

**ASSESSING THE CYCLONE EARLY WARNING SERVICES OF
WOMEN, CHILDREN AND PERSON WITH DISABILITY: A CASE
STUDY IN NIJHUMDWIP**



A Dissertation for the Degree of Masters in Disaster Management

By

Md.Shahjahan
13168015

Spring 2018

Postgraduate Program on Disaster Management
BRAC University, Dhaka, Bangladesh

**ASSESSING THE CYCLONE EARLY WARNING SERVICES OF
WOMEN, CHILDREN AND PERSON WITH DISABILITY: A CASE
STUDY IN NIJHUMDWIP**

By

Md.Shahjahan

A thesis submitted in partial fulfillment of the requirement for the degree of
Post Graduate Program on Disaster Management

Examination Committee: Professor Dr. A H M Abdul Baqee
Professor Dr. Md. Humayun Kabir
Professor Dr. Md. Mizanur Rahman
Muhammad Ferdaus, Lecturer & Coordinator

Nationality: Bangladeshi
Previous Degree: Masters in Geography and Environment
University of Dhaka

Acknowledgements

First of all, I would like to thank to almighty Allah to give me enough energy and capacity and at least made me enthusiasm to start and finish my whole dissertation. I would also like to express my deepest gratitude and honor to my advisor Professor Dr. Humayun Kabir, Professor, Department of Geography and Environment, University of Dhaka for his supervision, guidance and constructive comments throughout the preparation of this thesis and which help to carry out the research in systematic manner. I would also like to thank PPDM programme Coordinator Muhammad Ferdaus for his relentless support and encouraging me to complete this study. I extend my inner thanks to Professor Shahjahan Mondol who initially helped me to develop this proposal concept and expressed my thanks who has helped me by providing different resources on cyclone early warning and disaster which was really useful in completing this study. I also want to thanks all of our batch mates who have patience and encourage each other for completing the dissertation. I would also extend my inner thanks to Nijhumdwip Union Parishad, Hatiya Upazila Porisad, CPP Dhaka office and CPP volunteer in Nijhumdwip and local people of Nijhumdwip for their concerted effort to make my field work possible. I am indebted to Habib, Red Crescent volunteer who helped me in the field for collection of data being in the field despite of his busy study schedule. I would also like to thank my office colleague hasib who helped me for developing the GIS map. Finally, I am very grateful to my family members who also support me complete this study after busy daily work in the office. At last but not least I am very grateful to my office because they gave me permission to complete Master Degree on Disaster Management under BRAC University.

Abstract

This study was done as a part of the Masters of Disaster Management under BRAC University. Research was conducted in Nijhumdwip assess the cyclone early warning service for the vulnerable groups.

The success of cyclone early warnings depends on appropriate hazard detection, information dissemination, and responses by affected people. In addition to a variety of socioeconomic factors, psychological and cultural factors may also determine the human response to warning.

Women and children are the most vulnerable group in Bangladesh particularly in the hazard-prone coastal areas. Their vulnerability to cyclone hazard has already been widely reported. In Bangladesh, women tend to have more limited access to assets- physical, financial, human, social and natural capital such as land, credit, decision making bodies, agricultural inputs, technology, extension and training services which would all enhance their capacity to adopt. In the coastal areas, the situation remains worst. Nijhumdwip, located at very remote geographic location at the Meghna river estuary and the Bay of Bengal under Hatiaya *Upazila* of Noakhali District, is highly vulnerable to cyclone and a large part of the population is continually suffering for frequent hit of storm and cyclone, specially women and children who cover about 70 percent of the inhabitants. This study assessed the cyclone early warning services of women, children, aged and person with disability at Nijhumdwip.

Both primary and secondary data have been used to fulfill the objectives of the present study. Primary data have been collected through PRA techniques from field by triangulating different data collection methods of household survey, focus group discussion (FGD) and key informant interviews (KII). 100 household surveys, 10 FGDs and 10 KIIs were conducted.

In general, radio broadcasting, word-of-mouth from neighbours and CPP (Cyclone Preparedness Programme) volunteers were the most common sources of information dissemination about cyclone early warning. However, women (79%) find neighbors as most effective medium to know about cyclonic condition. Besides, volunteers from CPP also play important role in this regard. Those who have radio rely mainly on it. After

receiving cyclone warning, the next stage is to understand such a warning in order to take proactive action. Study found that nearly 70 percent of women very poorly interpreted disseminated signals during cyclone. Illiteracy has strong correlation with it where 86 percent of women are illiterate. In the case of children, the scenario is same.

This study reveals that a majority of the respondents is unable to follow & respond to the cyclone warning. As children lack proper knowledge about cyclone and preparedness, they have to depend on their mother to act. About 34 percent of respondents (women) often find it very difficult to manage children, aged persons and commodities to reach shelter in adverse weather.

As outlined above, religious belief, disbelief in cyclone warning, scarcity of safe infrastructure, distance & condition of shelter, socio-economic vulnerability and locational insecurity are the integral causes of inaccessibility of women, children as well as PWD who are striving to survive in the fragile environment. Thus, without having a reliable and responsive warning system, even the existing availability of options remains under-utilized. As early warning is not simply a linear process of information dissemination, the success of a warning depends on the proactive responses of individuals and the community as a whole. Therefore, more effective and timely early warning forecast, dissemination as well as increased interpretation by locals are needed to be ensured. Moreover, awareness building through proper education and also more effective & interactive comprehensive programs in larger scale by CPP integrating more people of Nijhumdwip are absolutely essential.

Chapter 1

Introduction

1.1 Background

Severe cyclones and storm surges are quite common in Bangladesh (Ali 1999; Paul 2009a). Geographic location, the unique natural setting of the country and its tropical monsoon climate modify and regulate the climatic condition and make the country more vulnerable to cyclones and storm surges (Paul and Rahman 2006; Paul 2009a). Several disastrous cyclones have struck Bangladesh: in 1822, 1876, 1961, 1965, 1970, and 1991 (GoB 2008). Earlier studies show that 80–90 % of global losses and 53 % of total cyclone-related deaths worldwide occur in Bangladesh (Ali 1999; GoB 2008; Paul 2009a, b). For example, in 1970 the cyclone-induced total death toll was estimated between 300,000 and 500,000, with 100,000 missing people; estimated damage was about USD 450 million. After the 1991 cyclone, the official death toll was recorded as 140,161 and the total affected population is 10,721,707. Compared to the cyclones in 1970 and 1991, the death toll in Cyclone Sidr occurred in 2007 was relatively small: approximately 3,406 people died and 55,000 were injured, with more than 1,000 missing, and estimated damage of USD 1.6 billion (Ali 1980; Haider et al. 1991; GoB 2008; Rashid 1997)

We live in a society where women and children are the most vulnerable group. During disaster, this vulnerability increases. Because women have less access to resources, they are victims of the gendered division of labor, they are primarily responsible for domestic duties and they do not have the liberty of migrating to look for work following a disaster (Paul 2008).

Although a number of studies have been carried out in Bangladesh looking at different aspects of cyclone and storm surge, a systematic documentation of the causes of human ignorance of cyclone warning, incapability to seek refuge is lacking. Systematic and in-depth studies on access of cyclone early warning of women, children for predicting cyclones in particular virtually do not exist. It is therefore imperative to collect, compile and systematize the diverse range human behavioral responses of women, children even PWD to cyclone early warnings and identifying

how increases Cyclone Early Warning System reduce the risk of Cyclone disaster for women and children.

Despite being poor and vulnerable to a range of natural hazards, Bangladesh has made significant progress in disaster management in recent years (Paul 2009a, b). Studies by Blake (2008), Heath (2007), Hossain et al. (2008), and Shamsuddoha and Chowdhury (2007) confirm that the lower-than-expected death toll and damage caused by Cyclone Sidr in Bangladesh was the result of timely cyclone forecasting and dissemination of warnings, as well as the evacuation of vulnerable people living in cyclone-prone areas. Disaster warning is considered as a linear process of communication between warning-issuing organizations and recipients of the warnings (Sorensen and Sorensen 2006). Irrespective of hazards, the main objective of warning is to reduce disaster impacts through enabling people to take precautionary measures. Therefore, the success of warnings depends on appropriate hazard detection, information dissemination, and responses by affected people (McLuckie 1970; Rogers 1985; Sorensen and Mileti 1987; Quarantelli 1980; Haque 1997). In addition to a variety of socioeconomic factors, psychological and cultural factors may also determine the human response to warning (Drabek 2004; Post et al. 2009). A number of efforts have been made to document such factors during hurricanes (Dow and Cutter 1998), floods (Drabek 2000), and several other disasters (Sorensen 2000). A growing body of literature has recently been developed on human responses to hazard warning at individual and organisational level (Drabek 1986; Lindell and Perry 1992; Mileti and Sorensen 1990; Sorensen 2000; Mileti and Peek 2000), and has used theoretical framework to describe public response to warning messages (Wogalter et al. 1999; Lindell and Perry 2004). However, very little research has been conducted on seeking shelter in response to warnings (Liu et al. 1996; Sorensen 2000).

Apart from modern disaster forecasting, people can understand forthcoming danger by looking at natural signs (Gregg et al. 2006). Coastal inhabitants in Bangladesh can predict impending cyclones by using age-old indigenous knowledge gained from nature and their ancestors through their experiences of recurrent cyclones. Nonetheless, such indigenous knowledge and experiences are not adequately recognized either by the GOs or NGOs; not formalized in policy mechanisms as well. Even coastal communities are not aware of their potential capabilities to face the

challenges of the disasters. Research on understanding the relationship between natural hazard-warning signs and human behavior is relatively scarce (Gregg et al. 2006). A few sporadic attempts have been made to address this issue, such as by documenting local knowledge on cyclone warning (Howell 2003) and ambiguous, seldom specific natural signs that can be used to predict tsunamis (Gregg et al. 2006). In Bangladesh, few studies focused only on measures to adapt climate change induced rise in sea level, coping with cyclone, storm surge and mitigation measures (Paul and Routray 2010b), community responses to multiple coastal hazards (Parvin et al. 2008), dissemination of cyclone forecasting, or adaptive responses, preparedness and management issues (Haque 1995, 1997; Schmuck 2003; Paul and Rahman 2006; Khan 2008).

1.2 Statement of the Research Problem

Although a number of studies have been carried out in Bangladesh looking at different aspects of flood, cyclone and storm surge, a systematic documentation of the causes of human ignorance of cyclone warning, incapability to seek refuge is lacking. Systematic and in-depth studies on access to cyclone early warning of women, children and persons with disability (PWD) for predicting cyclones in particular virtually do not exist. It is therefore imperative to collect, compile and systematize the diverse range human behavioral responses of women, children and PWD to cyclone early warnings and identifying gaps and challenges to ensure their last mile connectivity. This research report also provides some policy measures towards rendering improved the existing access of women, children and PWD to cyclone early warning system through existing CPP dissemination system. The practical significance of these findings may help policymakers, planners and practitioners to advise on interventions for enhancing the effectiveness of current cyclone forecasting systems, with a broader goal of building a disaster-resilient coastal community focusing women, Children and PWD.

1.3 Research Questions:

The answer of following questions will be fulfilled the objectives of the study.

1. What are the existing cyclone early warning systems?
2. What is the access to CEWS for Women, Children and PWD?
 - Do the Women, Children, aged and PWD get the CEW message at the time when the male gets?
 - Is there any delay in getting the messages?
 - Does it create any problem for evacuation?
 - How can it improve?
3. What are the underlying causes of women, children's and PWD for access to CEW system and what measures should be taken to improve their access?

1.4 Objectives of the study

Objectives:

1. This research is to evaluate existing CEWS
2. To find out the limitation of access to CEWS for women, children and PWD through CPP dissemination system.
3. To find out the possible ways of access to CEWS for Women, Children and PWD from the disaster cyclone through CPP dissemination system.

1.5 Importance of the study

Areas in which women are traditionally engaged and which are closely tied to the availability of natural resources (for example food security, domestic energy and water) will be affected particularly by the consequences of climate change (WEDO, 2008) and require greater adaptation. With regard to climate adaptation, it should be noted that women often do not have much say in decisions taken by the family or the community and are therefore unable to diversify cultivation (Rodenberg, 2009). The present study will attempt to know the existing and possible adaptation practices, different types of vulnerabilities of women, children, aged and PWD in the study area and the adaptation measures taken by women to reduce the vulnerability of disaster. What are existing accessing systems is available for women, aged, PWD and children.

1.6 Limitations of the study

Due to time constrain, detailed mapping was not possible which could offer more insight of the problem through location analysis. The study has been done in the one CPP union area which might not be represent of the whole CPP command areas. of the Moreover, it was not possible to consult with all stakeholders from CPP and BDRCS.

1.7 Organizations of the Dissertation

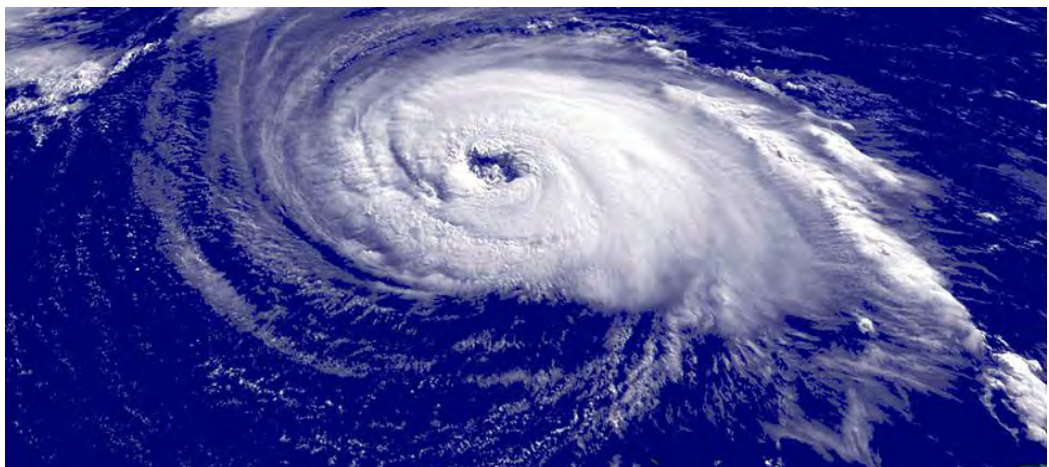
First chapter denotes the aim, objectives and methodology along with conceptual background of this study. Second chapter contains literature review and the mechanism of cyclone early warning dissemination system through existing CPP as well as network. Research methodology is presented in third chapter. Fourth chapter represents result of analysis of the limitations of access of women and children to cyclone early warning signals along with children and brings out the constraints behind this. Final chapter (chapter 5) offers summery findings of the study and also conclusion and recommend some ways to ensure last mile connectivity through existing CPP network followed by references and necessary annex.

Chapter 2

Literature Review and Mechanism of Early Warning Services

2.1 Tropical Cyclone

From Wikipedia, A **tropical cyclone** is a rapidly rotating storm system characterized by a low-pressure center, a closed low-level atmospheric circulation, strong winds, and a spiral arrangement of thunderstorms that produce heavy rain. Depending on its location and strength, a tropical cyclone is referred to by different names, including hurricane, typhoon, tropical storm, cyclonic storm, tropical depression, and simply cyclone. A hurricane is a tropical cyclone that occurs in the Atlantic Ocean and north-eastern Pacific Ocean, and a typhoon occurs in the north-western Pacific Ocean; while in the south Pacific or Indian Ocean, comparable storms are referred to simply as “tropical cyclones” or “severe cyclonic storms”.



2.1 A close-up satellite image of Hurricane Isabel taken on Sept. 15, 2003.

Source: <https://oceanservice.noaa.gov/facts/cyclone1.jpg>

2.2 Early Warning System

The impact of climate change manifested in terms of floods, cyclones or droughts is expected to be severe in the Asia-Pacific region in the coming years. But the coping capacity is weak in most countries and communities. And Early Warning Systems (EWS) can play a crucial role in disaster risk reduction induced by climatic changes. Issuance of an early warning is closely linked to timely communication of such warning to all vulnerable population at risk. One of the lessons learned globally

during recent past is that in spite of the major advances in information and communication technologies in recent times, still large number of vulnerable people do not receive timely warning.

Nearly a million of people have been killed over the last decade in disasters caused by storms, drought, floods etc. While some material losses seem to be unavoidable especially in the case of large and complex disasters, in many cases the loss of life could have been avoided. This was amply evident during the Indian Ocean Tsunami 2004 which killed more than a quarter of millions of people. In many cases such as Cyclone, Flood, Drought etc. elaborate early warning system have been in operation for long but in spite of that our societies continue to suffer huge losses of life and properties damage which emphasize the need of greater scrutiny of such system and identification of gaps to achieve more effectiveness. After the paradigm shift of disaster management research from dominant approach to community based bottom-up approach, people realized to revisit the root causes of disasters. Socioeconomically and politically marginalized people from rural and slums areas are becoming victims of every disaster phenomena in developing countries. These marginalized people are also being neglected from development and disaster management strategy. Though these groups are living with others dominating groups, but the communication level among these groups is tremendously very weak. It is perhaps because of poor social capital among the different groups in our society.

Early warning system, most of the times, ignores the need and knowledge of this weaker section, making the phenomena, sometimes, too technical and technology dependent to communicate easily and timely. Communication is not a function of technology alone; it has to reach all sections of people irrespective of their level of education, understanding etc. However, local knowledge was rarely taken into consideration by policy makers in designing risk reduction strategies and very few institutional mechanisms exist to mainstream traditional coping and adaptation. There are three types of communication process works in our society, i.e., Social Communication, literary communication and technical communication. The community based communication system works among the groups from grassroots levels and connects the local people to disaster management policy makers. The social communication system provides a space to share their existing knowledge to mitigate and reduce the impacts of disaster. The social communication system by the local

people identifies most vulnerable households within the community and existing community resources (Social, human, natural) to provide greater support during pre and post disaster situation. On the other hand, the literary communication among communities leads through social communication system which helps to enhance the capacity of local people to deal with risk. In the same way technical communication will be successful by the existence of social and literary communication.

2.3 Cyclone Early Warning Services in Bangladesh

Bangladesh Meteorological Department (BMD) under the Ministry of Defence plays the key role in generating warning in Bangladesh. Bangladesh Meteorological Department is responsible for generating warning for all hazards, disseminating the warning through public media and different preparedness units and to follow up the warnings at periodic intervals. For dissemination of the warnings BMD uses existing cyclone warning network. The network was established in 1973 as Cyclone Preparedness Programme (CPP) which was developed as a joint venture program of Bangladesh Red Crescent Society (BDRCS) and the Ministry of Food and Disaster Management and the Government of Bangladesh. CPP (Cyclone Preparedness Programme) and BMD (Bangladesh Meteorological Department) mainly work together for disaster warning generation and dissemination of the warning to the root level people in Bangladesh.

2.4 Cyclone preparedness Program (CPP)

Cyclone preparedness Program was developed with a goal to develop and strengthen the disaster preparedness response capacity of coastal communities vulnerable to cyclones, to increase the efficiency of volunteers and officers, and to maintain and strengthen the warning system ensuring effective response in the event of a cyclone. In order to achieve the goal, CPP is involved with number of pre-disaster, during disaster and post-disaster activities.

The following main activities of the program are being implemented to fulfil the objectives of the Cyclone Preparedness program:

1. Disseminate cyclone warning signals issued by the Bangladesh Meteorological department to the community people.
2. Assist people in taking shelter.
3. Rescue distressed people affected by a cyclone.
4. Provide First Aid to the people injured by a cyclone.
5. Assist in relief and rehabilitation operations.
6. Assist in the implementation of the BDRCS Disaster Preparedness Plan.
7. Assist in participatory community capacity build-up activities.
8. Assist in the co-ordination of disaster management and development activities.

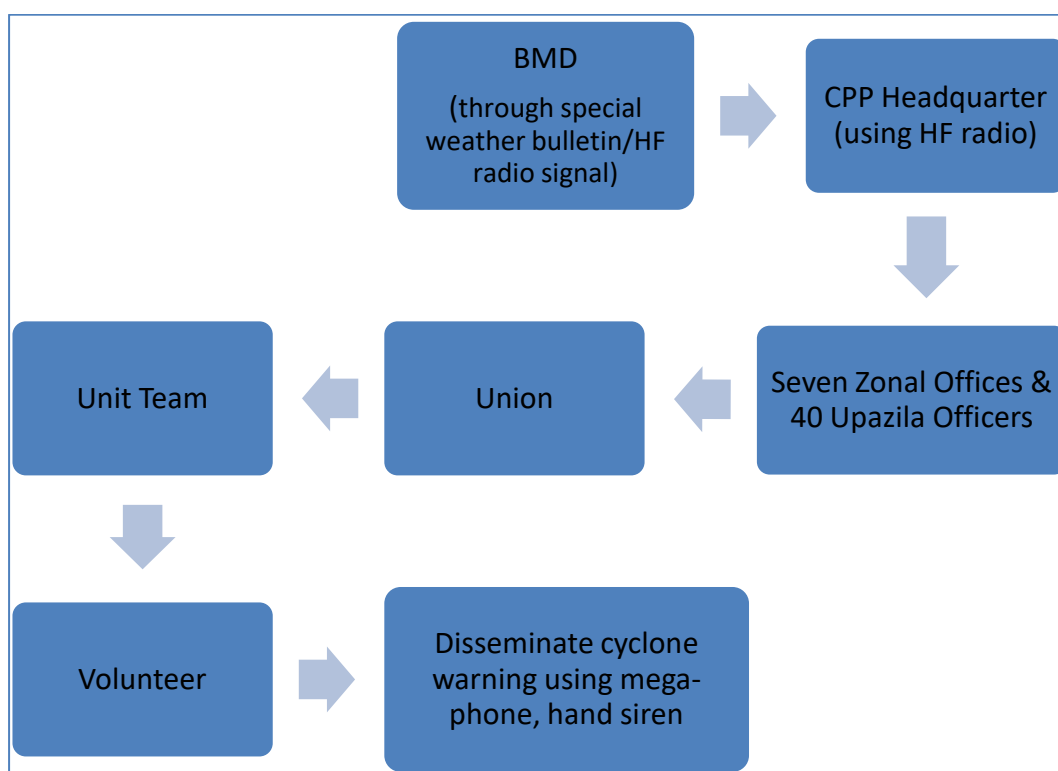


Figure 2.1: Operational method of CPP (Source: A good practice of CPP, published by CPP in 2013)

2.4.1. Warning Equipment

Bangladesh Meteorological Department is primarily responsible for generating warnings for hazards which is disseminated to the vulnerable community through the administrative network of Bangladesh Government along with the infrastructure of the Bangladesh Red Crescent Society where CPP is a project of the BDRCS. BDRCS and the CPP units receive messages of warning from BMD through high frequency satellite radio. The unit Team Leaders of CPP is provided with a transistor radio for receiving the messages. CPP then disseminate the warning signals among the villagers through megaphones, sirens, public address equipment, signal lights etc. Signal flags are also provided to each volunteer's teams where number of flags on a mast indicates the severity of the event.

2.4.2 Volunteers' Gears

To facilitate the Volunteers movement in the adverse weather, they are provided with rain coats, gum boots, hardhats, life jackets and torch lights. Besides these, the first aid and rescue Volunteers are provided with first aid and rescue kits.

2.4.3 Telecommunication Network

The Cyclone Preparedness Programme operates an extensive network of Radio communications facilities, in the coastal areas, linked to its Head Quarter (Head Quarter of BDRCS) at Dhaka. The network consists of a combination of High Frequency and Very High Frequency radios, which covers most of the high risk cyclone areas.

The telecommunication network of the Cyclone Preparedness Programme is composed of three elements as follows:

a) High Frequency (HF) Transceiver Radio:

- With a main base station located at the Dhaka Headquarter
- To transmit information related to the cyclone and the preparedness.

- Field stations send the progress and effects of the cyclone to the headquarter

b) Very High Frequency (VHF) Transceivers:

- To receive and transmit messages from HF field stations to Sub-Stations locate at Union/Islands.

c) Transistor Radio:

- Used by each unit Team leader (3684 teams)
- Receive Meteorological information, cyclone warning signal and special
- Weather transmitted by Radio Bangladesh on regular basis.

CPP operates a total of 142 Radio stations, among those 64 stations are placed in cyclone shelters, built by the BDRCS, in the high risk cyclone prone areas (CPP, BDRCS, 2002). These radio stations are powered by solar panels and also storage battery. 26 stations have both HF and VHF Radio transceivers operating, and 10 stations where only HF Radio transceivers operating. Only VHF Radio transceivers are located and in operation in 106 stations.

2.4.4 BMD Operational Method

Bangladesh Meteorological Department (BMD) monitors hazard around the country round the clock and disseminate warning through the organizational network of Bangladesh Government and BDRCS. Figure shows the BMD's dissemination network. Different institution of Bangladesh government is immediately informed about the disaster. The institutions of the government then participate on the dissemination through its organization network. Figure shows the organizational chart of Bangladesh government that reveals how the warning is disseminated to the local community through the governmental network. Information directly to CPP from BMD also acts parallel.

BMD is responsible for:

- Observing different meteorological parameters both for surface and upper air all over Bangladesh round the clock.

- Preparing and analyzing all weather charts and to make interpretation on the basis of analyses.
- Providing weather forecasts for public, farmers, mariners and aviators on routine basis and also to issue warnings for severe weather phenomena such as tropical cyclones, tornadoes, nor'swesters, heavy rainfall, etc.
- Maintaining surveillance of weather radars for probing impending tropical cyclones, nor's westers and tornadoes.
- exchanging meteorological data, forecasts and warnings to meet national and international requirements
- Receiving round the clock satellite imageries for timely use in operational meteorology.
- Extracting maintain quality control, process, archive and publish climatic data for use of various interested agencies at home and abroad.
- Providing meteorological data, radar echoes and Satellite imageries and weather forecast for flood forecasting and warning centre.
- Monitoring micro seismic events and earthquake round the clock.
- Conducting special studies required for the policy makers and for the development of hydrometeorology and Meteorological sciences in the region.

BMD possess different observational facilities such as 35 First Class Surface Observatories, 10 Pilot Ballon Observatories, 3 Rawinsonde Observatories etc.

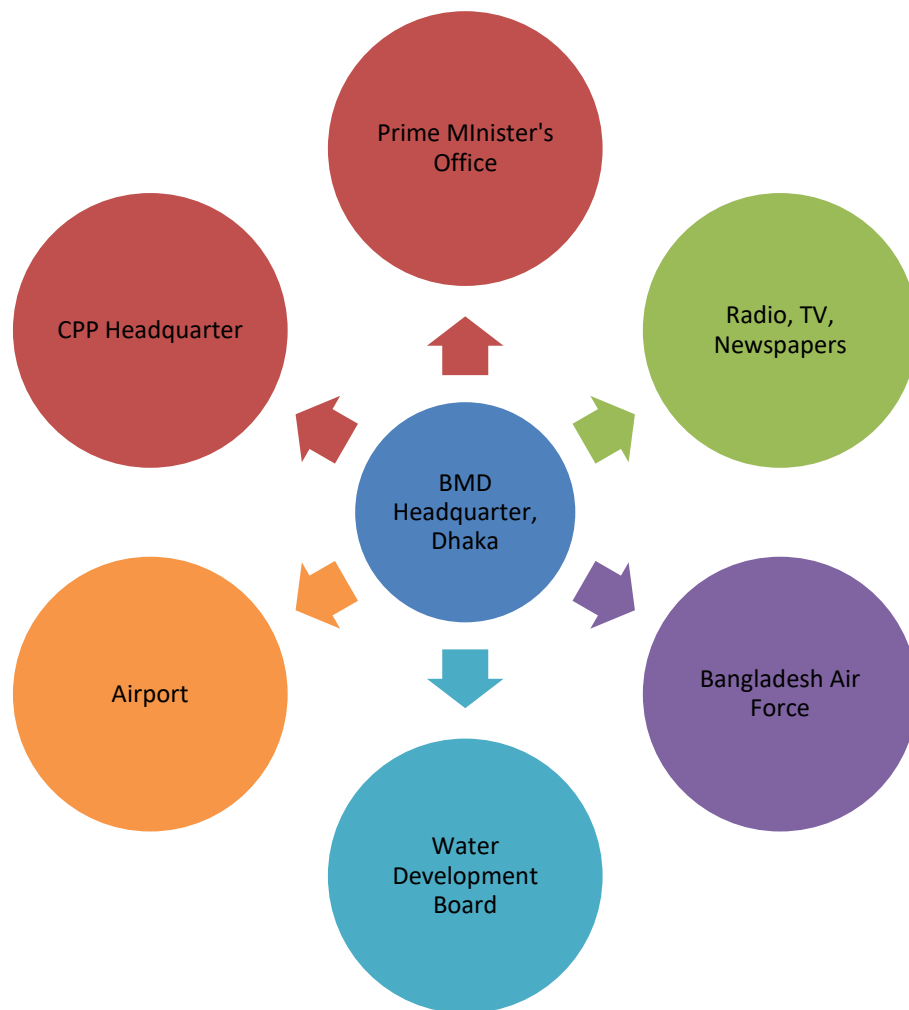


Figure 2.2: BMD's Dissemination Network

2.4.5 Signalling System

Bangladesh Meteorological Department (BMD) is responsible for all kinds of weather forecasting. Cyclone warning system is the only one and well known warning system used in Bangladesh. The signalling system currently used for cyclone warning was inherited from British India which were developed for maritime and river ports of British India. There were 11 numbers of signals for Maritime ports and 4 numbers of signals for river ports to indicate the severity of weather conditions. Table 1 and 2 reveal the meanings of the signal numbers for maritime ports and river ports respectively. However, the meanings of these signals, which were developed for port system, have been ambiguous to the local community.

Signals	Meaning
1. Distant Cautionary Signal No.1	There is a region of Squally weather in the distant sea where a storm may form
2. Distant Warning Signal No.2	A storm has formed in the Distant area
3. Local Cautionary Signal No. 3	The port is threatened by squally weather
4. Local warning Signal No. 4	The port is threatened by a storm but it doesn't appear that the danger is as yet sufficiently great to justify extreme precautionary measures
5. Danger Signal No. 5	The port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the south of Chittagong or Cox Bazaar and to the east of the port of Mongla port.
6. Danger Signal No. 6	The port will experience severe weather from a storm of slight or moderate intensity that is expected to cross the coast to the north of the port of Chittagong or Cox Bazaar and to the west of the port of Mongla
7. Danger Signal 7	The port will experience severe weather from a storm of light or moderate intensity that is expected to cross over or near the port.
8.Great Danger Signal No.8	The port will experience severe weather from a storm of great intensity that is expected to cross the coast to the south of the port of Chittagong or Cox Bazar and to the east of the port of Mongla.
9.Great Danger Signal No.9	The port will experience severe weather from a storm of great intensity that is expected to cross the coast to the north of the port of Chittagong or Cox Bazar and to the west of the port of Mongla
10. Great Danger Signal No.10	The port will experience severe weather from a storm of great intensity that is expected to cross over or near the port.

Table 2.1: Warning System for Maritime ports (BMD) (Source: Dhar, 2008)

Signals	Meaning
1. Cautionary Signal No. 1	The Area is threatened by squally winds of transient nature.
2. Warning Signal No. 2	A storm is likely to strike the area (Vessels of 65 feet and under in length are to seek shelter immediately)
3. Danger Signal No. 3	A storm will strike the area (all vessel will seek shelter immediately)
4.Great Danger Signal No.4	A violent storm will soon strike the area (all vessels will take shelter immediately)

Table 2.2: Warning system for river ports (BMD) (Source: Dhar, 2008)

CPP has simplified the signalling system through introducing flagging system corresponding to maritime signals. Three flags have been developed to represent the whole range of Maritime Port Signalling System of British India. Meanings of first flag correspond to signal numbers 1 to 3, second flag corresponds to signal number 4 to 7 and the third flag correspond to signal numbers 8 to 11 of Maritime Port signals. While understanding of the meanings of these flags still remain questionable, increase in the number of flag on a mast generally indicates a greater severity of the cyclone event to the local community.

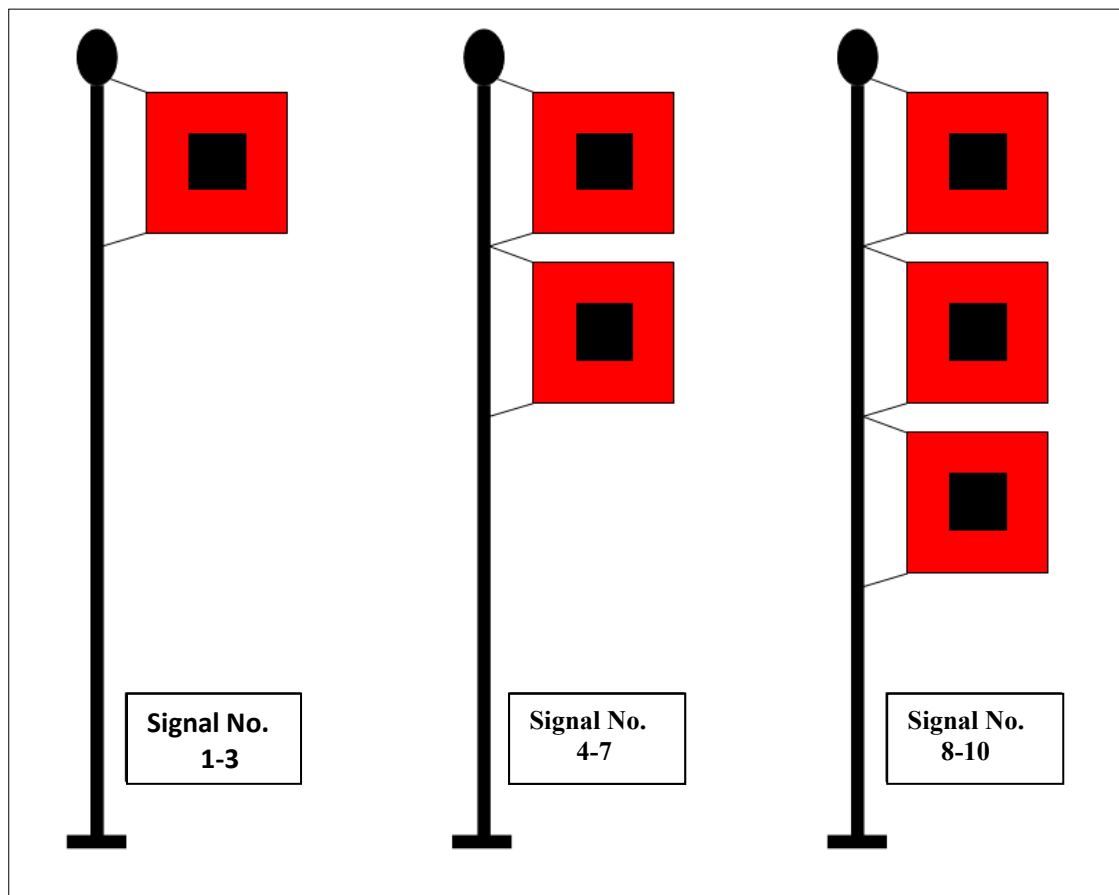


Figure 2.3 Shows flag numbers and corresponding maritime port signals. (Source: A good practice of CPP, Published by CPP in 2013)

2.5 Past reference of Cyclone Early Warning Service for vulnerable groups

Harun-AL-Rashid, (1997) described the Cyclone Preparedness program and how its work by the collaboration with the government of Bangladesh and different components of CPP. Here was not explaining or described the access of Cyclone Early Warning Systems for Women and Children. The writer did not describe the quality and dissemination process of CPP. So, in this regards it is essential to find out the accessibility of Cyclone Early Warning Systems especially for women and children even the remote community people who live in the coastal areas.

Haque et al (2012), explained different measures which had good impacts for declined cyclone-related mortality in Bangladesh by more than 100-fold over the past 40 years, from 500 000 deaths in 1970 to 4234 in 2007. In this report mentioned the main factors responsible for these reduced fatalities and injuries are improved defensive measures, including early warning systems, cyclone shelters, evacuation plans, coastal embankments, reforestation schemes and increased awareness and communication. Although warning systems have been improved, evacuation before a cyclone remains a challenge, with major problems caused by illiteracy, lack of awareness and poor communication. This paper summarizes the most recent data and outlines the strategy adopted in Bangladesh. It offers guidance on how similar strategies can be adopted by other countries vulnerable to tropical storms. Further research is needed to enable countries to limit the risks that cyclones present to public health. In this research report the writer describes that after the implementation of CPP program, in Bangladesh number of death cause by Cyclone have been reduced dramatically. There is a shortage in this research report to describe the access of Cyclone Early Warning Systems for Women and Children. So, it should needs further research how access of Cyclone Early Warning System Reduced the death rate of Women and Children by the impacts of Cyclone.

Miyan, (2006) described that The country faces grave poverty conditions, which are accentuated by natural calamities like cyclone, flood, storm surge etc. The country has been subjected to frequent natural disasters in many forms, particularly cyclonic storms and storm surges. From 1797 to 1998, 67 major cyclone storms and storm surges have been reported. These indicate that Bangladesh is prone to frequent

destructive tropical cyclones associated with storm surge, particularly in pre-monsoon months of April-May and post-monsoon months of October-November. The low-lying coastal areas are particularly vulnerable, thus placing these population, infrastructure, agriculture, livestock and economic development in a high-risk situation. Cyclone disaster mitigation is a major concern in Bangladesh. Especially here the researcher explains different types of disaster in Bangladesh and then focus on Cyclone and Storm surges in the southern areas (coastal areas) of Bangladesh. Different sectors which effected by Cyclonic Disasters. The causes of Cyclone in Bangladesh and probable mitigations measures have been taken by the Government of Bangladesh for reducing the losses of lives and livelihoods from the effects of Cyclone and storm surges. There was a lack in this research to describe the effectiveness of Cyclone Preparedness program and the increases of Cyclone Early Warning System reduced the death toll day by day. So, it is important to find out how access of Cyclone Early Warning System reduces the death toll in regards women and children.

Anderson (2000) explained that the special exposure of women and children to munities differ significantly in their degree of vulnerability due to disasters. It examines what the exposure means from ability to natural disasters. This is also true of groups a policy and programmatic standpoint. Only relatively within any particular country or community. There is, recently have researchers turned their attention to the then, significant inequality in disaster vulnerability even impact of gender and age on disaster vulnerability when the physical dimensions of particular threats are harassment and pressurized migration. Developing need for more systematic research on this important countries are the most vulnerable to natural hazards topic. New knowledge from additional research would because they have less financial and other requisite advance sound on disaster management and develop- resources, such as knowledge, institutional arrangement policy.

Developments, and technology, to counteract them. Finally, within both developing and industrialized societies, the most vulnerable are the poor, particularly poor women Vulnerability of Women and Children .In developing countries disasters seriously deplete scarce resources, causing these countries to slide deeper Research suggests that in general women and children into poverty When disaster strikes,

development plans are at greater risk to natural disasters than men, especial are set aside, and vital resources, from both internal specially in developing countries .

One sources and external donors are redirected to meet important explanation for this is social inequality. Emergency recovery and reconstruction needs. Thus, Women and children comprise a larger portion of the if sustainable social and economic development goals poor in developing countries, even in many developed are to remain within reach, effective disaster manage countries, such as the United States. Thus, women and children is imperative in at-risk, low-income countries. Children have less capacity to take effective preventive. The writer also explain here that the Women are more vulnerable during disasters because they have less access to resources, are victims of the gendered division of labour, and they are the primary caregivers to children, the elderly and the disabled.

Women and Children are the most vulnerable by the impacts of disaster due to their involvement in the daily activities at house level. Compare to the women and children to developing and least countries with develop countries, the women and children are the most vulnerable in the least develop and developing countries because most of the women in the developing and least developing is suffering by poverty. As a result most of the times the women and children are engage with livelihood activities and most of the tome time they are working in the risk zone and working with risk elements. Due poverty in the developing and least developing countries most of the families involve their children with child labour for income generating activities. In this research the researcher mainly focus on Women and Children vulnerabilities but not discussed the accesses of women and children in the early warning systems of disaster especially on Cyclone.

Paul, et al (August 20, 2008) described response to and effectiveness of early warning systems, which have been in existence in this South Asian country for more than three decades, has not been systematically investigated since the cyclone of 1991. He mentioned that Cyclone warning systems are an obvious precautionary measure, but mere existence of these warning systems themselves is not a sufficient criterion for reducing risk; there also needs to be general compliance with such warnings. This

study seeks to capture empirical data and personal accounts of Sidr victims who complied with evacuation mandates, as well as those who did not comply, in four coastal districts of Bangladesh severely impacted by the November 15, 2007 cyclone (GOB 2008). Author tried to find out 1. The communication channels utilized by public agencies to disseminate cyclone warning messages to Sidr victims, and determine how effective they were, 2. Explored the extent of compliance with evacuation orders, and also 3. Investigated the factors which would explain why Sidr victims did or did not comply with evacuation orders.

This research report did not provide useful information to help public authorities administer emergency management personnel. He focused on conceptual considerations of hazard warnings and evacuation mandates and provided essential background information about emergency response and preparedness.

Shitangsu Kumar Paul and Jayant K. Routray explores the causes of non-response to cyclone warning and unwillingness to seek refuge and identifies natural methods for predicting cyclones and storm surge through local knowledge, which could be integrated into a modern cyclone forecasting system in coastal Bangladesh. Despite significant progress in cyclone forecasting in Bangladesh, still it lacks in clear communication of warning information to people at risk at the local level, and also in terms of accuracy in the prediction of landfall timing as well as intensity factor. The study reveals that coastal inhabitants are frequently familiar with cyclones and aware of the potential risks; however, they do not respond to cyclone warnings proactively because of poor road networks, long distances between home and cyclone shelters, low capacity of cyclone shelters, fear of burglary and stealing of household assets and goods, disbelief and misinterpretation of warning information, etc. There is also a higher degree of fatalism among the people. There are other reasons why people do not respond to official warnings, such as poor understanding of cyclone warnings, past experience of the failure of warnings, no or limited income-earning opportunities during and after the cyclone if people decide to evacuate, pressure from employers to go fishing, etc. This study also explores the fact that coastal inhabitants can predict the onset of cyclones based on local indigenous knowledge gained through everyday life on the coast. This method of indigenous cyclone prediction is based on a

combination of different factors, such as unusual animal behaviour, water and weather conditions, etc. The present study advocates building awareness of proactive responses to official cyclone early warnings while integrating local knowledge systems in order to improve the proactive response rate and establish reliable forecasting that would help in disaster mitigation and lessen the emergency management activities.

Bishawjit Mallick et al , (December 2009), find out to Social vulnerability to disasters refers to the inability of a society and its people to withstand adverse impacts from multiple stresses to which they are exposed. Using a combination of geographical and social research methods, this paper examines the people's (re)action and responses during cyclone Sidr 2007 at Baniasanta union of Dacope Upazila in Bangladesh. Finding shows that their adopted strategies to cope with cyclone address their vulnerability and it is necessary to integrate their local wisdom of living with unnatural situation into the future planning and development process of the coastal belt. Accordingly, the plans and development should not only be necessity, but also be accepted by the local community.

“Determinants of evacuation response to cyclone warning in coastal areas of Bangladesh: A comparative study, *Oriental Geographer*, Vol. 55, No. 01 & 02 2011 (Published in January 2014)” In this paper the writer try to identified the causes of people's noncompliance with evacuation initiatives during cyclone sidr and comparing with previous other studies to find out common responsible factors for non-evacuation. In the study the writer found that more than 90 percent of respondents had received cyclone warning and nearly 41 percent had evacuated in formal and informal cyclone shelters. 13.6 percent had formally evacuated to the designated cyclone shelters. Even though Bangladesh has made significant progress in cyclone warning dissemination, there still some critical deficiencies in evacuation response. Reasons are broadly cyclone shelter related, warning message related and respondent's perception related. Besides, several factors such as location, age, gender, education, primary occupation, distance from cyclone shelter and access to road and cyclone shelter play vital roles for evacuation decisions.

Shakil Akther et al. in the report “Cyclone wind hazard assessment in coastal regions of Bangladesh” described that one of the most dangerous cyclone basins of the world is located in the Bay of Bengal and the population most affected lives in coastal areas in Bangladesh. Bangladesh often suffers from many climate induced disasters such as flood, drought, cyclone etc among which the cyclone is the most catastrophic one. The coastal morphology of Bangladesh influences the impact of cyclone hazards on the area. Especially in the south western area, cyclone hazards increase the vulnerability of the coastal dwellers and slow down the process of social and economic development. This includes districts like Chittagong, Noakhali, Patuakhali, Barisal, and Khulna where the cyclones strike most in Bangladesh.

Cyclones continue to pose a dangerous threat to the coastal populations of Bangladesh, despite improvements in disaster control procedures. After 138,000 persons died in the April 1991 cyclone, a rapid epidemiological assessment was carried out to determine factors associated with cyclone-related mortality and to identify prevention strategies. Wind hazard assessment of the cyclones that make landfall in the coastal regions of Bangladesh is of great significance. To understand the land falling tropical cyclones of Bangladesh and the associated risk and vulnerability in coastal areas is also important and accurate results and probability of hazard assessment can be done through the application of GIS in the wind speed analysis of cyclones for the purpose. It is hoped that this study will contribute to taking proper disaster planning efforts in Bangladesh especially in the mitigation phase for the reduction of damage from the cyclone hazard. Future cyclone-associated mortality in Bangladesh could be prevented by more effective warnings leading to an earlier response, better access to designated cyclone shelters, and improved preparedness in high-risk communities.

Bern et al. studied cyclones continue to pose a dangerous threat to the coastal populations of Bangladesh, despite improvements in disaster control procedures. After 138 000 persons died in the April 1991 cyclone, we carried out a rapid epidemiological assessment to determine factors associated with cyclone-related mortality and to identify prevention strategies. A nonrandom survey of 45 housing clusters comprising 1123 persons showed that mortality was greatest among under-

10-year-olds (26%) and women older than 40 years (31%). Nearly 22% of persons who did not reach a concrete or brick structure died, whereas all persons who sought refuge in such structures survived. Future cyclone-associated mortality in Bangladesh could be prevented by more effective warnings leading to an earlier response, better access to designated cyclone shelters, and improved preparedness in high-risk communities. In particular, deaths among women and under-10 year-olds could be reduced by ensuring that they are given special attention by families, neighbours, local authorities, and especially those in charge of early warnings and emergency evacuation.

IUCN showed “Disaster and gender statistics”, where Neumayer and Plümper analyzed disasters in 141 countries and found that, when it came to deaths, gender differences were directly linked to women’s economic and social rights; in societies where women and men enjoyed equal rights, disasters caused the same number of deaths in both sexes. They also confirmed that discrepancies were the result of existing inequalities. For example, boys were given preferential treatment during rescue efforts and, following disasters, both women and girls suffered more from shortages of food and economic resources (Neumayer and Plümper, 2007). Studies showed that women, boys and girls are 14 times more likely than men to die during a disaster (Peterson, 2007). In 1991, during the cyclone disasters in Bangladesh, of the 140,000 people who died, 90% were women (Ikeda, 1995).

In industrialized countries, more women than men died during the heat wave that affected Europe in 2003. In France most deaths were among elderly women (Pirard et al., 2005). During the emergency caused by hurricane Katrina in the United States, most of the victims trapped in New Orleans were Afro-American women with their children, the poorest demographic group in that part of the country (Gault et al., 2005; Williams et al., 2006). In Sri Lanka, it was easier for men to survive during the tsunami because knowing how to swim and climb trees is mainly taught to boys. This social prejudice means that girls and women in Sri Lanka have very few possibilities of surviving in future disasters (Oxfam, 2005). Following a disaster, it is more likely that women will be victims of domestic and sexual violence; they even avoid using shelters for fear of being sexually assaulted (Davis et al., 2005). Nutritional condition

determines the capacity to deal with disasters (Cannon, 2002). Women are more likely to suffer from malnutrition because they have specific nutritional needs when they are pregnant or breast feeding, and some cultures have food hierarchies. For example, in south and south-east Asia, 45–60% of women of reproductive age are below their normal weight and 80% of pregnant women have iron deficiencies. In sub-Saharan Africa women lift much heavier loads than men but consume fewer calories because the culture rules that men receive more food (FAO, 2000).

In some cases, gender differences also increase men's mortality in disaster situations. Many men are exposed to risky situations and even die because they believe that by being the "stronger sex" they need not take precautions and because society expects them to take heroic rescue action. For example, there were more immediate deaths among men when hurricane Mitch struck Central America, not only because they were engaged in open-air activities, but because they took fewer precautions when facing risks (Bradshaw, 2004). In Kenya, fetching water may use up to 85% of a woman's daily energy intake; in times of drought a greater work load is placed on women's shoulders, some spend up to eight hours a day in search of water (Duncan, 2007). Extreme weather events often create conditions conducive to outbreaks of infectious diseases; heavy rains produce insect breeding grounds, and contaminate clean water sources while drought on the other hand can cause fungal spores and spark fires. Women, especially expectant mothers, are highly vulnerable to water-borne diseases, thermal and other extreme events. In refugee camps that arise as a result of natural disasters and conflicts over scarce resources, women and the girl child refugees are exposed to higher risks compared to male refugees. Social strains in such situations aggravate stress levels in the family, which may result in incidences of domestic violence.

Georgina Cooper (July 2007) described women most at risk in Bangladesh disasters. Women are severely marginalised all over Bangladesh, but the problem is magnified in coastal areas where life is more conservative and women are fairly house-bound and don't mix with men outside the family. Men are the heads of the families and take responsibility in community matters but this leaves women disempowered and extremely vulnerable. Women usually have to get their husband's approval to leave

the home and there are stories of women staying indoors even as a cyclone approached simply because their husbands were not around to grant permission. Rather than fleeing to the nearest shelter, the women feared they would be blamed if their home was looted. What astonished me was that cultural practices like these lead to a whole section of society being forgotten - particularly worrying against the backdrop of global warming. Cyclones are already common and earlier this year the Intergovernmental Panel on Climate Change predicted that tropical cyclones are likely to become more frequent as climate change accelerates. To save themselves and their livelihoods, people need simple and practical tips on how to cope when a cyclone hits, and it is the communities who need to spread this information themselves.

Chapter 3

Research Methodology and Data Sources

3. Research Method

The techniques and tools employed to complete the research are based on both secondary and primary sources which are discussed in details in the following.

3.1 Study Areas

Nijhumdwip is the study area of this study. Nijhumdwip, one of the off-shore islands in Bangladesh is located between $90^{\circ}58'26''$ E & $91^{\circ}02'54''$ E and $22^{\circ}05'58''$ N & $22^{\circ}0'56''$ N under Hatiya Upazila in Noakhali District. This study area is selected considering its very remote geographic location at Meghna river estuary and Bay of Bengal that is highly vulnerable to cyclone, number of population at risk and continuous sufferings of them for frequent hit of storm and cyclone.

In the year 2009, this island is declared as a Union consists of nine wards under Hatiya Upazila. The island began to form in the 1950s, and during the 1970s and 1980s the higher parts of the island silted up to about the mean high water (MHW) line (+2.2 m public works datum) (MES 1998). At present, the total area of the island is 4,057 ha (SA Nur, CDSP III, pers. com.). The soils of Nijhumdwip are mainly underdeveloped with some slightly developed Meghna alluvial deposits. The surface soil is primarily medium textured silt loam and generally poor in organic matter (MES 1998). Human settlement began on the island early 1970s. Most of the early settlers migrated from adjacent Hatiya Island to escape problems of river erosion (RDC 2000). At present 4200 households and 27350 population live on the island (source: Nijhumdwip Union Office, 2018) and are mainly dependent on fishing, agriculture and forestry for their livelihood (RDC 2000).

Forestry is a major land use (68% of the area is covered) of the island. The Forest Department started planting mangroves in 1973 with *S. apetala* (about 80%) and *A. officinalis* (15%). Thinning operations were carried out in these plantations from 1988 to 1990 in all areas where the trees were older than 9 years. However, thinning has been discontinued after 1991 due to cyclone damage, its high cost and relatively low

returns of the procedure. Following this, very little management and silviculture activities were undertaken such that the trees have remained in close spacing, but protected and left to grow. Currently, many of the *Sonneratia* trees have become infested with stem borer, killing the trees and creating open spots inside the plantation areas (MES 1998). The ecosystem is biologically very diverse. Through a transect analysis Rosario (1997) estimated that the island contains 68 plant and 66 animal species. The island is at the crossroad of two international flyways, viz. the East-Asia Australasian Flyways and Central Asian Flyways and is the southern-most staging ground of around 60 species of migratory birds. The site supports globally critically endangered species such as the Indian Skimmer (*Rynchops albicollis*), Spoon-billed and piper (*Eurynorhynchus pygmeus*), Nordmann's Greenshank (*Tringa guttifer*), and Asian Dowitcher (*Limnodromus semipalmatus*) by providing their wintering ground.

To further enhance the biodiversity three pairs of spotted deer (*Axis axis*) were released on the island in 1980. The number of deer has increased to 14,400 at present (estimated in 2006; BFD 2006). Subsequent introductions have included several pairs of monkeys (*Macaca mulatta*), snakes (*Python molurus*) and one pair of Leopard cat (*Felis bengalensis*). As a formal recognition of the biodiversity value, part of the island and adjacent newly accreted lands were declared as a National Park in 2001 under the Bangladesh Wildlife (Preservation) Order 1973. Peoples' entrances in the forest, hunting, killing or capturing any wild animal and damaging or destroying, any plant or tree have been banned (PDO-ICZMP 2004).

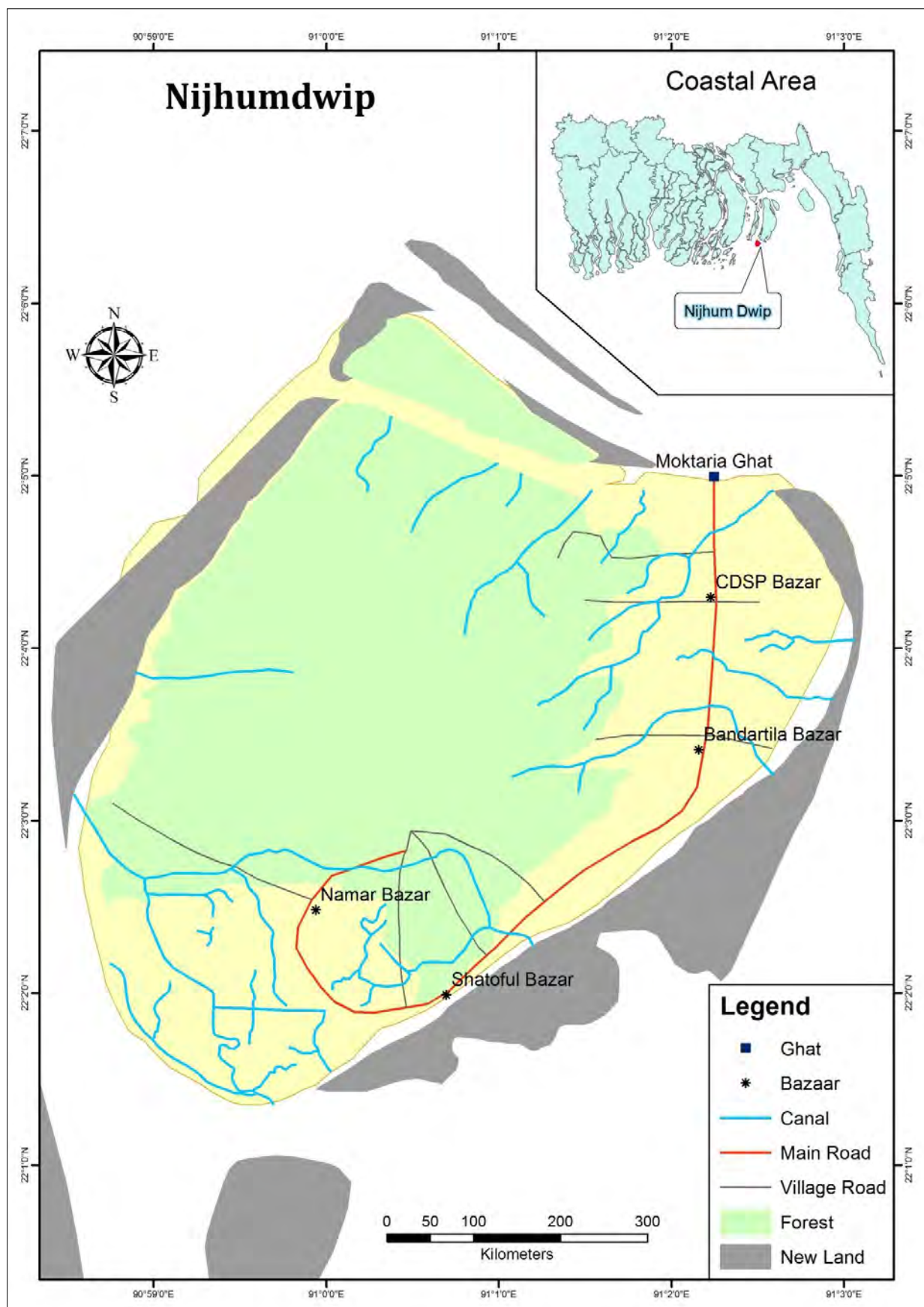


Figure 3.1: Study area

3.2 Literature Review

Literature review included reviewing secondary documents most of which are publications from NGOs along with articles and journals from websites. The publications collected focuses on the intervention of pond sand filters in storm surge areas, functioning of PSF, and general drawbacks in using the technology. The journals in the internet were found from different WebPages such as Google, Ask and Yahoo that referred to links to websites of journals related to Cyclone Early Warning Systems and tropical cyclone options.

The research methods in case of literature review were thus:

- i. Reviewing secondary documents (Publications, web, newspaper, etc)
- ii. Listing down and grouping all possible indicators in order to investigate
Cyclone
Early warning system in Nijhumdwip, management and disaster resilience
- iii. Developing questionnaire based on background information and conducting
Assessment of technology based on sustainability indicators

3.3 Data Sources

Both primary and secondary data are used to fulfill the objectives of this study. Primary data are collected through different PRA techniques from field e.g; FGDs, KIIs, questionnaires for house hold surveys' and direct observation. Secondary data and information are collected from the respective institutions (for example- BBS, Department of Disaster Management, Bangladesh Red Crescent Society, Hatiya Upazila office, LGED), Cyclone Preparedness programme. Alongside, peer reviewed journal papers in the field of disaster management, climate change induced vulnerability, relevant books, research reports, Masters /MPhil/PhD theses etc and different web link are consulted as well.

3.4 Data Collection

Collection of Primary Data

A field visit will be carried out to Cyclone prone and CPP intervention areas selecting most of the Cyclone affected Nijhumdwip areas as a case study in Hatiya, Noakhali district to interview and discuss with target groups such as CPP volunteer to understand the functioning of the access of Cyclone early warning and limitation cyclone early warning. Key informants from different local governmental, CPP volunteers, school teacher, Union Chairman and non governmental institutions will be interviewed to compile their experience on the intervention CPP areas in coastal areas to decide on the recommendations.

The research methods in case of primary sources will be:

- i. Collecting and compiling expert's opinion about the possible indicators to investigate suitability of CPP in the aspect of disseminating Cyclone early warning and disaster resilience
- ii. Discussion with local and international NGOs & GOs about their experience on the intervention of Cyclone early warning and suggestions on sustainability of cyclone early warning system.
- iii. Conducting field visit to a Nijhumdwip most post affected regions in the coastal area
 - a. Interviewing/ Discussion with local community/ CPP volunteers and beneficiaries of Cyclone Early warning Systems.
 - b. Discussion with Elites, local NGOs & GOs about the intervention, management and limitation of CPP and suggestions for using the Cyclone early warning for reducing Cyclone impacts in the coastal areas.



Photos3.1: a) FGD with women; b) FGD with men; c) FGD with school children; d) KII with fisherman;
e) KII with Primary school teacher f) KII with CPP volunteer

This primary data are collected by triangulation of different data collection techniques of household survey, focus group discussion (FGD), key informant interview (KII) and direct observation. As Nijhumdwip is a small island with homogenous characteristics in terms of livelihood pattern, civic facilities and environmental conditions; 5 FGDs and 10 KIIs were conducted using semi-structured questionnaire (see annex 1 annex 2 and annex 3). Aged women, School teacher, CPP team leader and key person were chosen as respondent in KII. On the other hand, FGD groups consisted of both male, female participant and children as a participant. Both informal contact and cold-calling approaches were utilized to reach participants for FGD.

3.5 Research Strategy:

The study was mostly qualitative, based mostly on the field findings and literature review. Due to time constraint only Nijhumdwip where one CPP unit is exut could be studied on the basis of sustainability indicators as qualitative assessment was made. Quantitative analysis could be considered in case of further study of broader CPP intervention areas with larger sample size.

3.6 Sampling Techniques

Both probability and non-probability sampling techniques are used in this research. Households were selected through clustered sampling technique. Household was selected ward wise. There were total 4200 households and 27350 population in (source: Nijhumdwip Union office, 2015) in 9 wards. According to the proportion of the number of household in different wards, number of sample household was selected. Among individual ward, household sampling were taken systematically (every 40th household) where first one was chosen randomly. In the case of FGD groups, a single FGD was conducted from each ward. And, one FGD was conducted at Namar bazaar which is the biggest bazaar of the union and one FGD was conducted at Shataful Secondary School and one with Shataful Primary School students and two was conducted at two Cyclone shelter with female and children. Bazar area is considered as important because all kinds of information disseminate from bazaar area first.

3.7 Data Analysis and presentation

Data is analysed and presented using MS Office 2007 package, SPSS 19 version and the map which shows location of market area (bazaar), road network, forest coverage & existing canals of the study area; is prepared using ArcGIS 10 software. Photographs were taken using Sony DSC-W120 digital camera and presented in this report without any kind of manipulation.

3.8 Quality Consideration

In terms quality consideration, a number of factors were looked into in order to maintain the quality of the study. The sample size of interviewee in all selected locations was maintained. Women & adolescents (users) chosen for interview in the field were of similar age range. Research methods and interview questions were prepared using the paper reviewed. Finally, the author had personally carried out the study in the field.

3.9 Introduction to Chapters

First chapter denotes the aim, objectives, Second chapter denote literature review, third chapter denote methodology along with conceptual background of this study. Forth chapter denote analysis of Assessing to Cyclone Early Warning of Vulnerable Groups where represents the limitations of access of women and children to cyclone early warning signals along with children and brings out the constraints behind this. Final chapter (chapter 5) offers summery findings of the study and also recommend some ways to ensure cyclone early warning increase up to women groups.

Chapter 4

Demography and Socio-economic Aspect

Demographic condition of a community directs its culture, norms and behavior. Understanding the demography, offers a great insight of the psychological and social aspect of the community that direct their decision making process. Nijhumdwip, the study area consists of 4004 households.

4.1 Age Sex Pyramid

Age-sex pyramid represent a scenario of underdeveloped society because of its dome shape. It means there is significant portion of population is dependent. It is also observed that most of the women are aged below 30 years. About 40 percent of the population is under 15 years old and proportion of male and female are almost same. As the target population of this study is women and children, it covers about 70 percent of the population of Nijhumdwip.

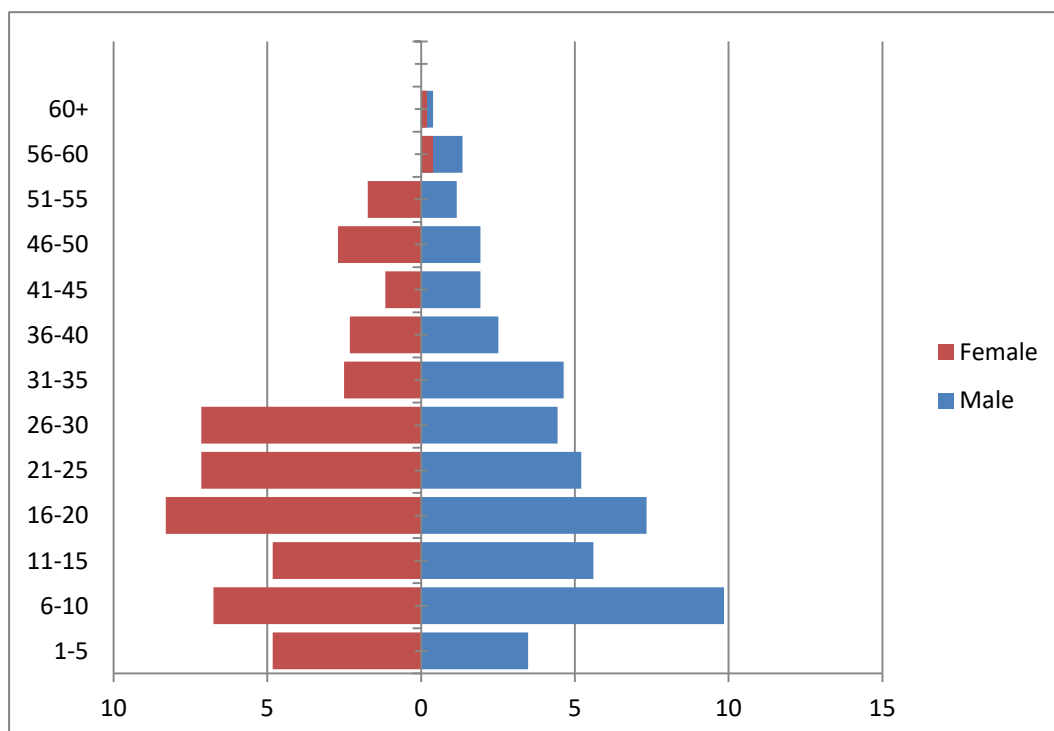


Figure 4.1: Age-sex composition;

Source: Household Survey, 2015

4.2 Male Female Ratio

In Bangladesh, sex ratio is 100.3 (BBS, 2011a) where as the ratio is 98 in Nijhumdwip (BBS, 2011b). That means, more than half of the inhabitants of this island are women. As a result, more women are having exposure to cyclonic hazard.

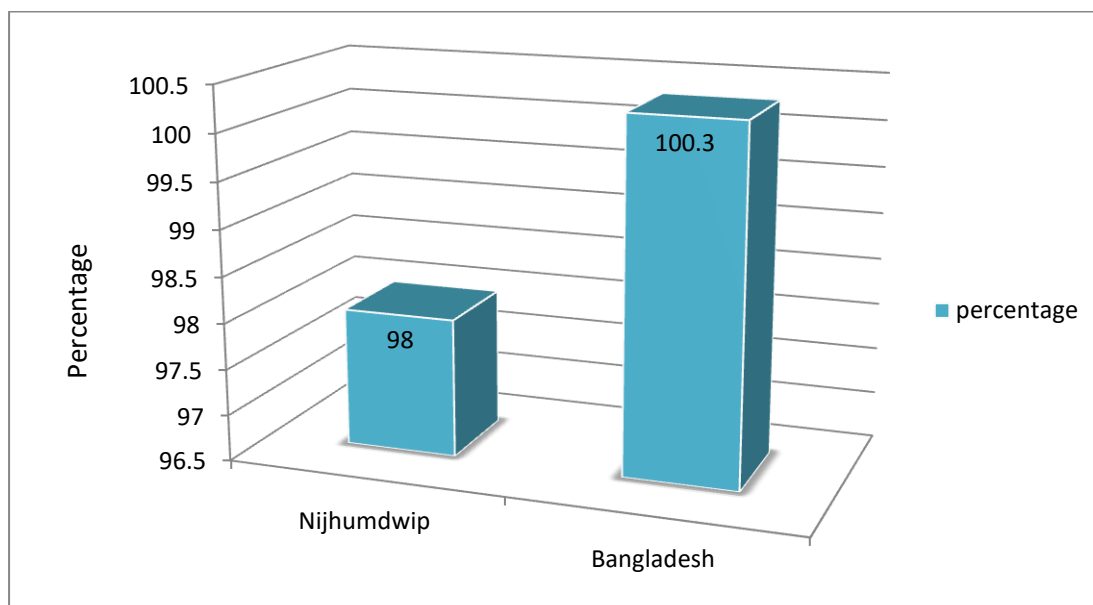


Figure 4.2: Sex ratio

Source: BBS, 2011a & 2011b

4.3 Educational Status

Only 13 percent of the people of Nijhumdwip are literate considering writing a letter. The percentage of illiteracy is more or less is same in case of both male and female. The level of education remarks the inability of the inhabitants to understand the mode of cyclone early warning dissemination system. It can be noted that there are two primary schools; one junior high school is available at the island. Besides, there are few informal madrasa are also found.

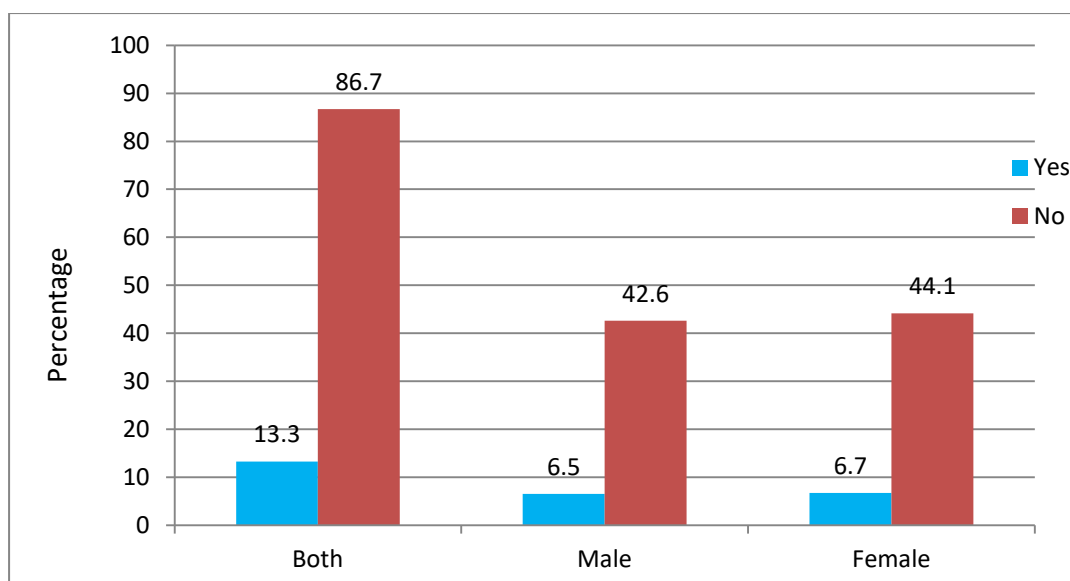


Figure 4.3: Literacy (can write a letter) rate

Source: Household Survey, 2015

4.4 Average Household Size

It is known that average household size is always higher at coastal area of Bangladesh than the national average. In the case of Nijhumdwip island the scenario is indifferent. The average household size is 5.5(BBS, 2011a) whereas the national average is 4.4(BBS, 2011a).

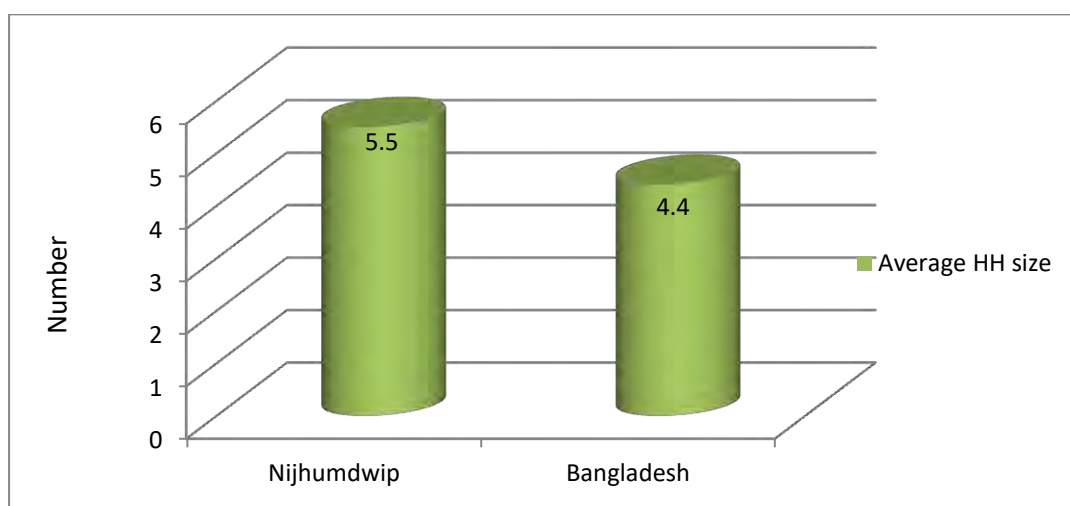


Figure 4.4: Average household size

Source: BBS, 2011a, 2011b

4.5 Housing Structure

Economic condition of the island people is not good enough which is evident from their housing structure. More than 80 percent of the houses are katcha that means floor, wall and roof of these houses are made of earth material, bamboo, thatch or wood. Besides, only 1.3 percent houses are brick build which can be considered as disaster resilient. Semi pacca houses are resilient to storm but not to cyclonic storm. Overall, all of the houses, except very few, are physically highly vulnerable to cyclone disaster. In a storm in October 2012, most of the katcha houses were damaged due to their weak structure.

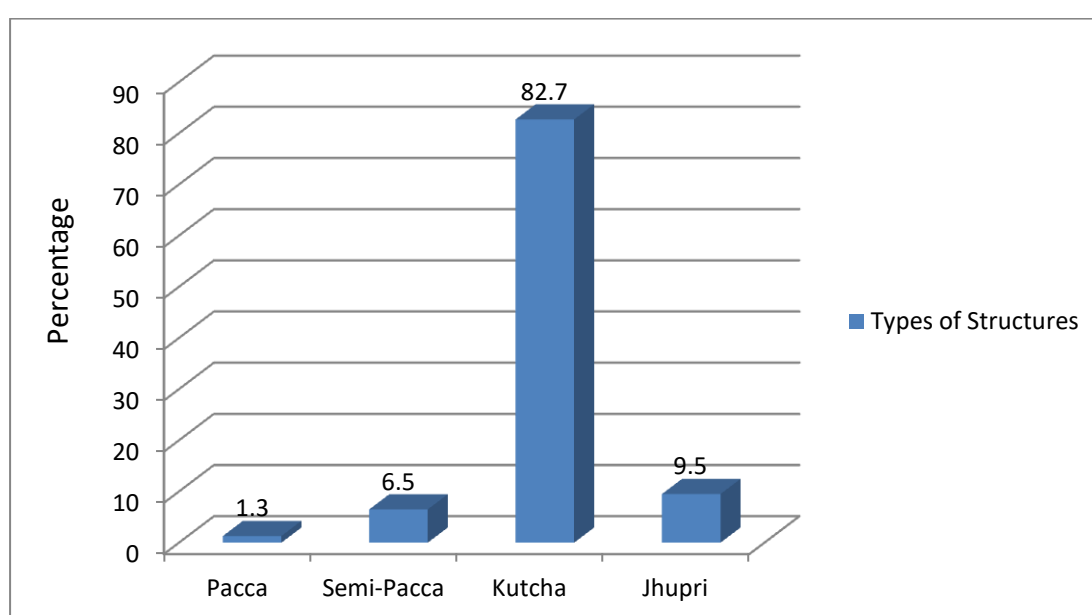


Figure 4.5: Types of housing structure

Source: BBS, 2011b

4.6 Sanitation Facilities

A significant portion of the household does not have any sanitation facilities. The figure is 27.1 percent. Hygienic sanitation facilities are found in one third of the houses. Mostly, non-water sealed sanitary facilities are reported in 35.5 percentage of houses. However, only 5.8 percent uses sanitary (water-sealed) toilet.

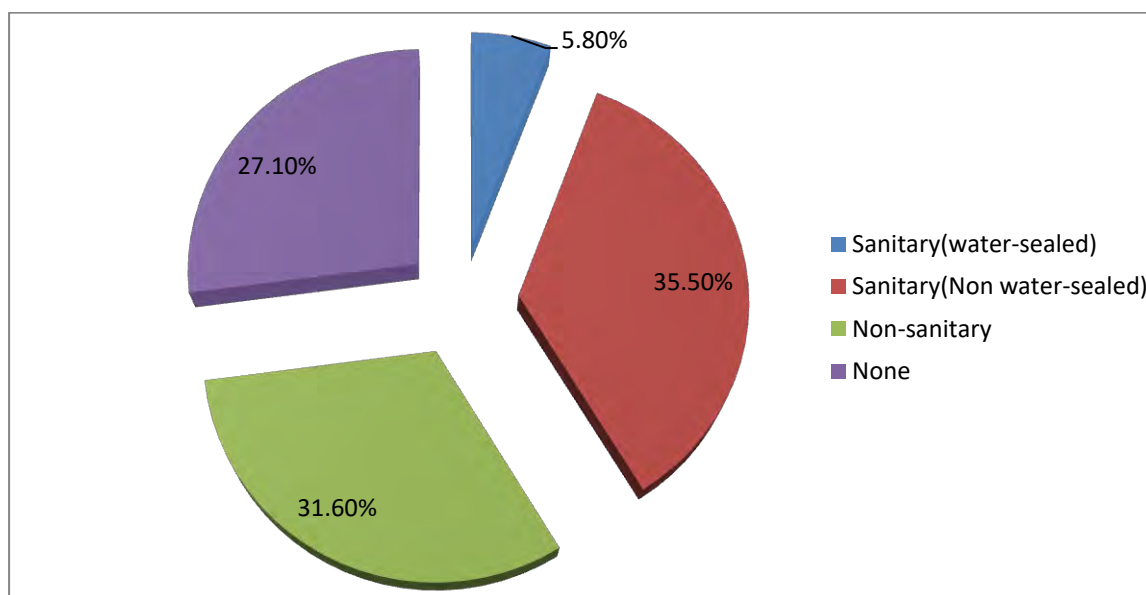


Figure 4.6: Toilet facilities

Source: BBS, 2011b

4.7 Sources of Drinking Water

Nearly 90 percent of homestead uses tube-well in the island as a source of drinking water supply. These tube-wells are free from arsenic and other related pollution. It is noticed that a very few number of tube well are high enough from the ground so that they can be saved from flood water. About 12 percent people use tap water.

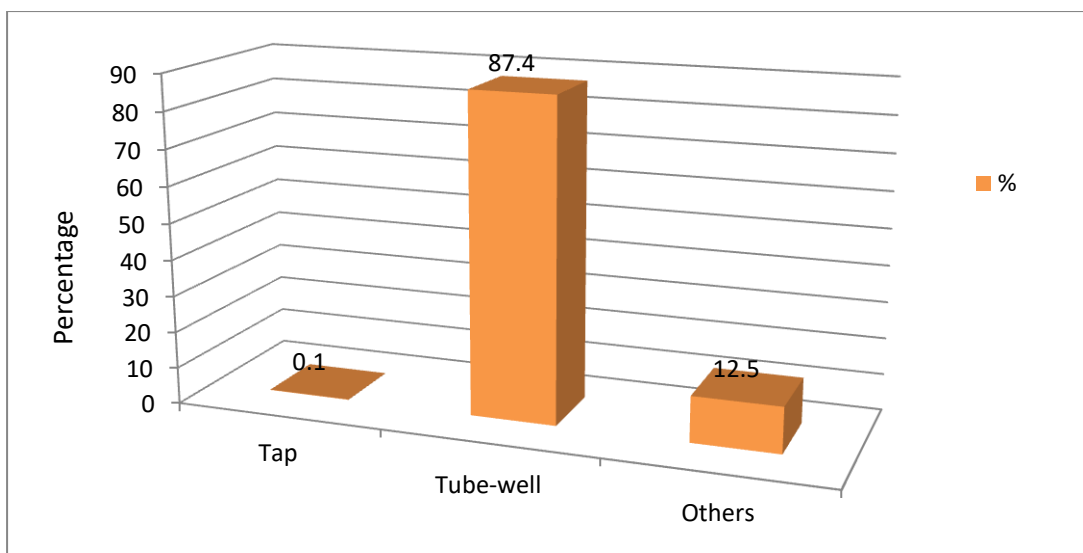


Figure 4.7: Sources of drinking water supply

Sources: BBS, 2011a

4.8 Electricity Connection

Nijhumdwip is disconnected from national grid. There is no sub-station there for electricity supply. There are only 4.4 percent people who use their own source of electricity from renewable energy. Solar panel is used there. It is also noticed that, bazaar area is supplied with generator services temporarily.

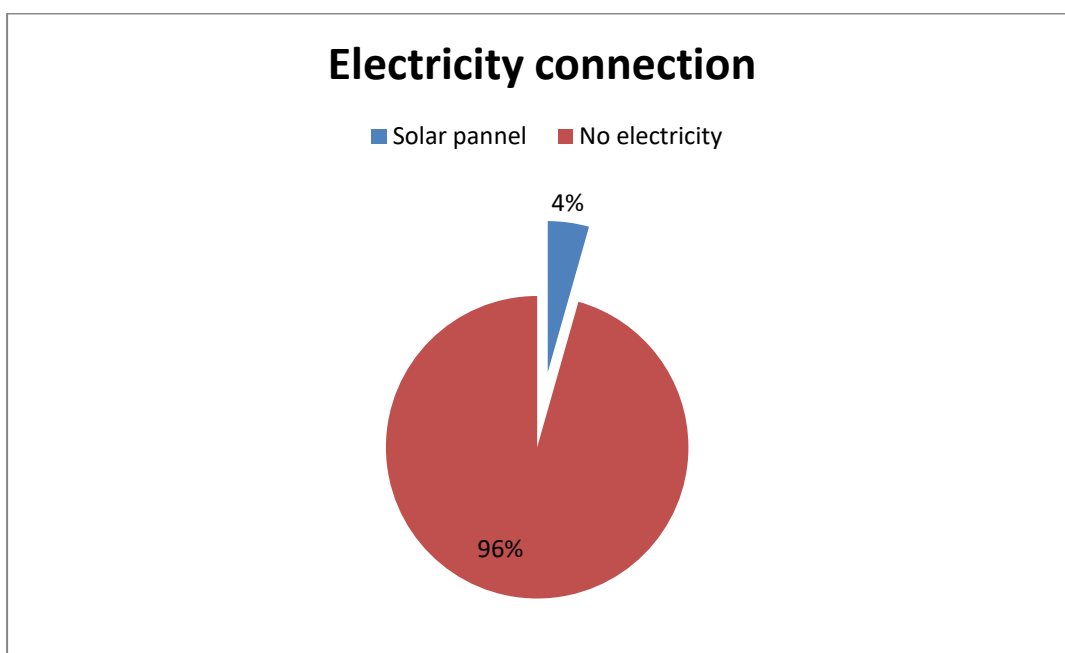


Figure 4.8: Electricity supply

Sources: Household Survey, 2015

4.9 Economic Activities

Fishing, cropping and wage labor are most significant income generating activities of male. In off season, they mostly went to nearby town (Noakhali, Chittagong, Feni etc) for labor when they go out of cropping or fishing. Women are mostly engaged with rearing of livestock's and poultry. Besides, they also get themselves engaged in fish drying activities at summer. Moreover, they along with their children also collect fuel wood from forest and sell them in market to earn their living. Field study reveals that mostly children are engaged in such activities. In addition, children are also engaged in fishing with elders. Those; who aged under 10 years help their mother in collecting woods from forest. Study found that a child collect 3 to 5 'aati' (a collection of wood tied together) and sell them at nearby market at 20 to 40 taka depend upon quality and amount of wood. They use those woods their homestead cooking. Besides, boys are mainly engaged in fishing in nearby khals. Few of them also go to sea though they lack sufficient physical strength to carry on.

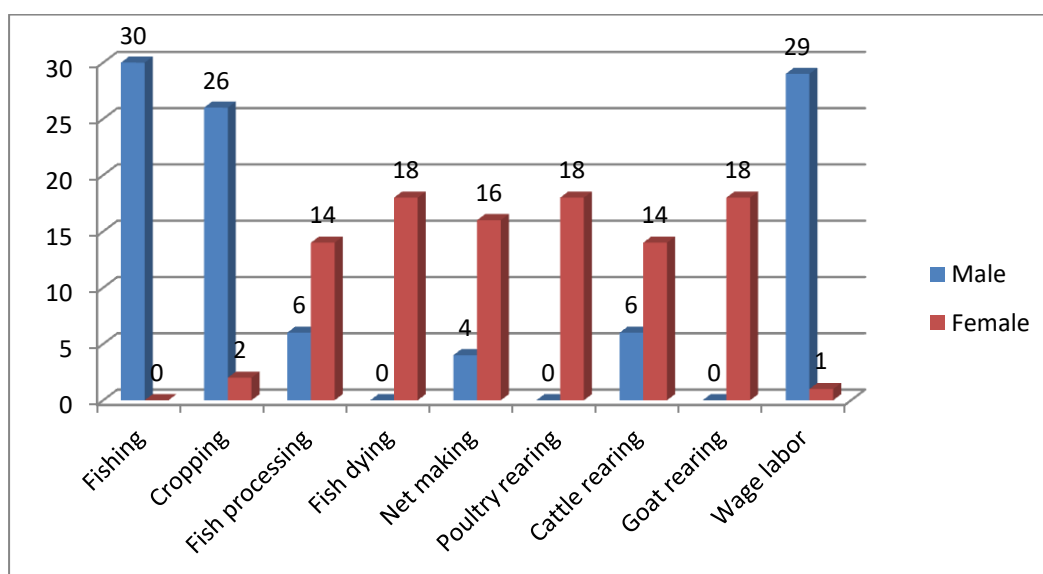


Figure 4.9: Different economic activities

Source: Rahman, 2015



Source: Field Observation, 2015



Photos 4.1: Children are engaged in different income generating activities

4.10 Income

Most of the household income ranges from 50,000 BDT to 1,00,000 BDT on yearly basis. There are about five percent household that income more than 2,00,000 BDT. They are mostly engaged in business like fishing. They own boat, net and export fishes to other parts of the country mainly Chittagong and Dhaka.

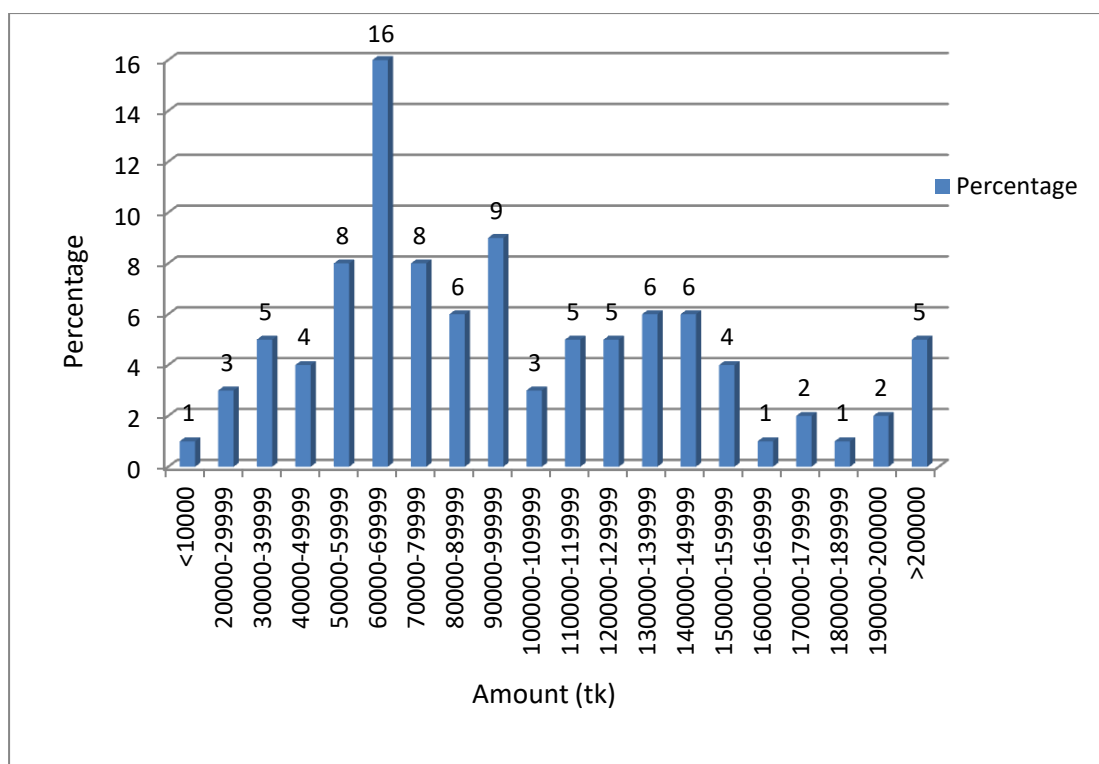


Figure 4.10: Yearly income of households

Source: Household Survey, 2015

4.11 Resources

Although about one-fourth of the household possess boat, they are mostly small in size and not suitable to go deep sea. About 5 percent of them have deep sea fishing boat. In the case of net, about one third of them possess small net which are used for fishing in nearby khals, ponds and shore area. Very few van and rickshaw are available in this area. However, one third of the families own radio which are the main tools for receiving cyclone early warning signals. People of the locality found bi-cycle as the popular medium of transport. Who are economically solvent use bike for transportation.

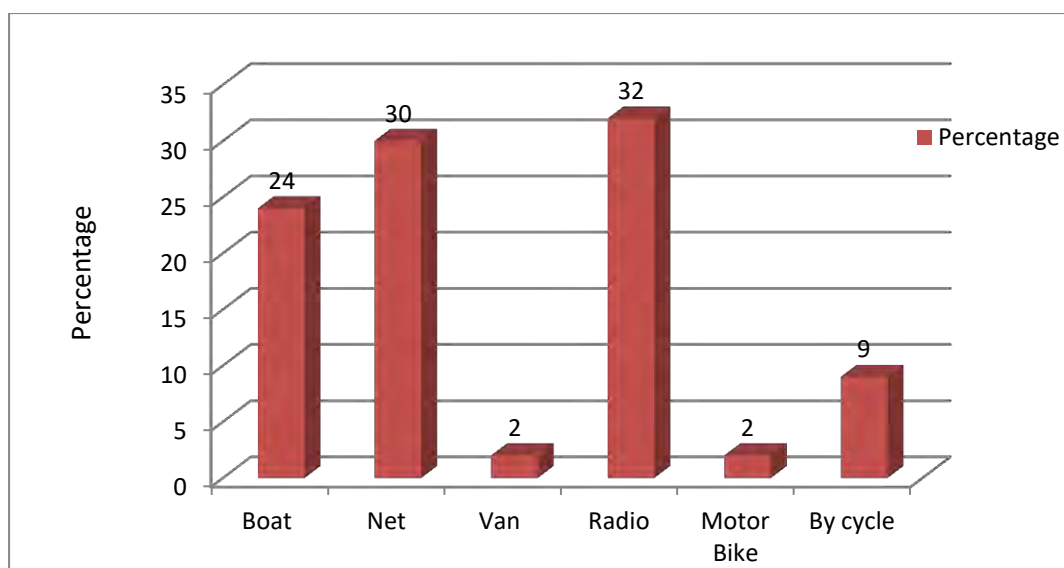


Figure 4.11: Available resources

Sources: Household Survey, 2015

4.12 Road Structure

Only 20.5 kilometer (in length) roads are available in then Nijhumdwip. Most of them are made of earthen material. However, 4 kilometer is made of brick. Recently, the construction of pacca road has been started, from Muktaria ghat to namar bazaar area. This earthen road limits the access of locals to nearby cyclone shelters. As these road are mainly made of clay soil, during rainy season, it becomes difficult to use them as it become slippery and sticky.

Road name	Road type	Length (in km)	Road structure(distance in km)	
			Earthen	Pav brick
Bandartila to Namar bazar	Village Road-A	9.5	9.5	0.0
CDSP to Muktaria Ghat	Village Road-A	5.0	1.0	4.0
CDSP to Damar Char	Village Road-B	1.5	1.5	0.0
Bandartila bazaar to Damar Char	Village Road-B	2.0	2.0	0.0
CDSP bazaar to New embankment	Village Road-B	2.5	2.5	0.0

Table: 4.1: Road structure in Nijhumdwip

Source: LGED, 2012

4.13 Medical Facilities

Unfortunately, there is no medical centre at this remote island except few village doctors who lack professional degree on medicine. They treat their patient from their experience. As a result, local people suffer more in sickness, especially women and children. For severe case, they had to go to hospital at Hatiya Upazila Hospital. During field observation, it was found that a disaster resilient building is constructed near Namar bazaar which is mentioned as new medical centre. The new centre has a small operation room. Although, construction is not complete yet, local people are expecting standard medical service from there. There is no deadline to start functioning of this very medical centre.



Photo 4.2: Medical centre is under construction near Namar Bazaar, Nijhumdwip (Taken in February 2015)

Chapter 5

Assessing the Cyclone Early Warning Services of Vulnerable Groups

5. Facts and Figure why women and Children are more vulnerability Of Disasters

UNISDR 2012 campaign theme emphasized ‘women and children, considering them as invisible force of disaster resilience’. Their access to cyclone early warning system is crucial because of their high fatality rate during cyclones and also for social responsibilities. After a devastating cyclone in 1991 which left almost 140,000 people dead, a study carried out by the Bangladesh Red Crescent and other organizations, revealed that 90% of the victims were women and children(Dhar, 2008).

According to WHO, women are portrayed as the victims of disaster, and their central role in response to disaster is often overlooked. A woman’s pre-disaster familial responsibilities are magnified and expanded by the onset of a disaster or emergency, with significantly less support and resources. Women play a central role within the family, securing relief from emergency authorities, meeting the immediate survival needs of family members and managing temporary relocation.

In the IUCN fact sheet, Neumayer and Plümper analyzed disasters in 141 countries and found that, when it came to deaths, gender differences were directly linked to women’s economic and social rights; in societies where women and men enjoyed equal rights, disasters caused the same number of deaths in both sexes. They also confirmed that discrepancies were the result of existing inequalities. For example, boys were given preferential treatment during rescue efforts and, following disasters, both women and girls suffered more from shortages of food and economic resources (Neumayer and Plümper, 2007).

Studies show that women, boys and girls are 14 times more likely than men to die during a disaster.

In industrialized countries, more women than men died during the heat wave that affected Europe in 2003. In France most deaths were among elderly women.

During the emergency caused by hurricane Katrina in the United States, most of the victims trapped in New Orleans were Afro-American women with their children, the poorest demographic group in that part of the country.

In Sri Lanka, it was easier for men to survive during the tsunami because knowing how to swim and climb trees is mainly taught to boys. This social prejudice means that girls and women in Sri Lanka have very few possibilities of surviving in future disasters.

Following a disaster, it is more likely that women will be victims of domestic and sexual violence; they even avoid using shelters for fear of being sexually assaulted.

Nutritional condition determines the capacity to deal with disasters. Women are more likely to suffer from malnutrition because they have specific nutritional needs when they are pregnant or breast feeding, and some cultures have food hierarchies. For example, in south and south-east Asia, 45–60% of women of reproductive age are below their normal weight and 80% of pregnant women have iron deficiencies. In sub-Saharan Africa women lift much heavier loads than men but consume fewer calories because the culture rules that men receive more food.

In some cases, gender differences also increase men's mortality in disaster situations. Many men are exposed to risky situations and even die because they believe that by being the "stronger sex" they need not take precautions and because society expects them to take heroic rescue action. For example, there were more immediate deaths among men when hurricane Mitch struck Central America, not only because they were engaged in open-air activities, but because they took fewer precautions when facing risks.

In Kenya, fetching water may use up to 85% of a woman's daily energy intake; in times of drought a greater work load is placed on women's shoulders, some spend up to eight hours a day in search of water.

Extreme weather events often create conditions conducive to outbreaks of infectious diseases; heavy rains produce insect breeding grounds, and contaminate clean water sources while drought on the other hand can cause fungal spores and spark fires. Women, especially expectant mothers, are highly vulnerable to water-borne diseases, thermal and other extreme events.

In refugee camps that arise as a result of natural disasters and conflicts over scarce resources, women and the girl child refugees are exposed to higher risks compared to male refugees. Social strains in such situations aggravate stress levels in the family, which may result in incidences of domestic violence.

5.1 Knowledge of women about cyclone early warning signal

More than half of the inhabitants of Nijhumdwip are women. Study found that more than 80 percent of women know that there is a cyclone early warning system that is announced during cyclone. They also aware that during cyclone or storm, different warning signals are disseminated on the basis of severity. They mentioned that they received Cyclone Early service later than male because CPP volunteer disseminate warning message in the road side and in the market and hat. Female staying in the house to busy with household works. Most of the time they received warning messages when male person return home from road side or market.

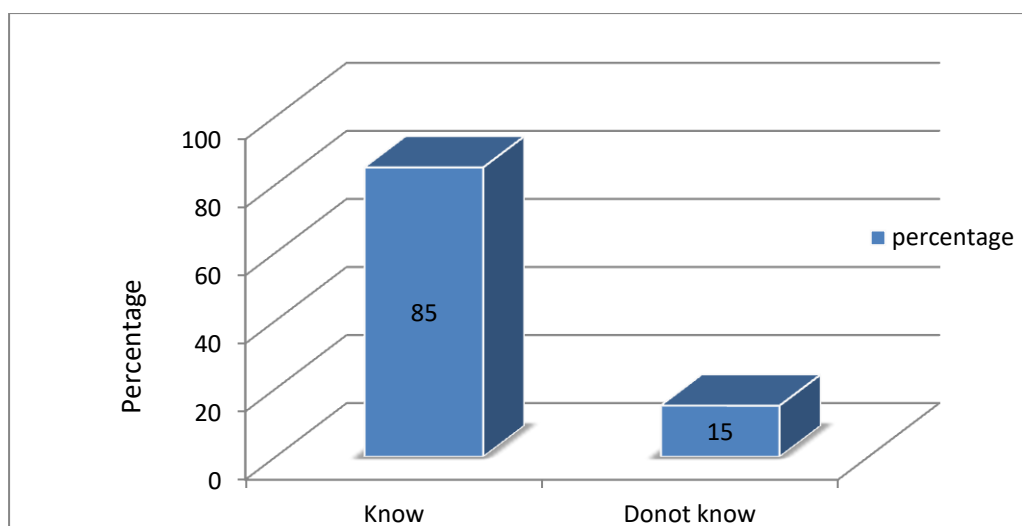


Figure 5.1: Knowledge about cyclone early warning dissemination (Source: Household Survey, 2015)

5.2 Interpretation of early warning signal

Although, most of the women know that cyclone early warning signal is disseminated during cyclone, more than two-third of them cannot interpret those signal meant. About one third of them hardly hear miking where 38 percent of them mentioned that they never heard any. Those who hear about miking on cyclone early warning signal remain inactive until their male dominant say something. In the case of unavailability of their male personnel of the family, they had to depend on their neighbour.

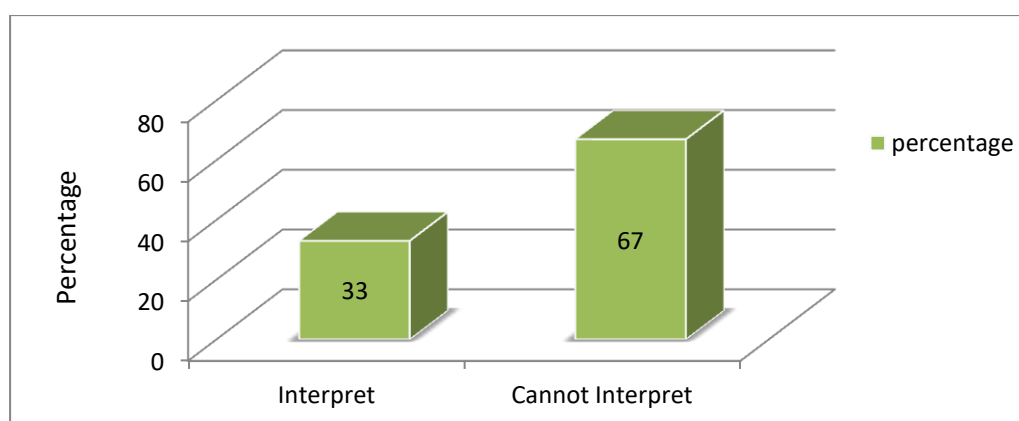


Figure 5.2: Level of interpretation of cyclone early warning signal (Source: Household Survey, 2015)

Following figure 5.3 clearly demonstrate that level of interpretation increases with education. The women who are illiterate mostly cannot interpret cyclone early warning signal when it is disseminated.

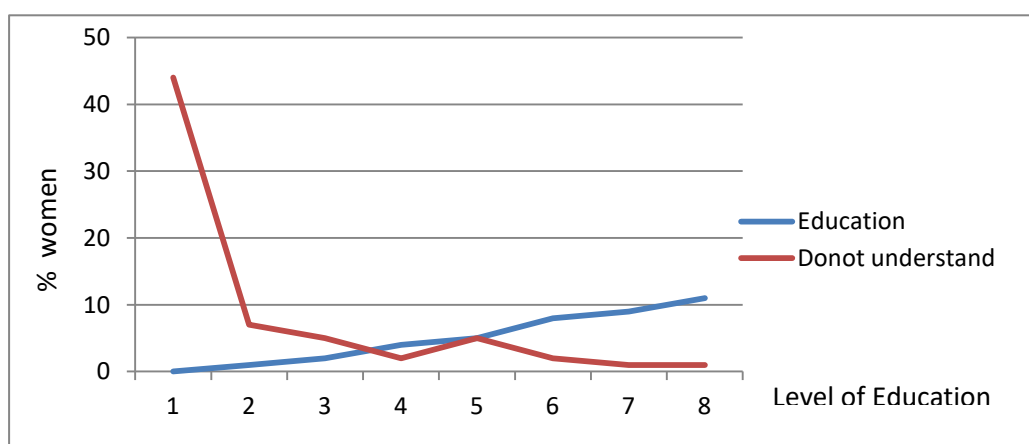


Figure 5.3: Education and level interpretation of warning signal

5.3 Training on early warning signal

The one third of the women, who understand the warning signal, attained some kind of training or awareness programs. In most cases, these programs were introduced by Bangladesh Red Crescent Society in last two and half years.

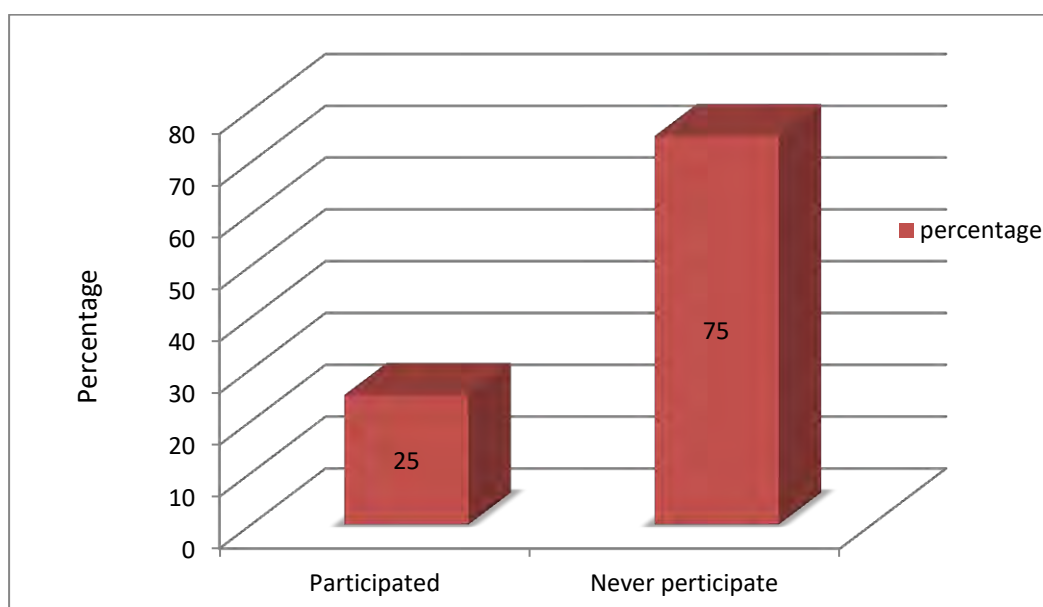


Figure 5.4: Participation in training program on early warning signal (Source: Household Survey, 2015)

5.4 Medium of dissemination of signals

There are several ways to disseminate cyclone early warning signal from Bangladesh Meteorological Department (BMD) to community people. Government try to disseminate the signal through its own network and finally Upazila disaster management committee is expected to disseminate the signal. On the other hand, BDRCS tries to disseminate through its very own CPP network. In the case of Nijhumdwip, people generally find following three source of early warning signal dissemination as there is no electricity, TV are not available. Moreover, no newspaper regularly reaches in this remote island. Three medium through community people receive early warning signal are

- Radio
- CPP volunteer
- Neighbors

Study found that, nearly 80 percent of the household know about the severity of cyclone from neighbors. However, volunteer from CPP volunteers are also found effective source of early warning signal dissemination. Those who possess radio, found that very effective as warning signal disseminator.

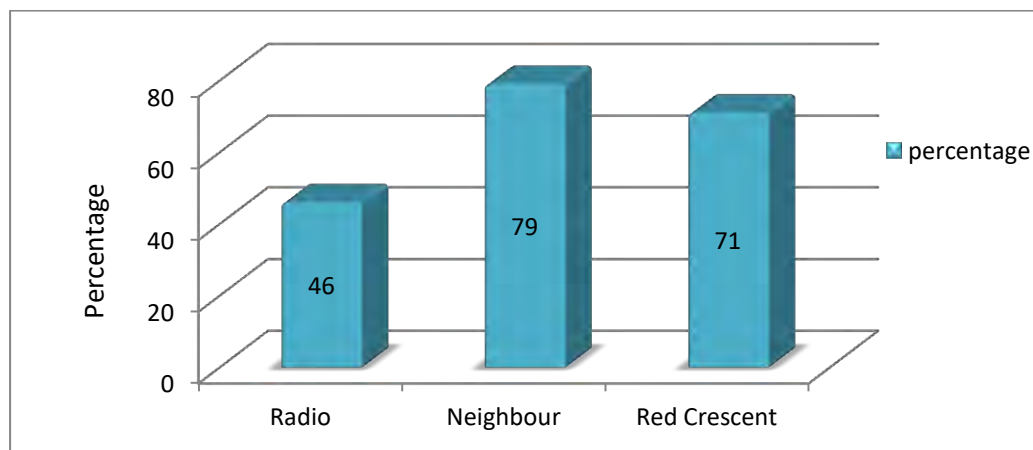


Figure 5.5: Sources of early warning signal (Source: Household Survey, 2015)

It was assumed that those who had radio will find it as a most effective medium of warning signal disseminator. But, study reveals that the households, who own a radio, do not find it most effective medium of signal disseminator. Red Crescent volunteer

and neighbor play importance role to inform them about early warning signal.

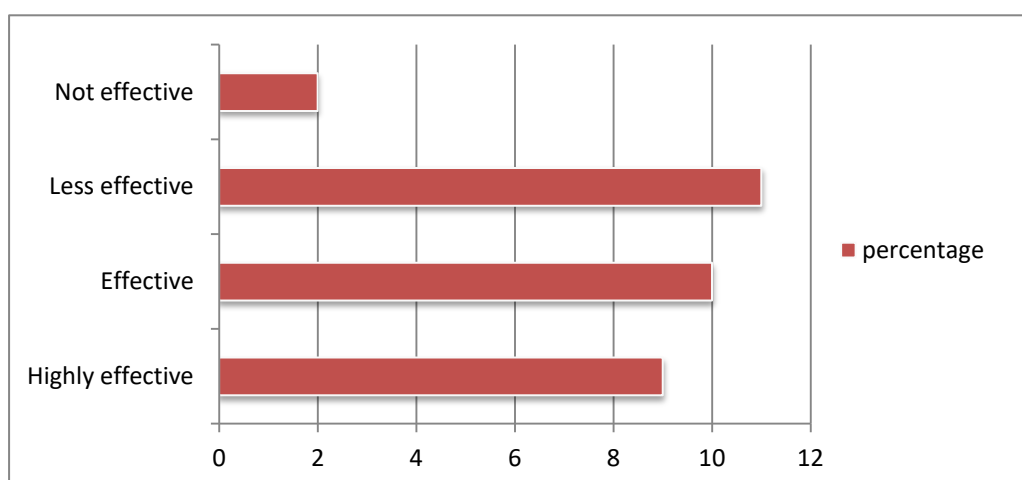


Figure 5.6: Effectiveness of radio as early warning signal disseminator (Source: Household Survey, 2015)

5.5 Warning signal dissemination time

About two-third of the women (73.30%) receive cyclone early warning signal from zero to eight hours before landfall. It indicates that women get very little time to prepare themselves to get ready for cyclone shelter. About 18.70 percent of them get the signal between 8-16 hours before landfall of cyclone. However, about 5 percent of them never get the warning signal. Where male received cyclone early warning earlier compare to women.

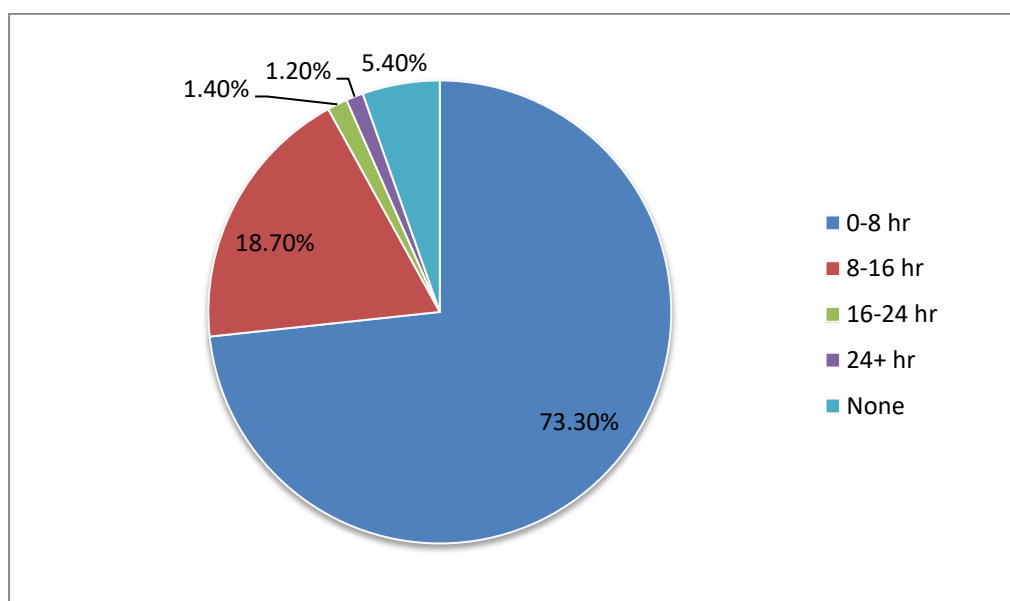


Figure 5.7: Receiving time of warning signal (Source: Household Survey, 2015)

5.6 Preferable cyclone shelter

All women, aged and children want to go to nearby cyclone shelter. However, few women chose nearby neighbour's brick build house as shelter. Number of cyclone shelter is not enough based on the total number of population.

5.7 Time to reach cyclone shelter

About two third of the household is located in such a place from where it will take around half an hour to reach the shelter. However, this ways become extremely challenging during cyclone as there is very limited access road is existed. During storm, roads became slippery as they are mostly made of clay soil. Moreover, flood water make more challenging.

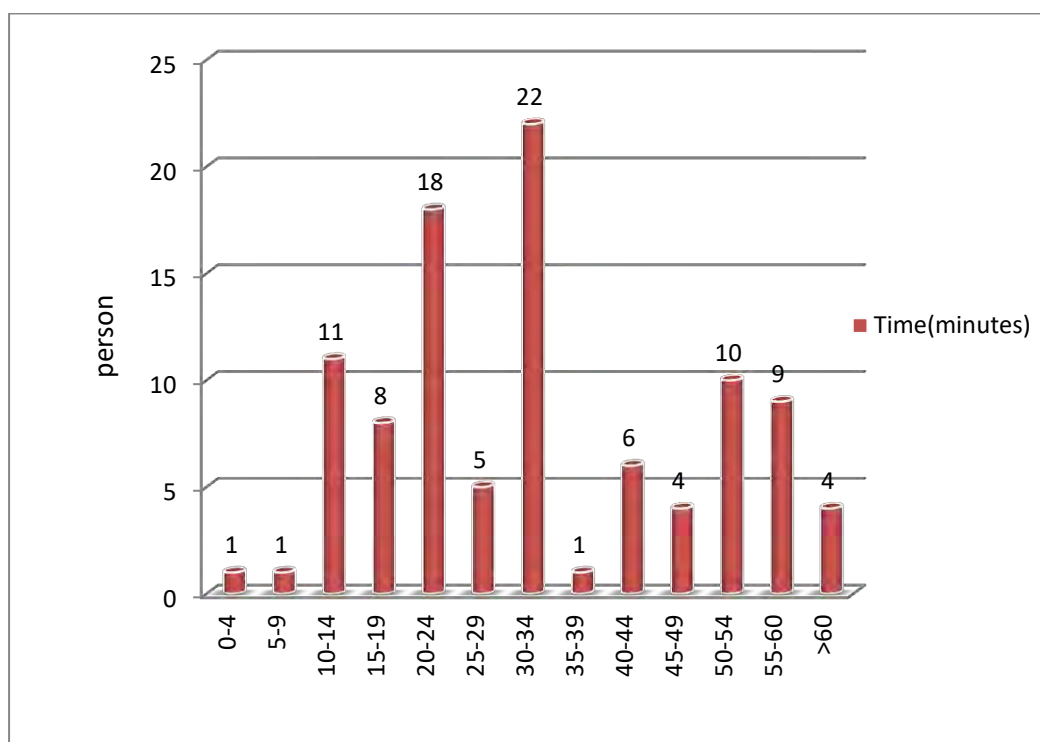


Figure 5.8: Time to reach nearby cyclone shelter (Source: Household Survey, 2015)

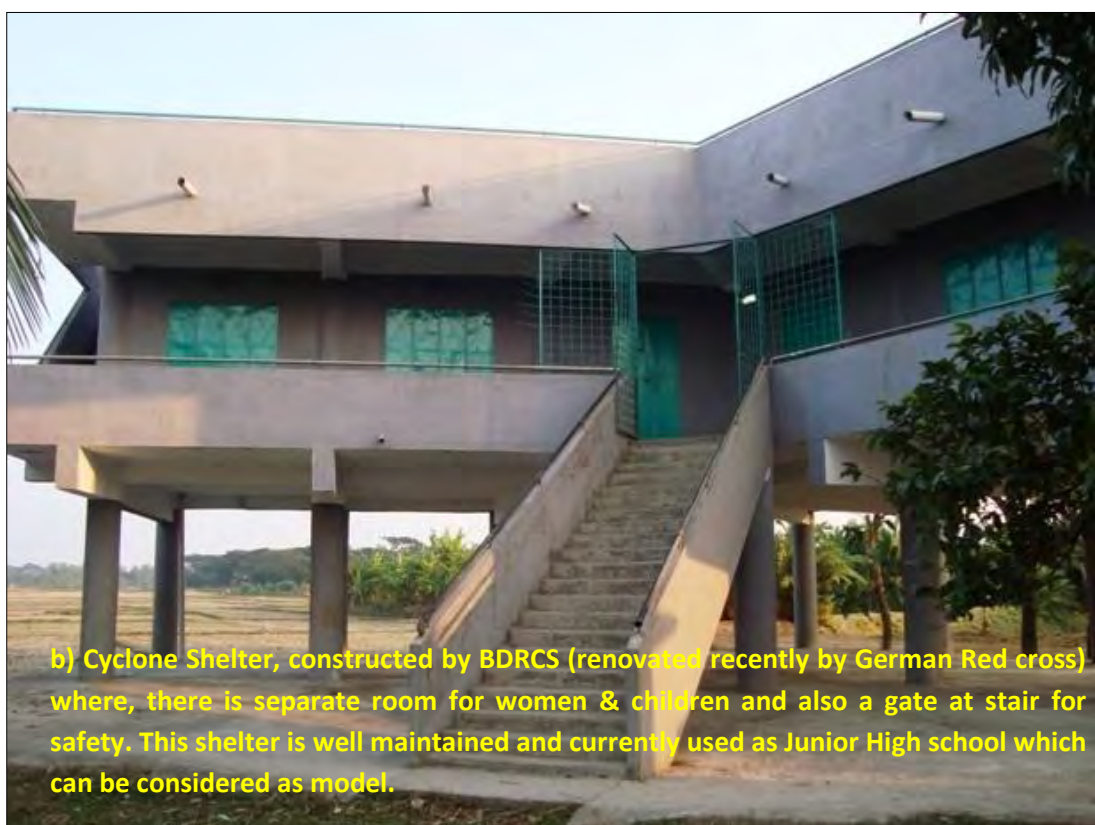
5.8 Overview of Cyclone Shelters

There are seven cyclone shelters available at Nijhumdwip. The existing cyclone shelters are two storied keeping the Ground Floor totally open. Stairway is attached within the building. There are also attached toilets but no provision of water supply facility exists in the building. There are tube-wells beside the shelter.

The physical condition of the shelters is quite good so far as their ages range within 12 to 15 years. There are few cases where cracks, damping, broken doors and windows can also be seen. Only one shelter which was constructed by BDRCS and was renovated later by German Red Cross is used by a Junior School recently. They take care about the maintenance of it. Another one is temporarily using by Police department as their office. However, other shelters are remained unused. It is noticed that other shelter are rented for warehouse. On an average every shelter is capable of accommodating 500 to 600 people. However, in practice, nearly 1000 to 1200 people take shelter there during cyclone.



Photo 5.1: Cyclone Shelter constructed by Proshika, Source: Photo taken February 2015 during



Photos 5.2: Cyclone Shelter, a) Cyclone Shelter constructed by LGED, b) Cyclone Shelter Constructed by BDRCS; Source: Photo taken February 2015 during field observation

Due to lack of proper ventilation, light, water supply and sanitation facilities along with insufficient space cause great sufferings. There is no allocation of separate space for male and female in any cyclone shelter except one which is also another major problem as Nijhumdwip is religiously conservative enough to maintain distinction between male and female. When cyclone shelters are used for exclusively male activities (mosques or madrasahs in particular) women do not believe themselves to have sanctioned access and will not enter. Women fear for their safety in route to the shelters. This condition demotivates the women to take shelter. Again most of the times the women feel very insecure and vulnerable in the mass where there is also possibility of physical assault. After a devastating cyclone in 1991 which left almost 140,000 people dead, a study carried out by the Red Crescent and other organizations, revealed that 90% of the victims were women and children. Despite the existence of some cyclone shelters, the communities living around them were not aware of their purpose or didn't feel it was safe to take refuge in them.

The absence of connecting road to the shelter also discourages the families to move to shelter. On the other hand the evacuation order disseminates in such a time that it becomes difficult to cross the road and reach the shelter with children and female in a real bad weather.

By the order of GoB (Cyclone shelter construction, maintenance and management guideline-2011), UNO (Upazila Nirbahi Officer) has the authority of all these shelters and perform its entire works through Union Disaster Management Committee. In practice, Union Disaster Management Committee does not play any effective role in shelter management works. It is wondered that no such committee is existed at Nijhumdwip union. According to National Plan for Disaster Management 2010-2015, Upazila Disaster Management Committee (UzDMC) has the responsibility of the entire repair and maintenance works of cyclone shelters. Though there is a provision of financial support from the authorized Ministry, but in practice they do not response to the requirements of UzDMC.

5.9 Problems faced by women during cyclone

Women are the worst sufferer during cyclone. Firstly, they get the cyclone early warning signal at eleventh hour of the disaster. They cannot leave the house immediately after receiving the signal as they have to complete some household chores. They had to cook food for them to take to shelter with them. Besides, gathering livestock, poultry, and daily commodities also lies on them. It is them, who prepare children for shelter and responsible to keep the house safe during cyclone. In many cases, it is found that women cannot take decision to leave their house due to absence their male dominant. If, male partner stay at sea, situation becomes worse. As most of the male members are engaged in fishing during rainy seasons and stay at sea to earn their living, such situation is often faced by women.

During cyclone women find it very difficult to make it to the shelter due to slippery road, stormy wind and wave of tidal flood water. It become challenging to maintain children, older people and children all together for them. With so many difficulties they reach the shelter and find that very crowded. They often find that very uncomfortable to stay with unfamiliar male person there. They often become victim of violence there. As a result few women don't became interested to go to shelter, they prefer die at home with honor rather than saving their lives staying at shelter and become victim of violence. Besides, there is also insufficient space for local people to accommodate there as existing seven shelters can accommodate hardly 12,000 people where the existing number of population is three times s higher.

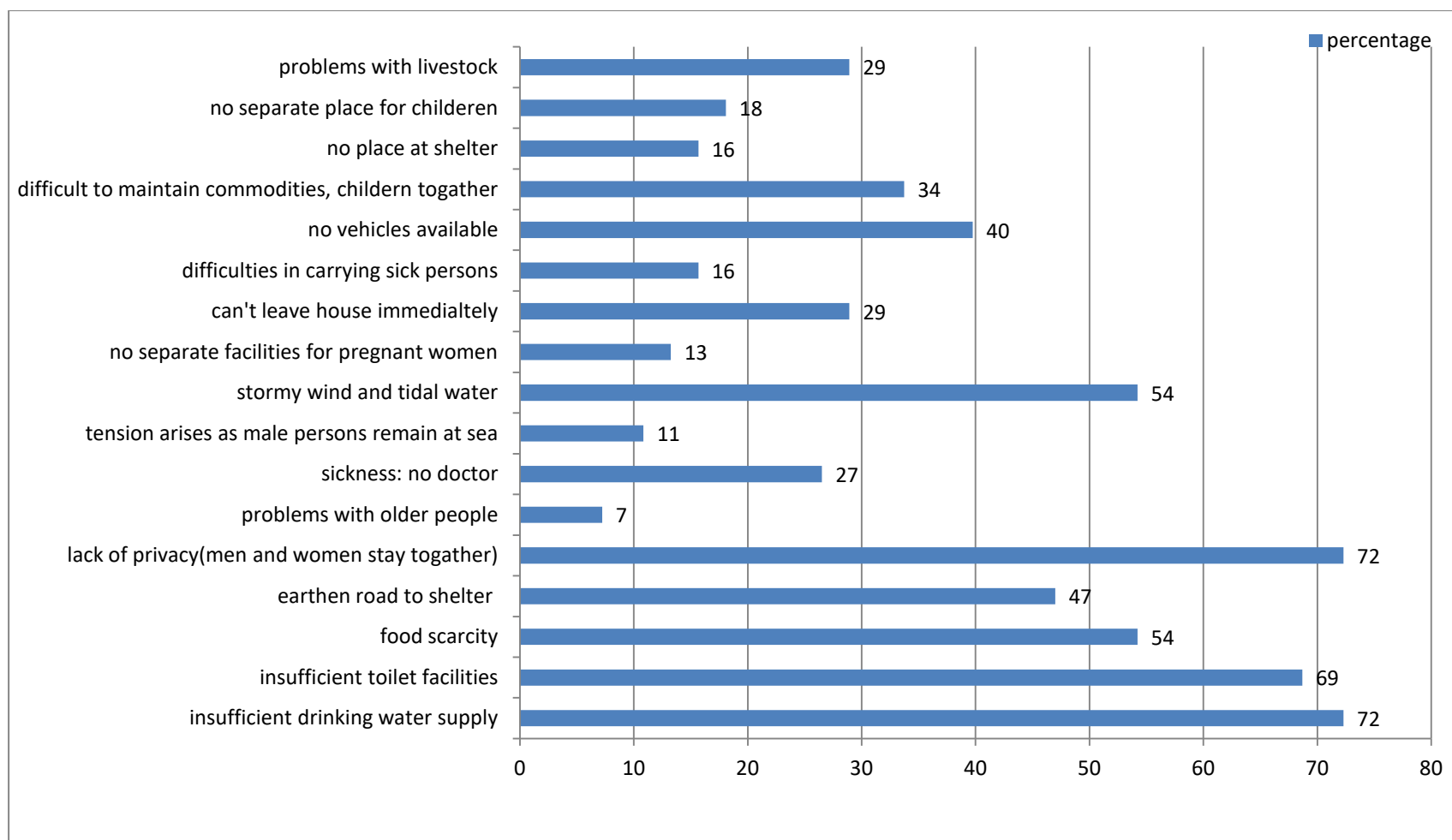


Figure 5.9: Problems faced by women during cyclone (Source: Household Survey, 2015)

Insufficient supply of safe drinking water and food made the scenario worse. Moreover, there are also problems with toilet facilities. In most cases one toilet is available at shelter. No separate facilities for women. As a result, there is always long line for it. It does not need to mention about the hygienic condition of the toilet. In addition, there are facilities for separate room for women even for pregnant women. They situation became very tough for them. Women became sick due to bad weather and hygienic condition of the shelter and there is no medical facility available for them. After considering all of these constrain, women decide to go to shelter to save their life. However, they cannot accommodate themselves there due to excessive refugee.

All of these factors act as constrain for them to reach the nearby cyclone shelter. As a result women remain in unresponsive category to cyclone early warning services.

5.10 Problems with children during cyclone

In most cases, women are responsible to carry their children to nearby shelter as their male partner remain unavailable during cyclone. It often becomes very difficult for women to carry children to shelter due to stormy wind and wave. Children start crying in bad weather which often makes the scenario worse. Many children become injured in bad weather. Few became sick and there is no medical facility available during cyclone at shelter. They also fall short for food and drinking water. Crowd at shelter make the children afraid and the whole shelter became a place of cry of children. Problem with PWD is severe. They cannot comfort themselves at the crowd. Moreover, other people find it very uncomfortable to live with them at shelter. Irony of fate is that PWD had to stay a place to save their own lives where they are not welcome.

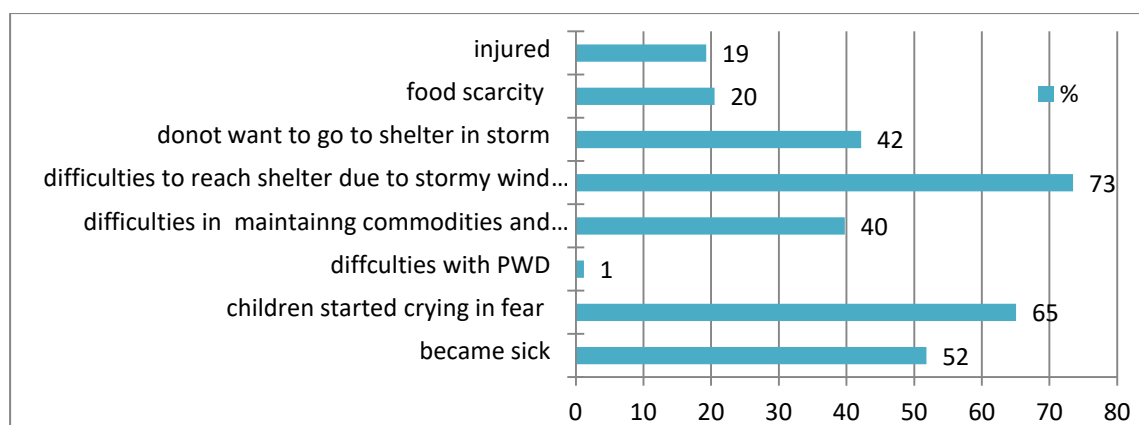


Figure 5.10: Problem faced by women with children and PWD during cyclone (Source: Household Survey, 2015)

5.11 Children's knowledge about cyclone signal and preparedness

It can be evident that most of the children (up to 15 year's age) do not go to school so that they remain illiterate. They don't even know the Bengali or English letter. As a result they have lack of awareness and knowledge about cyclone severity and preparedness activities. Moreover, there are no scope of teaching about cyclone preparedness and early warning system in schools.

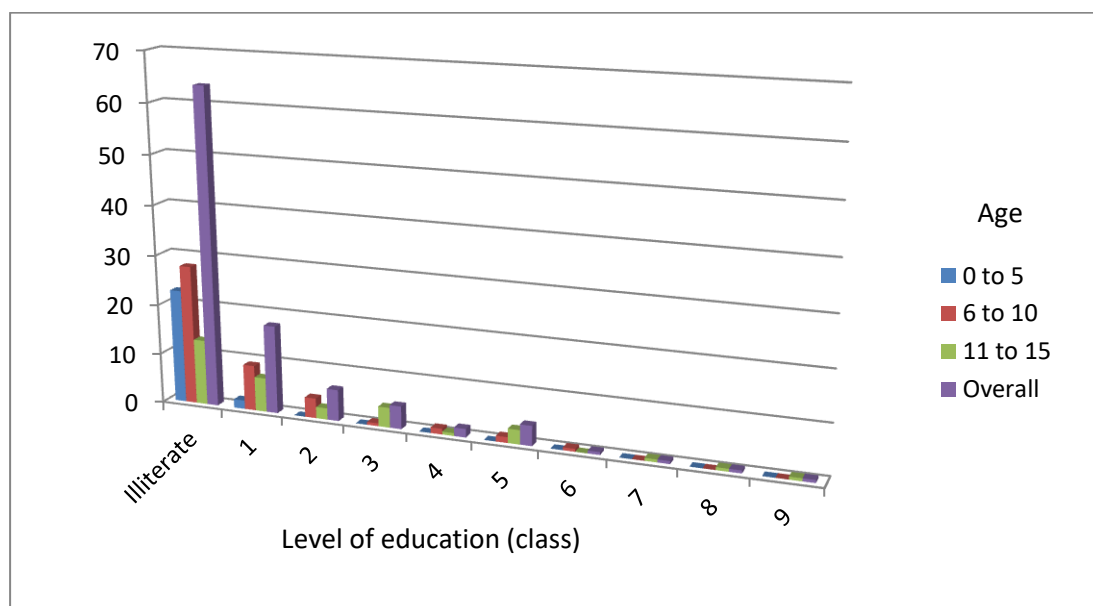


Figure 5.11: Child education (Source: Household Survey, 2015)

Study also found that about 85 percent of children have no idea about cyclone early warning signal. Moreover, they do not know about the preparations needed to be taken before and during cyclone. As a result, become exposed to cyclone disaster by increasing their social vulnerability.

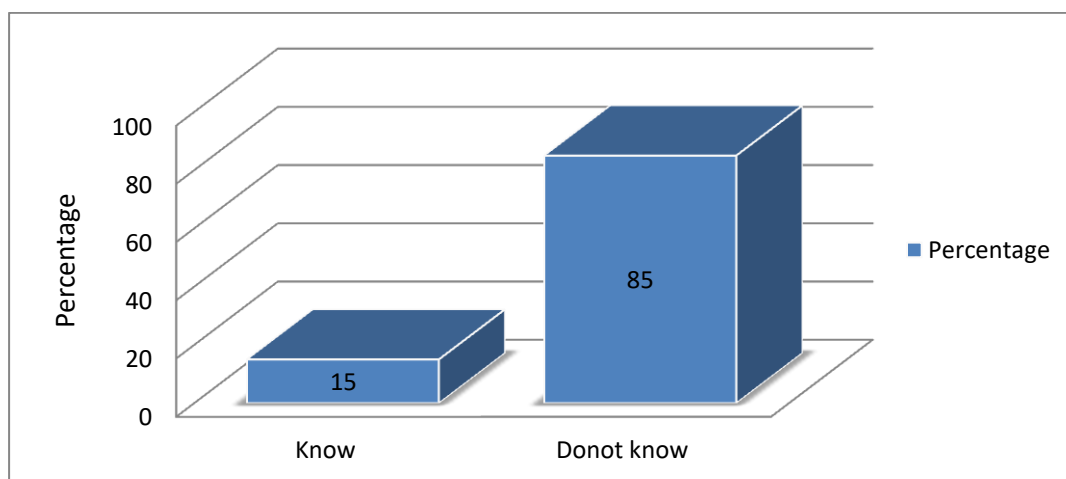


Figure 5.12: Knowledge of children about cyclone early warning signal (Sources: Household Survey, 2015)

Chapter 6

Summary of Findings, Suggestions and Conclusion

6.1 Summary of Findings

Nijhumdwip the very remote island of mid-coast of the country is often affected by severe cyclone. Nearly 70 percent of inhabitants of the island are women and children and there are also some persons with disabilities. This large group of population often remains in unresponsive categories to cyclone early warning services like early warning signal, evacuation order. This study reveals the underlying causes of this situation which is summed up as follows:

- I. Women and children do know about the cyclone early warning signal dissemination. But, unfortunately they cannot interpret them due to lack of proper knowledge. About 70 percent women fall in this category. In the case of children, 65 percent of them are illiterate and 85 percent do not know anything about warning signals. The correlation between lack of education and lack of knowledge about early warning signal is highly significant (R^2 value is 0.83). Finally they had to wait for someone who will tell them about the existing early warning and preparation need to be taken.
- II. Moreover, only 25 percent women have participated in awareness training or program. In most cases, they are organized by Bangladesh Red Crescent Society (BDRCS). It must be mentioned that BDRCS are currently working with only 820 household which is limited only in CDSP bazaar and Banadartila Bazaar that covers about 20 percent of the total household in the island. About 80 percent of them still to be covered.
- III. Although nearly 70 percent of inhabitant found local CPP as effective cyclone early warning signal disseminator, they are not wholly satisfied with their performance. They complained about timely signal dissemination from their experience. They also stated that Red Crescent volunteer emphasis more on relief activities than early warning signal dissemination. Local people mentioned about low manpower of Red Crescent volunteer and their

incapability of logistic support. These facts were also justified by local Red Crescent officials who stated that enough logistics like hand mike, siren could have improve their performance.

- IV. Inadequate access roads to cyclone shelter are another constraint. It is found that most of the existing access roads are made of earthen materials which became muddy and slippery during rainy seasons and people especially women and children find that very difficult to reach the nearby shelter by using them. It is also noticed that most of the household are located in such a place from where it will take around 30 minutes to reach to nearby shelter, however it takes double to triple time due to unfavorable condition of road and weather during cyclone.
- V. There are only seven cyclone shelter is found in the island. These shelters hardly accommodate about 12000 people. The number of population in Nujhumdwip is about 30,000; that means about 60 percent of the inhabitants still had to look for another safe place. Unfortunately, only 1.3 percent of the houses are brick-build which is negligible considering demand of safe places as shelter during cyclone.
- VI. As most of the family income source is fishing or fish related business or labor, male member often remain unavailable at home during cyclone. In that case, women had to take care her household chores. They often remain confused on the evacuation time. It is their common tendency not to leave their house without male partners. Moreover, they had to wait for someone to tell them what to do.
- VII. Women is responsible to collect food, drinking water and taken the children, old persons and also PWD if there is any; to the cyclone shelter. It is reported that it's become a challenge to reach the shelter with household commodities, children, elderly personnel in such bad weather. Stormy wind and wave of tidal flood water make their way difficult. Many of them had experience to loss their children in wave during 1991 cyclonic flood.

- VIII. Violence against women at cyclone shelter discourages them to go to cyclone shelter during cyclone. As there is always insufficient space for people, male and female persons had to stay together. Unmarried women find it uncomfortable to stay together in crowded room with male members. About half of women reported violence at shelter from their experience. Few of them said that they would rather die in honor at home than to go to shelter.
- IX. Women and children often face the scarcity of food and water supply. There is only one toilet at most shelters, there is always a long line for it and no separate facilities for women. Moreover, even for pregnant women the situation is worse. There is no doctor at Nujhumdwip, expect two or three village doctors. However, they remain unavailable during cyclone. Recently, A shelter which is maintained by German Red Cross introduced provision for separate room for women and children considering their problems.
- X. The infrastructural condition of the existing shelter is not up to the mark. Doors and windows are broken. Few shelters are currently used as store house on rental basis. One of the shelter was became unfit for use that might cause another hazard, is demolished recently. Unfortunately, there is no plan for constructing new shelter there, although the accommodation capacity of all shelters are far below considering the number of population of the whole area.
- XI. The area is not connected with national grid. Moreover, there is no sub-station. Only 4.4 percent of the houses have electricity which is run by solar power. As a result, after dusk the whole area remains in darkness that makes the scenario worse during cyclone.

6.2 Suggestions to Improve Early Warning Services for the vulnerable groups

The existing demography, socio-economic aspect of Nijhumdwip, early warning dissemination system and situation during cyclone which is faced by women, children and PWD as well limit their access to early warning services. To improve their existing access, following facts are highly recommended.

- I. Education of children should be the first priority. New school is highly demanded to increase the level of knowledge of children as well as women. Informal school system can be introduced.
- II. Training, drill and workshop are needed to be organized at regular interval. It is believed that knowledge about cyclone early warning system, preparedness activities can be disseminated through this method in better manner.
- III. The area coverage of CCA project which is implemented by BDRCS at Nijhumdwip, need to cover larger population. They yet to cover about 80 percent of the total households of this island by scaling up their initiatives.
- IV. Cluster programs can be introduced ward wise. Small groups can be initiated who will be responsible to build awareness about early warning system and preparedness activities.
- V. Local CPP volunteer require necessary equipments like mike, siren, bi-cycle. It is needed to equip the local CPP volunteer well with these equipments for timely and effective cyclone early warning signal dissemination.
- VI. HF and VHF radio station need to activated on 24/7 basis so that timely cyclone early warning signal dissemination will be succeeded with proper support from CPP volunteer.
- VII. Separate room for women is needed to be maintained so that they will be more encouraged to go to shelter. In this case, a shelter which is renovated by German Red Cross recently, can be considered as model. In the shelter, there is separate room for woman and also extra facilities for pregnant women. Safety is also ensured here by adding iron-gate at stairs.
- VIII. Medical facilities need to be improved for women. In this manner, few women can be selected from each ward for training about emergencies that can help

other women at shelter during cyclone. These selections must be well distributed so that they can cover the whole area in equal manner.

- IX. Approach road of existing shelter is needed to lighten up with electricity as dark stormy night always makes the situation worse.
- X. More community based cyclone shelters have to be constructed as existing all seven cyclone shelters at Nijhumdwip can accommodate about 3500-4000 that cover nearly 15 percent of total population of the island.
- XI. Community based adaptation technique can be introduced. Local people can be taught about techniques to make their home strength enough to resist stormy wind. Homestead forestation can be encouraged.
- XII. Using Geographical Information System (GIS); vulnerability mapping, location analysis of cyclone shelters and settlement pattern are highly recommended.
- XIII. Strategic establishment of local office around whole area can be helpful to raise awareness among local inhabitants.
- XIV. Construction of a lighthouse at the island is highly essential so that fishing boat can make their way back home during stormy night without getting lost in dark. It will save valuable lives of fisherman and also facilitate their own family to take safe shelter during cyclone before it's too late.

6.3 Conclusion

Nijhumdwip is a very remote island which is highly vulnerable to cyclone. The existing condition of the locality is not fit for proper preparedness activities and incapable of reduce the impact of devastating cyclone in significant amount due to lack of knowledge, awareness and capabilities. Women and children who cover about 70 percent of the population are most vulnerable group. Immediate actions are needed to be taken to reduce their vulnerability by increasing their access to cyclone early warning services. After ensuing large scale awareness program among locals along with capacity building of the responsible authorities as well as increasing facilities for women and children can only change the current scenario and finally it can be expected to have a disaster resilient community at Nijhumdwip.

References

- Ahmed, A.U. (2005) Adaptation options for managing water related extreme events under climate change regime: Bangladesh perspectives. In: Mirza MMQ, Ahmad QK (eds) *Climate change and water resources in South Asia*. Balkema Press, Leiden, pp 255–278
- Ali, A. (1980) *Storm surges in the Bay of Bengal and their numerical modeling*. SARC Report No. 125/80. Atomic energy commission, Dhaka
- Ali, A. (1999) Climate change impacts and adaptation assessment in Bangladesh. *Climate Research*. 12:109–116
- As-Salek, J.A. (1998) Coastal trapping and funneling effect on storm surges in the Meghna estuary in relation with the cyclones hitting Noakhali-Cox's Bazar coast of Bangladesh. *J Physical Oceanography*. 28(2):227–249
- Bangladesh Forest Department [BFD] (2006) *Deer census report of Nijhum Dwip, Noakhali* (in Bengali). Bangladesh Forest Department, Noakhali
- BBS(2011a) *Population and Housing census*, Dhaka: BBS
- BBS(2011b) *Community series- Noakhali district*, Dhaka: BBS
- Blake, G. (2008) The gathering storm. *On Earth* 30(2):22–37
- Centre for Environmental and Geographic Information Services [CEGIS] (2005) *Report on ground-truthing of islands and chars in the coastal zone*. Centre for Environmental and Geographic Information Services, Dhaka
- Dow, K. and Cutter, S. (1998) Crying wolf: Repeat responses to hurricane evacuation orders. *Coast Management* 26(4):237–252
- Drabek, T. (1986) *Human system response to disaster: An inventory of sociological findings*. Springer, New York
- Drabek, T. (2004) *Social dimensions of disaster*, 2nd ed. Emmitsburg, Maryland. Emergency Management Institute, Federal Emergency Management Agency

Dhar, A.S. and Ansary, M.A.(2008) *Disaster early warning system for Cox's Bazar*, Dhaka, BUET

Dube, S.K., Chittibabu, P., Sinha, P.C., Rao, A.D., Murty, T.S. (2004) Numerical modelling of storm surge in the head Bay of Bengal using location specific model. *Natural Hazards*. 31(2):437–453

GoB (2008) *Cyclone sidr in Bangladesh: damage, loss, and needs assessment for disaster recovery and reconstruction*. A report prepared by the government of Bangladesh assisted by the international development community with financial support from the European commission

Gray, W.M. (1985) *Tropical cyclone global climatology*. WMO Technical Document WMO/TD . 72(1), WMO, Geneva, Switzerland, 3–19

Gregg, C.E. et al. (2006) Natural warning signs of Tsunamis: human sensory experience and response in Thailand. *Earthquake Spectra* 22(3):671–691

Haider, R., Rahman, A., Huq, S. (1991) *Cyclone '91: an environmental and perceptual study*. Centre for Advanced Studies (BACS), Bangladesh

Haque, C.E. (1995) Climatic hazards warning process in experience of, and lessons from, the April cyclone. *Environmental Management* 19(5):719–734

Haque, C.E. (1997) *Hazards in a fickle environment: Bangladesh*. Kluwer Academic Publisher, The Netherlands

Haque, C.E., Zaman, M.Q. (1989) Coping with riverbank erosion hazard and displacement in Bangladesh: Survival Strategies and Adjustments. *Disasters* 13(4):300–314

Haque, C.E., Zaman, M.Q. (1993) Human responses to riverine hazards in Bangladesh: A proposal for sustainable floodplain development. *World Development* 21(1):93–107

Haque, C.E., Zaman, M.Q. (1994) Vulnerability and Response to Riverine Hazards in Bangladesh: a critique of flood control and mitigation approaches. In: Varley A (ed) *Disasters, development and environment*. John Willy and Sons, London, pp 65–79

- Heath, M. (2007) *UN grants aid to Bangladesh to assist 3 million hit by cyclone*. Available (September 2012) www.bloomberg.com
- Hossain, M.Z., Islam, M.T., Saka, T., Ishida, M. (2008) Impact of Tropical Cyclones on Rural Infrastructures in Bangladesh. *Agricultural Engineering International* 10(2):1–13
- Howell, P. (2003) *Indigenous early warning indicators of cyclones: potential application in coastal Bangladesh benfield hazard research centre*. Available (September 2012) www.benfieldhrc.org/disaster_studies/working_papers/pdfs/workingpaper6.pdf
- Iftekhhar, M.S. and Takama, T.(2008) Perceptions of biodiversity, environmental services and conservation of planted mangroves: a case study on Nijhum Dwip Island, Bangladesh, *Wetlands Ecology management*. 16:11-137
- IPCC (2001) Climate change 2001: The Scientific basis. In: Houghton et al (eds.) *Contribution of working group-I to the IPCC third assessment report*. Cambridge University Press, Cambridge
- Emanuel, K. (2005) Increasing destructiveness of tropical cyclones over the past 30 years. *Nature*. 436(4):686–688
- Islam, M.A. (1980) Agricultural adjustments to flooding in Bangladesh: a preliminary report. *Natural Geography J India* 26:50–59
- Islam, R.M. (2008) towards institutionalization of global ICZM efforts. In: Krishnamurthy RR (ed) *Integrated coastal zone management. Research Publishing Services*, Singapore, p 23
- Khan, M.S.A. (2008) Disaster preparedness for sustainable development in Bangladesh. *Disaste Prevention Management* 17(5):662–671
- LGED(2012) *Road database*, Dhaka: LGED Available at www.lged.gov.bd ; accessed on 21 January 2012
- Lindell, M., Perry, R. (1992) *Behavioral foundations of community emergency planning*. Hemisphere Publishing Co., Washington

- Lindell, M.K., Perry, R.W. (2004) *Communicating environmental risk in multiethnic communities*. Sage Publications, Thousand Oaks
- Liu, S., Quenemoen, L., Maliday, J., Moji, E., Sinks, T., Mendlein, J. (1996) Assessment of a severe- weather warning system and disaster preparedness. *Public Health* 86(1):87–89
- Madsen, H., Jakobsen, F. (2004) Cyclone induced storm surge and flood forecasting in the northern Bay of Bengal. *Coast Engineering*. 51(4):277–296
- McLuckie, B. (1970) *The warning system in disaster situations: a selective analysis. Report series 9*, Disaster Research Center, University of Delaware, Newark, Del 19716
- MES (1998) *Draft development plan, volume 3: part 1, Feasibility study Nijhum Dwip integrated development project. Meghna Estuary Study Project*. Bangladesh Water Development Board, Ministry of Water Resources of Bangladesh, Dhaka
- Mian, S.M. (2005) *Generating Sustainable Employment in the Coastal Zone of Bangladesh- Present situation and future potentials*, Working paper WP042, Program Development office for Integrated Coastal Zone Management, Dhaka
- Mileti, D.S., Peek, L. (2000) The social psychology of public response to warnings of a nuclear power plant accident. *J Hazard Mater* 75:181–194
- Mileti, D.S., Sorensen, J. (1990) *Communication of emergency public warnings ORNL-6609*. Oak Ridge National Laboratory, Oak Ridge, Tenn
- Mimura, N. (1999) *National assessment results of climate change: impacts and responses*, CR Special 6. Interresearch, Oldendorf 230
- Mooley, D.A. (1980) severe cyclonic storms in the Bay of Bengal 1877–1977. *Mon Weather Revolution* 108:1647–1655
- Murty, T.S., El-Sabh, M. (1992) Mitigating the effects of storm surges generated by tropical cyclones-A proposal. *Natural Hazards* 6(3):251–273
- Nicholls, R.J. (1995) Synthesis of vulnerability analysis studies. In: Beukenkamp P. et al (eds.) *Proceedings of the world coast conference 1993*. The Hague, National

institute for coastal and marine management, Coastal zone management centre publication. 4, 181–216. Available (September 2012) <http://www.survas.mdx.ac.uk/pdfs/nicholls.pdf>

Nicholls, R.J., Hoozemans, FMJ., Marchand, M. (1999) Increasing flood risk and wetland losses due to global sea-level rise: regional and global analyses. *Global Environmental Change*. 9(1):69–87

Nicholls, RJN., Mimura, N., Topping, J.C. (1995) Climate change in South and South–East Asia: some implications for coastal areas. *J Global Environmental Engineering*. 1:137–154

Parvin, G.A., Takahashi, F., Shaw, R. (2008) Coastal hazards and community—coping methods in Bangladesh. *J Coast Conservation* 12(4):181–193

Paul, A. and Rahman, M. (2006) Cyclone mitigation perspectives in the Islands of Bangladesh: a case of Sandwip and Hatia Islands. *Coast Management* 34(2):199–215

Paul, B.K. (1984) Perception of and agricultural adjustments to floods in Jamuna floodplain. *Bangladesh Human Ecology* 12(1):3–19

Paul, B.K. (2009a) Why relatively fewer people died? The case of Bangladesh's cyclone sidr. *Natural Hazards*. 50(2):289–304

Paul, B.K. (2009b) Human injuries caused by Bangladesh's cyclone Sidr: An empirical study. *Natural Hazards*. 54(2):483–495

Paul, S.K. and Routray, J.K. (2010b) Household response to cyclone and induced surge in coastal Bangladesh: coping strategies and explanatory variables. *Natural Hazards*. 57(2):477–499

Post, J., Wegscheider, S., Muck, M., Zosseder, K., Kiefl, R., Steinmetz, T., Strunz, G. (2009) Assessment of human immediate response capability related to tsunami threats in Indonesia at a sub- national scale. *Nat Hazards Earth System Science* 9:1075–1086

Program Development Office for Integrated Coastal Zone Management Plan Project [PDO-ICZMP] (2004) *Areas with special status in the coastal zone. Working paper WP030*, Program Development Office for Integrated Coastal Zone Management Plan

Project, Water Resources Planning organization; Ministry of Water Resources, Bangladesh, Dhaka

Quarantelli, EL. (1980) *Evacuation behavior and problems: findings and implications from the research literature*. Disaster Research Center, Ohio State University Press, Ohio

Rahman, M., Rahman, M.M., Hasan, M.M. and Islam, M.R. (2012) Livelihood status and the potential of alternative income generating activities of fishers' community of Nijhmjdwip under Hatiya upazila of Noakhali district in Bangladesh, *Bangladesh Research Publication Journal*, 6(4):370-379

Rasid, H. (2000) Reducing vulnerability to flood disasters in Bangladesh: compatibility of floodplain residents preferences for flood alleviation measures with indigenous adjustments to floods. In: Parker DJ (ed) *Floods, vol II*, Routledge, London, pp 46–65

Rasid, H., Haider, W. (2003) Floodplain residents' preferences for water level management options in flood control projects in Bangladesh. *Natural Hazards*, 28(1):101–129

Rasid, H., Paul, BK. (1987) Flood problems in Bangladesh: is there an indigenous solution? *Environmental Management* 11(2):155–173

Resource Development Centre [RDC] (2000) *Baseline survey of coastal chars in CDSP areas 1999-2000, vol VI, Nijhum Dwip*. Resource Development Centre, Dhaka

Rogers, G.O. (1985) *Human components of emergency warning*. University Center for Social and Urban Research, University of Pittsburgh, Pittsburgh

Rosario, E. (1997) *Conservation management plans for protected areas other than the Sundarbans Reserved Forests*. Bangladesh Forest Department, Dhaka

Schmuck, W.H. (1996) *Living with the floods: survival strategies of Char-Dwellers in Bangladesh*. ASA-Text 6, Berlin, FDCL. ISBN 3-923020-18-X

Schmuck, W.H. (2003) Living with cyclones: strategies for disaster preparedness in Cox's Bazar district. Bangladesh, *Geographische Rundschau* 55(11):34–39

Shamsuddoha, M., Chowdhury, RK. (2007) *Climate change impact and disaster vulnerabilities in the coastal areas of Bangladesh*. COAST Trust, Dhaka

Sorensen, J., Mileti, DS. (1987) Decision making uncertainties in emergency warning system organizations. *Int J Mass Emergency Disasters* 5(1):33–61

Sorensen, JH. (2000) Hazard warning systems: review of 20 years of progress. *Natural Hazards* 1(2):119–125

Sorensen, JH., Sorensen, BV. (2006) Community processes: warning and evacuation. In: Rodríguez, H., Quarantelli, EL., Dynes, RR. (eds) *Handbook of disaster research*. Springer, New York, pp 183–199

Wisner, B., Blaikie, P., Cannon, T., Davis, I. (2004) *At risk*, 2nd edn. Routledge, London

MS, Dejoy., DM, Laughery. (1999) *Warnings and risk communication*. Taylor and Francis, London

<https://oceanservice.noaa.gov/facts/cyclone1.jpg>

Annex- 1

ASSESSING THE CYCLONE EARLY WARNING SERVICES OF WOMEN, CHILDREN AND PERSON WITH DISABILITY:A CASE STUDY IN NIJHUMDWIP

Household Questionnaire

1. Household information

Name of Interviewee:.....

(Father/Husband).....

Code No.	Name	Relation with HH	Age	Sex	Marital status	Education	Working Status
I	ii	iii	iv	v	vi	vii	viii

**ii Put Household Head's name first*

iii Relations

1=Husband/Wife
2=Father
3=Mother
4=Son
5=Daughter
6=Grandson
7=Granddaughter
8=Daughter in Law
9=Sister
10=Brother
11=Brother's Wife
12=Nephew
13=Others

v Sex

1=Male
2=Female

iv Marital Status

1= Unmarried
2=Married
3=Divorced
4=Widow
5=Separated

vii Education

-=<6 years
0=Illiterate
1-10=class
11=SSC Passed
12=Intermediate
13=HSC Passed
14=BA/BSc/BCom
15=Honors
16=Masters
17=Medical
18=Engineer
19=Other(Specify)

viii Working Status

1=Earning member
2=Housewife
3=Household work
4=Student
5=Infant
6=Old
7=Disable
8=Unemployed
9=Others

2. Housing Structure

Housing Unit	Floor	Wall	Roof
Main house			
Kitchen			
others			
1.Earth 2.Brick 3.Wood 4.Bamboo 5.Tin 6.Custed Sheet 7.Thatch 8.Tally 9.Leaf 10. Others			

3. Degree of vulnerability of different sectors during cyclone

Sectors	Yearly Income (in BDT)	Vulnerability			
		Highly	Moderately	Low	No
Housing					
Agriculture					
Fishing					
Fish Business					
Poultry					
Livestock					
Trees and forestry					
Institutions					
Health					
Transport					
Infrastructure					
Industry					
Loan					
Savings					
Others					

4. Assets

Items	Amount/Number	Ranking
Cash & Savings		
Agriculture land		
Homestead		
Boat		
Net		
Livestock (Cow/Goat/Buffalo)		
poultry		
Television		
Radio		
Bicycle		
Motor Cycle		
Van/Rickshaw/Auto		
Others(specify)		

5.

Assistance during Cyclone	Agency	Remarks
Cyclone Signal Training		
Cyclone Warning		
Evacuation warning		
Evacuation		
Security		
Food supply		
Drinking water supply		
Shelter		
Medical		

6. Do you know about cyclone early warning signals? Yes/No
7. What do you know about early warning system ?
8. Do you understand the meaning of early warning signal when declared? yes/no
9. How do get cyclone early warning signals?

Medium of receiving signals	Ranking on effectiveness	remarks
TV		
Radio		
Newspaper		
CPP Volunteer		
Other NGOs		
Neighbors		
Nature		
others		

10. What are the preparations you took during cyclone early warning signal dissemination?

No	Preparations	Properly	Partially	Absent	Timely	Latently	N/A
a	Gather money						
B	Preservation of documents						
C	Preservation of drinking water						
D	Preservation of medicine						
E	Preservation of food						
F	Sending cattles to killas						
G	Preservation of machineries						
H							
I							
J							
K							

11. Who give you evacuation order during cyclone?

Name of Agency	Remarks
CPP Volunteer	
Upazila Office	
Other NGOs(specify)	

12. Where do you go after getting evacuation order?

Nearby Cyclone Shelter	
Neighbor's house(pacca/semi-pacca/katcha)	
Mosque	
School	
Others	

13. What is the distance of nearest cyclone shelter?.....

14. Do you like to go to cyclone shelter during cyclone after evacuation order?

a. Yes, why?	b. No, why?
i.	i.
ii.	ii.
iii.	iii.
iv.	iv.
v.	v.

15. What problems do you face during cyclone?

i	
ii	
iii	
iv	
v	
vi	

16. What problems do you face with children and PWD during cyclone?

i.	
ii.	
iii.	
iv.	
v.	
vi.	

17. How do you manage them?

18. Do your children know about cyclone preparedness? Yes/ No

19. Why women and children are worst sufferer during cyclone, what do you think?

20. What special measures can be taken for women and children so that they became less vulnerable?

Annex-2

Assessing the Cyclone Early Warning Services (CEWS) for Women, Children and Person with Disable (PWD): A Case Study in Nijhumdwip Island

FGD/KII Check list

Type of Stakeholder:

অংশগ্রহণকারীর সংখ্যা/ উত্তর দাতার নাম ও ঠিকানা :

1. How do you receive give early warning signal? সাইক্লোনের পূর্বাভাসের সংকেত আপনি/ আপনারা কিভাবে পেয়ে থাকেন ? ১. টিভি ২) রেডিও ৩) খবরের কাগজ ৪) সিপিপি স্বেচ্ছাসেবক, ৫) বিভিন্ন এনজিও প্রতিনিধির মাধ্যমে, ৬) প্রতিবেশী, ৭) প্রকৃতি থেকে/ এন্ডিজেনিয়াস নলেজ থেকে, ৮) অন্যান্য মাধ্যম থেকে
2. Do women. Children. Aged and Disable get the EW message at the time when male get? সাইক্লোন এর পূর্বাভাস যখন পুরুষরা পেয়ে থাকে একই সাথে সাথে কি নারী, শিশু, বয়স্ক ও প্রতিবন্ধী পেয়ে থাকে? না পেয়ে থাকলে কারণ কি কি আপনি/ আপনারা মনে করেন। হ্যাঁ/ না ১. ২. ৩. ৪.
3. Is there any delay in getting EW messages between men and women, children, aged and disable? সাইক্লোন এর পূর্বাভাস পুরুষদের চেয়ে নারী, শিশু, বয়স্ক ও প্রতিবন্ধীদের কাছে পৌছতে দেরী হয় বলে আপনি/ আপনারা মনে করেন। হ্যাঁ/ না

4. Does it create any problem for evacuation? সাইক্লোন এর পূর্বাভাস পুরুষদের চেয়ে নারী, শিশু, বয়স্ক ও প্রতিবন্ধীদের কাছে দেবীতে পৌঁছলে স্থানান্তরে কি কি সমস্যা হয় বলে আপনি/ আপনারা মনে করেন ১. ২. ৩. ৪.
5. How can it improve? সাইক্লোন এর পূর্বাভাস পুরুষদের সাথে সাথে নারী, শিশু, বয়স্ক ও প্রতিবন্ধীদের কাছে পৌঁছে দেওয়ার জন্য কি কি করা দরকার বলে আপনি/ আপনারা মনে করেন ১. ২. ৩. ৪.
6. What are your activities after getting cyclone early warning signal? সাইক্লোন এর পূর্বাভাস/ সংকেত পাওয়ার পর কি কি কাজ করেন থাকেন? ১. ২. ৩. ৪.
7. What are your activities after getting evacuation order? অপসারণ বা স্থানান্তর আদেশ পাওয়ার পর আপনারা কি কি কাজ করেন থাকেন? ১.

২. ৩. ৪.
৪. What stuff do you take with you while going cyclone shelter? যখন সাইক্লোন সেল্টারে আশ্রয় নিতে যান তখন কি কি জিনিস পত্র আপনি/আপনারা সাথে নিয়ে যান? ১. ২. ৩. ৪.
৯. What are the conditions of cyclone shelter? সাইক্লোন সেল্টারের অবস্থা কেমন ? ১. ২. ৩. ৪.
১০. Why women/children/aged/ disable are found more in non-response category of early warning? পূর্বাভাস সাড়া প্রদানের ক্ষেত্রে কেন নারী/শিশু/বয়স্ক/ প্রতিবন্ধীরা সবচেয়ে কম সাড়া পেয়ে থাকে? ১. ২. ৩. ৪.
১১. What are the activities of CPP volunteer?

সিসিপি'র স্বেচ্ছাসেবকরা কি কি কাজ করে থাকে? ১. ২. ৩. ৪.
12. Level of satisfaction or dissatisfaction of CPP volunteer activities সিসিপি'র স্বেচ্ছাসেবকদের কার্যক্রম সম্পর্কে কতটুকু সন্তুষ্ট? ১. পুরোপুরি সন্তুষ্ট ২. আংশিক সন্তুষ্ট----কেন?----- ৩. আদৌ সন্তুষ্ট নয়---কেন?-----
13. What more CPP volunteer can do for you during cyclone? সিসিপি'র স্বেচ্ছাসেবকরা সাইক্লোনের সময় আরও আরও কি করতে পারে বলে আপনি/আপনারা মনে করেন? ১. ২. ৩. ৪.
14. What else can be done for you? পূর্বাভাস/সংকেত আর সহজভাবে সকলের কাছে পৌঁছে দেওয়ার জন্য কি কি করা দরকার বলে আপনারা মনে করেন? ১. ২. ৩. ৪.

15. Do you know about Cyclone Early Warning Signals ?

সাইক্লোন পূর্বাভাসের সংকেত সম্পর্কে আপনি/ আপনারা জানেন কি না ? জানলে বলবেন কি কি জানেন?

16. What are the preparation you took during cyclone warning signal dissemination?

সাইক্লোনের পূর্বাভাস প্রচারের সময় আপনি/ আপনারা কি কি ধরনের প্রস্তুতি নিয়ে থাকেন?

১.

২.

৩.

৪.

17. Who give you evacuation order during cyclone?

সাইক্লোনের সময় কে আপনাদের স্থানান্তর/ অপসারণ আদেশ দিয়ে থাকে?

16. Where do you go after getting evacuation order?

স্থানান্তর আদেশ পাওয়ার পর আপনি/ আপনারা সাধারণত কোথায় কোথায় গিয়ে থাকেন?

17. What is the distance of nearest Cyclone Shelter?-----

নিকটবর্তী সাইক্লোন আশ্রয়কেন্দ্রের দূরত্ব কত?-----

18. Do you like to go to Cyclone Shelter during cyclone after evacuation order?

Yes. Why?

No. Why?

স্থানান্তর আদেশ পাওয়ার পর আপনি/ আপনারা কি সাইক্লোন আশ্রয়কেন্দ্রে যান?

গেলে কেন যান?

না গেলে কেন যান না?

19. What problems do you face during cyclone?

সাইক্লোনের সময় আপনি/ আপনারা কোন কোন সমস্যার সম্মুখীন?

১.

২.

৩.

৪.

20. What problems do you face with children and PWD during cyclone?

সাইক্লোনের সময় আপনি/ আপনারা শিশু, বয়স্ক ও প্রতিবন্ধীদের নিয়ে কোন কোন সমস্যার সম্মুখীন?

১.

২.

৩.

৪.

21. How do you manage them?

আপনি/ আপনারা সাইক্লোনের সময় কিভাবে শিশু, বয়স্ক ও প্রতিবন্ধীদের সমস্যার মোকাবেলা করেন

১.

২.

৩.

৪.

22. Do your children know about cyclone preparedness? Yes/ No

আপনার ছেলে-মেয়েরা সাইক্লোনের পূর্ব প্রস্তুতি সম্পর্কে জানেন কি?

23. Why women, children, PWD and Aged are worst sufferer during cyclone, What do you think?

সাইক্লোনের সময় কেন নারী, শিশু, বয়স্ক ও প্রতিবন্ধীরা সবচেয়ে বেশী ভোগান্তির শিকার হয়? এ জন্য আপনারা/ আপনি কি কি মনে করেন?

১.

২.

৩.

24. What special measures can be taken for women, children, aged and PWD, so that they became less vulnerable?

নারী, শিশু, বয়স্ক ও প্রতিবন্ধীদের জন্য কি কি ব্যবস্থা নেওয়া প্রয়োজন বলে আপনি/ আপনারা মনে করেন? যাতে করে তারা সাইক্লোনের সময় কম বিপদাপন্ন হয়।

১.

২.

৩.

৪.

Annex-3

List of Key Informants

1. Chairman, Nijhumdwip Union, Mr. Miraz Uddin
 2. Jahid Sir, Teacher, Primary School, Nijhumndwip
 3. Belal Hossan, Fisherman, Nijhumndwip
 4. Ashraf Doctor, Nijhumndwip
 5. Halima Khatun, Locally known as 'Kepra Buri', Nijhumndwip
 6. Tajul Islam, Ex-Member, Nijhumdwip Ward
 7. Mrs. Karin, German Red Cross
 8. Habibur Tahman, Hasi, Nijhumdwip
 9. Sabina Yasmin, CO-BDRCS, Nijhumndwip
 10. Fazlul Karim Bokhari, Union team Leader, BDRCS, Nijhumdwip
-

Cluster Sampling Process

Ward no.	Total no. of HH	Sample no.	Sample interval
1	330	8	40
2	270	7	40
3	350	9	40
4	250	6	40
5	616	15	40
6	900	22	40
7	678	17	40
8	170	4	40
9	440	11	40
Total	4004	100	