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From Knowledge to Practice: The Current Status of Disaster Risk Reduction Education in Coastal Bangladesh

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MPhil Thesis

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Certificate

This is to certify that the thesis titled "From Knowledge to Practice: The Current Status of Disaster Risk Reduction Education in Coastal Bangladesh" is an original piece of work accomplished by Md. Ikhtiar Uddin, an MPhil fellow in Education of the session 2017-2018 at the Institute of Education and Research (IER), University of Rajshahi, Bangladesh. The findings and views expressed in this thesis are originated from both primary and secondary data and entirely his contribution. He has not submitted anywhere else for any purposes e.g. any degree or diploma or publication.

I have gone through the draft thesis thoroughly and found it satisfactory for submission. The thesis is therefore recommended and forwarded to the University of Rajshahi through Institute of Education and Research for necessary formalities leading to its acceptance in partial fulfillment of the requirements for the degree of MPhil in Education.

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Declaration

I hereby declare that the thesis titled "From Knowledge to Practice: The Current Status of Disaster Risk Reduction Education in Coastal Bangladesh" has been prepared by me. It is an original work carried out by me taking advices and suggestions from my honorable supervisor. I will take all the responsibilities for all comments, statements and opinions written in the thesis. The thesis or any part of it has not been submitted partially or fully to any academic institution or university in pursuing any degree or diploma.

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Abstract

A large amount of studies has been produced on disaster domain over the last decades. Many of previous studies have focused on the disaster risk reduction (DRR) related issues, yet there are gaps to focus on translating DRR knowledge into practice at the ground. Considering this gap, this study aims to explore the existing DRR education programs and its dissemination process to the community; reveal how coastal households practise DRR knowledge; and identify possible ways to strengthen DRR education programs. Findings show that government and NGOs have taken a good number of DRR education programs e.g. legal frameworks, public awareness, risk assessment and vulnerability mapping etc. They used several processes (e.g. training, workshop, group meeting, media etc.) to disseminate DRR knowledge to the cyclone affected communities. Majority of the households received DRR knowledge from the informal sources e.g. Union Parishad, NGO, media, family, neighbours, friends and voluntary organizations. The local community learned many issues on disaster preparedness and mitigation from the various formal and informal sources. The households practised the learned knowledge in various ways at the before and during disaster stages. However, a gap was found between achieved and practiced knowledge. This gap is due to a lack of technological and financial support, corruption and favoritism, lack of coordination, traditional attitude of local people, top-down approach of government and a gap between local and scientific knowledge. This study suggests that informal knowledge sources should be strengthened and tagged them with the mainstream sources of DRR knowledge. Besides, informal knowledge sources should be institutionalized through the effective intervention of government. At the same time, formal sources such as textbook, and formal education should be more focused on DRR issues. This study also argues that participatory-based training and workshop, role of local government and religious institutions, technological and financial support and bottom-up approach should be amplified for strengthening the initiatives of DRR education and its practice at the community level.

Keywords: Disaster risk reduction, Disaster risk reduction education, Bangladesh coast.

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Abbreviations and Acronyms

ADRC	Asian Disaster Reduction Centre
BCCSAP	Bangladesh Climate Change Strategic Action Plan
BDT	Bangladeshi Taka
BRRI	Bangladesh Rice Research Institute
CBO	Community-Based Organization
CPP	Cyclone Preparedness Program
DRR	Disaster Risk Reduction
FBO	Faith-based Organization
FGD	Focus Group Discussion
HHS	Household Survey
IPCC	Intergovernmental Panel on Climate Change
KII	Key Informant Interview
MVC	Most Vulnerable Country
NAPA	National Adaptation Program of Action
NDMC	National Disaster Management Council
NGO	Non-Governmental Organization
NID	National Identity Card
NPDM	National Plan for Disaster Management
PSF	Pond Sand Filter
SFDRR	Sendai Framework for Disaster Risk Reduction
SMS	Short Message Service
SPSS	Statistical Package for Social Sciences
TV	Television
UNFCCC	United Nations Framework Convention on Climate Change
UNISDR	United Nations International Strategy for Disaster Reduction
WHO	World Health Organization

CHAPTER -1
INTRODUCTION

This study aims to explore the existing status of disaster risk reduction education in coastal Bangladesh. It is expected that the knowledge generated from this study will provide new insights and information to the growing body of disaster literature. This study uses a mixed methods approach to explore the answers to the research questions. Two Bangladeshi coastal villages, which were severely affected by the devastating Cyclone Aila in 2009, are selected purposively as the study area. The introductory chapter begins with a background of the issue that frames the study problem. This chapter also discusses the theoretical underpinning, conceptual understanding of key concept, study aims, scopes and limitations.

1.1 Introduction

Bangladesh is rated the world's most vulnerable country (MVC) to climate change. More than half of the population suffers from climate induced natural disasters in Bangladesh. Due to the climate change, coastal communities of Bangladesh also face various natural hazards e.g. cyclones and storm surge, flooding, and riverbank erosion, etc. These natural hazards threaten the lives and livelihoods of coastal communities and create vulnerabilities (Huq and Alam, 2011). Bangladesh is also one of the most natural disaster-prone countries in the world. Bangladesh ranked sixth among the world's top 10 countries most affected by extreme weather events (e.g. floods, cyclones, and drought) in the last 20 years (Eckstein et al.). These extreme weather events create enormous damage and loss of lives, livelihoods, and properties. On an average, a total of 679 people died in 185 climatic events in Bangladesh during the period of 1996 to 2015, which have a negative impacts on the country's economy (Daily Star, 2017). The coastal areas of Bangladesh are affected by regular cyclones and storm surges - the major disasters in this region, where about 30 percent of the country's people live. About 40 million poor people of Bangladesh coast are extremely vulnerable to cyclones, storm-surges and sea-salinity. The nation is one of the most exceedingly terrible victims of every cyclonic loss on the planet. With increasing population, many people are bound to live in the risky coastal areas threatened by cyclones and storms-surges and, till now,

cyclone with storm-surge is the major killer in the coastal regions of Bangladesh. However, people living in this areas, have been vulnerable for centuries (Government of the People's Republic of Bangladesh, 2014).

1.2 Problem statement

Bangladesh is situated between the boundary of India and Myanmar and countenances the Bay of Bengal. Bangladesh is a low-lying deltaic country shaped by the Ganges, the Brahmaputra and the Meghna waterways. Over 310 rivers and their branches have made this nation a place that is known as a land of rivers. Bangladesh has a tropical rainstorm atmosphere portrayed by wide occasional varieties in precipitation, high temperatures, and high mugginess (Asian Disaster Reduction Centre (ADRC), 2003). Bangladesh has a long history of catastrophic events. Somewhere in the range of 1980 and 2008, the nation experienced 219 catastrophic events. Bangladesh is extremely vulnerable to natural hazards because of its topographical position, land features, diversity of rivers and the monsoon climate. The waterfront morphology of Bangladesh impacts the effect of natural calamities on the zone. Bangladesh experiences floods, tornadoes, cyclones, storm-surges, riverbank erosion, seismic tremor, drought, salinity interruption, fire, and tidal wave. Cyclones and floods especially caused enormous damages. Cyclones happened in 1970, 1991, 2007 and 2009 and caused death to 364,000, 136,000, 3,363 and 190 correspondingly (Asian Disaster Reduction Center, 2020).

Cyclones create enormous damage and loss of infrastructure (e.g. roads, culverts, embankments) community services (e.g. water, electricity, education, market, health facility, etc.), shelter (housing, community housing, public shelter center), livelihoods (fishing, agriculture), properties (land, livestock, and poultry), food, environment, and economy. The cyclone disaster also has many social impacts, for example, unemployment, poverty, inequality, and migration/displacement (Islam and Walkerden, 2014, Mallick et al., 2011, Mallick and Vogt, 2012).

Many initiatives have been taken by the government and NGOs to address these vulnerabilities. Government and NGOs have taken massive prevention, preparedness, response, and recovery programs to reduce the cyclone vulnerabilities. Disaster risk reduction (DRR) education is one of the key initiatives of reducing the disaster vulnerabilities.

Education for preparedness and effective mitigation measures is essential for reducing disaster risk (Khan, 2008). Therefore, the study intends to examine the present status of disaster preparedness and mitigation through DRR education in the country with special attention to the more frequent and damaging disasters – cyclone and storm-surge. Considering the vulnerability of Bangladeshi coastal communities, this study is rationale for several reasons: this study is necessary to explore how DRR education contribute to prepare the community and provide mitigation strategies to face cyclone-induced damage and loss, this study is also important to know how the coastal communities use disaster risk reduction education/knowledge to withstand against cyclone and storm surge, and this study is crucial to find out the possible ways to strengthen DRR education on preparedness and mitigation.

To address the disaster vulnerabilities and reduce damage and loss, effective preparedness and mitigation measures need to take at the community level. Community preparedness and mitigation strategies can be strengthened through providing DRR education to the affected communities. Considering this reality, the current study aims to explore the government and NGOs' DRR education programs, how government and NGOs provide DRR education to the cyclone affected communities, and how the coastal communities practice DRR knowledge to face disaster risks.

1.3 Rationale of the study

Considering the importance of DRR education, the government policies have emphasized on introducing DRR education in the national curricula. The National Plan for Disaster Management (2010-2015) has incorporated DRR education in formal and informal education, civic education, professional education, and training. Education for preparedness and effective mitigation measures is essential for reducing disaster risks. Therefore, the study intends to examine the present status of DRR education in the country with special attention to preparedness and mitigation. Considering the vulnerability of coastal communities of Bangladesh, this study is necessary for several reasons:

- This study is necessary to explore how DRR education contribute to prepare the community and provide mitigation strategies to face cyclone-induced damage and loss.

- This study is also important to know how the coastal communities use disaster risk reduction education/knowledge to withstand against cyclone and storm surge.
- This study is crucial, as it will find out the possible options to strengthen DRR education at the community level.

1.4 Theoretical underpinning

1.4.1 Understanding key concepts

1.4.1.1 Disaster risk reduction

Disaster risk reduction means to reduce disaster risks through methodical attempts to evaluate and manage the underlying factors of disasters through reducing exposure to hazards, decreasing susceptibility of people and property, and improving preparedness for harmful events (United Nations International Strategy for Disaster Reduction-UNISDR, 2009). Disaster risk reduction reduces the underlying factors of human vulnerability. DRR activities are well recognized at the grassroots level as a method of reducing vulnerability to all hazards and can involve 'structural' (e.g. building infrastructure), or 'non-structural' (e.g. education and awareness raising) mitigation activities (Mercer, 2010).

1.4.1.2 Disaster risk reduction education

Disaster risk reduction education is a process of giving systematic information on reducing disaster risk. This study understands DRR education as a process of preparing community and taking mitigation measures to reduce damage and loss through formal and informal education programs taken by the government, NGOs, and other CBOs (community-based organizations) in the coastal areas of Bangladesh.

DRR education is very crucial by which the disaster affected people can reduce risk in their community. Considering the importance of DRR education in disaster preparedness and mitigation, the government policies have emphasized on introducing DRR education in the national curricula. Prioritizing DRR education, the National Plan for Disaster Management (2010-2015) has been incorporated DRR knowledge on prevention, mitigation, preparedness, response,

and recovery, in formal and informal education, civic education, and in professional education and training (Disaster Management Bureau, 2010). Some international policies, for example, the Sendai Framework for Disaster Risk Reduction (SFDRR[1]) have also emphasized on DRR education to build disaster resilient communities (United Nations, 2015). DRR education can be provided through existing curriculum in the classroom and training (UNICEF, 2012, Alain and Jimena, 2008), and it can also be provided through community-based program like awareness campaign (Gero et al., 2011). Disaster education at school can raise risk perception among the students. Community plays an essential role to promote students' actions for DRR. Therefore, community involvement is the most important factor for disaster education at the school level (Shiwaku et al., 2007). Shiwaku and Shaw (2008) mentioned that disaster education creates students' awareness on disaster preparedness and mitigation, and overall social environment.

1.4.2 Educational research paradigms

Contemporary educational research works are shaped by educational research paradigms. These paradigms are ranging from the context of traditional positivist to the latest multi-paradigmatic worldview (Taylor and Medina, 2013). From a philosophical point of view, a paradigm comprises a view of existence and nature of knowledge and its reality (i.e. ontology). A related perspective on the sort of knowledge that demonstrates how we know knowledge e.g. nature of knowledge and the methods of knowing (i.e., epistemology) (Crotty, 1998). For educational researchers, there are a few significant paradigms that administer their investigations into the policies and practices of education (Taylor and Medina, 2013). The purpose of this sub-section is to provide a brief description of major educational research paradigms and identify which paradigm the current study is aligned with.

1.4.2.1 Positivist paradigm

Positivism is a certain knowledge based on natural phenomena, their properties and relations. This

[1] The Sendai Framework for Disaster Risk Reduction (2015-2030) is a 15-year voluntary and non-binding agreement which recognizes that the state has the primary role to reduce disaster risk through shared responsibilities with other stakeholders including local government, and the private sector. The Framework was adopted at the Third UN World Conference on Disaster Risk Reduction in Sendai, Japan, on March 18, 2015.

paradigm attempts to investigate the patterns of behavior, is frequently used in advance research to test theories or hypotheses. This paradigm is generally used in natural and physical science and in the social sciences as well (Creswell, 2002). The positivist paradigm generally includes quantitative approach. It uses experimental methods, which comprises experimental and control groups and organization of pre- and post-tests to quantity gain scores. Here, the researcher is an outside observer of the research site and is the regulator of the research procedure.

An instance of positivism research is how handmade oral saline works in anti-diarrheal activity. This exploratory research utilizes an experimental group and a control group. The experimental group is given a treatment (handmade oral saline) while the control was left untreated. The ontology (nature of knowledge) of this research is realism, the epistemology is objectivism, and a quantitative strategy administered the research procedure. The quality standards Validity and reliability are the quality standards of this study. Using statistical method, the study data are measured and analyzed (Taylor and Medina, 2013).

1.4.2.2 Post-positivist paradigm

Post-positivism paradigm is a minor type of positivism that follows the similar standards but permits more cooperation between the researcher and research participants. It utilizes quantitative methods e.g. survey and qualitative techniques e.g. interview and observation (Creswell, 2002). It means to create objective and generalizable information about social examples and connections among pre-characterized factors. This epistemology is established by quasi-experimental study designs (the management of an independent variable without the random assignment) that use action, results and investigational units. The level of standard of this paradigm are impartiality, validity and reliability that may be accomplished through triangulation of data, methods and theories (Taylor and Medina, 2013).

1.4.2.3 The interpretive paradigm

In the late 1970's, the interpretive paradigm arrived in educational research. This paradigm was strongly influenced by anthropologists that aims to know other culture from the inside – to realize the ethnically diverse people through learning from their position, from their point of view and from their feelings (Taylor and Medina, 2013). The application of this paradigm empowers

researchers to shape rich neighborhood understandings of the life-world experiences of teachers and learners and of the cultures of classrooms, schools and the networks they work. The epistemology (nature of knowledge and the ways of knowing) of this paradigm is to develop inter-subjective knowledge. Interpretive knowledge of the other culturally different people is formed through a long interaction of ethnographers are engaged them in the culture where they conduct study. Interpretive researchers build trust and true records of the culturally different other people through utilizing ethnographic strategies of casual interview, doing participant observation and setting-up morally stable connections (Taylor and Medina, 2013).

1.4.2.4 The critical paradigm

The critical paradigm focuses on power differentials, social inequalities, and social change. It practices ‘deep democracy’, which includes recognizing and changing socially unfair social structures, strategies, convictions and practices. The key points of the critical paradigm are to recognize, challenge, and support for resolving power imbalances in society. It boosts up morally doubtful profitable actions that add to systemic discriminations and inequalities for example, social and financial avoidance, loss of social capital and social character among ethnic minorities, and human-centric environmental change and loss of biodiversity (Taylor and Medina, 2013).

1.4.2.5 The postmodern paradigm

The postmodern paradigm is comparatively a new model, which opens numerous novel and thrilling entrances for educational researchers. Postmodernism is a great extent to a response against the scholarly suppositions and estimations of the advanced period throughout the entire existence of western way of thinking. There is no window in our minds that permits someone else to look straightforwardly into our brains and see 'precisely what we mean'; all the better we can do is 'speak to' our observations and sentiments through different methods for correspondence for example language, art and, gesture). Similarly for researchers, there is no window into nature that straightforwardly uncovers the surprises of nature. Every single logical perception are 'hypothesis loaded' regardless of whether directed utilizing the natural eye or mechanical expansions, for example, radio telescopes, electron magnifying lens, and so forth. In this manner, knowledge is at best case scenario of the ‘unseeable’ and its feasibility (or helpfulness) is verified against the

human purposes that shape its creation (Taylor and Medina, 2013). Postmodernism is a mentality of doubt or dismissal the accounts and philosophies related with modernism. It regularly reprimands edification objectivity and concentrating on the job of belief system in keeping up political or economic force. Basic focuses of postmodern analysis incorporate Universalist thoughts of target reality, profound quality, truth, human instinct, reason, science, language, and social advancement.

1.4.2.6 Theoretical position of the study

Based on the above discussion, the current study is aligned with the post-positivist paradigm as it permits additional contact between the researcher and research participants. It utilizes quantitative approaches e.g. survey and qualitative methods e.g. interviews, focus groups and observation. The quality of this paradigm are objectivity, validity and reliability, which may be accomplished through triangulation of data, methods and theories.

1.5 Study aims

The main aim of the study is to explore the present status of disaster risk reduction education in coastal Bangladesh. The specific objectives of the study are to:

a) identify the existing DRR education programs of government and NGOs for preparedness and mitigation of cyclone;
b) explore the processes of providing DRR education to the disaster affected coastal communities;
c) reveal how the coastal communities practice DRR knowledge to face disaster risks; and finally
d) find out the possible ways to strengthen DRR education in the coastal areas of Bangladesh.

1.6 Scope and limitations of the study

The key focus of this study is to understand the present status of disaster risk reduction education in coastal areas of Bangladesh. This study will let us know the existing disaster risk reduction education programs on cyclone preparedness and mitigation of government and NGOs in

Bangladesh. The study will also explore the ways of providing disaster risk reduction education to the cyclone affected coastal communities. The current study will reveal how the coastal people practice disaster risk reduction knowledge to face disaster risks. Finally, the study will find out the probable ways to strengthen disaster risk reduction education in the coastal areas of Bangladesh. At the same time, this study has identified the options for further research in this field. Therefore, there is a great scope of the study in the domain of disaster management in Bangladesh.

However, due to the time constraints the study has accomplished with some limitations. The present study has not included the whole disaster-prone communities of Bangladesh as the study population. Only two cyclone affected villages of an Upazilla have been selected.

1.7 Thesis structure

Chapter 1 of this thesis provides a basic introduction, background of the study area and describes the study problem. This chapter also discusses the study rationale, conceptual understanding of key concept, theoretical stance, study aims, scopes and limitations. To address the research aims, finally this chapter has explored the thesis argument, contributions of the thesis and the thesis structure.

Chapter 2 is based on the review of the existing literature on disaster, disaster risk reduction and disaster risk reduction education. Literature review describes how the proposed research is related to previous research works. This chapter explores the existing literature to provide a foundation of knowledge on topic, identify the research gap, justify the proposed methodology, and identify need for additional research.

Chapter 3 discusses the methodology of the study. Several methods and techniques are used to achieve the key goal of study. This chapter discusses the study approach, study area, cyclone Aila, sampling and recruitment of research participants, data sources and data collection techniques, study indicators, data analysis, study coordination schema and ethical considerations.

Chapter 4 is designed based on the study area profile. This chapter provides a brief description about the geophysical settings of the study area and profile of the respondents. This chapter includes general background, location and climate of the study area. Some maps are included in

this section like affected area map of cyclone and studied Upazilla. This chapter also includes respondents' profile, occurred disasters in the study areas, disaster damage and loss, and vulnerabilities of the local households.

Chapter 5 is written based on the disaster risk reduction programs of government and NGOs in Bangladesh. This chapter discusses about preparedness and mitigation related programs. It also focuses on public awareness, risk assessment and vulnerability mapping, policies and plans and formal education. Finally, the chapter briefly points out the key issues related to disaster risk reduction education, for example, shelter/housing, food, agriculture, fisheries, water and sanitation, early warning, vulnerable group of people, and solidarity.

Chapter 6 analyses the ways of providing DRR education programs to the community. This chapter includes media, mobile phone, training and workshop, faith-based organization, group meeting, textbook, local government (Union Parishad) as the ways of providing DRR education to the community.

Chapter 7 provides a discussion on how the households of coastal community practise disaster risk reduction knowledge to face disaster-induced risks. This chapter focuses on a comparative feature of learned and practised knowledge on disaster risk reduction of preparedness and mitigation. This chapter also discusses the problems related to practice of DRR knowledge.

Chapter 8 discusses how the disaster risk reduction knowledge is important to build a disaster resilient community**.** There are some limitations to provide DRR knowledge to the coastal community due to a lack of education, lack of skilled manpower, poor communication system, prejudice of coastal people, geographical vulnerability etc. Therefore, this chapter explores some probable ways to strengthen DRR education.

Chapter 9 provides a discussion and conclusion for this thesis. The discussion section briefly provides the answer of the central research aims, shows how the answers are supported by the findings, and explains how the answers suit to the existing body of knowledge about the disaster management domain. It also discusses the responsive measures of local community to reduce the

disaster risk. Finally, it draws a conclusion with recommendations for further research. Table 1.1 indicates the research aims and response locations in the thesis.

Table 1.1: Research aims and location of answers

Research aim 1: To **i**dentify the existing DRR education programs of government and NGOs for preparedness and mitigation of cyclone.
This research aim is addressed in Chapter 5. **Chapter 5** Disaster risk reduction education programs
Research aim 2: To explore the processes of providing DRR education to the disaster affected coastal communities.
This research aim is addressed in Chapter 6. **Chapter 6** Ways of providing disaster risk reduction education
Research aim 3: To reveal how the coastal community practise DRR knowledge to face disaster risks.
This research question is addressed in Chapter 7. **Chapter 7** Practice of disaster risk reduction knowledge
Research aim 4: To find out the possible ways to strengthen DRR education in the coastal areas of Bangladesh.
This research question is addressed in Chapter 8. **Chapter 8** Probable ways of strengthening disaster risk reduction education and its practice

1.8 Chapter summary

This chapter has discussed the background of the study area and described the study problem. This chapter has also discussed the study rationale, conceptual understanding of key concept, theoretical stance, study aims, scopes and limitations. To address the research aims, finally this chapter has explored the thesis argument, contributions of the thesis and the thesis structure.

CHAPTER -2
LITERATURE REVIEW

2.1 Introduction

This chapter analyzes the current literature on disaster, disaster risk reduction and disaster risk reduction education. Literature review describes how the proposed research is related to previous research works. This chapter explores the existing literature to provide a foundation of knowledge on the topic, identify the research gap, justify the proposed methodology, and identify need for additional research.

2.2 Introduction

Increasing changes of global climate are projected to distress coastal communities round the world. Many coastal areas are already considered as vulnerable to continuing climatic changeability and many human and ecological systems are at risk (IPCC, 2018). Bangladesh is one the most vulnerable countries to the impacts of climate change in the world. More than half of the population suffers from climate change induced natural disasters in Bangladesh. The country is exposed to multi-disasters such as flood, cyclone, storm surges, droughts, riverbank erosion, etc. These extreme natural disasters threaten the lives and livelihoods of coastal communities and wreak destruction and chaos in the communities through casualties, injuries, and damage and losses that lead socioeconomic, physical and ecological vulnerabilities (Huq and Alam, 2011, Dolan and Walker, 2006, Rawlani and Sovacool, 2011, Parvin and Johnson, 2014).

Such crises put pressure on the poor coastal households and test their capacity to face these crises. Within such a situation, the existing literature highlights the coastal community's vulnerability and their ability to overcome the vulnerabilities. Literature also highlights the need to develop a collaboration among community, government and NGOs to identify community needs and resource, and support them to strengthen their capacity to reduce disaster induced vulnerabilities (Parvin et al., 2008, Islam et al., 2014, Brouwer et al., 2007, Ahamed et al., 2012, Alam and Collins, 2010).

2.2.1. Vulnerability

Vulnerability implies the conditions of a community that make it susceptible to the harming impacts of a hazard. There are numerous parts of vulnerability, arising from different physical, social, financial, and ecological elements (United Nations International Strategy for Disaster Reduction-UNISDR, 2009). Disaster literature identifies three broad characterizations of vulnerability. The *first* point of view is exposure to dangerous occasions (for example droughts, floods) and how this influences individuals and structures (Comfort et al., 1999). A *second* point of view sees vulnerability as a human relationship instead of physical one (i.e. vulnerability is socially developed rather than determined by the occurrence of a physical occasion, e.g. poverty) (Kelly and Adger, 2000). A *third* point of view incorporates both the physical occasion and the basic causal characteristics of populations that lead to risk exposure and limit the capacity of communities to respond to a threat (Adger, 2000). Vulnerability is therefore a physical hazard and a social reaction inside a geographic context. A few research works have seen vulnerability as both physical and social vulnerability points of view (Dolan and Walker, 2006).

Felsenstein and Lichter (2014) discussed the social and economic vulnerability of extreme coastal flooding events and suggested possible ways to mitigate these vulnerabilities. Clark et al. (1998) revealed how the interplay of social and physical factors produce human vulnerability and how the people cope with and mitigate climate change induced hazards in the USA coast. Identifying six climate vulnerable sectors (e.g. water, infrastructure, agriculture, forestry, fisheries, and health) Rawlani and Sovacool (2011) explored challenges of climate change adaptation in Bangladesh. Another study identified four vulnerable sectors (e.g. shelter, employment, water and health) of Bangladesh coast and explored people's perception and community coping strategies to reduce vulnerabilities (Parvin et al., 2008). Brouwer et al. (2007) investigated the complex relationship between flood risk and household and community vulnerability and explored their adaptive coping mechanisms – where they emphasized on the community preparedness to reduce the vulnerability. Climate variability creates livelihood vulnerability in the fishing communities of Bangladesh coast. This study suggests that lack of adaptive capacity in terms of physical, natural, and financial capital and diverse livelihood strategies increase livelihood vulnerability (Islam et al., 2014). Considering the rapid changes in climate and its widespread impacts, coastal vulnerability has received significant attention by the researchers, development thinkers and

policymakers. However, the vulnerability of cyclone affected rural poor coastal villages of Bangladesh has received less attention.

2.2.2 Disaster risk reduction and vulnerable group

Many literature focused on various issues of disaster risk reduction. Martin (2010) shows child participation in disaster risk reduction in flood-affected areas of Bangladesh. This study shows how children's participation overcome the cultural barriers. It showed that, to enable children to participate fully in the DRR process, guardians of children and DRR actors need to change their attitude and start to trust children's abilities to act positively in DRR process. Another study discussed the child-focused and child-led DRR approaches and techniques. This study highlights some of the DRR activities focused on or led by children that have been undertaken with children in different communities across the world. The study also focused that DRR begins from school (Back et al., 2009). Children are most affected by disasters, particularly girls and children from indigenous communities. Therefore, it is important to put in place education – such as health and education – that affect child wellbeing (Back et al., 2009).

2.2.3 DRR education

A considerable development has been made in incorporating DRR issues in education system in Bangladesh. Islam (2010a) discussed the growth and successes on integration and institutionalization of DRR education in the education curriculum in Bangladesh. Baytiyeh (2018) argues that the incorporation of disaster risk reduction education into school curricula in developing countries has improved public awareness about hazards and probable disaster risks. The author stresses both on the possible role of disaster education and the obstacles (e.g. financial, cultural, and technical) of integrating DRR education into school curricula. Habiba et al. (2013) gave emphasis on informal education and addresses climate change education that helps to develop people's attitudes, create new knowledge on disaster risk reduction. The authors also opine that Bangladesh needs specialists with background and education in disaster management to deal with the impacts of natural and manmade hazards. It requires political commitment to include DRR issue in the education system of Bangladesh.

Selby and Kagawa (2012) recognizes the important role of education to reduce disaster vulnerability and building resilience in the countries are prone to both natural and manmade disasters. The authors thought that education can build knowledge, skills, and attitudes – are essential to prepare for and cope with disasters, as well as help students/learners, and the community to back to a normal life after a disaster. Disaster risk reduction education is also linked to agricultural activities in the disaster affected areas. Education and awareness on crop change or the overview of hazard resilient crop varieties; risk assessments and related plans; the safety of natural resources help farmers to cope with disasters (United Nations Framework Convention on Climate Change (UNFCCC), 2006).

2.2.4 Disaster preparedness

Existing literature have also focused on community preparedness for facing any disasters. Khan (2008) showed that along with government organizations, several NGOs work for disaster preparedness in the cyclone affected areas of Bangladesh, where trained volunteers provided information regarding proper use of the multi-purpose shelter centers. To promote disaster resilient communities, they provide formal and informal education programs on disaster preparedness to the community people. Government and NGOs should take sustainable planning and structural intervention for broader and easier access to the disaster education and awareness-building programs to the people (Khan, 2008).

2.2.5 Disaster resilience

Many studies focused on building disaster resilient community through DRR education. Chou and Wu (2014) argued that training on disaster preparedness is a key contributor to strengthen community-based disaster prevention and protection of critical community infrastructure and household resources. Stewart et al. (2009) argues that public-private partnership can promote community resilience through improving the ability of community people for response to and recovery from a disaster. Focusing on earthquake education Izadkhah and Hosseini (2005) claimed that resilient communities can be built through providing disaster preparedness education and raising awareness on disaster mitigation of children.

2.2.6 Disaster mitigation

Disaster risk reduction, community preparedness, and mitigation programs are taken by the government and NGOs to reduce damage and loss, which are implemented through formal and informal education in the coastal areas of Bangladesh. Paul and Rahman (2006) argued that cyclone mitigation measures differ among the islands based on awareness, confidence, and trust of affected communities.

Many studies have been conducted on disaster domain over the last century. Many of previous studies have focused on the disaster risk reduction (Shaw et al., 2013), disaster preparedness (Khan, 2008, Mathbor, 2007), disaster mitigation (Paul and Rahman, 2006), disaster resilience and recovery (Islam and Walkerden, 2015) , disaster coping strategies (Paul, 1998, Paul and Routray, 2010), community vulnerabilities (Alam and Collins, 2010), and climate change adaptation (Ali, 1999) in Bangladesh. However, little of the research has considered the DRR education in the context of disaster preparedness and mitigation. This study recognizes that existing literature dealing with disasters in the context of Bangladesh does not adequately focus on DRR education. Considering this gap in the literature, this research aims to explore the status of disaster risk reduction education in coastal Bangladesh and how it works regarding preparedness and mitigation to reduce disaster induced damage and loss.

2.3 Chapter summary

This chapter has focused on existing literature on disaster, disaster risk, disaster risk reduction education etc. It has focused on vulnerability, disaster risk and vulnerable group, disaster preparedness, disaster resilience, and disaster mitigation. Based on reviewing the literature this chapter has identified the research gap.

CHAPTER -3
METHODOLOGY

3.1 Introduction

The study is designed to explore the present status of disaster risk reduction education in coastal Bangladesh. Several methods and techniques are used to achieve the key goal of the study. This chapter discusses the study approach, study area, cyclone Aila, sampling and recruitment of research participants, data sources and data collection techniques, study indicators, data analysis, study coordination schema and ethical considerations.

3.2 Study approach

The study has followed the mixed methods approach. Both qualitative (e.g. interviews, focus group) and quantitative (e.g. survey) data have been used in the study. The mixed methods approach is usually used in social and human sciences when the impediments of quantitative and qualitative methods are pertinent to the enquiry (Creswell, 2003). In this research, mixed methods approach has been used for a more robust investigation to know whether DRR education is transformed into practice and to what extent it is practised in the cyclone affected villages of Bangladesh. In this research, quantitative data were collected to know about achieved DRR knowledge and their sources. Qualitative narrative data were collected to get insight into practices of gained DRR knowledge and perceived challenges to practise that knowledge in the everyday life.

3.3 Study area

The study area was Padmapukur Union of Shyamnagor Upazila, Satkhira district. Two villages (Jhapa and Pakhimara) have been selected from the Union (see Fig. 3.1). Satkhira is a coastal district and prone to cyclone and storm-surge. This district was highly affected by the last big cyclone Aila in 2009. The recent cyclone Fani also hit (4 May 2019) in this area. Padmapukur was

the most affected Union by cyclone Aila, and Jhapa and Pakhimara were the worst affected villages in this Union. The aforesaid areas were comprised of cyclone Aila victims therefore, enabling the researcher to collect data mainly in the context of pre-disaster preparedness and mitigation, and the contribution of formal and informal sources to provide DRR knowledge in building household resilience.

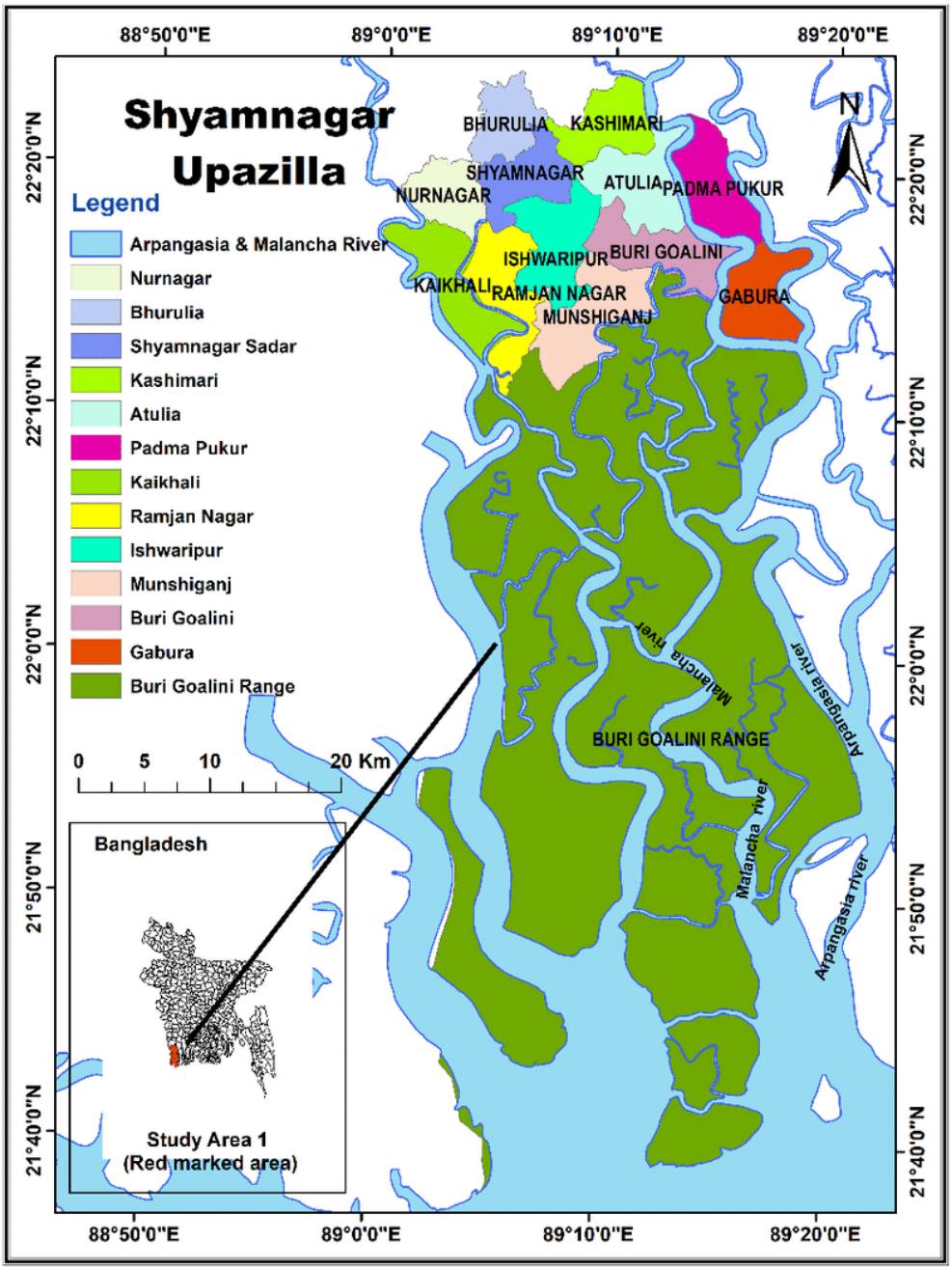

Fig. 3.1 Location map of study area. Source: Google map. Retrieved on 14 July 2020.

3.3 Cyclone Aila

Cyclone Aila was formed over south west Bay of Bengal on 23rd of May 2009. It was the worst cyclone after Sidr in November 2007. The devastating cyclone Aila crossed the southwestern part of Bangladesh and west Bengal with strong winds, heavy rainfalls, and massive storm surge on 25th of May 2009. Aila highly affected 11 districts out of 64 of Bangladesh. The wind speed of Cyclone Aila was 110 kilometers per hour (70 miles per hour) which was gusting up to 120 kilometers per hour (75 miles per hour). The height of storm surge was 3 meters (10 feet). Mainly it crossed between south 24 Pargana of West Bengal and Satkhira district of Bangladesh with a lot of damages. About 9.3 million people were affected by the cyclone Aila. About 1 million people became homeless and the total losses were BDT. 89.46 billion. Approximately 190 people died and about 7,000 were injured. It additionally harmed numerous basic infrastructure and land for example roughly 500,000 covered homes, 7000 km of streets, 1,000 km of banks, and 123,000 hectares of land in Bangladesh (Reliefweb, 2009).

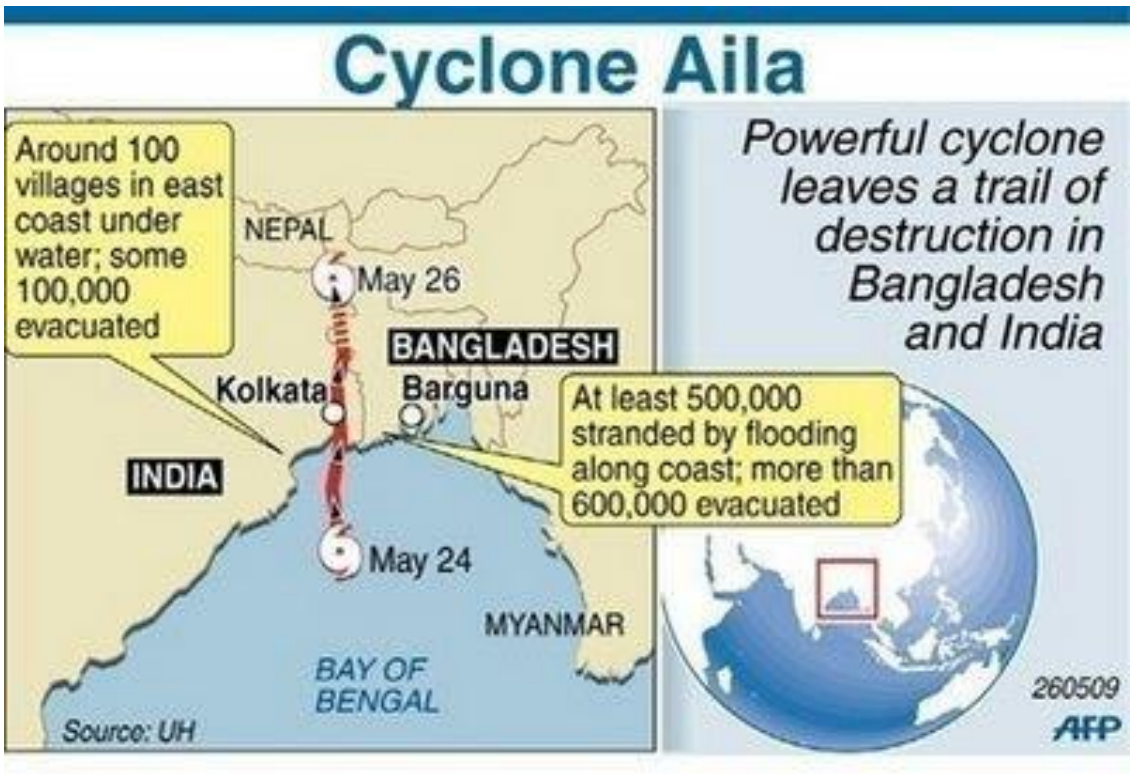

Fig. 3.2 Cyclone Aila track. Source: Google map. Retrieved on 14 July 2020.

3.4 Sampling and recruitment of participants

The study has used a combination of random and purposive sampling. The study villages have been selected purposively and research participants (for survey, interviews, and focus group) have been selected randomly. Following a statistical formula, $n = \frac{N}{1+N(e)^2}$ where, n= Sample size, N= Population and e= Precision level (95%) (Israel, 1992), this study has selected 107 household-heads (out of 511 households) from the two villages (Jhapa and Pakhimara). Four (4) FGDs (2 from each village) have been conducted. Various occupational groups (e.g. farmers, fishermen, businessmen, religious leader, day labor, students, etc.) and gender groups (male, female) were included as the focus group participants. Ten (10) key informant interviews have been conducted including village leaders, Union Parishad Members, school and madrasa teachers, village doctor, imam, NGO leaders, and women leaders.

Some of the questions were asked to the participants: What socioeconomic and physical impact do cyclones and storm-surges have in the study area? What DRR education/knowledge did the community receive from government and NGOs on disaster preparedness and mitigation? How they use the DRR knowledge to face the disaster risks? What are the possible options that may strengthen the DRR education in preparing and mitigating disaster risk?

3.5 Data sources and data collection techniques

Data sources of this study were both primary and secondary. Primary data have been collected from affected household and community through household survey, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs). Semi-structured checklist has been used to conduct FGDs and KIIs. The study has collected secondary information from various sources e.g. books, journal articles, research reports, thesis works, and government and NGO documents. Note taking method has been used to collect FGDs and KIIs data from the research participants. Researcher himself and two research assistants were involved to take notes and write down the interviews on the notebooks. Finally, the researcher has accumulated the interview information based on the main theme and aims of the research.

3.5.1 Household survey

The researcher and two research assistants (university graduates who are experienced with conducting several fieldworks) were directly involved in conducting face-to-face interviews through a structured survey questionnaire with 18 close-ended and open-ended questions (see detailed survey questionnaire in Appendix A). The questionnaire was pre-tested (10% of total sample) and necessary corrections were made before the final survey was administered. A local NGO assisted during the fieldwork to introduce the researchers to the villagers. During interviews with household-heads, the physical settings and the everyday lives of villagers were observed, which contributed to overall understanding about the study area (Islam, 2015). Household-heads were interviewed in their homes, and on most cases, other household members were part of the discussion and donated with further information. In these villages, the traditional practice is for household-heads to be the main speaker on behalf of family, as they have a clear idea of their household's vulnerability to cyclones (Islam and Walkerden, 2014).

3.5.2 Focus Group Discussions

Focus Group Discussions (FGDs) were employed to obtain more in-depth and diverse data for study aims and to understand the present status of DRR education and its application. Four FGDs with the villagers were conducted through a semi-structured open-ended checklist (see Appendix B). Each focus group consisted of eight to 10 members. Some basic criteria were followed during group formation, for example, homogeneity, different occupational groups (e.g. fishing, farming, housewives and students), age, education, and gender (Islam, 2015). FGDs were carried out in a room in an NGO office, refreshments were arranged, and a moderator from the community was selected and briefed about the questions and gave a summary to the participants about the aims of the study. Ten questions were set, and the duration of each discussion was 50–70 minutes for each group. The researcher and two research assistants took notes during each discussion.

3.5.3 Key Informant Interviews

Ten Key Informant Interviews (KIIs) took place with key local leaders including local government and NGO officials, Imams, teachers, village leaders, and so on. A checklist was used to conduct the interviews (see Appendix B). These people are the key individuals in the villages and played a direct and indirect role in the community during and after Cyclone Aila. Therefore, their experience was important to include in the thesis how they achieved DRR knowledge and practise it in the community to reduce cyclone induced vulnerabilities.

3.6 Study indicators

The study has used some indicators to understand the existing conditions of DRR education in the coastal villages of Bangladesh. The broad indicators were preparedness and mitigation – which have involved some other co-indicators, for example, shelter/housing, food, livelihood (agriculture, fishing), water and sanitation, and gender issues. Both formal and informal education programs were considered as the indicators to understand the status of DRR education.

3.7 Data analysis

Qualitative data have been analyzed by coding and grouping to identify key themes of data. Thematic analysis was used to analyze the qualitative data collected from the FGDs and KIIs. The participants' answers were coded. After coding the answers, the themes were constructed and organized based on the key aims of the study. Quantitative data have been analyzed by using Statistical Package for Social Sciences (SPSS). For data triangulation, multiple sources of data (e.g. KIIs, FGDs, and Observation) were used. To strengthen the reliability and validity, primary data have been correlated with secondary data.

3.8 Study coordination schema

This study has used a study coordination schema that includes research aims, data sets, data sources, and data collection tools, which is shown in Table 3.1.

Table 3.1: Study coordination schema

Study aims	Data sets	Data sources	Data collection tools
to know the existing DRR education programs of government and NGOs	policies and plans on preparedness and prevention/mitigation	Both primary and secondary e.g. Focus group, key informants, NGOs, local government staff, current literature.	HHS, FGDs, KIIs, meeting with GO, NGO officials.
to explore the processes of providing DRR education to the disaster affected coastal communities	providing strategies (e.g. awareness building, group meeting, formal and informal education)	Both primary and secondary e.g. Focus group, key informants, NGOs, local government staff, current literature.	HHS, KIIs, FGDs, meeting with GO, NGO officials.
to reveal how the coastal community practise DRR knowledge to face disaster risks	Knowledge practised in housing, food, livelihood, water & sanitation, and gender	Focus group, key informants, NGOs, local government staff, current literature.	HHS, KIIs, FGDs, meeting with GO, NGO officials.
to find out the possible ways to strengthen DRR education in the coastal areas of Bangladesh	Recommendations for strengthening DRR education programs	Focus group, key informants, NGOs, local government staff, current literature.	HHS, KIIs, FGDs, meeting with GO, NGO officials.

3.9 Ethical considerations

This study has followed several ethical protocols. *First,* this study has used an informed consent form, which seeks consent from the participants before starting formal interviews, and discussions. The data enumerators have clearly described the aims of this research to the participants and have given an idea about the questions to be asked. The data collectors have asked them to decide whether they wish to participate in this research or not. They were not bound to participate and if they decide to participate, they were also informed of their right to withdraw if they ever feel uncomfortable with the questions asked. *Second,* the researcher has used some quotes in reports. In this regard, researcher has quoted the participants comments and opinions as the quotes. No individual name has been identified in the thesis. Only the researcher and supervisor of this

research have access to the data. *Third*, confidentiality of the responses of the respondents was ensured and they were debriefed after the interview sessions.

3.10 Chapter summary

This chapter has discussed the study methodology. The mixed-methods approach has been taken for the study. Two cyclone Aila affected villages such as Jhapa and Pakhimara, Padmapukur Union of Shyamnagor Upazila, Satkhira district have been selected as the study area. This chapter has described about cyclone Aila – its growth, landfall, and damage and loss. This chapter has also mentioned the sampling and recruitment of participants. Following a statistical formula, this study has interviewed 107 household heads. Data sources and data collection techniques (e.g. household survey, focus group discussion and key informant interviews) have been discussed in this chapter. This study has taken 4 FGDs and 10 KIIs from the study areas. Preparedness and mitigation have been used as the broader indicators in this study. However, other co-indicators such as shelter, food, livelihood (agriculture, fishing), water and sanitation, and gender issues have been taken. Thematic analysis and SPPS have been used for analyzing qualitative and quantitative data, respectively. Finally, this chapter has drawn a study coordination schema (mentioning study aims, data set, data sources and data collection tools) and described an ethical consideration.

CHAPTER -4

STUDY AREA AND RESPONDENT'S PROFILE

4.1 Introduction

This chapter provides a brief description about the geophysical settings of the study area and profile of the respondents. This chapter includes general background, location, and climate of the study area. Some maps are included in this section like affected area map of cyclone and studied Upazilla. This chapter also includes respondents' profile, occurred disasters in the study areas, disaster damage and loss, and vulnerabilities of the local households.

4.2 General background

The present study has been conducted in Shymnagar Upazilla of Satkhira district, one of the largest coastal zones, located in the southwestern region of Bangladesh. Shyamnagar Thana was transferred into an Upazila in 1982. It contains 12 Union Parishads, 127 mouzas and 216 villages. The average literacy rate in the Upazila is 28.1%, including 38% among males and 17.4% among females. There are five colleges, 28 secondary schools, 98 madrasas and 96 government primary schools in the Upazila. The main occupation of this area is agriculture, where 32.93% are engaged with this work. The main export goods are paddy, jute, and shrimp. Shyamnagar is the largest thana of Bangladesh. Some indigenous community people such as Munda, Bhabene, Charal and Kaiborta are also found in this Upazila. Religious institutes like mosque, temple, pagoda, Buddhist vihara and church are available here. Educational institutions, cultural organizations, cooperative society, women's association, public library, theatre stage, cinema hall, community center, playground are also available at Shyamnagar. Agricultural productions are high in this area. The main crops of this area are paddy, pulse, sugarcane, watermelon, and vegetables. The main rivers are: Raymangal, Kalindi, Kobadak, Kholpetua, Arpangachhia, Malancha, Hariabhanga and Chuna. Some NGOs are working in this area such as BRAC, ASA, CARITAS, SUS, etc. (Islam and Miah, 2012).

Box 4.1: Shymnagar Upazilla

- Total area: 1968.24 sq. km.
- Total household: 46592
- Population:
  - Both sexes: 318254
  - Male: 160294
  - Female: 153487
- Density: 160/km^2
- Literacy rate:
  - Both sexes: 28.1%
  - Male: 38%
  - Female: 17.4
- Total union: 12

4.3 Climate

From the climatic standpoint, three separate seasons are observed in the study areas such as (a) the cool dry season from November to February, (b) the pre-monsoon summer season from March to May, and (c) the rainy season from June to October. March might also be considered as the spring season. During mid-October to mid-November is called the autumn season. The dry season begins first in the study area by mid-December, where its duration is about four months and continues to mid-March. The pre-monsoon dry season is categorized by high hotness and the occurrence of thunderstorms. After the month of April, the temperature reduces in the area. Mostly, the rainy season coincides with the summer monsoon, which is characterized by winds, high humidity, and heavy rainfall. Rainfall in this season is caused by the depressions in the study area from the Bay of Bengal (Islam and Miah, 2012).

4.4 Area and location

Shyamnagar is situated at 22.3306°N 89.1028°E . It has 46,592 households and all out region of 1968.24 km². Shyamnagar Upazila is surrounded by Kaliganj (Satkhira) and Assasuni Upazilas toward the north, the Sundarbans and the Bay of Bengal toward the south, Koyra and Assasuni upazilas toward the east and the Indian province of West Bengal toward the west (Islam and Miah, 2012).

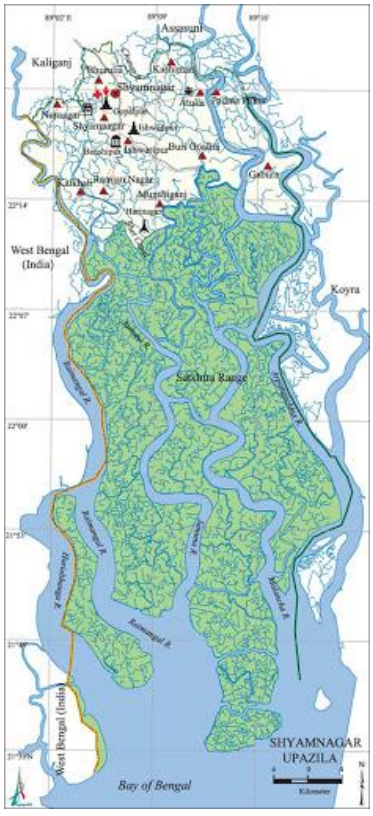

Fig. 4.1 Shyamnagar Upazila map

4.5 Background of Padmapukur Union

Padmapukur Union has been selected for the present study due to its location and it was affected by cyclone Aila. Total area of this union is 37 km^2 and total population of this union is 28651. Out of them male is 14242 and female is 14409. Besides, total households of Padmapukur Union is 6359. The literacy rate of Padmapukur union is 37%. There are 15 villages in this union, the study villages Jhapa and Pakhimara are two of them. There are different

occupational groups of people available here. Among them agriculture and fishing community is dominated. Most of the houses are kutcha which are made by bamboo, mud, thatch, straw, tin, and polythene (www. padmapukurup.satkhira.gov.bd).

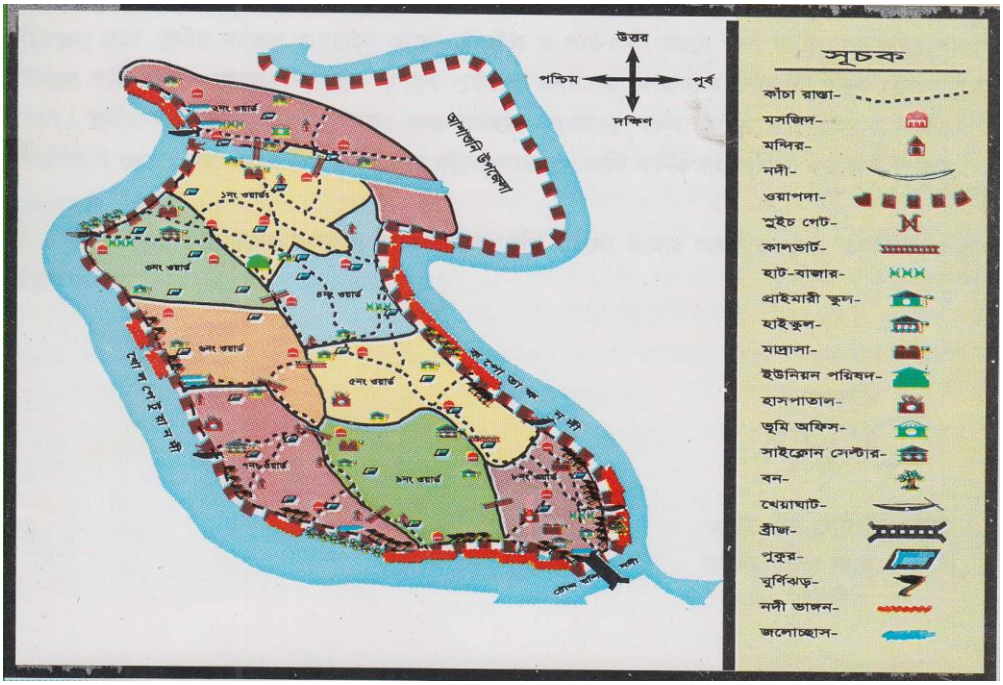

Fig. 4.2 Padmapukur Union map

4.6 Respondents profile

4.6.1 Gender

Most of the household heads of the study area were male. More than 81 percent respondents were male (Table 4.1). The data prove the traditional household head system in Bangladesh, where male members are the main bread earner of a family. Only 18 percent respondents were female who basically acted as the household heads in absence of their counterpart. During the interview session, few male household heads were outside of their home due to regular earning activities. Therefore, some female members were present as the household heads. However, few of household heads were really women because of the death of their husband and/or injury/sickness of main earning members.

Table 4.1: Gender distribution of respondents

Gender	Number	Percent
Male	87	81.3
Female	20	18.7
Total	107	100

Source: Household survey, 2019.

4.6.2 Age

Age is an important factor to acquire disaster related knowledge. Most household-heads were middle-aged – 26% were in the age group of 36–45 (Table 4.2). The average age of household-heads was 46 years, which implies that in coastal Bangladesh, households' main breadwinners were middle-aged. The age of more than 22 percent household-heads was between 26 and 35 years. Fourteen percent of household-heads age was between 56 and 65 years, which indicates that senior citizens also work as the main income earners, despite having the physical inability to continue regular earnings (Table 3).

Table 4.2: Age of the respondents

Age (years)	Number	Percent
18 to 25	8	7.5
26 to 35	24	22.4
36 to 45	28	26.2
46 to 55	20	18.7
56 to 65	15	14
66 to 75	8	7.5
Above 75	4	3.7
Total	107	100

Source: Household survey, 2019. Mean age 46.21.

In the study villages, involvement of senior citizens in the main income earning activities existed due to the absence of young working members in the family, lack of male household members, and because younger sons form a separate household (Household survey, FGDs).

4.6.3 Occupation

Most of the coastal household-heads (43.9%) were labor. For example, day labor 32.7%, agriculture labor 7.5%, and fishing labor 3.7% (who catch fish on others' boats as the day labor) (Table 4.3). And rest of 33% household-heads were involved with non-fishing activities for example agriculture, business, non-agriculture labor, etc. (Table 4.3). More than 22 percent household heads were involved in fisheries, who cultivate shrimp fish in their own land and gher, which is popular farmining in this region.

Table 4.3: Occupation of respondents

Occupation	Number	Percent
Farmer	13	12.1
Agriculture labor	8	7.5
Day labor	35	32.7
Fisheries	24	22.4
Fishing labor	4	3.7
Business	11	10.3
Service	9	8.4
Catch fry (young fish) from the sea	2	1.9
Housewife	1	0.9
Total	107	100

Source: Household survey, 2019.

4.6.4 Educational background

The educational status of household heads was poor in the study villages. About 22 percent respondents were illiterate and about 35 percent have completed their primary level of education.

Only 3.7 percent respondents were educated up to higher secondary and graduate levels (Table 4.4). There were several factors evident to have a lower education rate in the study villages, e.g. disaster induced educational building collapse and school dropout (FGD, KII). Due to the lower education rate, there was a limited opportunity to gain DRR knowledge from the formal educational sources (KII). It was evident that educated households had a better understanding of disaster warning signals and a higher capability to stock food, water, medicine and save money, which were useful in reducing disaster vulnerability. However, disaster risk reduction issues are not properly addressed in the education curriculum through which coastal people can learn from them (KII, FGD).

Table 4.4: Education of respondents

Educational status	Number	Percent
Primary	37	34.6
Secondary	24	22.4
Higher secondary	4	3.7
Graduate	4	3.7
Illiterate	23	21.5
Can sign only	15	14
Total	107	100

Source: Household survey, 2019.

4.6.5 Income

Household income is an important factor representing the coping capacity of people living at risk. Household income is directly linked to resilience, as higher-income households are more resilient than lower-income households. The annual household income of coastal people was low. The largest number of households (about 33%) had an annual income between Tk. 50,001 to 80,000 (Table 4.5). About 2 percent households' income was Tk. 20,000 to 30,000 and 200001 to 250000 (Table 4.5). The average annual household income was Tk. 85,859.

Table 4.5: Annual household income

Household income	Number	Percent
BDT. 20000 to 30000	2	1.9
BDT. 30001 to 50000	25	23.4
BDT. 50001 to 80000	35	32.7
BDT. 80001 to 120000	27	25.2
BDT. 120001 to 150000	10	9.3
BDT. 150001 to 200000	6	5.6
BDT. 200001 to 250000	2	1.9
Total	107	100

Source: Household survey, 2019. Mean 85859, Std. Deviation 42766.

4.6.6 Expenditure

Household expenditure is also an important factor for a resilient community. The households that have more income than expenditure, are more resilient than who have higher expenditure than their income. A balance between income and expenditure promotes savings. Survey data indicates that majority of households' expenditure (30.8%) was between Tk. 80001 to 120000. More than 27 percent households spent between taka 30001 to 50000 and 50001 to 80000 (Table 4.6).

Table 4.6: Annual household expenditure

Household expenditure	Frequency	Percent
BDT. 20000 to 30000	4	3.7
BDT. 30001 to 50000	29	27.1
BDT. 50001 to 80000	29	27.1
BDT. 80001 to 120000	33	30.8
BDT. 120001 to 150000	7	6.5
BDT. 150001 to 200000	5	4.7
Total	107	100

Source: Household survey, 2019. Mean 78943.93, Std. Deviation 37354.96.

The average annual household expenditure was Tk. 78, 944 which is less than their annual income (Tk. 85,859, Table 4.6). Due to a balance between income and expenditure, the villagers have some savings, which they can use during their emergency and to face disaster induced vulnerabilities (FGDs). Alam and Rahman (2014) found that whenever possible, coastal households of Bangladesh usually save an amount from their family expenditure.

4.7 Disasters, damage and losses and vulnerabilities

4.7.1 Types of disasters

The study villagers usually face various types of disasters. Hundred percent of the people face cyclone, storm-surges, and sea-salinity (Table 4.7). Many households of study villages face water crisis. More than 92 percent households said that they have water crisis (Table 4.7). Due to salinity the villagers have a lack of safe drinking and cooking water (FGDs, KIIs). Alam and Rahman (2014) found that about 80 percent households of coastal Bangladesh have a lack of fresh drinking and household water. Due to climate extreme events, (e.g. cyclone, storm-surges, coastal flooding, etc.) and human activities (e.g. cutting tree and mud) many households face riverbank erosion problem. More than 70 percent respondents reported that they have been facing riverbank erosion in their areas (Table 4.7). Many respondents said that during last 10 years, they have lost their agricultural land due to riverbank erosion (FGDs). Salinity has been increasing alarmingly in the coastal area since last decade. Salinity and riverbank erosion hamper agricultural production in these areas. Therefore, the people of study villages face economic and food crisis (KIIs).

Table 4.7: Type of disaster

Types of disaster	Number	Percent
Cyclone and storm surge	107	100
Salinity	107	100
Flooding	26	24
Riverbank erosion	77	72
Water crisis	99	93

Source: Household survey, 2019. Multiple response. N=107.

4.7.2 Disaster induced damage and loss

Enormous damage and losses occurred due to the impact of disasters in the coastal areas of Bangladesh. The study villagers have also been affected by various damage and losses. Most of the households were affected by shelter damage. More than 83 percent respondents said that their houses were damaged by the impact of Cyclone Aila (Table 4.8). The people of Jhapa and Pakhimara villages told that their houses were washed away during cyclone Aila in 2009 (FGDs). Damage of agricultural activities and standing crops were also high during cyclone Aila in the study villages. About 74 percent households reported that they suffered from crop loss (Table 4.8). Alam and Collins (2010) also found that cyclone affected coastal villages lost their houses and cropping fields. Poultry and livestock are important earning source of villagers. These sectors were also affected by cyclone Aila. For example, 94 percent and 85 percent respondents respectively told that their poultry and livestock were affected by cyclone (Table 4.8). Cyclone Aila also caused both physical and mental health injury. Fifty-Seven and 36 percent respondents respectively told that they have suffered from physical health injury and emotional breakdown (Table 4.8). Other research conducted in coastal Bangladesh also shown that cyclone severely affects human health, nutrition, and health infrastructure (Paul et al., 2012).

Table 4.8: Disaster-induced damage and loss

Damage and loss	Number	Percent
Damage of housing	89	83.1
Damage of agricultural activities and crops	79	73.83
Health injury	61	57.0
Education (building collapse, dropout)	35	42.0
Damage of livestock	91	85.0
Damage of poultry	101	94.4
Damage of trees	85	79.44
Fisheries	29	27.10
Emotional breakdown/mental stress	39	36.44

Source: Household survey, 2019. Multiple response.

In these areas, there was insufficient cyclone shelter before cyclone Aila. For these reasons, the people of Pakhimara and Jhapa were helpless to what to do in that situation. Most of the people were busy to save their lives during Aila. Poultry and livestock had a little priority due to safer place crisis in that moment. A few people were able to save their livestock and poultry (FGDs, KIIs).

4.7.3 Disaster vulnerabilities

Disaster creates lots of vulnerabilities. Cyclone Aila caused different types of vulnerabilities (e.g. physical, socioeconomic, and environmental) in the study villages. Among the physical vulnerabilities, water source damage was the highest. About 100 percent households reported that their water sources, roads, and culverts were affected by the cyclone Aila in 2009 (Table 4.9). In the coastal villages, embankment is an important structure to protect storm-surge and coastal flooding. Due to damage of embankments, the villagers suffered in many ways e.g. crop loss, water source damage, water logging, etc. (FGDs, KIIs). There were no emergency initiatives taken by the government to regain the physical facilities in the study villages. Therefore, physical vulnerabilities of the study villages are still evident (Field observation). Another study on cyclone Aila also found that coastal villages faced various physical vulnerabilities like road-network, culverts, bridges, embankments, drainage and healthcare facilities, disrupted mobile communication, etc. (Mallick et al., 2011). Shelter vulnerability was also high due to damage and loss of housing. More than 91 percent respondents told that their houses were affected by the cyclone Aila (Table 4.9). Other study also found that due to cyclone Aila, 85 percent houses were damaged (Mallick and Vogt, 2012). Availability of community shelter center is also important to reduce disaster vulnerability. The households having quick access to cyclone shelter and robust housing are comparatively less vulnerable to cyclone impacts than those who do not have this access (Hossain, 2015). Trees are considered as one of the more significant sources of household income in coastal Bangladesh, because trees provide economic benefits to the households and protection from cyclones (Rabbani et al., 2013). Both fruit (e.g. banana, coconut, betel nut, mango, jackfruit, etc.) and timber (e.g. rain tree, mahogany, raj koroi, etc.) trees were found in the study villages. These trees were also affected by cyclone Aila. Eighty percent households reported that their fruit and timber trees were damaged (Table 4.9). The coastal trees usually face two major

challenges. *First*, most fruit trees are relatively sensitive to salinity. *Second*, the frequency of cyclones harms and destroys (through uprooting) many trees (Islam, 2015).

There were also many socioeconomic vulnerabilities created by the impact of cyclone Aila in the study villages. Majority of the households claimed that cyclone Aila increased poverty and caused income loss. More than 92 percent and 85 percent respondents respectively said that after cyclone Aila their poor condition was increased and many of them lost their income (Table 4.9). A good number of households depend on agricultural activities for their livelihoods. Cyclone Aila hampered their income sources. At the same time, salinity and riverbank erosion have made their way of earning difficult (FGDs). The villagers had health vulnerability (57%) as well (Table 4.9). At the post disaster phase, many people were injured in these areas. They were basically injured during moving to a safer place and due to their weak housing (FGDs). As a socioeconomic vulnerability, social inequality was also created after cyclone Aila. More than 55 percent respondents told that due to cyclone Aila, social inequality was created through nepotism and favoritism during distribution of relief goods (Table 4.9). Sometimes, relief provider organizations like Union Parishad favored their political party-men and NGOs supported their microcredit borrowers, whereas, other cyclone affected households got less priority (FGDs, KIIs). Thus, there created an inequality between political party-men and common people. Islam and Walkerden (2014), Mahmud and Prowse (2012) also found in their study that local government representatives and NGOs favored their political supporters and members during distribution of material support after cyclone Sidr. A disaster not only creates income loss, health vulnerabilities, and social inequality, but also family violence. Akter and Mallick (2013) found in their study that cyclones are likely to reduce incomes and standards of living among the coastal communities.

During and after disaster, violence against women are common phenomenon and they are at higher risk of violence during and after disasters. About 48 percent respondents said that family violence (e.g. quarrel between husband and wife, beating wife, etc.) occurred due to disaster (Table 4.9). After cyclone Aila, lack of financial support and due to mental depression, family violence occurred in these villages (FGDs). The physical and emotional violence happen inside the families and in the flood and cyclone shelters or displaced person camps. Women are vulnerable to reproductive and sexual health problem, and the rates of sexual and domestic violence during disasters are increased (Rahman, 2013). Moreover, disasters often increase eve-teasing, sexual harassment in the family and public places and violence against women and girls (KIIs). Along

with developing countries, the developed countries also experienced domestic violence after a disaster. Parkinson and Zara (2013) showed in their study that domestic violence was increased in the USA and New Zealand in the aftermath of earthquakes, hurricanes, and floods.

Table 4.9: Disaster-induced vulnerabilities

Vulnerabilities	Number	Percent
Physical		
Shelter	98	92
Roads and culverts	99	93
Embankments	100	94
Water sources	105	98
Communication (mobile and internet)	47	44
Hospital/clinics	84	79
Trees (wood and fruit)	86	80
Socioeconomic		
Health injury	61	57
Dropout	54	50
Poverty increases	99	93
Income loss	91	85
Social inequality	59	55
Family violence	51	48
Environmental		
Soil erosion	93	87
Salinity intrusion/increase	107	100
Environmental pollution	89	83
Outbreaks of diseases	81	76

Source: Household survey, 2019. Multiple response. N=107.

Along with physical and socioeconomic vulnerabilities, the households of study villages faced massive environmental vulnerabilities e.g. soil erosion, salinity intrusion, water pollution and outbreaks of diseases. Hundred percent of households claimed that they suffered from salinity intrusion problem as an environmental vulnerability (Table 4.9). About 87 percent and more than

83 percent respondents suffered from soil erosion and environmental pollution due to cyclone Aila (Table 4.9).

Some villagers said that salinity has rapidly been increasing in the coastal villages. Much of the cultivable lands are not used for farming activities due to salinity (FGDs). A key informant told, "In many places of Bangladesh, the farmers are usually using their cropping land all the year round, whereas, in the coastal areas, we can use them once per annum due to saline water intrusion in the cropping land" (KII -2). A study conducted in the same area found that the Aila affected households faced various environmental vulnerabilities e.g. salinity in soil and water, lack of safe drinking water, waterborne diseases, etc. (Alam et al., 2013).

4.8 Chapter summary

This chapter has discussed a brief description about the geophysical settings of the study area and profile of the respondents (e.g. gender, age, occupation, education, income, and expenditure). This chapter has included general background, location, and climate of the study area. Some maps have been included in this section like affected area map of cyclone and studied Upazilla. This chapter has also discussed the occurred disasters in the study areas, disaster damage and loss, and vulnerabilities (physical, socioeconomic, and environmental) of the local households.

CHAPTER -5
DISASTER RISK REDUCTION EDUCATION PROGRAMS

5.1 Introduction

There are a good number of programs on disaster preparedness and mitigation of government and NGOs available at the community level in coastal Bangladesh. Considering the disaster-induced vulnerabilities, government and NGOs have taken a good number of disaster risk reduction related initiatives in the coastal areas of Bangladesh. Government programs like the National Disaster Management Council (NDMC) work to disseminate warning signals, raise public awareness through training and workshop through coordination with other agencies. Local NGOs and community-based organizations (CBOs) have also taken various initiatives to reduce disaster risk through organizing volunteer groups, disseminating information on decreasing risk and vulnerability, building cyclone shelters, providing alternative livelihood support, and adapting to extreme weather (Give2asia, 2019). This chapter explores the government's legal framework, risk assessment and vulnerability mapping, public awareness, preparedness, mitigation, and formal education programs. Nearby NGOs and network based associations (CBOs) have likewise taken different activities to lessen catastrophe hazard through sorting out volunteer gatherings, giving data on diminishing danger and weakness, developing tornado covers, supporting elective jobs, and adjusting to outrageous climate.

5.2 Preparedness related programs

Both government and NGOs take many initiatives on preparedness at the disaster affected communities in coastal Bangladesh. About 74% respondents opined that GOs and NGOs have disaster preparedness related activities at the community level (Table 5.1). Coastal villagers also said that both government and NGOs run different types of DRR education programs at the community level. NGOs have been disseminating preparedness activities e.g. disaster drill, preparing robust housing, store dry food, protect valuable household resources, and preserve drinking water (KIIs). Religious leaders play a vital role to prepare and make aware of local people.

For example, the priests of the temple were involved to make aware the community people about danger of disaster. One priest told that local people now know many ways to reduce disaster risk (KII). An FGD participant told,

> *"Before taking initiatives of GOs and NGOs, we haven't learnt much about disaster preparedness. The GOs and NGOs made everyone aware through training, workshop, group meeting, and mock drill. Now, we get the warning signals from the local government, NGOs and CPP volunteers. Our women members know well to wear salwar-kameez in place of sari and tightly tie their hair. We used to go to the shelter center before a cyclone prioritizing on bringing the pregnant, old age, children, and disable. We are aware of protecting our valuable items such as NID, cropping seeds, money and other household resources, as well as planting trees as the preparedness activities to prevent soil erosion" (FGD-3).*

Qualitative data found that some NGOs like Caritas provided life jacket to the fishermen of study villages. In the study villages, some leading NGOs, for example, Shusilon, Caritas and Leaders are working on disaster drill, street drama, song, group meeting, workshop, training as the preparedness activities. They also provide awareness on storing dry food and water purification (KIIs). The Cyclone Preparedness Program (CPP) provides training for the volunteers to facilitate emergency response to the community. The NGOs work for disaster preparedness close by the GOs. Their formal and non-formal education programs on disaster preparedness have a collective target of building disaster resilient community (Khan, 2008).

5.3 Mitigation related programs

Government and NGOs have many mitigation programs at the community level. More than 77% respondents told that GOs and NGOs provide disaster mitigation activities (Table 5.1). Government mainly takes both structural (e.g. roads, culverts, embankments, water sources, etc.) and non-structural mitigation programs (e.g. awareness, training, workshop, meetings, policies, etc.). However, the study data found that NGOs mitigation activities (46.7%) were higher than the GOs (12.1%) (Table 5.1). NGO's mitigation activities include protecting shelter, crop, and fisheries, using container to collect rainwater, setting-up tube-well and pond sand filter -PSF, etc.

(FGDs, KIIs). Paul and Rahman (2006) found that the cyclone affected island people have knowledge on mitigation measures of protecting shelter, embankments, and water sources. The local people are also aware to follow early warning. One key informant said, "Pond sand filter and tube-well have been set-up by the NGOs at the community to get saline free drinking water. They also provide information on mitigation, which help them to reduce disaster risk" (KII -5).

5.4 Public awareness

Public awareness was the leading program on DRR in the study villages. About hundred percent respondents told that there were many awareness programs available in their community regarding disaster risk reduction. In this regard, NGO's contribution was significantly higher than GO's (Table 5.1). Public awareness includes protecting shelter, crops, foods, and necessary items, purifying water, following early warning, prioritizing special group of people (e.g. elderly, children, pregnant, disable, etc.). In fact, disaster information increase knowledge and awareness, which enable local people to reduce disaster risk. One FGD participant said,

> *"We are now aware of protecting house, purifying water, storing dry food, understanding warning signals, maintaining personal hygiene, and protecting shelter. Some local NGOs have given us training in this regard. We also know how to use and maintain pond sand filter" (FGD-2).*

Ahamed et al. (2012) argued that people become aware through seminar, meeting, discussion, etc. However, many people do not participate in these awareness programs due to their unawareness and lack of information. Therefore, people should participate in the awareness programs, otherwise, GOs and NGOs initiatives will not get expected results.

5.5 Risk assessment and vulnerability mapping

Other DRR related programs of GOs and NGOs are like risk assessment (e.g. identify the elements at risk in the community), risk and vulnerability mapping (e.g. drawing the village map, identify the critical infrastructure and potential disaster impacts, and find out the places where community people can take refuge). More than 75% respondents told that GOs and NGOs have risk assessment

and vulnerability mapping programs at the community level, where NGOs contribution was higher than GOs (Table 5.1). One FGD participant told,

> *"Through the help of NGOs, we learnt to draw risk and vulnerable map of our village. We can now understand which areas of our village are more vulnerable and who and what infrastructure are at risk. Based on the map, we can take quick decision to move to a safer place" (FGD-4).*

Preparedness, and mitigation were almost at same level in the study villages, where NGO's contribution was significantly higher than government organizations (Table 5.1). Considering risk and vulnerability assessment as a key step towards effective disaster risk reduction, Roy and Blaschke (2015) argued that agriculture, education, health, housing, and industry sectors should be included in the process of vulnerability and risk assessment.

Table 5.1: DRR education related initiatives available at community level

DRR education initiatives	GO		NGO		Both GO and NGO		Total	
	N	%	N	%	N	%	N	%
Legal frameworks (policies, plans, act)	46	43	0	0	10	9.3	56	52.3
Risk assessment & vulnerability mapping	14	13.0	21	19.6	46	42.9	81	75.7
Public awareness	6	5.6	81	75.7	18	16.8	105	98.1
Preparedness activities	9	8.4	58	54.2	12	11.2	79	73.8
Mitigation activities	13	12.1	50	46.7	20	18.6	83	77.5
Formal education	69	73.8	0	0	0	0	69	64.4

Source: Household survey, 2019. N=107.

5.6 Policies and plans

Legal frameworks, such as-policies and plans are also important DRR related programs of government. More than 52% households reported about having government policies and plans at the community level (Table 5.1). There are good numbers of disaster management policies and

plans in Bangladesh, such as-the National Plan for Disaster Management-NPDM (2016-2020), Bangladesh Climate Change Strategic Action Plan-BCCSTAP (2009), Disaster Management Act (2012), and National Adaptation Program of Action-NAPA (2009). These policies have indicated many strategies to reduce disaster risk. Moreover, Bangladesh is also a signatory of some international policies, such as-the Sendai Framework for Disaster Reduction (2015-2030), which also indicates disaster risk reduction strategies for building resilient community.

5.7 Formal education

Through formal education, villagers can learn DRR related information, mainly from their school going children. More than 64% household-heads told that they know, there are some information available in the school textbook regarding disaster risk reduction (Table 5.1). One primary school teacher informed that disaster related information is available in the textbook of primary school to make aware the future generations about the damage and loss of disaster (KII). This information was found in a book of primary school (grade four and five) titled "Bangladesh and World Introduction" (Bangladesh O Bissawporichoy). These books have discussed about the damage and loss of cyclone, flood, riverbank erosion, drought, and earthquake and proposed probable ways to reduce disaster vulnerabilities (Nasrin et al., 2017, Nasrin et al., 2018). Moreover, some public university introduced disaster management discipline and many disciplines of public and private universities teaches disaster management as an independent unit. Through these disciplines, students can learn many DRR issues. For example, Abedin and Shaw (2015) argued that University networks and their research works have a significant role to identify various risk reduction approaches.

5.8 DRR programs of GOs and NGOs: key issues

Based on above discussion, briefly the key focus of government and NGOs on disaster risk reduction are shelter/housing, food, agriculture, fisheries, water and sanitation, early warning, vulnerable group of people, and solidarity (Table 5.2).

Table 5.2: Issues of DRR education of GOs and NGOs

Issues	Specific focus and learning
Shelter/housing	Robust housing Elevating housing
Food	Store dry food Baby food
Agriculture	Saline resilient crops Protecting cropping seeds
Fisheries	Protecting fisheries
Water and sanitation	Water purification Rainwater harvesting Storing water
Early warning	Providing warning signal Move to safer place
Vulnerable group of people	Women dress Priority on children, aged and disable moving to a safer place
Solidarity	Mutual help Sharing food, shelter, knowledge, and skills

5.9 Chapter summary

This chapter has explored the disaster risk reduction programs of government and NGOs in Bangladesh. This chapter has discussed with preparedness and mitigation related programs. It has also focused on public awareness, risk assessment and vulnerability mapping, policies and plans and formal education. Finally, the chapter has briefly pointed out the key issues related to disaster risk reduction education, for example, shelter/housing, food, agriculture, fisheries, water and sanitation, early warning, vulnerable group of people, and solidarity.

CHAPTER -6
WAYS OF PROVIDING DISASTER RISK REDUCTION EDUCATION

6.1 Introduction

The previous chapter has discussed about the programs of government and NGOs on disaster risk reduction education at the community level. The current chapter discusses the ways of providing DRR education programs to the community. This chapter includes media, mobile phone, training and workshop, faith-based organization, group meeting, textbook, local government (Union Parishad) as the ways of providing DRR education to the community.

6.2 Media (electronic, print, and social)

Media plays a vital role in community-based disaster risk reduction (ADPC, 2006). Media includes electronic, print, and social media. The government organizations and NGOs used several processes to disseminate DRR knowledge to the communities. Majority of households (85%) reported that they got DRR knowledge through radio and TV (Table 6.1). A focus group member stated, "We usually get early warning signal through radio and TV. Therefore, before a cyclone, we follow the news of radio and TV" (FGD-4). Along with cyclone warning signal, electronic media also provides information related to disaster preparedness (food, water, health, sanitation), mitigation (shelter protection, maintenance of roads and culverts), and awareness of post-cyclone outbreak (KII-9). Olson et al. (2010) argued that media played crucial roles following an earthquake in Chile and Haiti, such as, media coverage of the disaster events which create a special concentration among the concerned group and people to support the disaster victims. Media plays a vital role for broadcasting early warnings in the whole country of Bangladesh. Because of the low education rate in Bangladesh, the vast majority of the individuals favored electronic media as opposed to print media. Therefore, Bangladeshi television (TV) and Bangladeshi radio are the government's only private channel that receive early warning messages and disseminate this information all over the country (Habiba and Shaw, 2012). Ahsan and Khatun (2020) argued that

community radio provides hazard-related information and early warnings, which help people to take preparation for reducing cyclone risks. Community radio also helps the people to improve their knowledge and awareness on disaster preparedness, which has made them more experienced to minimize disaster damage and loss.

Along with electronic media, print media also play a significant role before, during and after a disaster. More than 19% respondents told that government and NGOs provide necessary DRR related information through newspaper (Table 6.1). Firoz-Ul-Hassan and Islam (2014) argued in his research on cyclone Aila that print media provides public education, early warning, evacuation, and coordination of post-disaster relief works. It also reflects the affected people's interest and needs, so that concerned individuals, groups, and authorities can take necessary steps to support them. In fact, newspaper's role is vital in providing DRR information. However, the rural coastal people are not well-acquainted with following newspaper news regarding disaster. Therefore, this rate is less in the study. Moreover, unfavorable geographical location to reach newspaper and low education rate of local people is also responsible behind the low rate of following daily newspaper to know DRR related information (KII-7). One FGD participant opined,

> *"Newspaper doesn't reach timely in our village due to communication difficulties. Besides, many of us can't read newspaper and we are also busy with our daily activities, which doesn't allow us sufficient time to follow newspaper information. Mostly, we receive disaster related information through radio and TV" (FGD- 3).*

Flood affected children in Bangladesh can utilize various forms of the media such as drama, concerts, radio to support their community's concern and capabilities with the local and national authorities (Martin, 2010).

Social media e.g. Facebook is also a popular way to disseminate DRR knowledge. Government and NGOs provide disaster preparedness and mitigation knowledge through social Facebook. About 18% respondents told that Facebook is a way to get DRR related information. However, the respondents of the study villages do not have financial capacity to buy smartphones, therefore, they have less opportunity to use Facebook. A village headman said,

"Most of the people of these villages are poor and live from hand to mouth. They are busy with their daily work. Therefore, they don't get time to involve with Facebook. Few young people have smartphones who usually use Facebook for networking rather getting information on disaster risk reduction" (KII-4).

6.3 Training and workshop

Training and workshop are other dominant processes of providing DRR knowledge. More than 79 percent respondents told that GOs and NGOs provide DRR related education through training and workshop. The government and NGO are doing a lot of work to reduce the risk of disaster in the area (Table 6.1). However, NGO has done more work than GOs. NGOs provided knowledge to the community through training, workshop, meeting and so on. But NGO help with Mike and life jacket (KII - 6). Parvin et al. (2013) argued that workshop is an important way to make aware local disaster-affected communities to reduce urban disaster risk. Coastal community people learn about preparedness, mitigation and responsive knowledge through training and workshop of government and NGOs. Almost every month many voluntary organizations arrange training and workshop to aware people in coastal villages. One FGD participant told,

"Before training and workshop, we had less contemporary knowledge about how to prevent ourselves and community from a disaster effect. Now, we are aware about water purification, rainwater harvesting, tree plantation, women issue (dress and hair) during an emergency evacuation etc." (FGD -2).

6.4 Mobile phone

Mobile phone is also an important way to disseminate DRR related information. Mostly government provides DRR information through mobile phone. More than 63% respondents told that they received DRR related information through mobile phone (Table 6.1). Most of the people of the study villages have mobile phone. Nowadays, the disaster affected people are informed about disaster preparedness and mitigation knowledge through mobile phone. Government has taken many necessary steps to provide information through mobile phones. Recently Government has set a hotline (1090) for free call service to provide disaster related information to make aware

people before disaster. Many voluntary organizations also provide preparedness and mitigation knowledge through SMS (In Bengali) in the coastal area. A focus group participant said,

> *"We receive early warning signal and other information (water purification, rainwater harvesting, store dry food, wear comfortable dress) through mobile phone. Likewise, our relatives, friends, and neighbors also provide disaster risk related information through mobile phone during emergency" (FGD - 1).*

One key informant said, "My elder son lives in Dhaka. When a cyclone or other disaster forms, he calls me and provides necessary information how to cope with the situation. Now we are calling to 1090 for receiving pre-disaster risk information" (KII – 5). The private sector is also gradually playing a role in Disaster Risk Reduction. Grammen Phone (private) and Teletalk (government) - these two mobile companies in Bangladesh, have begun to provide early warning signals by sending message to their subscribers in two disaster affected districts, Shirajgang (flood prone) and Cox's Bazar (cyclone prone). They intend to expand it across the country later (Habiba and Shaw, 2012).

Table 6.1: Ways of providing DRR knowledge to the community

Ways of providing DRR knowledge	Number	Percent
Training and workshop	85	79.4
Group meeting	54	50.5
Textbook	55	51.4
Electronic media	91	85.0
Print media (Newspaper)	21	19.6
Social media (Facebook)	19	17.8
Faith-based organization (Mosque)	65	60.7
Union Parishad (Local government)	37	34.6
Mobile phone	68	63.5

Source: Household survey, 2019. Multiple response. N=107.

6.4 Faith-based organization (mosque)

Faith-based organization like mosque also plays a vital role to disseminate DRR knowledge. More than 60 percent household-heads said that mosque provides DRR knowledge (Table 6.1). In the Bangladeshi coastal villages, mosque usually disseminate early warning information through mike. The Imams of the mosques also provide necessary information regarding DRR (preparedness and mitigation) through their weekly speech (i.e. khutba) during jumma prayer (FGDs). An Imam said, "Mosque also provides shelter during disaster and gives psychological support to the disaster victims through milad (special prayer)" (KII - 1). The mosque plays a vital role not only in Bangladeshi coast but in other disaster-prone Muslim countries also. For example, in Indonesia, mosques play significant roles in providing shelter, relief, mental support, raising fund for the disaster victims, promoting volunteerism, and coordinating community participation (Jansen, 2013). Imam and mosque/madrasah committee works voluntarily during and after disaster (for evacuating people and funeral activities). Imam also plays a crucial role to minimize trauma and mental satisfaction of the affected people. Sometimes, Imam works as a counselor for vulnerable people (KII-1). One KII participant told,

> *"When cyclone affected people were using mosque as a shelter center, mosque committee provided dry food (chira, muri, gur). After Aila, our Imam and mosque committee helped affected people by arranging millad (special prayer) for mental satisfactions. These initiatives helped affected people to recover from a cyclone" (KII-8).*

Different religious communities pray in different ways to resist the cyclone. The Hindu people offers sugar, coconut, and banana to the seawater. Muslims practise religious submission in mosques during prayer times. In madrassas, religious teachers oblige students to stay longer to pray loudly for Allah to resist the cyclone. All these religious activities are performed with the firm belief that only Allah can prevent the cyclone (Alam and Collins, 2010).

Distinctive strict networks implore in various manners to oppose the typhoon. The Hindu people group offers sugar, coconut, and banana to the seawater. Muslims practice strict submission in mosques during supplication times. In madrassas, strict educators oblige understudies to remain longer to ask noisily for Allah to oppose the twister. All these strict exercises are performed with the firm conviction that no one but Allah can forestall the tornado.

6.5 Group meeting

Group meeting (i.e. group discussion) is another significant way to disseminate DRR knowledge. More than 50% respondents told that they received disaster risk reduction information (Table 6.1) through group meeting. Most of the NGOs have microcredit group, through which they usually provide necessary information on DRR e.g. preparedness and mitigation. Ikeda (2009) argued that in many cases, necessary information on community-based disaster risk management are provided through group discussion in Bangladesh. An FGD participant opined,

> *"Many of us are the microcredit borrower of different NGOs. Most of the NGOs have regular group meeting, where the NGO workers discuss about many issues related to disaster risk reduction, e.g. stockpiling of food, following early warning, water purification, saving valuable household goods and resources" (FGD-1).*

6.6 Textbook

Textbook is an important source of dissemination of DRR related information. Usually, students can learn about disaster risk, preparedness, and mitigation, and they share this learning with their family members and neighbours. More than 51% respondents reported that they learned disaster risk reduction knowledge through textbook (Table 6.1). A school teacher commented,

> *"Some of the textbooks of primary and secondary schools discuss about climate change, climate extreme events e.g. cyclones, floods, tornado, droughts, riverbank erosion and fire. Our intention is to provide a basic information on disaster-induced risks to the students so that they can understand about risk and their role to reduce the risks" (KII-2).*

Habiba et al. (2013) found that primary secondary and higher secondary level of education provide disaster risk reduction education through textbooks in Bangladesh. Selby and Kagawa (2012) also argued that textbook-driven approach is an important way to disseminate disaster related knowledge. An NGO leader told that mostly the cyclone affected coastal community learn about disaster risk reduction information through informal sources like NGO intervention, group meeting, discussion, and media rather than formal sources like textbook (KII-3).

6.7 Local government (Union Parishad)

Local government e.g. Union Parishad plays a vital role in disaster management in Bangladesh. More than 34% respondents told that Union Parishad provided disaster risk reduction information before (e.g. early warning, safer shelter, food stock, protecting shelter, etc.) and after cyclone (e.g. relief, rehabilitation support, water purification, reconstruction, etc.) (Table 6.1). Islam et al. (2017) found that Union Parishad has a significant contribution to disaster recovery in the cyclone affected coastal areas of Bangladesh. The study also argued that favoritism and corruption has weakened the contribution of Union Parishad. In fact, Union Parshad could play vital role in providing disaster risk reduction support, however, due to their nepotism, corruption, and political intervention, sometimes they cannot play their active roles (FGDs).

6.8 Sources of receiving DRR knowledge

Government and NGOs provide DRR knowledge on preparedness and mitigation in the coastal villages of Bangladesh in various ways (see Table 6.1). However, people receive DRR knowledge from different sources. Majority of the households (about 88%) of study villages received DRR knowledge from the informal sources like NGOs, family, and community (Table 6.2). The villagers said that they received DRR knowledge through group meeting, awareness campaign, and training arranged by NGOs (FGDs). Voluntary organizations (75.7%) and electronic media (62.6%) were dominant sources of DRR knowledge. Qualitative data revealed that the villagers got DRR knowledge from voluntary organizations e.g. cyclone preparedness program (CPP), cooperative organizations, club and electronic media like Radio and TV (KII - 10).

The villagers also got DRR knowledge from family members (e.g. school going children and senior citizens 52.3%) and neighbors and friends (53.3%) (Table 6.2). Qualitative data show that the households of study villages got many DRR related information e.g. warning signal, store dry food, protect valuable household goods, documents, and cropping seeds, water purification, harvest rainwater, etc. from family members, senior members of the society, neighbors and friends (FGDs).

Table 6.2: Sources of receiving DRR knowledge

Sources of receiving knowledge	Number	Percent
Formal sources		
Formal education	45	42.0
Informal sources		
Union Parishad	40	37.3
NGOs informal education	94	87.9
Electronic media (Radio, TV)	67	62.6
Print media	14	13.1
Social media	21	19.6
Family members	56	52.3
Neighbors and friends	57	53.3
Voluntary organizations	81	75.7

Source: Household survey, 2019. Multiple response. Number of cases 107.

6.9 Learning on preparedness and mitigation from various sources

Coastal people gain DRR knowledge from various sources (Table 6.2). They learned many things about disaster preparedness from these knowledge sources. Most of the respondents learned about the safety of their valuable household goods and documents. More than 95 percent household-heads told that they learned how to save their necessary household goods and documents (Table 6.3). The villagers also learned about the priority issues at the before and during disaster stages. About 93 percent household-heads opined that they learned to give priority on the special group of people e.g. aged, pregnant, disable and children before and during a disaster (Table 6.3). The households also learned to follow cyclone warning signal and move to a safer place after getting

signals. More than 77 and 72 percent respondents respectively claimed that they usually follow cyclone warning signals & weather report on Radio and TV and move to a safer place after getting warning signal (Table 6.3). Moreover, the households learned about storing dry food and safe drinking water, keeping emergency medicine and essentials for infants, and issue of women hair and dress as the knowledge of disaster preparedness (Table 6.3).

Table 6.3: Learning about preparedness to reduce disaster risk

Preparedness learning	Number	Percent
Following warning signal	83	77.5
Moving to safer place	78	72.8
Storing dry food	75	70.0
Storing safe drinking water/rainwater harvesting	68	63.5
Keeping emergency medicine	70	65.4
Saving necessary household goods and documents	102	95.3
Keeping sanitation and hygiene items	59	55.1
Keeping essentials for infants (food, milk, clothing)	81	75.7
Women hair and dress	71	66.3
Prioritizing the special group of people	99	92.5

Source: Household survey, 2019. Multiple response. Number of cases 107.

Coastal people gain DRR knowledge from various sources (Table 6.2). They learned many things about disaster mitigation from these knowledge sources. Mostly they learned about housing related knowledge e.g. protect housing, building elevated and robust housing. More than 90 percent household-heads claimed that they learned to build robust housing and about 89 percent learned how to protect their shelter during cyclone (Table 6.4). Trees are also important for the coastal villagers. They learned to plant both fruit and wood trees to protect their housing and environment from the impact of cyclone. More than 75 percent households reported that they learned to plant trees around their residents (Table 6.4). Water purification knowledge was main learning amongst non-structural mitigation.

About 89 percent respondents told that they gained water purification knowledge (Table 6.4). DRR information is an important factor for disaster resilient community. More than 67

percent household-heads reported that they learned about sharing DRR knowledge amongst neighbors and friends (Table 6.4). Knowledge about government policies and plans on DRR was significantly lower than other knowledge. Only 42 percent respondents said that they learned about government policies and plans regarding disaster risk reduction (Table 6.4).

Table 6.4: Learning about mitigation to reduce disaster risk

Mitigation learning	Number	Percent
Structural mitigation		
Protect house during cyclone	95	88.7
Elevating house	89	83.1
Building robust housing	97	90.6
Constructing embankment	76	71.0
Fisheries protection by embankments and use of net	69	64.4
Tree plantation/forestation	81	75.7
Non-structural mitigation		
Information/knowledge share	72	67.2
Water purification	95	88.7
DRR policies and plans of government	45	42.0

Source: Household survey, 2019. Number of cases 107. Multiple response.

Qualitative data show, GO and NGOs gave them structural and non-structural knowledge, so that they stay safe from disaster. Most of the structural knowledge are – tightly tied house roof with trees before cyclone and building strong house, repairing embankment, and promoting forestry, protecting fisheries (FGDs). Non-structural information in that area has been provided through GOs, NGOs, and local government. These include, training and workshops, awareness information, water purification and sanitation. Leaders, an NGO, supplies water purification tablets and DRR awareness programs in the area (FGDs).

6.10 Chapter summary

This chapter has discussed the ways of providing DRR education to the community. This chapter has discussed the media (print, electronic and social), mobile phone, training and workshop, faith-based organization (mosque), group meeting, textbook, local government (Union Parishad) as the ways of providing DRR education to the community. This chapter has also discussed the sources of receiving DRR education of community people. The formal source includes formal education and informal sources include Union Parishad, NGOs informal education, electronic media, print media, social media, family members, neighbours and friends, and voluntary organizations (CBOs). This chapter has discussed the learning about preparedness and mitigation. Learning on preparedness includes following warning signal, moving to safer place before a cyclone, storing dry food and safe drinking water/rainwater harvesting, keeping emergency medicine, saving necessary household goods and documents, keeping sanitation and hygiene items and essentials for infants, caring women's hair and dress and prioritizing the vulnerable group of people before and during disaster. On the other hand, learning on mitigation includes protecting house, elevating house, building robust housing, constructing embankment, protecting fisheries, planting tree, sharing information/knowledge, purifying water, and following DRR related policies and plans of government.

CHAPTER-7
PRACTICE OF DISASTER RISK REDUCTION KNOWLEDGE

7.1 Introduction

This chapter reveals how the households of coastal community practise disaster risk reduction knowledge to face disaster-induced risks. This chapter focuses on a comparative feature of learned and practised knowledge on disaster risk reduction of preparedness and mitigation. This chapter also discusses the problems related to practise of DRR knowledge.

7.2 Practice of disaster risk reduction knowledge at the community level

The households of study villages learned many preparedness and mitigation knowledge from different formal and informal networks. All the households of the study villages practised their achieved DRR knowledge.

7.2.1 Preparedness

In case of preparedness, most practiced knowledge was saving household goods during cyclone. More than 92 percent household-heads told that they usually practised saving necessary household goods and documents before and during a cyclone. In this regard, achieved and practiced knowledge are almost in same nature. More than 95 percent respondents achieved knowledge on saving necessary household goods and items (Table 7.1). The villagers usually put their necessary documents and items e.g. educational certificates, NID (National Identity Card), land deeds, books, ornaments, money, cropping seeds, matches/lighter, etc. in the plastic bag or in earthen jar (FGDs).

People also learned to take care of the vulnerable group of people (e.g. women, children, pregnant, disable, and aged) during a cyclone disaster. About 89 percent respondents reported that they prioritized the special group of people before and during a disaster (Table 7.1).

Table 7.1: Learned and practiced DRR knowledge

Knowledge	Learned		Practised	
	N	%	N	%
Preparedness				
Following warning signal	83	77.5	80	74.7
Moving to safer place during warning signal	78	72.8	68	63.5
Storing dry food	75	70.0	65	60.7
Storing safe drinking water/rainwater harvesting	68	63.5	60	56.6
Keeping emergency medicine/first aid kit	70	54.2	51	47.6
Saving necessary household goods and documents	102	95.3	99	92.5
Keeping sanitation and hygiene items	59	55.1	40	37.3
Keeping essentials (baby food, milk, clothing) for infants	81	75.7	71	66.3
Managing women hair and dress before disaster	71	66.3	67	62.6
Prioritizing the special group of people	99	92.5	95	88.7
Mitigation				
Protect house during cyclone	95	88.7	95	88.7
Elevating house	89	83.1	70	65.4
Building robust housing	97	90.6	40	37.3
Constructing embankment	76	71.0	21	19.6
Fisheries protection	69	64.4	61	57.0
Tree plantation	81	75.7	79	73.8
Information/knowledge share	72	67.2	59	55.1
Water purification	95	88.7	71	66.3
DRR policies and plans of government	45	42.0	18	16.8

Source: Household survey, 2019. Number of cases 107. Multiple response.

Rahman (2013) found vulnerable group of people (ethnic minority, women, physical or mental disable, elder, children, etc.) face more challenge during and after a cyclone. One FGD participant told,

> *"During warning signal (before a cyclone), we usually move to cyclone shelter center. During this time, we give priority on sick, disable, aged, children, and pregnant for sending them to the shelter center first. Then, we move there with our valuable household belongings and necessary foods" (FGD-3).*

There was also a close relationship between achieved and practiced knowledge on following warning signal and weather report. About 78 percent respondents achieved knowledge on it and about 75 percent practiced it in their everyday life (Table 7.1). During the weather depression, they frequently listen to the Radio-TV news to follow the warning signals. They usually move to the safer places after getting warning signal number three (FGDs).

An interesting information was found regarding women hair and changing dress before disaster. In this regard, achieved (66.3%) and practiced (62.6%) knowledge was almost same (Table 7.1). Disaster vulnerability is higher to women than men. Research shows that women are 14 times more likely to die than a man during a natural disaster. The 1991 cyclone of Bangladesh killed 138,000 people, where the death rate of women over 40 years old was 31 percent. More than 70 percent of the death in the Indian ocean tsunami in 2004 were women (Kamal, 2019). Considering the women vulnerability, GOs and NGOs are aware to train women to save themselves from a disaster. In the study villages, women achieved knowledge and practiced to tie their long hair tightly and wear salwar-kameez in place of sari before a cyclone (FGDs).

A gap was found between achieved and practiced knowledge on health and sanitation. More than 54 percent respondents achieved knowledge on keeping emergency medicine but about 48 percent practiced it. Fifty-five percent respondents achieved knowledge on keeping sanitary and hygiene items (e.g. soap, sanitary napkin, antiseptic cream, etc.) during disasters. In contrast, only 37 percent respondents practised it (Table 7.1). An explanation was found regarding this gap that during an emergency, people were mostly aware to save their life and valuable household resources rather than taking medicine and sanitary items with them. They thought that they may get these items in the shelter center or will be given by the relief provider organizations after a disaster (FGDs, KIIs).

7.2.2 Mitigation

In case of mitigation, the most practised knowledge was protecting house during cyclone. In this regard, the percentage of achieved and practiced knowledge was same (88.7%). Nearer scenario was found in case of achieved and practiced knowledge on tree plantation. About 76 percent respondents achieved knowledge on tree plantation and about 74 percent practised it. The villagers opined that tree could save them from storm and soil erosion. Therefore, they usually plant

different trees (e.g. banana, coconut, bamboo, acacia, and palm) beside their residents (FGDs). An FGD participant said,

> *"Before cyclone season, we usually take mitigation measures to protect our house by binding rope between roof top of house and tree. We also elevate the floor of our house and sometimes, some households build robust housing (by brick and cement) to protect them from cyclone and storm-surge" (FGD-4).*

A gap was found between achieved and practiced knowledge on building robust housing, constructing embankment, and DRR policies and plans of government. About 91 percent respondents achieved knowledge on building robust housing to withstand against cyclone, only 37 percent practised it (Table 7.1). Despite their knowledge on building robust housing, the households did not practice it due to financial incapability (KIIs). Though, 42% households achieved knowledge on DRR policies and plans of government, they do not practise it (i.e. have not discussed this issue with their neighbors and friends) (Table 7.1).

7.3 Problems relating to applying DRR knowledge

7.3.1 Lack of water purification technology

Water purification is essential after cyclone, as water of coastal area is salty. Besides, due to cyclone, water sources are mostly damaged by saline water intrusion. Therefore, the coastal households need to purify their water and harvest rainwater. They also have shortage of water storing pot for harvesting rainwater. Islam and Wahab (2017) found the same findings in their study that the coastal households do not have modern support to preserve rainwater. Government and NGOs should provide technological support (e.g. water tank, plastic pipe, etc.) to the local households for harvesting rainwater (FGDs).

7.3.2 Lack of shelter center and it's far location from home

Shelter is an important factor before, during and after cyclone. The local households want to go to the cyclone shelter center after hearing the warning signal. However, shelter center is far from the home and communication ways are poor (e.g. roads and vehicle). An FGD participant told,

"Cyclone shelter center is far from my house (about two km away). The communication roads are kutcha and if I want to go there, I have to take auto-riksha, which is difficult to get and risky to use immediately before a cyclone" (FGD-1).

Paul and Routray (2011) found that due to disadvantageous location and far from home, many cyclone-affected households did not go to the shelter center before a cyclone. Nearly 90% of the coastal households of a study said that they did not have access to the cyclone shelter centers. If there were sufficient cyclone shelter centers, the affected people could have taken shelter there and minimize damage and loss (Mallick et al., 2011).

7.3.3 Weak embankments

Government has taken many initiatives for disaster risk reduction in the coastal areas of Bangladesh. However, they have poor initiative to reconstruct embankments. Due to weak embankments, the coastal households suffer a lot, for example, tidal water easily get into the farmland. Therefore, local people cannot protect their crops and access of saline water intrusion in the ponds and other water bodies. A Union Parishad member told, "Government is doing many works to protect and repair embankments. However, due to the recurrent cyclones and riverbank erosion, embankments are frequently damaging. Besides, there is lack of fund to repair embankments (KII). Kartiki (2011) found that weak embankments cannot defend coastal people and create a threat to life and livelihood. This study also found that the houses built near the embankments are more vulnerable.

7.3.4 Corruption in local government

Practice of DRR education is sometimes hindered due to the corruption of local government. Local government institute e.g. Union Parishad sometimes involves with corruption during distribution of post-disaster recovery support and repairing roads, culverts, and embankments (FGDs). Islam et al. (2017) found that the Union Parishad representatives are highly involved with favoritism during distribution of relief goods. Mahmud and Prowse (2012) also found that Union Parishad

members are involved with corruption during cyclone preparedness and relief distribution. Due to this corruption, many coastal households could not reduce their post-disaster risk and practice achieved DRR knowledge.

7.3.5 Lack of coordination

Lack of coordination is a barrier to practise DRR knowledge at the community level. Lack of coordination creates duplication of works. For example, lack of coordination between local government and NGOs, sometimes they may take same kind preparedness and mitigation programs at the community level. Sarker and Wu (2019) argued that GOs and NGOs do repetitive work due to a lack of coordination. Consequently, the result of disaster management cannot be attained at an expected level. Mainly the negative bureaucratic attitude creates this weak coordination, which lead poor communication and information flow, and lack of response of disaster management committees at local level.

7.4 Chapter summary

This chapter has explored how the households of coastal community practise disaster risk reduction knowledge on preparedness. Achieved and practiced knowledge on preparedness are following warning signal & weather report, moving to a safer place before a cyclone, storing dry food and safe drinking water/rainwater harvesting, keeping emergency medicine, saving necessary household goods and documents, keeping sanitation and hygiene items and essentials for infants, caring women's hair and dress and prioritizing the vulnerable group of people before & during disaster. On the other hand, achieved and practised knowledge on mitigation are protecting house, elevating house, building robust housing, constructing embankment, protecting fisheries, planting trees, sharing information/knowledge, purifying water, and following, DRR related policies and plans of government. This chapter found that in many cases, there are gaps between achieved and practiced DRR knowledge at the community. This chapter also identified the problems related to applying DRR knowledge at the field, such as-lack of water purification technology, lack of community shelter center, weak embankments, corruption of local government, and lack of coordination between GOs and NGOs works.

CHAPTER-8

PROBABLE WAYS OF STRENGTHENING DISASTER RISK REDUCTION EDUCATION AND ITS PRACTICE

8.1 Introduction

Disaster risk reduction knowledge is important to build a disaster resilient community**.** There are some limitations to provide DRR knowledge to the coastal community due to lack of education, lack of skilled manpower, poor communication system, prejudice of coastal people, geographical vulnerability etc. Therefore, this chapter explores some probable ways to strengthen DRR education.

8.2 Participatory-based training and workshop

Government and NGOs have been providing disaster risk reduction information to the cyclone affected coastal community through various training and workshop. This training and workshop should be participatory for effective DRR education. More than 40% respondents suggested that this training and workshop should be more participatory (Table 8.1). One key informant claimed that NGOs training and workshop is participatory (KII-10). However, FGD participants told,

> *"Sometimes NGOs training and workshops are monotonous. It should be more visual, where picture, video and story can be used. At the same time, participants can also play a role in the training and workshop to explore the disaster risk related issues to the community" (FGD- 4).*

8.3 Increasing local government intervention

Disaster preparedness related programs are mostly done by NGOs. Local government i.e. Union Parishad plays a vital role in structural mitigation through constructing and repairing roads,

culverts, embankments, etc. Therefore, local people expect to see more involvements of Union Parishad. About 72% respondents told that there needs an increasing intervention of Union Parishad in providing disaster risk reduction knowledge and support (Table 8.1). FGDs data reveal that Union Parishad's roles are mostly found after a cyclone during distribution of relief goods (FGD- 1).

Table 8.1: Possible ways of strengthening and practicing DRR education

Stakeholders	Possible ways	Number	Percent
Community	Participatory-based training and workshop	43	40.19
	Increase the role of religious institutions/leaders	80	74.77
	Strengthening the role of voluntary organization	64	59.81
	Avoiding traditional attitude to follow early warning	51	47.66
GOs	Increasing local government intervention	77	71.97
	Building more community shelter center	103	96.26
	Include more DRR issues in the textbooks	72	67.29
	Improve communication (road and transport)	92	85.98
Both GOs & NGOs	Technological and financial support	62	57.94
	Coordination between GOs and NGOs activities	52	48.60
	Need skilled manpower to provide DRR education	83	77.57
Community, GOs & NGOs	Arranging regular DRR program at the community	63	58.88
	Promoting coastal forestry	77	71.97
	Controlling favoritism and corruption	87	81.31

Source: Household survey, 2019. Multiple response.

8.4 Technological and financial support

For practicing DRR knowledge, the local people need technological and financial support from GOs and NGOs. About 58% respondents claimed that they need technological and financial support in this regard. Through the DRR education, coastal people learned to purify drinking water and harvest rainwater. However, they have a lack of fund and technology to practise it effectively. Therefore, their expectation is to get water jar, plastic pipe, purification tablets, etc. from GOs and NGOs.

8.5 Building more community shelter center

The studied villagers are more aware of following warning signals than before. Many coastal people want to move to a safer place (in the community cyclone shelter center) immediately before a cyclone. However, there is a lack of shelter center in the study villages. At the Pakhimara village there is a shelter center, but there is no shelter enter in Jhapa village. In this circumstance, many times, people cannot take refuge in the shelter centers before a cyclone. Therefore, more than 96% respondents reported that they need cyclone shelter center.

8.6 Avoiding traditional attitude to follow early warning

Some people of the study villages have traditional attitude to follow early warning signal. About 48% respondents opined to avoid traditional attitude to follow cyclone warning signals (Table 8.1). All coastal people do not follow early warning, as they thought cyclone will not be happened. In this regard their logic is “last time there was also a warning signal like this, however, cyclone was not struck. This time will also not be happened” (FGD-2). Due to this attitude, many times more damage and loss occurred and sometimes death rates had been increased. Damage and loss include shelter, crops, livestock, and water sources, etc. Sometime, coastal people also think, “the cyclone is far away from the coast. This is not the right time to go to cyclone shelter center. Moreover, God will save us, nothing will be happened” (FGD-3). Based on this fact, coastal people should be more conscious and strictly follow early warning to minimize damages and losses of a cyclone.

8.7 Increase the role of religious institutions (FBOs)

Faith-Based Organizations (FBOs) play a significant role to reduce cyclone risk through providing shelter and disseminating information on early warning. As the important FBO, madrasa, mosque, and temple in the study areas, usually provide comfort to the cyclone affected people to boost them up mentally. However, due to lack of training, financial and technological support they cannot play a vital role before, during and after a disaster. Some of the religious institutions are in very vulnerable conditions (i.e. physical structure is not well), they are built with bamboo, tin, and straw. There is a few well-structured mosque and temple (especially it is Muslim and Hindu prone area) in these villages, where the imam and the priest are not well trained up to play a role at the pre and post cyclone stages. Therefore, about 75% respondents suggested that the role of religious leaders (imam, priest, madrasa teacher) should be increased. In this regard, GOs and NGOs can train them and provide financial and technological support.

8.8 Coordination between GOs and NGOs activities

Coordination is too essential to do any work successfully. GOs and NGOs provide many DRR support to the community. Coordination between GOs and NGOs is very important for the cyclone affected coastal people, because after a disaster affected people have many needs e.g. food, water, shelter, cooking utensils, cloths, seeds, sanitary items, etc. Lack of coordination creates repetition of works, where some organizations may provide the same support to the same community. For example, if one organization provides food and other provides shelter, then it will be a balance support, alternatively, if both organizations provide cloth as an emergency support, it will not be an effective support for the affected people. So, coordination between GOs and NGOs should be increased to provide right facilities at right time to the right person. Therefore, coordination is needed between GOs and NGOs before and after a disaster. Therefore, local people emphasized on coordination. About 49% respondents said that coordination between GOs and NGOs should be increased.

8.9 Arranging regular DRR related program at the community

GOs and NGOs provide disaster risk reduction related programs at the community. However, these programs are not arranged regularly. Mostly post-disaster programs were found, where relief works are prioritized. To prepare and aware the community, these programs should be regularly arranged. About 59% respondents said that if GOs and NGOs arrange regular DRR related programs at the community, it will be helpful to strengthen the practice of DRR education at the community level (Table 8.1). Coastal people become aware about preparedness and mitigation to reduce cyclone risk. Coastal people are very busy with their regular activities (e.g. fishing, labor) and survive to fight against disadvantaged situation. Therefore, they do not get much time to attend the DRR program. If the DRR programs are regularly arranged in the community, people can participate there.

8.10 Strengthen the role of local/voluntary organizations (CBOs)

Community-Based Organizations play a vital role to help cyclone-affected community. For example, many local/voluntary organizations work for rescuing people after a cyclone and providing other emergency supports such as evacuation, relief, etc. GOs and NGOs also try to build the capacity of local CBOs so that they can actively play role in DRR. Therefore, about 60% respondents think that government should provide more support to the local/voluntary organization for strengthening and practising DRR education at the community level (Table 8.1).

8.12 Include more DRR issues in the textbooks

Some textbooks of primary and secondary school have focused on disaster risk reduction issues, which play a vital role to aware students about disasters, damage and losses, and ways to reduce risks. More DRR issues should be included in the higher secondary level textbooks. More than 67% respondents opined that more DRR issues such as preparedness, mitigation, response, recovery, risk, and vulnerability should be included in the textbooks (Table-8.1). All the universities should also include DRR issues in their curriculum. Tuladhar et al. (2015) argued that the disaster education should not only be confined within the school students.

8.13 Promoting coastal forestry

The GOs and NGOs have taken many programs at the community level to aware people on disaster risk reduction. Promoting coastal forestry is one of the key programs of GOs and NGOs. Forestation has several benefits, such as-it protects wind and soil erosion. It also protects embankments and housing from a disaster (especially cyclone and flood). However, there was no large forest found in the study villages. Therefore, about 72% respondents said that coastal forestry should be promoted through direct intervention of GOs and NGOs (Table 8.1).

8.14 Improve communication (road and transport)

The roads and overall communication system of study villages are poor. Vulnerable communication system is a major barrier to fully implement DRR education at the community level. Most of the roads of the study area are kutcha and since 2009, after cyclone Aila to till date, the roads and other communication systems remain damaged. Moreover, due to bad communication systems, the villagers mostly fail to go to the community shelter center before a cyclone. Therefore, 86% respondents said that roads of the study area should be reconstructed for providing better facilities to the disaster affected people.

8.15 Need skilled manpower to provide DRR education

The skilled manpower can easily provide DRR education among the disaster affected people. Though the GOs and NGOs have been providing DRR knowledge to the community to aware people to reduce the disaster-induced risks, they have a lack of skilled manpower to do the job. Therefore, about 78% respondents opined that GOs and NGOs should recruit more skilled manpower and train the existing manpower to effectively provide DRR education among the coastal households (Table 8.1).

8.16 Controlling favoritism and corruption

Favoritism and corruption of GOs and NGOs are other obstacles to strengthen DRR programs at the community level. Sometimes, local government members (union parishad chairmen and members) are involved with favoritism and corruption at the affected area during the distribution of mitigation (roads, culverts, embankments) and recovery facilities (relief, rehabilitation). Sometimes, they provide facilities to their relatives and political supporters. Besides, they sometimes take bribe during providing support. More than 81% respondents told that government organizations should control their favoritism and corruption to strengthen DRR facilities.

8.17 Chapter summary

This chapter has explored some probable ways to strengthen disaster risk reduction education. The local stakeholders have suggested many ways, which are needed to take for strengthening and practising DRR education at the community level. The key stakeholders of implementing these initiatives can be community, GOs and NGOs. As a community level initiative, most of the respondents have emphasized on the increasing roles of religious institutions or leaders. Other ways include – active role of voluntary organizations, avoiding traditional attitude to follow early warning and increasing participatory-based training and workshop on DRR. Government can play a vital role in this regard. Most of the respondents focused on building more community shelter centers in the study villages and increasing communications systems e.g. roads and transports so that they can easily move to safer place like shelter centers. Government can also include more DRR issues in the textbooks, which can provide more DDR knowledge among the students and community. Respondents also emphasized on increasing local government intervention to strengthen and practise DRR education. As the GOs and NGOs initiatives, majority of the respondents emphasized on recruiting skilled manpower to provide DRR education. Technological and financial support, and coordination between GOs and NGOs activities are also important to strengthen and practise DRR knowledge. The community, government and NGOs also can control favoritism and corruption, and promote coastal forestry. The above ways directly or indirectly influence to strengthen DRR education.

CHAPTER-9

DISCUSSION AND CONCLUSION

9.1 Introduction

Bangladesh is considered one of the most disaster-prone countries in the world. Due to the impact of climate change, Bangladesh has been facing many disasters such as floods, cyclones, storm-surges, riverbank erosion, sea-salinity, etc. These disasters create many socioeconomic and physical vulnerabilities. To address these vulnerabilities, many initiatives have been taken by the government, NGOs, and other community-based organization. Disaster risk reduction education is one of the important initiatives of government and NGOs. Through disaster risk reduction education, community people enriched themselves and got knowledge. The achieved knowledge has helped to develop community response to reduce disaster risk. This study aims to explore the current status of disaster risk reduction education in the coastal Bangladesh. This chapter briefly provides the answers of the central research aims, shows how the answers are supported by the findings, and explains how the answers suit to the existing body of knowledge about the disaster management domain.

This study argues that theoretically the findings are aligned with the post-positivist paradigm of educational research. Because, the current study allows more interaction between the researcher and research participants. It uses quantitative methods e.g. survey and qualitative methods e.g. interviewing and participant-observation. The study also ensures the validity and reliability of findings through triangulation of data.

9.2 Existing DRR education programs of government and NGOs

The first aim of this study was to explore the existing disaster risk reduction education programs of government and NGOs in Bangladesh coast. There are a good number of programs available at the community level in coastal Bangladesh on disaster preparedness and mitigation run by the government and NGOs. The study found as the most important DRR programs of GOs and NGOs are public awareness, mitigation activities, preparedness activities, risk and vulnerability

assessment, formal education, and legal frameworks e.g. laws, policies, and plans. Islam et al. (2020) found that Bangladesh has taken many DRR initiatives to decrease the effect of natural hazards. The government has implemented many DRR related programs, such as effective early warning system, construction of flood and cyclone shelters, vulnerable group feeding and food for work for the poor people, which partially supports the findings of current study. Seddiky et al. (2020) argued that in Bangladesh, NGOs have taken many community-based disaster risk reduction initiatives through arranging training and education for building awareness.

Though the government and NGOs have many DRR related programs at the community, most of the programs are post-disaster related. The community needs more pre-disaster programs on preparedness and mitigation. However, post-disaster programs are found at the community after a disaster such as response and recovery, where relief and reconstruction are predominant.

9.3 Processes of providing DRR education

The second aim of the study was to identify the processes of providing disaster risk reduction education. The study found government and NGOs follow various ways of providing DRR education programs to the community, such as media, mobile phone, training and workshop, faith-based organization, group meeting, textbook, local government (Union Parishad) as the ways of providing DRR education to the community. Tuladhar et al. (2015) argued that government and non-governmental organizations provide DRR knowledge to the disaster affected people in Nepal. They have gained DRR knowledge through awareness campaigns, trainings, and meetings. This finding is similar with the current study, as the cyclone affected villagers of the study villages have also achieved DRR knowledge through training, workshop, and awareness campaign. Saizen and Sasi (2015) showed awareness workshop as an effective approach to provide disaster risk reduction education in Tamil Nadu, India. Emphasizing on school as the process of providing DRR knowledge Tuladhar et al. (2015) argued that the disaster education must not only be limited within the school students, but it should also be endorsed to families and communities. The current study found that people mostly achieved the DRR knowledge from informal sources rather than formal education. The informal sources are - Union Parishad, NGOs informal education, voluntary organizations, media (print, electronic, social), family, neighbours and friends.

People learned many issues related to DRR from the informal sources such as following warning signal, moving to safer place after getting warning signals, storing dry food and safe drinking water, keeping emergency medicine, saving necessary household goods and documents, keeping sanitation and hygiene items, keeping essentials for infants (food, milk, clothing), concerning on women hair and dress, and prioritizing the special group of people.

9.4 Practice of DRR knowledge to face disaster risks

The third aim of the study was to reveal how the coastal community practise DRR knowledge to face disaster risks at the community level. The findings of this aim show that households of coastal community practise disaster risk reduction knowledge on preparedness and mitigation. Achieved and practiced knowledge on preparedness are - following warning signals, moving to safer place before a cyclone, storing dry food and safe drinking water, harvesting rainwater, keeping emergency medicine, saving necessary household goods and documents, keeping sanitation and hygiene items and storing essentials for infants, caring women's hair and dress and prioritizing the vulnerable group of people before and during disaster.

On the other hand, achieved and practiced knowledge on mitigation are - protecting house, building elevated and robust house, constructing embankment, protecting fisheries, planting tree, sharing information/knowledge, purifying water, and following DRR related policies and plans of government. This study found that in some contexts, there are gaps between achieved and practised DRR knowledge.

9.5 Probable ways to strengthen DRR education

The final aim of this study was to find out the possible ways to strengthen DRR education in the coastal areas of Bangladesh. This study has identified some probable ways to strengthen the DRR knowledge and its practice at the community. This study argues that participatory-based training and workshop, increasing local government intervention, technological and financial support, building more community shelter center, avoiding traditional attitude to follow early warning, increase the role of religious institutions (FBOs), coordination between GOs and NGOs activities, arranging regular DRR related program at the community, strengthen the role of local/voluntary

organizations (CBOs), include more DRR issues in the textbooks, promoting coastal forestry, improve communication (road and transport), need skilled manpower to provide DRR education and controlling favoritism and corruption are essential for strengthening DRR education and practising it at the community.

The stakeholders' involvement is necessary to implement these probable ways. Based on the nature of probable ways, different stakeholders (e.g. community, government, and NGOs) should take initiatives. For example, community initiative is needed in participatory-based training and workshop, strengthen the role of local/voluntary organizations (CBOs), increase the role of religious institutions (FBOs), and avoiding traditional attitude to follow early warning. Government initiative is needed in - increasing local government intervention, technological and financial support, building more community shelter center, include more DRR issues in the textbooks, and improve communication (road and transport). Both of GOs and NGOs initiative is needed in - coordination between GOs and NGOs activities, arranging regular DRR related program at the community, promoting coastal forestry, need skilled manpower to provide DRR education and controlling favoritism and corruption.

9.6 Responsive measures

Cyclone affected households usually take many initiatives to reduce their vulnerabilities. Among them moving to safer place, storing food and water, introducing saline resilient crops, planting tree, prioritizing special group of people, etc. are noteworthy. Some responsive measures are discussed here.

9.6.1 Moving to safer place

Strong housing is essential to withstand against cyclone disaster. Most of the coastal villagers do not have strong housing, as these are mainly constructed by mud, bamboo, and straw and few of them are made by brick and cement (FGD, KII). These types of housing are not strong enough to protect them from cyclone. Therefore, before cyclone majority of the villagers (64%) move to safer place usually to the public shelter centers (Table 3). Siddeqa et al. (2018) showed in their research that about 70 percent coastal villagers moved to safer shelter before a cyclone. Many households

of the study villages claimed that they moved to the shelter center before Aila to secure themselves from the impact of cyclone. Some villagers also took shelter at neighbors' house which were comparatively stronger than their own houses (FGD). Due to weak houses, most of the coastal households rely on community shelter centers. Robust housing can protect the lives and properties of coastal households. However, due to poverty, they could not build robust housing. Only 37 percent households built strong houses by brick and cement (Table 3). Women, children, pregnant, disable and elderly people are particularly more vulnerable than others during, before and after a disaster (WHO, 2002). Therefore, most of the coastal households usually provide special attention to this group of vulnerable people for bringing them to safer place as early as possible before a disaster. About 90 percent households reported that they paid special attention to take care of the vulnerable group of people both in the family and community (Table 3).

9.6.2 Food store

As the preparedness activities, coastal households store food to face the cyclone-induced emergency. Sixty-One percent households informed that they stored food before cyclone Aila (Table 3). Households stored different types of dry food, for example, puffed rice (*chira/muri*) and boiled sugarcane juice (*gur*) (FGDs). They used various containers e.g. plastic drum, tin-made pot to store these foods (Islam and Wahab, 2017). Coastal households also reduced food intake i.e. the number of meals per day. They ate food twice a day (sometimes only once a day) rather than three times (FGDs, Islam and Walkerden, 2014). Paul and Routray (2010) also found that Bangladeshi flood-affected households reduced their daily number of meals to face the disaster challenges. Cyclone victims also shared food with each other (e.g. between family members, neighbors, and friends) for survival. This study found practicing the norms of reciprocity among the cyclone victims through sharing of food, water, and shelter within the community after a cyclone (FGDs, KIIs). The cyclone victims also stored baby food, as minor baby needs special food to survive. During this time, NGOs helped to provide milk powder, cerelac, semolina (locally called *suji*), etc. for babies (FGDs, KIIs).

9.6.3 Storing water

The households of coastal Bangladesh store drinking water before a cyclone. Majority of households (57%) in the study villages stored drinking water before cyclone Aila (Table 3). Salinity is a major problem in the coastal areas of Bangladesh. The study villages suffered from lack of drinking water because of salinity problem (FGDs). Therefore, coastal households purify water and harvest rainwater. Several initiatives have been implemented by NGOs for safe drinking water in the study villages; for example, PSF (Pond Sand Filter – drinking and cooking water source, in which salinity tastes low) and rainwater harvesting (FGDs). As the part of purifying water, they boiled pond water and used water purification tablets and alum (locally called *fitkari*) to make the drinking water safe. Households collect rainwater during monsoon season through using rooftop catchment and store in the small containers, for example, earthen pots and plastic drums (FGDs, KIIs, Islam, 2015). Khan et al. (2011) found the same findings in their study. Khan and Nahar (2014) found that many disaster-affected households depend on rainwater. Rainwater harvesting was largely practised on an individual basis in the study villages. Some NGOs encouraged the local people to harvest rainwater, but villagers did not have the modern technologies and reservoirs to do so. Consequently, local households expected technical and logistic support from government and NGOs to collect and use rainwater properly (Islam and Wahab, 2017).

9.6.4 Searching alternative livelihoods

Fishing related works are the main earning option for the coastal people. Regular earning activities of coastal households are interrupted (e.g. damage and loss of boat and net) by the impact of cyclone. To face the income vulnerabilities, coastal households usually search for alternative job options. Fifty-eight percent households reported that they searched alternative job options after cyclone Aila (Table 3). Alternative job includes mud cutting as a day labor, catching small fish (such as *Bagdapona*, the fish spawn – juvenile size of shrimp) and pulling a *rikshaw* (a three-wheeled passenger cart) in nearer city areas through short-term migration (Islam, 2015). Coastal households also involve with small business, livestock and horticulture production, wage labor,

collecting fish fry (juvenile fish), etc. as the alternative income activities to cope with cyclone-induced temporary crisis (Siddeqa et al., 2018, Paul, 2013).

9.6.5 Tree plantation

Bangladeshi coastal households usually plant tree around their houses to protect soil erosion and cyclonic wind. Seventy-Four percent household-heads told that they plant tree around their residence (Table 3). The villagers opined that trees can save them from storm and soil erosion. Therefore, they usually plant different trees (e.g. banana, coconut, bamboo, acacia, and palm) beside their residence and near embankments (FGDs). It is evident from another study that many NGOs and other community-based organizations are working in the coastal villages on social forestation specially bamboo and other erosion protective plantation (Islam, 2010b).

Table 3: Households' responsive measure to reduce vulnerability

Responsive measures	**Number**	**Percent**
Building robust housing	40	37
Food store	65	61
Water store	60	57
Providing special attention to vulnerable people	95	89
Saline resilient crop	69	64
Health and sanitation	91	85
Tree plantation	79	74
Moving to safer place	68	64
Environmental sanitization	52	49
Searching alternative job	62	58
Helping each other	61	57

Source: Household survey, 2019. Multiple response. N=107.

9.6.6 Saline resistant crop

Costal villagers use saline resistant crop for sustainable livelihood. Sixty-four percent household claimed that they practise saline resistant crop variety (Table 3). Due to saline water intrusion in the agricultural land, local farmers can grow only one crop per annum. Therefore, a salt-resistant paddy – *BRRI Dhan-47* (Invented by the Bangladesh Rice Research Institute) – has been cropping in the coastal region and the farmers are achieving good yields (FGDs, Islam, 2015). This should be popularized (through NGOs and Upazila Agriculture Offices), and many other alternative varieties need to be adopted.

9.6.7 Helping each other/solidarity

Households' social capital is strong in the coastal villages. Coastal households help each other before, during and after a cyclone. Fifty-Seven percent household-heads told that they helped each other through food, shelter, cash, labor, etc. during cyclone Aila (Table 3). The local people reported that they helped each other before (providing information of warning signal), during (helping neighbors to bring safer shelter), and after (providing food, shelter, money, comfort, mutual help, etc.) cyclone (FGDs). Another study found that after receiving warning signal, the local community members play an important role in saving the lives and properties. After a cyclone, the unaffected local people provide support to the affected people and the fishermen work as a group and share the same net and boat rather fishing separately (Siddeqa et al., 2018).

10. Conclusion

The main aim of the study was to explore the current status of disaster risk reduction education in the coastal villages of Bangladesh. More specifically, the study intended to identify the existing preparedness and mitigation programs of government and NGOs; to explore the ways of disseminating DRR knowledge; to reveal the practice of DRR knowledge; and to find out the possible ways to strengthen DRR education in the coastal areas of Bangladesh.

This study has shown that government and NGOs have taken a good number of disaster risk reduction programs in the coastal villages of Bangladesh. Government programs include disseminate warning signals, raise public awareness with the coordination with other local

agencies. Legal frameworks e.g. policies, plans, acts, and formal education are also important initiatives of government to reduce disaster risk. Other DRR programs are risk assessment, risk and vulnerability mapping, preparedness activities, mitigation activities. Preparedness related programs include disaster drill, building robust housing, store dry food, protect valuable household goods and items, and preserve drinking water. Mitigation includes protect shelter, crop, and fisheries, use of container to collect rainwater, set-up tube-well and pond sand filter, etc.

Government and NGOs used several processes to disseminate these DRR knowledge to the cyclone affected communities who can achieve the DRR knowledge to face upcoming disasters. These processes include training and workshop, group meeting, textbook discussion, print, electronic and social media, faith-based organization like mosque, local government (e.g. Union Parishad), and mobile phone (e.g. text message). Though government and NGOs provide DRR knowledge on preparedness and mitigation in the coastal villages through various ways, people receive DRR knowledge from different sources. Majority of the households of study villages received DRR knowledge from the informal sources like NGOs, local government, informal discussion with family members, neighbors and friends, and voluntary organizations.

People learn many things about preparedness and mitigation through the processes that government and NGOs run at the community level. These learnings include saving necessary household goods and documents, prioritizing the special group of people (e.g. aged, children, disable, pregnant, etc.) before and during disaster, following warning signal and weather report on Radio and TV, keeping essentials for infants (e.g. food, milk, clothing, etc.) before and during disaster. Besides, protecting house during cyclone, building robust housing, planting tree, purification of water, sharing knowledge, etc. are also learning issues from the knowledge sources.

The households of the study villages practised the learned knowledge in various ways in their everyday life. In case of preparedness, most practised knowledge was saving household goods during cyclone. The villagers usually put their necessary documents and items e.g. educational certificates, NID (National Identity Card), land deeds, books, ornaments, money, cropping seeds, matches/lighter, etc. in the plastic bag or in earthen jar. In case of mitigation, the most practised knowledge was protecting house during cyclone. They also planted various types of trees (e.g. banana, coconut, bamboo, acacia, and palm, etc.) beside their residences to save themselves from storm and soil erosion. However, a gap was found between achieved and practised knowledge in regarding health and sanitation, building robust housing, constructing embankment, and sharing

DRR policies and plan with other community people. These gaps are due to lack of technological and financial support, lack of community shelter center, lack of government initiatives to reconstruction of embankment, corruption and favoritism of local government, lack of coordination and conflict between GOs and NGOs, and traditional attitude of local people to follow warning signals.

The findings from this study have several implications. *First*, this study provides evidence of how coastal households achieve DRR knowledge and how they use it to face the upcoming disasters. Therefore, this research contributes to existing knowledge. *Second*, these findings are also useful in a policy context. This study discovered that there is a gap between achieved and practised knowledge, therefore, government and NGOs should take necessary action to formulate policy in this regard. *Third*, the empirical findings can help to generalize the overall conditions of DRR knowledge in coastal villages of Bangladesh, because the natural hazards, households' vulnerabilities, socioeconomic characteristics of the villages are almost similar in this region.

The results of this study indicate that the coastal villagers achieved DRR knowledge mostly from informal networks/sources, for example, NGOs, print and electronic media, social media, family members, neighbors and friends, voluntary organizations e.g. cooperative, clubs, CPP, etc. This study suggests that both GOs and NGOs should work together to strengthen the formal sources of knowledge and formalize the informal sources.

This study suggests that informal knowledge sources should be strengthened and tagged them with the mainstream sources of DRR knowledge. Besides, informal knowledge sources should be institutionalized through the effective intervention of government i.e. informal sources of DRR knowledge should be included in government programs. At the same time, formal sources such as textbook, and formal education should be more focused on DRR issues. This study also argues that participatory-based training, and workshop, role of local government and religious institutions, technological and financial support and bottom-up approach should be increased for strengthening the initiatives of DRR education and its practice at the community level.

The current study has only examined the pre and during disaster DRR knowledge regarding preparedness and mitigation. This study did not focus on DRR knowledge of post-disaster situation regarding response and recovery. Therefore, further research would be conducted to examine DRR knowledge regarding response and recovery aspects.

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Appendices

Appendix – A: Questionnaire for household survey

Number: Study area/village: Date: Signature:

From knowledge to practice: The current status of disaster risk reduction education in coastal Bangladesh

Section 1: Personal information

1. Name of respondent (optional)……
2. Sex
   1) Male
   2) Female
3. Age ……year
4. Occupation
   1) Farmer (own land)
   2) Agriculture labor
   3) Day labor
   4) Fishing (own boat)
   5) Fishing labor
   6) Business/small business
   7) Service
   8) Other (specify).....
5. Education
   1) Primary
   2) Secondary
   3) Higher Secondary
   4) Graduate
   5) Illiterate
   6) Other (specify).....

6. Annual household income: Amount.....Tk.
7. Annual household expenditure: Amount…….Tk.

Section 2: Disaster and vulnerability information

8. Have you been facing any natural disaster last 10 years?
    1) Yes
    2) No
9. If yes, what types of disaster?
    1) Cyclone and storm surges
    2) Flood
    3) Riverbank erosion
    4) Salinity
    5) Other (specify).....

10. What types of damage have you faced due to a disaster?
    1) Housing/shelter
    2) Agriculture/crop
    3) Fisheries/fishing
    4) Health (injury)
    5) Education (building collapse)
    6) Livestock
    7) Poultry
    8) Damage of tress
    9) Emotional breakdown/mental stress
    10) Other (Specify).....

11. What types of vulnerabilities have been created due to a disaster?

Physical	**Socioeconomic**	**Environmental**
1. Roads	1. Health	1. Soil erosion
2. Culverts	2. Education (dropout)	2. Salinity increase/intrusion

3. Embankments	3. Poverty	3. Pollution
4. Water sources	4. Income loss/livelihood	4. Disease outbreaks
5. Communication (telephone)	5. Social inequality	5. Other (specify)
6. Hospitals/clinics	6. Family violence	
7. Trees	7. Other (Specify)	
8. Other (Specify)		

Section 3: Disaster risk reduction information

12. What types DRR education related initiatives available at your community? (put tick)

Initiatives	**GO**	**NGO**
1. Legal frameworks (policies, plans, act)		
2. Risk assessment		
3. Risk and vulnerable mapping		
4. Public awareness		
5. Preparedness activities (disaster drill)		
6. Mitigation activities (structural)		
7. Formal education (textbook)		
8. Other (Specify)		

13. How do GOs and NGOs provide DRR knowledge to the community?

1) Through training
2) Through workshop
3) Through group meeting

4) Through school teacher
5) Through electronic media (Radio, TV)
6) Through print media (Newspaper)
7) Through social media (Facebook)
8) Through faith-based Organization (mosque mike, khutba)
9) Through local government (UP) staff
10) Through mobile phone
11) Other (specify).....

14. How did you know about disaster risk reduction knowledge?
    1) Formal education (from school and textbooks)
    2) Informal education of NGOs (through group meeting, awareness campaign, training)
    3) Local government (UP)
    4) Electronic media (Radio/TV)
    5) Print media (Newspaper)
    6) Social media (Facebook)
    7) Family members (school students, senior citizen)
    8) Neighbors and friends
    9) Voluntary organizations (CPP, cooperative organizations, club, etc.)
    10) Other (specify)…….

15. What did you learn about **preparedness** to reduce disaster risk?
    1) Following warning signal
    2) Moving to shelter center/safer place after getting signal
    3) Storing dry food
    4) Storing safe drinking water
    5) Storing emergency medicine/first aid kit
    6) Putting necessary documents (land deeds, educational certificate, NID) and items (books, gold ornaments, money, seeds, match/lighter, etc.) in plastic bag
    7) Keeping sanitation and hygiene items (soap)
    8) Essentials (baby food, milk, clothing) for infants (newborn baby)
    9) Listening weather report in radio, TV
    10) Tied of women hair and change dress

11) Priority on aged, pregnant women and disable

12) Other (specify)…

16. What did you learn about **mitigation** of disaster risk?

Mitigation knowledge	Source (GO/NGO/family/community)

A. Structural mitigation

1. House roof tie by rope (tana) before cyclone
2. High floor of house
3. Embankment
4. Protect fisheries by embankment and use of net
5. Making strong house
6. Other (specify).....

B. Non-structural mitigation

1. Information/knowledge share
2. Water purification
3. Knowledge of sanitation
4. Other (specify)…..

Section 4: Practice of disaster risk reduction knowledge at the community

17. How do you practice DRR knowledge at the community level?
    1. Water purification
    2. Move to a safer place after getting warning signals
    3. Store dry food
    4. Store drinking water
    5. Save necessary documents and items
    6. Issue of women dress and hair before cyclone

7. Save fisheries
8. Rainwater harvesting
9. Housing/shelter (tie house roof, high floor)
10. Fisheries protection by embankment and net
11. Tree plantation/mangrove forestation
12. Other (specify)…..

Section 4: Recommendations

18. How can DRR education be strengthened in the coastal communities of Bangladesh?
    1) ..... 2) .....
    3) ..... 4) .....

Thank you

Appendix – B: KII and FGD Checklist

Topic- From knowledge to practice: The current status of disaster risk reduction education in coastal Bangladesh

Disaster and vulnerability information

1. What types of natural disaster have you seen last 10 years in your area?
2. What types of vulnerabilities have been created due to a disaster?

   Physical

   Socioeconomic

   Environmental

Disaster risk reduction information

3. What types DRR education related initiatives available at the community level?

   Government

   NGOs
4. How do GOs and NGOs provide DRR knowledge to the community?
5. How does community know about **DRR** knowledge?
6. What does the community learn about **preparedness** to reduce disaster risk?
7. What does the community learn about **mitigation** to reduce disaster risk?

Practice of disaster risk reduction knowledge at the community

8. How does the community practice DRR knowledge at the community level?

Recommendations

9. How can DRR education be strengthened in the coastal areas of Bangladesh?

Thank you