacted to some degree. The death toll was estimated at around 3406 (GoB 2008). Thirty out of 64 districts of Bangladesh were affected by Cyclone Sidr and 19 coastal districts were virtually shattered (Haque & Jahan, 2016).

While the impact of Cyclone Sidr was relatively moderate when measured by impact on overall Gross Domestic Product (GDP) (estimated to be equivalent to 2.8 percent of Bangladesh's GDP), the effects of the storm were highly concentrated by district. These districts also suffer from high population density and higher poverty rates than the national average (over 50 percent in Barisal versus a national average of 40 percent). Thus, the impact is borne primarily by the poor. It is estimated that about 2 million people have lost income and employment in the more affected districts. The districts have some of the highest poverty rates in the country; the disaster was highly concentrated in the Districts of Bagherat, Barguna, Patuakhali, Pirojpur, and Barisal (Government of Bangladesh; International Development Community, 2008).

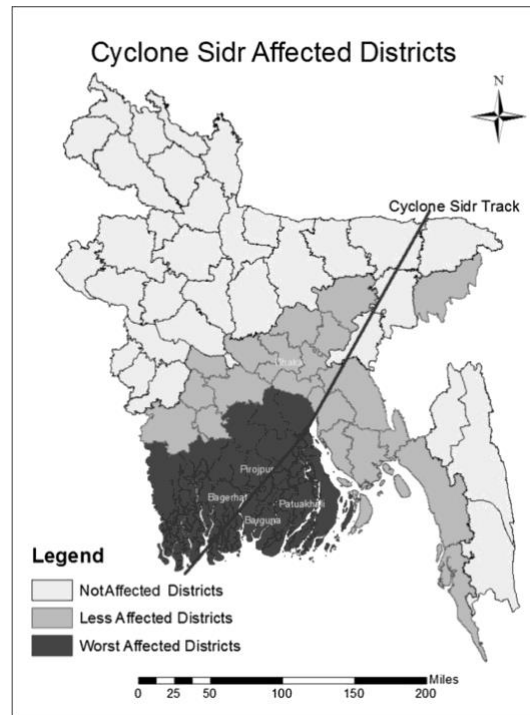


Figure 2.3: Cyclone Sidr Affected Areas and track (Source: Nadiruzzaman and Paul, 2013)

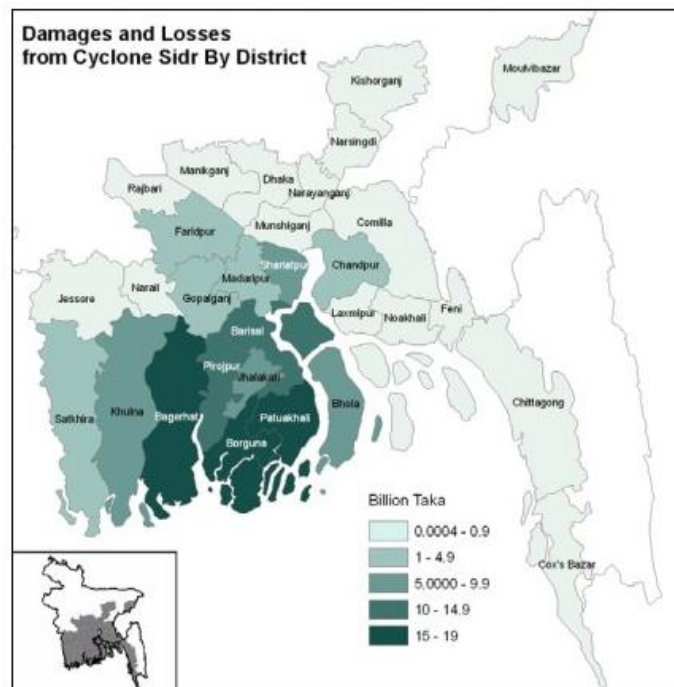


Figure 2.5: Cyclone Sidr damage and losses according to districts (Source: GOB, 2008)

Sarankhola sub-division is situated in the lower delta region of Bangladesh, was one of the worst hit areas. This flat low-lying area is characterized by rice fields (only one crop a year), many trees, the wide river Baleshwar and the closeness to the mangrove forest Sundarban. The Bay of Bengal is only some 40 km downstream. People in the area are mostly farmers, but along the river - outside the 2-3 m high embarkment, there are also a number of fishing communities, who fish from rather small boats in the river, or join as crew on bigger ocean trawlers to fish in the Bay of Bengal. The mangrove is an additional source of income, as many of the farmers and fishermen in the area traditionally have been going into the Sundarban mangrove to collect honey, firewood and sundari leaves. This was strictly speaking illegal, as the Sundarban is a protected area, being the largest mangrove in the world, a nature reserve and the home of numerous animals and birds - the Royal Bengal Tiger being the most famous. Still, until the cyclone Sidr struck, the government was not strict in enforcing this law. But after Sidr hit the area and destroyed around one third of the trees in the mangrove forest, the government is now trying to enforce the ban on entry into the mangrove, and thus this additional source of income is now (more or less) out of reach for the fisherfolks and farmers in the adjacent areas (DanChurchAid, 2008).

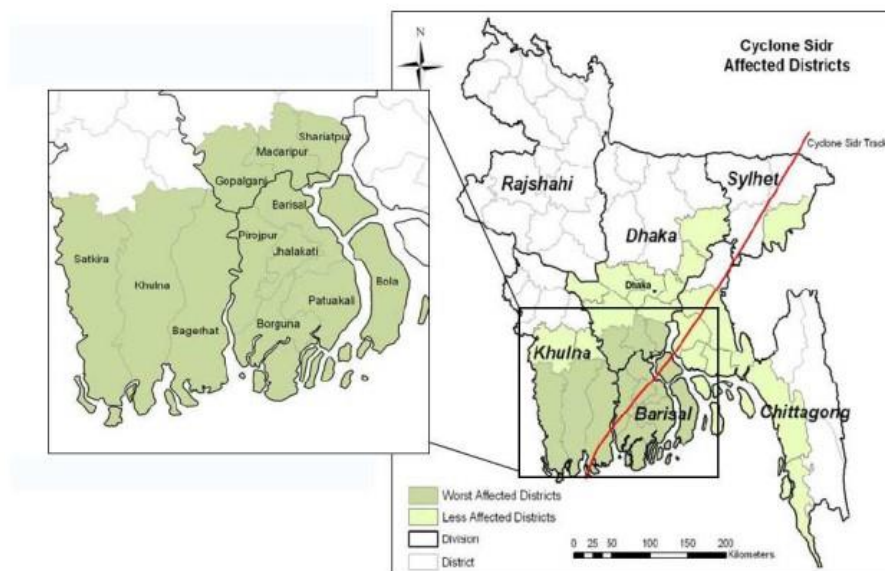


Figure 2.6: Cyclone Sidr Affected areas (Source: GoB, 2008)

Sidr was hit the eastern part of the Sundarbans, especially Dublar Char, Kotka, Kochikhali, Hiron Point, Sharankhola, and the Chandpai area, causing severe destruction within 300 m of riverbanks. Satellite imagery reveals that the cyclone covered about 30% of the Sundarbans. The severe ecosystem disruption included uprooted, broken and twisted plants, and burnt foliage. The Forest Department estimated that about 30,000 acres of forest resources were severely affected and another 80,000 acres were partially affected. The impact on the environment of Sundarban is one of the major overlooked factor of cyclone Sidr even though the role of it to reduce the impact of cyclone in Bangladesh is incomparable. (Khan, 2016)

2.4.4. Cyclone Roanu (2016)

A tropical storm, named Roanu, hit the Bangladesh coast around the noon of 21 May 2016. It affected 38 Upazilas along the Bangladesh coast. The storm caused severe damage including 27 casualties due to floods, storm surge and rain-triggered landslides (Sarwar, et al., 2017). The Cyclone Roanu formed from a low-pressure area over southwest Bay of Bengal and adjoining areas off Sri Lanka coast on 15 May 2016 and concentrated into a well-marked low (WML) in the afternoon of same day. It intensified into a Depression at noon of 17 May and further intensified into Deep Depression in the afternoon of 18 May and then into a cyclonic storm on 19 May. It moved nearly north to north northeastwards initially, then east-northeastwards and finally crossed Barisal-Chittagong coast near Chittagong (north of Chittagong) during 12 Noon to 05 PM (0600-1100 UTC) of 21 May 2016. Despite its long journey over sea, it did not intensify into a severe cyclonic storm (Bangladesh Meteorological Department, 2017). As a result, several hundred thousand people were marooned even though authorities took more than 500,000 people into shelters. Peripheral winds and heavy downpours brought on by the impending cyclone caused widespread devastation before the storm had even made landfall (Sarwar, et al., 2017). In 3,494 safer shelters the government provided dry food rations. The government allocated 3,522 MT of rice and cash of 10,052,000 Bangladeshi Taka (BDT 10,052,000), equivalent to CHF 128,800, to assist those impacted by the cyclone (International Federation of Red Crescent Society, 2017)

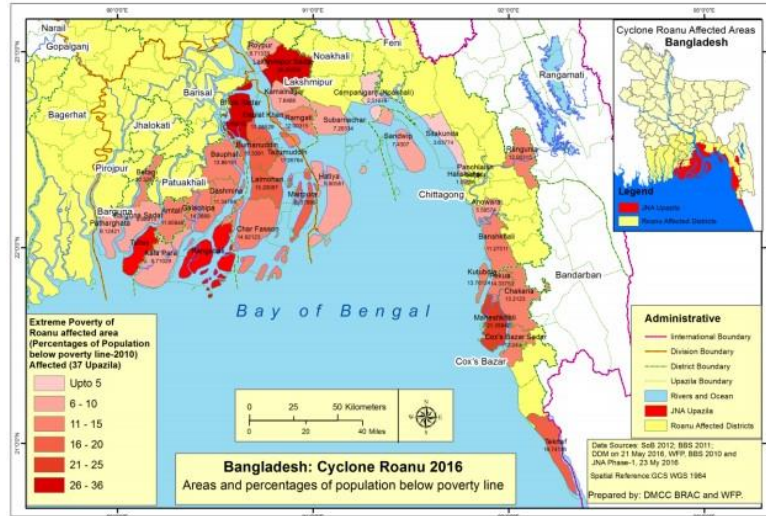


Figure 2.7: Cyclone Roanu Affected areas in Bangladesh (Source: GoB, 2016)

Kutubdia, Pekua, Chakaria, Maheshkhali, and Cox's Bazar Sadar had been identified as mostly affected upazilas in Cox's Bazar district. In addition, Banshkhali, Anowara, Patenga and Sandwip upazilas have also been impacted very high. Moreover, very highly damaged upazilas in other parts of the coastal zone are Hatiya Companyganj and Subarnachar in Noakhali; Manpura, Tazumuddin, Lalmohon and Char Fasson in Bhola; Galachipa, Rangabali and Kalapara in Patuakhli; Patharghata and Taltoli in Barguna districts. (Sarwar, et al., 2017). The storm affected a total area of 9,441 km² and caused causality for 27 lives. The number of fully affected household is 72,362. (Sarwar, et al., 2017)

The damage of cyclone Roanu in Bangladesh is about 31.8 million USD. It is in comparison to the success of the evacuation process not a good sign. The economic damage is higher than the impact of cyclone. Mainly due to the damage done in Cox's Bazar alone exceeded more than 10 million USD. (The Asian Age, 2016)

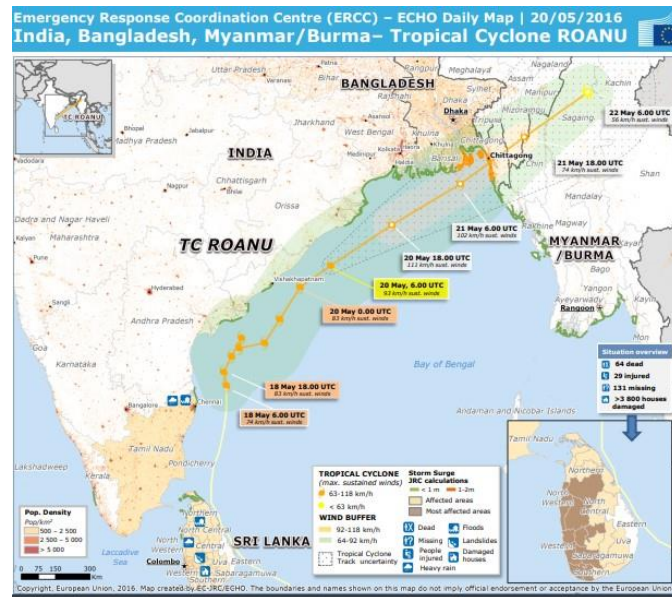


Figure 2.8: Cyclone Roanu Track (Source: Research Gate, 2016)

The main difference between cyclones nine years ago and today is that communities know much more. Villagers with access to television and radio can hear about the storm earlier than through the volunteer system, and the number of villagers who have access to radio and television has steadily risen. For many, the early warning system functions as a safeguard to check and see if the information matches what they've heard elsewhere. The village also recently built an irrigation system with the help of outside NGOs that allows stagnant water to flow back into the bay and bring water levels down more quickly. Three weeks after Cyclone Roanu, villagers were putting the final touches on repairing the last of the broken houses, wrecked boats, and leaking roofs. The shelter had returned to duty as a schoolhouse (Souza, 2016).

2.5. Policy Evaluation

The severity of cyclone in Bangladesh and the associated mortality rate have changed greatly in the past half century. (Haque, et al., 2011) Through the evaluation of cyclone management policy and early warning system the result was possible. There are many policies in the country those have been developed throughout the years. These policies changed with times as the country faced several cyclone incidents. Some of the policies regarding cyclone are: CPP

(Cyclone Preparedness Program), SOC (Standing Order of Cyclone), Cyclone Shelter Construction, Maintenance and Management Guideline 2011. This section elaborates the gradual evaluation of these policies. When these policies were made, what they say and what were the influence behind these steps.

2.5.1. Standing Order of Cyclone (SOC)

After the cyclone of 1985 during 24-25th May, the Standing Order of Cyclone was proclaimed by the Government of Bangladesh (GOB) in November 1985. It was updated thereafter constituting the basic plan for coping with cyclone disaster. “Within the framework of SOC, concerned authorities are required to deal with unforeseen and complex situations swiftly using initiative and imagination. The local authorities are required to take necessary action to prevent or reduce loss or damage to life and property by making maximum use of local resources instead of waiting for external assistance. The guidelines for disaster preparedness and management under SOC is organized into 5 stages as follows:

- (a) Pre-Disaster Stage (Off-cyclone season)
- (b) Alert Stage (Signal No. I, II and III)
- (c) Warning Stage (Signal No. IV)
- (d) Disaster Stage (Signal No. V, VI, VII and VIII, IX, X)
- (e) Post-Disaster stage (Immediately after the cyclone till normalcy is attained)” (Miyan, 2006)

2.5.2. Standing Order on Disaster (SOD)

Standing order on Disaster was first published in 1997. It was translated in English in 1999. After that many cyclones occurred, and various steps were taken under SOD. This is a guideline for national and regional state. It was revised in 2010. The revised SOD has reflected the vision of the government and clearly outlines the role and responsibilities of the ministries, divisions, agencies, organizations, committees, public representatives and citizens to cope with any natural disaster. In the revised SOD it is intended to implement several programs to shift the whole paradigm of disaster management from a response and recovery culture to a risk reduction culture. This changed risk environment has been taken into consideration in the revised Standing Orders on Disaster. (Ministry of Food and Disaster Management , 2010) SOD includes both the duties of the

national policy and coordination as well as local level coordination. It also decides the roles and responsibilities all the ministries, divisions, departments and governments owned corporation. SOD also gives brief discussion about responsibilities of field level officials and local government elected representatives and humanitarian organizations. Through SOD the duties of each sectors during disaster is stated and targets to reduce the impact of the damages and losses caused by any major disaster like flood or cyclones.

2.5.3. Cyclone Preparedness Program (CPP)

In last 50 years Bangladesh has decreased the death rate due to cyclone significantly. (Haque, et al., 2011) This has been possible for the steps regarding preparedness such as: modernizing early warning systems, developing shelters and evacuation plans, constructing coastal embankments etc. The CPP was launched by Bangladesh Red Crescent Society in 1970 after the Bhola cyclone. The goal is to strengthen and develop disaster preparedness, increase response capacity and reduce loss of lives and properties. The program's activities include: disseminating cyclone warning signals issued by the Bangladesh Meteorological Department through an extensive telecommunication network; providing and assisting in first aid, rescue, relief and rehabilitation operations; and coordinating and building community capacity, disaster management and development activities. (Haque, et al., 2011)

2.5.4. Cyclone Shelter Construction, Maintenance and Management Guideline 2011

In Bangladesh, cyclone shelters are critical for protecting human lives and livestock. During Cyclone Sidr in 2007, for example, 15 percent of the affected population took refuge in cyclone shelters, which were estimated to have saved thousands of lives. (Dasgupta, et al., 2011) With the objectives of protecting the lives and properties of the people from the devastating cyclones like Sidr and Aila (2009) Government and the non-government organizations, different development partner countries and organizations have constructed several cyclone shelters and constructions of more shelters are still going on. Although the physical infrastructure division of the planning commission prepared a guideline in this respect in 1996 but this is now inadequate for present time. After the SOD published in April 2010 all the activities related to rehabilitation were revised. (Ministry of Disaster Management and Relief, 2012) Maintenance of and access to cyclone shelters are important factors in enabling people to quickly find adequate protection. For example, only

two out of every five shelters were usable during the 1991 cyclone, because of flooding. People also had lack of access to shelters during Cyclone Sidr in 2007. (Haque, et al., 2011)

2.5.5. Disaster Management Act 2012

Policy Committee of Cyclone Preparedness program and Cyclone Preparedness Program Implementation Board are a part of national level disaster management committee according to Disaster Management Act (2012) of Bangladesh. In the Act no. 34 of the year 2012 “The Act enacted to make the activities about disaster management coordinated, object oriented and strengthened and to formulate rules to build up infrastructure of effective disaster management to fight all types of disaster.” (Disaster Management Act 2012)

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Chapter 03: Data Analysis and Discussion

3.1. Introduction

This chapter describes the analysis of the data of the effects on human dimension of cyclones (major three cyclones which were discussed in the previous chapters). And it also reflects upon the policy loopholes of cyclone management in Bangladesh.

3.2. Analysis of Human Dimensions of Cyclone

The human dimension of cyclone involves the losses of lives, damages to infrastructures and economic loss mainly. According to the chronological timeframe of cyclones given in the previous chapter, it can be seen that from 1970's to 1990's the intensity of cyclone was around category of cyclonic storms and severe cyclonic storms which had the wind speed around 105 km/h to 140 km/h. It was analyzed that from 1970 to 1990 there was only one occurrence of most severe cyclonic storm which has the wind speed above 200km/h. But from 1991 to 2017 there had been occurrence of most severe cyclonic storms about 5 times. This indicates to the increase of intensity of cyclones in the region. But the impact on human dimension has decreased, specially the death toll has decreased in the 2010 era. In the pre- 1990's era the death tolls were approximately 300,000 in the most severe cyclone. Since, the death toll decreased and in cyclone Gorky (1991) it was 150,000, which is half of the death toll of the previous cyclone. In Cyclone Sidr (2007) and cyclone Roanu (2016) the death toll is 3,500 and 27 accordingly. So, the level of improvement in the cyclone management system to decrease the amount of death has been a success comparatively even though the ultimate goal is to eliminate the deaths due to cyclone.

In cyclone Gorky along with death due to the impact of cyclone, death after cyclone was also high. About 2,000 people died within 2 weeks of cyclone Gorky to bio-hazard, food insecurity and other causes. The causes were mainly due to lack of shelters for people and proper preparedness for a disaster which had such high intensity. In 1991 the cyclone shelters were only 412, along 216 nucleus houses which were used as cyclone shelters. Apart from constructing cyclone shelters, there was no systematic policy to promote the construction of concrete' buildings for the protection of the public. But in time of cyclone Sidr there was about 9 million people affected by the cyclone

among which almost 3 million people were evacuated but 1.5 million people were accommodated in 2,000 cyclone shelter. The overall impact on human life was reduced by decreasing the loss of lives from 150,000 to 3,500 due to better cyclone shelter construction and increasing the number of it. Also, the government also stocked food, medicine, water etc. necessities according to the capacity of each cyclone houses to avoid bio-hazards and contagious diseases. After Sidr the numbers of cyclone shelter were increased to accommodate more people. In cyclone Roanu the shelter houses were better structured due to the creation and implementation of “Cyclone Shelter Construction, Maintenance and Management Guideline 2011” which gave people better shelter houses for safety during cyclone.

But the impact on economic loss has increased as well as infrastructural damage. In cyclone Gorky, which represents the 1991-2000 time period, the economic loss was estimated to about 1.5 billion US dollar. It increased in the cyclone Sidr to 1.7 billion US dollar. Whereas, in time of cyclone Roanu the damage was 0.2 million US dollar in Kutubdia alone where 38 districts were affected in total. And the cyclone intensity was half of the previous two cyclones. The economic damage was greater in Roanu than Gorky and Sidr if we compare them intensity-wise.

In cyclone Gorky 780,000 houses were destroyed but in cyclone Sidr the damage was increased to 565,000 households which were totally destroyed and over 950,000 were partially but significantly destroyed. The number of households destroyed were 72,362 thousand in cyclone Roanu. If we see the overall statistics, the damage of infrastructure has since been increasing rapidly which shows the opposite result of decreasing death toll due to cyclone.

3.3. Analysis of Policies Regarding Cyclone

In addition to the plenteous loss of assets and properties due to cyclonic disaster, more than 3 lakhs and 1.38 lakhs people died in the devastating cyclones of 1970 and 1991 respectively. Although the loss of properties had been very severe in the cyclone SIDR of 2007 and AILA of 2009 but loss of human lives was only 3406 and 190 respectively due to effective disaster risk reduction and preparedness programs conducted by the Government. (Ministry of Disaster Management and Relief, 2012) in this chapter the policies regarding disaster management and cyclone are discussed to understand their loopholes and effectiveness in this sector.

3.3.1. Cyclone Preparedness Program (CPP)

CPP is a permanent voluntary program at the field level to face disasters. This is a unique joint program of Government of Bangladesh (GOB) and Bangladesh Red Crescent Society (BDRCS). CPP volunteers serve without monetary benefit keeping their lives at risk and so far, 26 volunteers ungrudgingly sacrificed their lives while they were on duty during cyclone in 1991(Gorky), 2007 (Sidr) etc. The CPP volunteers are taught on the seven fundamental principles. Bangladeshi culture support volunteerism e.g. religious advices of helping others are pro-volunteerism for eternal peace. (Amin, 2012) This shows that CPP through its voluntary contribution helped to reduce the deaths of human. Through CPP implementation the disaster management sector of Bangladesh shifted towards resilience building rather than recovery and rehabilitation. This is the only program that includes government and volunteer workers on the same platform.

3.3.2. Cyclone Shelter Construction, Maintenance and Management Guideline 2011

The buildings owned by the Government and the non-government organizations in the coastal areas are using as cyclone shelters. The structural designs and the amenities of those shelters are different. Due to poor maintenance, a number of those shelters have already become unsuitable for use. Also, there is no specific allotment provision in our national budget for restoration and maintenance of cyclone shelters. There was a guideline prepared by the Physical Infrastructure Division of the Planning Commission but it in context of 1996 which did not meet the needs of present time. So, the guideline is reevaluated and modified based on present time. Three designs are given as ideal. If any one of the three designs mentioned cannot be followed due to non-availability of land, then the plinth area of the cyclone shelters could be reduced or increased proportionate to the availability and angular position of the land. (Ministry of Disaster Management and Relief, 2012) Cyclone shelter plays an important role in saving human lives during cyclone. So, the maintenance of the cyclone shelter is much needed therefore, the guideline of this aspect is a vital part of the policy.

3.3.3. Disaster Management Act, 2012

Disaster management act is enacted to make the activities about disaster management coordinated, object oriented and strengthened and to formulate rules to build up infrastructure of effective disaster management to fight all types of disaster. However, it is focused on an overall scenario of the disaster. The act is not context specific. There was no specific chapter or act focusing on the

cyclone. Also, in chapter 4 the “National Disaster Management Fund” and “District Disaster Management Fund” is allocated but it is not implemented yet.

3.3.4. Standing Order for Cyclone (SOC)

Standing Disaster for Cyclone was proclaimed in 1985. But afterwards there is no sing of its implementation. It was organized into 5 stages. The stages are mentioned in previous chapter. No data was found regarding this plan. Furthermore, the SOD was developed in the 90s and the SOC was replaced by this or overlooked. But considering the damages caused by cyclones SOC should've been a major part or the Disaster Management of the country.

3.3.5. Standing Order on Disaster (SOD)

In 1997 when Standing Order on Disaster (SOD) was first proclaimed, it had great impact on the recovery process. Standing Order for Cyclone (SOC) which was proclaimed in 1985 and was focused on cyclone clasped and SOD was accepted nationwide. This policy states general responsibilities of national and sub-national sector but does not specify the disaster. Though the orders of each ministry are clearly stated, the steps are not disaster specific. There are no specific sections stating what are the responsibilities during cyclone. The focus in on overall disaster on national and regional sectors.

3.4. Shortcomings of the Policies

In all these policies the focus is to reduce loss and damages but none of these focuses on environmental vulnerability or climate change. In some cases, Bangladesh focused on carbon emission or environment pollution, but the carbon emission rate is low in the country comparing to the developed country. On the other hand, the effect due to the carbon emission and climate change is massive in context of Bangladesh. So, climate change adaptation part is missing in these policies which needs to be focused on including the sea level rising as well as other parts of climate change.

The geological location of Bangladesh provided it a coastline which is 734km long and consists of about 50 million people which is nearly one-third population of the entire country. Due to increased risk of climate change and other variable factors this coastal zone is severely vulnerable

to the risk of cyclone. Bangladesh possess some natural resources which helps it to withstand the effect of cyclones and these resources are the only natural barrier which are protecting the safety of coastal line from the beginning till today. Sundarban, the largest mangrove forest in the world, is the best natural defense for Bangladesh against cyclone. The geological location of Sundarban placed it in such a way where it absorbs the initial thrust of the wind of the cyclone and acts to “resist” the storm surge flooding. But there have been no policies or programs that protects these resources from further harm which has already been done. The area of Sundarban has decreased greatly. Also, the mangrove trees are decreasing day by day. This can potentially lead to increase of damage due to cyclones in Bangladesh. The forest act and other policies needs stronger implementation and improvement to reserve these areas from damage.

References

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Chapter 04: Findings and Conclusion

4.1. Introduction

This chapter concludes the final results and findings of this paper. It also includes limitations of the study which describes the limitations and gaps of knowledge of this paper.

4.2. Major Findings

This paper displays the chronological evolution of cyclones throughout the years. By analyzing the cyclones and the cyclone management policies and programs – we have come to the conclusions described in this chapter. The concluding thoughts or findings of this paper are:

Because of the rapid urban development in Bangladesh the aspect of loss and damages to the net value has increased which is why the economic loss due to disaster like cyclone has also increased. It can be seen through analysis of chronological evolution of cyclones loss and damage aspect.

The implementation of policy and programs regarding has increased in the past decades. The focus on human dimension specially regarding death toll has been the center of these policies which is reflected through the comparative studies.

The Cyclone Preparedness Program (CPP) creates a common field to work for both government and volunteer workers. In time of cyclone Gorky there were 20,000 volunteers of the Bangladesh Red Crescent Society who helped the people in need. This helped to reduce the human loss and impact caused by the cyclone.

The Standing Order on Cyclone (SOC) was first proclaimed in 1985. It was a great initiative towards cyclone mitigation and preparedness but, it was clasped by the Standing Order on Disaster (SOD) that was developed soon after in 1997.

The cyclone shelters have increased in numbers from what it was in 1991. In the most recent cyclone given in this study (cyclone Roanu), it was seen that the number has increased to accommodate more than 500,000 people in the shelter houses. Alongside the increase in numbers of construction of cyclone shelters a proper guideline to make proper and cyclone resilient shelters were needed. In 2011 the “Cyclone Shelter Construction, Maintenance and Management Guideline” was published. It increased the capacity of the shelters and reduced the management

problems of shelters in times of disaster as now there were proper guidelines of the activities of them. The progress due to this guideline can be seen through the impacts of cyclone Sidr and cyclone Roanu.

Disaster Management Act, 2012 fails to focus on particular disaster and there is no specific act or section addressing cyclone and its management. The budget allocation is also a problem as mentioned before. The ‘single disaster; single approach’ idea is absent here in this act. The context specific dimension is missing as well. It also fails on the multisectoral approach. So, it couldn’t accomplish neither ‘single disaster; single approach’ nor ‘multi-sectoral’ approach.

Standing Order on Disaster (SOD) is a success considering the reduce of the human losses and the ministries able to play they roles accordingly during disaster because of it. However, it is not single disaster-based approach. So, in the context of cyclone focused policies or program the SOD fails to meet the requirements. It gives a thorough guideline for the government bodies on risk reduction, emergency response, during disaster and post disaster period and emphasis on ‘all disaster; single approach’.

A major aspect that the policies failed to focus on is the climate change and environmental factors. To achieve cyclone resiliency, the focus of the policies and programs needs to be in both human dimension and environmental dimension. Because of the geographical settings and environmental condition, the humans are dependent on the climate and environment for their survival comparing to other countries. So, ignoring the climate aspect can’t help in building resilience on human aspect.

4.3. Limitations of the Study

This study intends to show the comparison among three cyclones for better understanding the effects of these cyclones and the overall implementation of policies and programs regarding cyclone management in Bangladesh. But due to unavoidable complexities there are some limitations of this paper. This study is purely based on secondary data collection method. It lacks the opinions or information gathered or provided in primary basis, such as surveys or field work or statistical data. So, the expected results may differ if statistical analysis is done in future.

As the study only shows comparison among three cyclones from three different decades, it might not reflect on the whole overview of the cyclone scenario of the country. Because it only shows a limited portion of information comparing to the frequency of cyclones occurring in this country. This paper has chosen three specific cyclones as representatives for the comparison.

This paper only focuses on the human dimension of cyclone affects. Thus, it excludes other dimensions such as economic, environmental etc. dimension of cyclonic affects. In the human dimension this study only focuses on some particular aspects such as amount of death, evacuated people, households etc. So, many other aspects are left for further discussion. The period of time given for this research has let us minimize the scope of broader analysis of the policies alongside minimizing the area of research for study.

4.4. Conclusion

This study tried to establish relationship between the implementation of cyclone policies and programs with the events of cyclone occurred in Bangladesh. The major focus of this paper goes to the damages done by cyclones in sectors like human death, household damages and economic losses. This was done by accomplishing a comparative study of three cyclones of three different decades (1990-2018). The selection of cyclones was done by analyzing the severity of the cyclones such as the intensity, wind speeds, death tolls and other impacts. The gradual decrease in human death toll indicated to the success of the policies and programs that focused on the human dimension of cyclones. But the economic and household damages indicated that the cyclone management policies greatly missed out the concept of climate change and environmental capacities and losses. These policies and programs also exclude the adaptation strategies regarding climate change and its impact on Bangladesh. The government has tried to implement the policies with great efficiency but considering the capacity of this country and the increase in cyclone damages in other than human dimensions, there has come a need to improvise these policies and programs and make them suitable for changing environmental issues with time.