# An Assessment of Cyclone Mitigation and Management Policies of Bangladesh: A Focus on Early Warning Systems

By

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## Abstract

This study was done as a part of the “Building of Environmental Governance Capacity in Bangladesh” project led by Dr. Emdad Haque through the Canadian International Development Agency. Research was conducted in Dhaka and Cox’s Bazar, Bangladesh to examine grass-roots cyclone vulnerability and the governmental policies and cross-scale linkages that address this vulnerability. This study aims to understand cyclone forecasting and the creation and dissemination of cyclone early warnings from the national government, down to the local government and local early warning dissemination volunteers. Capacity building at the local level and each level of government was examined, as well as evacuation options available to local coastal villagers. International partnerships to increase capacity building and improve forecasting capabilities were assessed to understand cyclone early warning limitations. After conducting surveys with local villagers, it was determined that while the majority of people understand the cyclone is coming, the options available to them for safe evacuation are limited, as there are not enough cyclone shelters and not all shelters are maintained and in usable condition. It was also found that budget restraints and improper relief distribution impair the country’s ability to mitigate against cyclone vulnerability.

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# Table of Contents

List of Tables

List of Figures

List of Photos

List of Appendices

Glossary of Acronyms

ADPC.....Asian Disaster Preparedness Center

BMD .....Bangladesh Meteorological Department

CDMP .....Comprehensive Disaster Management Programme

CPP .....Cyclone Preparedness Plan

CRA .....Community Risk Assessment

DER.....Disaster Emergency Response

DFID .....Department for International Development

DMB .....Disaster Management Bureau

DRR .....Department of Relief and Rehabilitation

GoB.....Government of Bangladesh

LCG.....Local Consulting Groups

LGED.....Local Government Engineering Department

MoFDM .....Ministry of Food and Disaster Mangement

NGO.....Non-Government Organization

SOD.....Standing Order on Disasters

TNO .....Thana Nirbahi Officer

UNDP.....United Nations Development Programme

# Chapter 1: Introduction

## 1.1 Preamble

Bangladesh faces some of the most severe environmental and socioeconomic conditions experienced by modern society. Their extreme population density, combined with their very low GDP and high governmental corruption creates complex social issues. The fact that Bangladesh is also one of the world's most disaster-proned countries creates a myriad of environmental hazards, making the challenges faced by Bangladesh unique and complex. These challenges become of greater concern in the light of climate change and the effect that it will have on both Bangladesh's weather patterns and possible land use. Bangladesh must develop new strategies to deal with the ever-increasing population and changes within the environment. These strategies include re-formatting existing natural disaster policies. The Bangladesh government has realized that with the increasing population it has become difficult to create and maintain disaster policies and to ensure sustainable economic growth of the country. It has opted to restructure these policies toward more holistic, community-level policies so individual communities will be able to best assess their needs and create appropriate policies. This study has examined the nature of Bangladesh's current disaster management policies with a focus on cyclone disaster management, the tools used to re-format the current policy structure and the success of both.


Map 1.1 Map of Bangladesh and location within Asia and Bay of Bengal. *Note:* From About.com: Geography 2009.

## 1.2 Background

### *1.2.1 Cyclone vulnerability in Bangladesh*

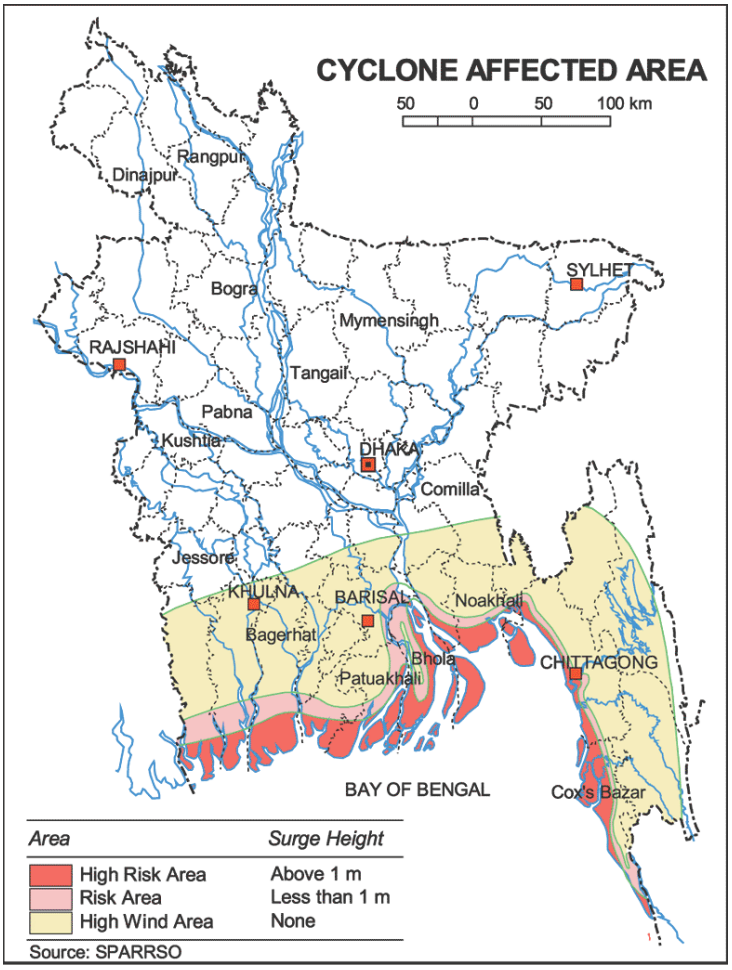
Bangladesh is located in an alluvial deltaic plain. It is divided into three zones; namely hills, terraces and flood plain (e-Citizen Services 2008). Bangladesh forms the lower part of three large river basins, the Padma, the Brahmaputra and the Meghna (e-Citizen Services 2008), and has 230 waterways (UNOPS 2008). Bangladesh is located in the delta of the world's second largest river basin (United States Agency for International Development [USAID] 2007) and has over 600 kilometers of coastline (USAID 2007). The human settlements in the coastal area are mostly developed in an unorganized and isolated manner, making community efforts to cope with disasters extremely difficult

(Miyan 2005). Bangladesh is part of the humid tropics, with the Himalayas, Assam and Burmese mountain ranges to the north and northeast (USAID 2007) and the funnel-shaped coast touching the Bay of Bengal on the south (Banglapedia 2008). This peculiar geography of Bangladesh brings not only the life-giving monsoons, but also catastrophic cyclones, tornadoes and floods (Banglapedia 2008). The Bay of Bengal is an ideal breeding ground for tropical cyclones (Banglapedia 2008), and is one of the most dangerous cyclone basins of the world (Bern, Sniezek, Mathbor, Siddiqi, Ronsmans, Cho4wdhury, Chowdhury, Islam, Bennish, and Noji 1993). These cyclones often have accompanying storm surges and cause great amounts of flooding, making them the most destructive of all atmospheric disturbances (Banglapedia 2008) and the worst killers (CDMP 2008, Asian Disaster Reduction Center [ADRC] 2003). The cities of Chittagong and Cox's Bazar are especially vulnerable areas for large losses of life (Molnar 2005).

### *1.2.2 Risk reduction in Bangladesh*

Historical data suggests that Bangladesh is one of the most disaster prone countries in the world (Haque 1997[1]), in terms of both fatalities and economic loss (Pacific Disaster Center [PDC] 2006). It is not that Bangladesh suffers from these events more than other countries, it is that the communities are more vulnerable to their impacts and therefore the consequences are more severe (Comprehensive Disaster Management Programme [CDMP] 2008). The Government of Bangladesh acknowledges the need for disaster risk reduction as opposed to the earlier concepts of responding after a disaster (PDC 2006), therefore Bangladesh has taken a holistic approach to disaster management to ensure that they are successful in monitoring and defining the risk environment. Bangladesh has adopted a unique approach to Community Risk Assessment (CRA). A key element of this approach is the establishment of uniform CRA guidelines for use by all stakeholders (CDMP 2008). These guidelines include both traditional and scientific analysis of the risk environment, including considerations for climate change impact. The guidelines also include an all hazards all sector approach to community participation in CRA and the determination of risk reduction options (CDMP 2008). The major steps of CRA include scoping the community, identification of hazards, vulnerable sectors, elements and

locations, risk analysis and evaluation, specific risk reduction options and action planning and consensus on options (CDMP 2008).




Map 1.2: Map of Bangladesh and areas affected by cyclones. *Note:* From Bangladesh Meteorological Department 2007.

*1.2.3 Recent disaster management initiatives*

Disasters are intersects of geophysical, biological, social, political, economic and cultural spheres; a holistic approach is therefore necessary for studying natural hazards and disasters (Haque 1997[1]). A common consensus is emerging amongst the policy makes, experts and professionals that the Government alone can not and will not properly manage and handle all types of disasters with its machinery which required active participation by the people in any region of the country (Asian Disaster Reduction Center [ADRC] 2003). The adverse impacts of all the natural hazards affecting socio-economic

condition need to be reduced for sustainable development (ADRC 2003). Despite the presence of some strengths, such as long experience in disaster response and recovery, the peoples' resilience, and donor support, the current management strategies suffer from a host of policy and institutional weaknesses (Khan and Rahman 2007). Bangladesh is in the process of developing a fully functional disaster risk information management system at the present time (PDC 2006). The vision of national disaster management program in Bangladesh is to reduce the vulnerability to natural, environmental, and human induced hazards through community empowerment and integration of sustainable risk management initiatives in all development programs and projects. This vision would be achieved by a multi-hazard and multi-agency approach to address vulnerability, risk assessment, and mitigation that include prevention, preparedness, response, and recovery. The vision considers a transition from a response and relief focus to vulnerability and risk reduction approach in disaster (PDC 2006). The Government of Bangladesh has pledged a total commitment toward the reduction of human, economic and environmental costs of disasters by enhancing overall disaster management capacities (GoB 2008, ADRC 2003). They have done so by recognizing a Community-Based Approach (CBA) which emphasizes the total participation of all people facing any hazard or disaster and makes sure to render all possible services to the community (ADRC 2003). The current vision of the Government of Bangladesh is to reduce the vulnerability of people, especially the poor, to the effects of natural, environmental and human induced hazards to a manageable and acceptable humanitarian level (CDMP 2008). Agencies such as the Flood Forecasting and Warning Centers (FFWC), the Bangladesh Meteorological Department (BMD), Centre for Environmental and Geographic Information Services (CEGIS), Institute of Water Modeling (IWM), and the Space Research and Remote Sensing Organization (SPARRSO) have particular interest in this information for early warning dissemination and collaborative linkages with regional and international organizations (PDC 2006). Government efforts have aimed toward ensuring community involvement so that the communities are aware of what they can do for protecting their lives and property against damage. Village-based self-help programs are most effectively implemented through locally constituted organizations. The rural population in general, and the displacees specifically, need encouragement and institutional assistance in

creating local-level organizations that can effectively articulate their concerns and needs to macro-level structures (Haque 1997[1]). The Government's plan involves preparedness, response, recovery and mitigation as key notes for building up self-reliance of the community people (GoB 2008). Haque (1997[1]) suggests that the riverine hazards problem in Bangladesh is not a problem of mere hydraulic dynamics, but rather an issue which reaches into macro-level societal concerns involving the economy, ecology, society, demography, settlement, politics and culture. As such, riverbank erosion and flooding issues must be addressed both in terms of sustainability and long-term development.

## 1.3 Problem Statement

The city of Cox's Bazar and the surrounding areas are especially vulnerable during Bangladesh's historical cyclone seasons. This area is saturated with marginalized people who are ill-prepared and unable to cope with these disasters. While the national government of Bangladesh is currently addressing vulnerability issues, increasing disaster frequency is still contributing to large losses of life in this area. This area was chosen because it was extremely affected during the 1991 cyclone, therefore parallels between historic disaster management practices and current practices could be drawn. Also, the CPP is very active in this area, so it was a suitable place to observe and understand the work of the local volunteers.

Cyclone early warnings were chosen as the focus as this study as it is imperative to have accurate early warnings to decrease the vulnerability of local coastal villagers. Early warnings are the first step in evacuating people to a safe location before a cyclone storm to decrease loss of life and property. Currently, there is a centralization of power within the national government. Although, the government has acknowledged that risk reduction and hazard mitigation is not feasible without the input of the local government and has begun to work together with community-level organizations to increase risk awareness and improve early warning systems. These systems are not yet affective in reducing vulnerability and loss of lives because of distrust within those receiving the warnings. This study has identified issues related to early warning system distrust and has outlined

recommendations regarding the policies that surround these early warnings to make them more effective at life-loss prevention.

## 1.4 Research Purpose and Objectives

The human aspect of disaster management is only as affective as the warning systems that aid people's disaster reactions. Currently mitigation measures are impeded by the complacency of local citizens to warnings. This complacency is a result of numerous issues including disbelief of warnings and distrust of the people and institutions issuing the warnings. The purpose of this study is to examine how the Government of Bangladesh is addressing these issues and creating new policies to incorporate community level involvement in disaster policy and the warning systems that are developed to protect the communities. Research was also conducted to understand how these policies are being implemented. This study incorporated both the government perspective and the community level opinions of the effects of these policies and early warning systems.

The objectives of this study include the following:

- to examine the current disaster management policies in Bangladesh and the discourse of these policies, focusing on cyclone disasters, the evolution and characteristics of these policies and exploring their strengths and weaknesses;
- to assess cross-scale institutional linkages in respect to cyclone mitigation preparedness and response
- to examine the state of community-level capacity to mitigate, prepare, respond and recover and ways and means to enhance such capacities with regard to cyclone disasters;
- to review the current cyclone early warning processes and assess the effectiveness of early warning creation at the national government level, and in turn, the dissemination of the warnings through the government and non-government channels down to the grass-roots level.

## 1.5 Summary of Methods

The first step in the research process was to create contacts in Bangladesh to aid in the research. These contacts were government officials in Dhaka, an interpreter for the duration of the research, community-level officials in the city of Cox's Bazar, and academics at North South University. Interested stakeholders and government and/or local organizations were involved to contribute insight to the study as to how to best approach the research process and fulfill all the necessary research requirements. A literature review was also done to complete the majority of the first objective.

Once in the field, informal interviews were done, initially, with non-government organizations to understand the current state of cyclone management within Bangladesh, as well as to understand which NGOs were currently operating within the Cox's Bazar area. While in Dhaka, the first objective was completed by collecting print material from local Bangladesh sources to support the information collected in the literature review and create a more complete understanding of local cyclone policies. The second objective was achieved by traveling to Cox's Bazar to conduct interviews with local officials and involved NGO participants. It is during the interviews that information was documented to indicate if the government's policy objectives are meeting the expectations of officials at the community level. These interviews also examined the relationship between the national and local levels of government, as well as the role of NGOs as policy making influences and local disaster management liasons. The third objective was executed by completing 90 surveys with local villagers, within three coastal villages and three inland villages. There were also five case studies done, within the 90 participants, to create an in depth understanding of the experiences felt by the local villagers before and during a cyclone storm. It was imperative, during the interviews, to utilize a local translator in order to properly and accurately document feedback to the survey. After the field research, 10 formal interviews were completed with government officials, after returning to Dhaka. There were also non-government participants interviewed after the field research in Cox's Bazar to fully understand the relationship between both levels of NGO offices and their roles within disaster management. These national interviews were compared to responses elicited by local officials in order to draw conclusions that will

help make decisions for the second objective. The fourth objective was completed at all levels of surveys. Questions regarding early warnings, their creation, dissemination and reception, were included in all three levels of questionnaires to understand each level's perspective of the current early warning situation. Both government and Non-Government organizations were asked about cyclone early warnings, as it was found that often the NGOs do the majority of cyclone warning dissemination, and in turn, the local villagers trust the NGO officials more than their local government officials. The last three objective were also completed upon return to the University of Manitoba with the analysis of the research collected. The recommendations were made after current policy changes, the perceived success of these changes and documentation regarding cyclone mitigation policies was reviewed.

## 1.6 Organization of Study

This study was organized into eight chapters. Chapter one acted as the introduction to the study, giving a background to the research and organizing the study. Chapter two is a review of relevant literature. This chapter includes information regarding current cyclone policies and helped to identify areas that lack research. Chapter three outlined methods, approaches and tools that were utilized throughout the study. Chapter four provided details regarding grass root vulnerability and local village responses to cyclone early warnings. Chapter five investigated the needs and concerns of the local level government officials as they address local vulnerability and convey those needs to the national level. It examined gaps in current policies and infrastructure needs at the upazilla level. Chapter six synthesized the cyclone policies and current early warning outlined by the national government. This chapter examined if the proposed changes outlined by the Government of Bangladesh align with what is occurring at the community level, and if the proposed paradigm shift is successful in increasing cyclone mitigation. Chapter seven synthesized the findings of this study. This chapter discussed all finding and gaps within both policy and early warning practices. Chapter eight summarized the findings of the study and its individual objectives. Conclusions and recommendations were detailed based on the

trends found within the different levels of study and common themes throughout the persons/organizations interviewed.

## 1.7 Contribution to Knowledge

This research aimed to assist in raising a voice to a country that on a global scale has often been forced into silence. It has acted to raise awareness toward an increasing problem plaguing a booming, but still very marginalized, economically disadvantaged population. Currently, there is approximately 56 million people living in poverty, 27 million of them in extreme poverty (Government of Bangladesh [GoB] 2009). The current national Gross Domestic Product (GDP) is $673 USD (World Bank 2011). It also acted as a model for future research and recommendations regarding developing countries and disaster management policy, providing insight into the benefits of community involvement in disaster mitigation. This study contributed to the current body of knowledge and literature in this area. It has addressed the compounding problems that occur when considering the implications of climate change in disaster management.

## 1.8 Study Limitations

There were numerous challenges and limitations when conducting a one-time study in a country other than the researcher's own, and in a language unfamiliar to the researcher. Direct, verbatim translation cannot be guaranteed and slight changes in context may have occurred. Cultural barriers may have caused respondents to withhold valuable opinions related to feelings of vulnerability. Participants may have been reluctant to share opinions or previous experiences. Since some of the households surveyed may have females as the head of the household and survey respondents, they may have had cultural rules that prevent them from answering honestly, or may fear judgement from their neighbors for participating in such a study. Also, some female respondents that were answering for the household because their husbands were out fishing, may have withheld information that they feel their husbands would not want them sharing. This study was also limited in its ability to be replicated. General patterns and themes may be identified in future studies,

but it may be difficult to replicate personal responses in the same manner. Content analysis should help produce recurring patterns and reliable and valid results (Krippendorff 2004).

# Chapter 2: Literature Review

## 2.1 Introduction

Of all the natural disasters experienced by Bangladesh, cyclones are responsible for the greatest losses of life. In terms of death toll due to tropical cyclones alone, Bangladesh suffer the most, (Ali 1996:172), as cyclones in Bangladesh cause approximately 53% of the total global cyclone fatalities (Pacific Disaster Center [PDC] 2006).

## 2.2 Cyclone Formation

Cyclones are classified as one of the natural disasters caused directly by weather events (De, Khole & Dandekar 2004). Cyclones generally begin as distinct tropical lows, with wind speeds no greater than 17 knots. These cyclones then progress to depressions of 17 to 33 knots, and then intensify into hurricanes in North America, typhoons in the China Seas, or cyclones in the Indian Ocean (Haque and Blair 1992). Cyclones are low-pressure systems that commonly originate between five and 15 degrees latitude in the tropics during specific weather and temperature conditions (Molnar 2005).

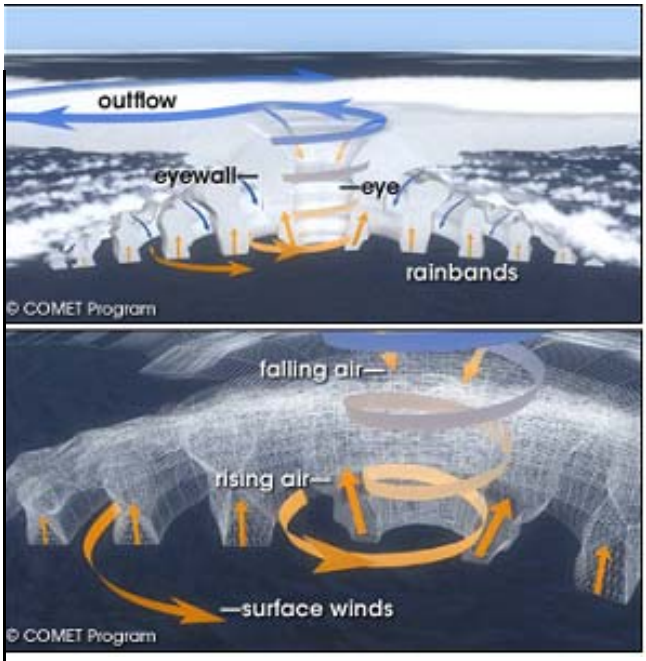


Figure 2.1: Cyclone formation. *Note*: From Weather Underground 2008. Reprinted with permission.

These conditions include water temperature that remains at least 26$^{o}$C throughout the year (Hastenrath & Lamb 1979, Ali 1996, Haque and Blair 1992). A water depth of at least 60 metres is needed in an area for the development of a cyclone (Anthes 1982, Emanuel 1988, Haque and Blair 1992). Water depth is important to the formation of cyclones as it promotes the transference of large amounts of water vapor into the atmosphere, where large quantities of latent heat are released when the vapor condenses (Haque and Blair 1992). The land surface is not able to deliver an equivalent amount of energy into the atmosphere, therefore tropical cyclones form only over large bodies of water (Haque and Blair 1992). There must also be little vertical shear in the horizontal wind near the prospective cyclone (Haque and Blair 1992, Haque 1995). These conditions exists in the Bay of Bangal during April-May and September-November, in the pre- and post- monsoon months (Haque and Blair 1992, Haque 1995, Haque 1997[2], Miyan 2005), when the wind field over the bay is conducive to the necessary low-level inflow and high-level outflow (Haque 1995). The Bay of Bengal, which forms Bangladesh's coastline is one of the world's most active areas for the development of tropical low pressure systems (Haque 1997[1]: 184). As many as 10 percent of the world's cyclones develop in the Indian Ocean, particularly in the Bay of Bengal (Gray 1968).

These cyclones are most predominant in the southeast area of the country (PDC 2006). These storms have a sustained wind-speed of at least 119 kilometres per hour (Molnar 2005) and can range from 300 km to 600 km in diameter (Banglapedia 2008). The majority of cyclone damage is caused by wind speed and storm surges (Maniruzzaman, Okabe & Asami 2001, Ali 1996).

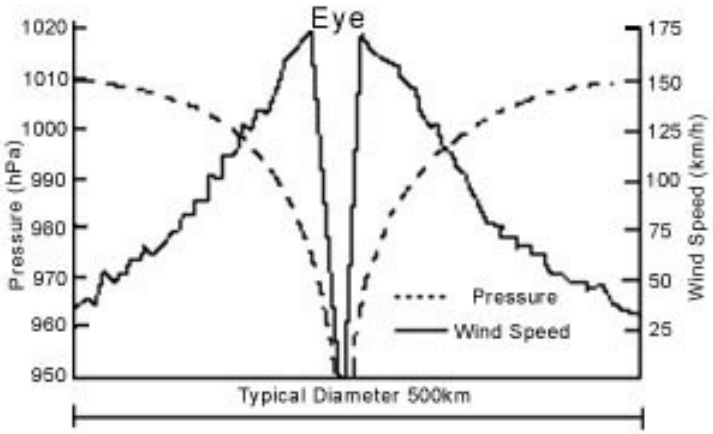



Figure 2.2: Typical wind speed and pressure. *Note:* From Australian Government Department of Meteorology 2009. Reprinted with permission.

Storm surges are generated by cyclonic winds and the atmospheric pressure drop associated with a cyclone (Ali 1996). Beside wind speeds, storm surges, heavy rains and tornadoes are hazards associated with cyclones (Molnar 2005). Bangladesh has very little coastal orograpy (Haque and Blair 1992) and therefore storm surges only a few meters high can completely overwhelm off-shore islands or travel far inland along the coast to combine with rainwater and cause drownings of humans and animals and widespread destruction caused by severe flooding (Monastersky 1991, Haque and Blair 1992).

Over the past 131 years, the area that is now termed Bangladesh, and was previously East Pakistan, has had 30 cyclones, which have killed an estimated 200 million people (Shapley 2007). The largest loses of life were from the following cyclones:

November 1, 1876 – about 200,000 dead

November 12, 1970 – up to 500,000 dead

May 24, 1985 – 11,000 people dead

April 29, 1991 – 140,000 people dead

November 29, 1997 – 150,000 people dead (Shapley 2007).

The 1970 cyclone caused damages ranging in the billions of US dollars, while the April 1991 cyclone caused more than two billion dollars in damage (Government of Bangladesh [GoB] 2008). The more recent cyclone of April 1991 had tidal surges of up to 30 feet high, and battered the Bangladeshi coastline for 3-4 hours (Chowdhury, Bhuyia, Choudhury and Sen 1993) The cyclone killed 140,000 people and caused property damage of more than two billion US dollars (GoB 2008). Both the 1970 and the 1991 cyclone hit in the dead of night, decreasing people's ability to properly react to the situation (Chowdhury et al. 1993). Cyclone SIDR was the most recent, severe cyclone (GoB 2008).

During the last serious cyclone, cyclone Sidr in 2007, the worst affected areas suffered wind destruction of approximately 90 percent of homes and 95 percent of rice crops and prawn farms (Foster 2007). The International Red Cross believe that an estimated 900,000 families were affected (Foster 2007), while UNICEF claims that the affected victims number is as high as 3.2 million people (Ramesh 2007).

The issues of disaster policy and management in Bangladesh demand specific attention since Bangladesh, located at the confluence of three major river systems (Khan & Rahman 2007, Brouwer, Akter, Brander & Haque 2007), is one of the most disaster prone countries in the world (Haque 1997[2]). Bangladesh is located at the tip of the Bay of Bengal, between India and Myanmar (Maniruzzaman, Okabe & Asami 2001). The seafloor at the northern Bay of Bengal slopes very gradually away from the Bangladesh shore, which combined with the shape of the coastline, funnels water inland up the river channels during a cyclone (Monastersky 1991). Although cyclones are weather phenomena, they mostly affect society, community, people, institutions and the overall environment (Nasreen 2004).

## 2.3 Vulnerability

Bangladesh, like any country who depends predominantly on agriculture, has strong linkages with seasonal weather systems (e-Citizens 2008). Historically, the floods of the monsoons were a welcome part of the agricultural process, bringing with them soil nutrients. At the same time, loss of harvests due to cyclones decreases the already small

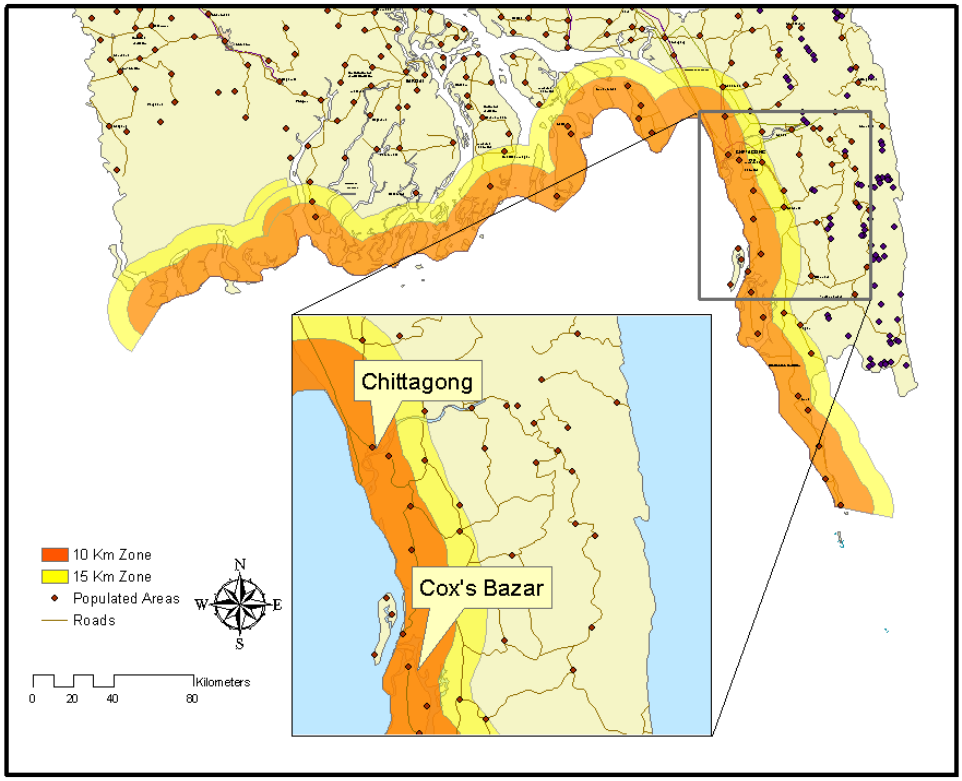
amounts of revenue the local farmers receive (USAID). Bangladesh's ever increasing population has forced more people to live in the flood plain, increasing the vulnerability and risk of the country as a whole. Vulnerability will continue to increase as Bangladesh will not only have to accommodate a booming population, but also face concerns of climate change and the land-loss that it threatens. The population of Bangladesh is expected to grow from approximately 150 million in 2008, to approximately 200 million by 2050, with almost half of those people living in small communities (GoB 2009).

Picture 1 and 2: Damage caused to homes by cyclones. *Note:* Picture 1 (left) from Disaster Relief International, reprinted with permission Picture 2 (right) from New York Times, reprinted with permission.

Picture 3 and 4: Moving water and supplies while fighting cyclone flood water. *Note*: Picture 3 (left) after Oxfam International, reprinted with permission. Picture 4 after OneWorld South Asia.

Countries with a large marginalized population, such as Bangladesh, have communities that are more vulnerable to the impacts of natural disasters, and therefore the consequences are more severe (Hewitt 1983, Paul & Rahman 2006). De et al. (2004) feel that it is the complex societal structure and the socio-economic issues that make the impacts of cyclones more disastrous for developing countries. Generally, vulnerability is

seen as the outcome of a mixture of environmental, social, cultural, institutional, and economic structures, and processes related to poverty and (health) risk, not a phenomenon related to environmental risk only (Brouwer et al. 2007: 314). Definitions of vulnerability focus on risk and risk exposure on the one hand, and coping and adaptation mechanisms on the other (Pelling 1999). Adaptation is difficult, as Monastersky (1991) states, Bangladesh's flood-prone geography and overpopulation elevate a disaster in that area to epic proportions. The inhabitants of the area are compelled to deal with environmental risks (Haque 1997[2]) as 80% of Bangladesh's area consists of very dynamic floodplains (Khan & Rahman 2007) and approximately one-third of the country lies less than 20 feet above sea level (Monastersky 1991).




Map 2.1 Areas of risk within Bangladesh during the 1991 cyclone. *Note:* From Molnar 2005.

The problem is likely to intensify if the predicted half-meter sea level rise comes to fruition by 2050, as several models indicate that the sea level rise would inundate

approximately 11 percent of Bangladesh territory. Nicholls, Mimura and Topping (1995) estimate that a one metre rise in sea-level could lead to a land loss in Bangladesh of nearly 30,000 $km^2$. This inundation would have catastrophic human impact as Bangladesh is the world's most densely populated country with more than 1,000 people per square kilometer (Khan & Rahman 2007). These disasters may create conditions, by damaging crops, and large scale seasonal unemployment, which could lead to famine and starvation (Haque 1997[2]). Such devastating loses were evident during the floods of 1988 and 2004, each of this flood caused more than US $2 billion of economic loss (Khan & Rahman 2007).

These threats can be addressed through policy frameworks. As these threats continue to change, the policies that address them must also be flexible enough to adapt as well. Currently the Government of Bangladesh is adjusting their disaster management policies to acknowledge that community level involvement is necessary to risk management and disaster mitigation. In light of this paradigm shift, new policies to deal with future vulnerabilities are needed.

## 2.4 Reducing Vulnerability

Adaptive capacity is seen as a key component of the concept of vulnerability (Adger 2000). One method adapting to cyclone-prone areas involves changing human attitudes and behaviors toward nature. This approach attempts to modify human vulnerability, and reduce hazard loss, by integrating technological means and human elements (Haque 1997[1]:183). Options for vulnerability modification can be grouped into the following categories: (i) forecasting and warning; (ii) community preparedness; and (iii) land-use planning (Smith 1992). Land-use planning is not an option for the people of Bangladesh (Haque 1997[1]), due to the extremely high population density. This population density also increases loss of life by forcing people to settle on dangerous islands and lowlands (Monastersky 1991). Forecasting and warnings are issued by the Bangladesh Meteorological Department (BMD) as cautionary and danger signals (1-10) to motivate residents to take steps to save their lives and properties. On the warning scale, 1-4 is the cautionary signal, 5-9 is a severe storm approaching, and 10-11 is a mature cyclone

preparing to strike land and disrupt communication (Paul & Rahman 2006). The warning systems are designed to enable people to take precautionary measures to minmize loss, and to insist on evacuation of an area in advance of an approaching hazard. The cyclone bulletins issued by the Bangladesh Meteorological Department include information on location of the cyclone, the direction of its movement, the maximum sustained wind speeds generated by the cyclone and the radius of maximum winds (Manirussaman, Okabe & Asami 2001). The success of the warning depends on the reactions and responses of people (Haque 1997[1]). Responses to warnings tend to be quite varied and often warnings will be ignored because of fatalistic attitudes, disbelief in the warnings or fear of loosing household assets (Haque 1997[1]), indecision, insecurity of cyclone centres, as well as love of domestic animals (Paul & Rahman 2006). Disbelief of warnings because of previous false warnings is a major factor causing inaction against warnings (Haque 1997[1]). Prior to the 1991 cyclone, the reliability of cyclone warning signals were under question, with residents failing to react to them because frequently no cyclone followed (Paul, Rahman & Mahbub 2002).

The traditional disaster management model focuses on disaster relief and recovery and has done little to address these rising levels of risk, since Bangladesh does not yet have any comprehensive disaster management policy (Khan & Rahman 2007). In more recent years the Bangladesh government has attempted to adopt a holistic approach; embracing the processes of hazard identification and mitigation, community preparedness and integrated response efforts. The reduction of vulnerability to specific hazards and enhanced capacities of at-risk communities is currently being tried through relief and recovery activities that are planned within an all-risk management framework (Government of Bangladesh 2005). Currently the BMD takes responsibility for preparing all weather forecasts and disaster warnings (Haque 1997[1]). The BMD has three radar stations at Dhaka, Khepupara and Cox's Bazar, which transmit hourly and half-hourly data (Haque 1997[1]). During a cyclone the BMD issues two types of storm-warning signals to maritime ports, cautionary and danger, and a different signal for inland river ports (Paul & Rahman 2006). The Disaster Management Bureau, created in 1992, is responsible for creating public awareness on the severity and risks associated with natural and human-induced hazards and to formulate programs and projects that will better

prepare at-risk communities and public officials to mitigate their consequences. Effective disaster governance in this situation is essential as it will influence considerably upon how individuals and institutions mitigate, prepare, respond and recover from disasters (Smith 1996, Blaikie et al. 1994) and sustain livelihoods (Cannon et al 2003, Twigg 2001). In this context, non-government organizations play a large mitigating factor in disaster recovery. Historically NGOs and other informal support mechanisms in the country have also made significant contributions during and after disaster response and recovery, the people's resilience, and donor support (Khan & Rahman 2007).

These relief efforts face a host of challenges in their attempts to be effective. There are inadequate amounts of shelters available for all the persons in need. While in these shelters residents, more-so children and the elderly, suffer from illness. Children, especially infants, and the elderly, are vulnerable to injury during the storm and often are unable to seek appropriate medical attention in the shelters. Pregnant women also suffer from inadequate medical attention. All shelter residents suffer from a severe lack of water supply and sanitation facilities. Moreover, women, particularly young women, frequently face different types of physical and mental harassment, while disabled people are also vulnerable to abuse in shelters (Paul & Rahman 2006).

## 2.5 Government Involvement

The various levels of government, with varying political agendas and interests, at times feel it difficult to come to a consensus as to where disaster relief funding should be going. Often times "relief and rehabilitation programs are used as a political instrument" (Khan & Rahman 2007: 372). All small and large rehabilitation projects are contracted out to regime politicians and party activists, who work closely with the current governing party (Khan & Rahman 2007). Government and many other bodies dealing with disaster management mainly communicate with wealthier, influential landowners who do not represent or serve the interest of the poor (Nasreen 2004). Current government practices have created a system where local government has limited or no autonomy either in decision-making or financial matters (Khan & Rahman 2007). "The center strictly controls the local governments as kind of a 'vote bank' for the party in power.

This is the reason why the winning party or any coalition after forming the government always initiates elections at the local government levels in Bangladesh" (Khan & Rahman 2007). These factors make it not only difficult to monitor the use of relief monies, but the current approach makes it very difficult to facilitate effective disaster recovery and rehabilitation. The 'single-silo approach' where jurisdictions work separately, without communication between each, makes it difficult to coordinate cross-jurisdictional relief efforts and to filter down relief efforts to the communities that need it the most. The current top-down approach to relief distribution compounds this problem. A shift in funding control and an increase in accountability is necessary to effectively disperse relief contributions. Since the local communities are the worst victims, effective and sustainable partnerships requires a shift from equal partnerships, to a focus on the community being the central partner (Bhatt 2005).

## 2.6 Governmental Disaster Infrastructure

The Government of Bangladesh gives equal importance to both structural and non-structural mitigation measures (GoB 2008). As part of the structural measures, the Government of Bangladesh set up the Bangladesh National Storm Warning Center in 1970 (Bern et al. 1993). Initially, 311 cyclone shelters were built to accommodate 350,000 people (Bern et al. 1993). To date, 2,023 cyclone shelters have been constructed (GoB 2008). Approximately 3,931 km of coastal embankment has been created to protect coastal land from inundation by tidal waves and storm-surges, and drainage channels of 4,774 km have been constructed, thus far (GoB 2008, ADRC 2003).

Non-structural mitigation by the Government of Bangladesh has emphasized early warning dissemination, legislation and policy. Early warnings are the necessary in cyclone mitigation. These warnings are carefully created to ensure accuracy, disseminated in a timely manner and are aimed at decreasing coastal vulnerability. Both the accuracy of the warning, and the lead time before the storm are imperative for effective warnings. Effective warnings have proven highly effective in decreasing loss of life. A large emphasis has been placed on training and public awareness, as past experience has revealed the enormously positive effects of education for disaster

management and risk reduction (Biswas 2008). The Disaster Management Draft Act has been finalized with the purpose of providing for the formulation of disaster management policy relating to preparedness and emergency measures, and rehabilitation programs to deal with disaster (GoB 2008). Also, as part of public awareness activities, booklets containing information regarding cyclones, floods, etc., and posters depicting disaster points have been regularly printed and distributed up to the grass-root levels (GoB 2008). Awareness among students is being increased by the introduction of a chapter on disaster management in education curricula from Grades Five to 12 (GoB 2008). The Government of Bangladesh has also made compulsory a session of at least two hours on disaster management in the training curricula of all types of Training Institutes, responsible for training officials and non officials (GoB 2008, ADRC 2003).

In conjunction with conventional techniques, space science, remote sensing and GIS methods are also used in disasters (Pramanik 1994). Remote sensing aerial photography is being used in Bangladesh since 1930s and 1940s for cartographic mapping, forest inventory and water resources studies. The use of satellite technology started with the establishment for an APT (Automatic Picture Transmission) system in 1968 (Pramanik 1994). Since then all the cyclonic storms formed in the Bay of Bengal have been tracked and necessary forecasting and warning through Bangladesh Meteorological Department (BMD) have been issued (Pramanik 1994). Bangladesh Space Research and Remote Sensing Organization (SPARRSO) is the focal point of space and remote sensing activities in the information to BMD (Pramanik 1994).

Emergency response has become another area targeted by the Government of Bangladesh. These efforts include the creation of an Emergency Operations Center (EOC), as an operational unit within the Ministry of Food and Disaster Management (MoFDM) (GoB 2008). The MoFDM has the mandate to coordinate all disaster management activities within the country (CDMP 2008). The mission of the MoFDM is to bring a paradigm shift in disaster management from conventional response and relief to a more comprehensive risk reduction culture and to promote food security as an important factor in ensuring the resilience of the communities to hazards (CDMP 2008). The EOC gets activated with the first information of the disaster emergency situation and

works on the overall direction from Inter-Ministerial Disaster Management Coordination Committee (IMDMCC)/MoFDM for handling all aspects of emergency situation.

Initially, disaster management in Bangladesh was limited to relief and rehabilitation activities. In line with the paradigm shift from relief and response to comprehensive disaster management, the Ministry of Relief and Rehabilitation was changed to the Ministry of Disaster Management and Relief, before being again renamed the Ministry of Food and Disaster Management in 2003. The Disaster Management Bureau (DMB) was created in April 1993 (GoB 2008), as a technical arm to the Ministry of Food & Disaster Management (GoB 2008, e-Citizen Services 2008). At this point the focus shifted toward the adaptation of a holistic approach that embraced processes of hazard identification and mitigation, community preparedness and integrated response efforts (GoB 2008). The Bureau now acts as a facilitator and a depository of all disaster related information, it monitors disaster preparedness activities through deputy commissioners and maintains coordination with line departments/agencies, NGOs, social organizations and other similar agencies (GoB 2008). The DMB acts under the administrative control of MoFDM to perform specialist functions at the time of emergency to help EOC by extending technical support services through MIS/GIS for information exchange (GoB 2008). The Directorate of Relief and Rehabilitation (DRR) and the Directorate General of Food are also agencies within MoFDM to manage disasters (Asian Disaster Reduction Center [ADRC] 2005). The Cyclone Preparedness Programme (CPP) plays a very useful role during cyclone activity (GoB 2008). As a continuation of the paradigm shift process, the Comprehensive Disaster Management Programme (CDMP) was designed and launched in November 2003, in partnership with DFID and UNDP (UNOPS 2008), as a long-term programme of the Ministry of Food and Disaster management with multi-agency involvement. The CDMP acts as a key strategy to advance whole-of-government and agency risk reduction efforts in the country (Ministry of Food and Disaster Management [MoFDM] 2008). CDMP is a strategic institutional and programming approach that is designed to optimize the reduction of long-term risk and to strengthen the operational capacities for responding to emergencies and disaster situations including actions to improve recovery from these events (MoFDM 2008). The CDMP is laying the foundation for the paradigm shift from a post-disaster relief and response strategy towards a

comprehensive risk minimization culture that encourages disaster resilience initiatives by including capacity building, partnership development, community empowerment, research and information management, and response management (Khan and Rahman 2007).

One of the main objectives of the project was to increase the capacities of households and local communities in the higher disaster prone areas through the establishment of Local Disaster Action Plans (LDAPs) to cope with cyclones (ADRC 2003). These action plans are aimed for a more holistic approach to risk management (ADRC 2003), therefore, communities within high risk areas are the immediate beneficiaries of program interventions (MoFDM 2008). Direct beneficiaries of the programme are communities and community based organizations through improved capacities, both at the national and local level to design and implement disaster management programmes that are based on formal and traditional community risk assessment, key national district and union officials who have disaster management programming and operational response coordination responsibilities, key government decision-makers, politicians and elected local Government officials through avocacy and awareness programmes, national planning officers and all line government departments of agencies involved in development planning activities through the promotion and incorporation of risk management measures, and private sector through increased interface and involvement in disaster management programme design and implementation (MoFDM 2008). CDMP is funded jointly by the United Nations Development Programme (UNDP) and the Department for International Development (DFID).

Bangladesh has instituted a two phase risk reduction framework. The first phase includes establishing the foundations for long-term risk reduction. The objectives of this phase, within the National Risk Reduction framework, is to strengthen the critical policy and planning frameworks and to commence the process of building professional capacities to position the MoFDM so that it could lead an expansive risk reduction program in future years (CDMP 2008). In March 2005 the MoFDM launched its Corporate Plan: Framework for Action 2005-2009 which sets out the priorities and broad strategies for achieving reform within the disaster management sector (CDMP 2008, PDC 2006). The Corporate Plan acknowledges the need for pre-disaster mitigation and

preparedness on the part of the people as opposed to the earlier concepts of responding after a disaster has taken place (Khan and Rahman 2007). The second phase of the framework is building holistic partnerships. This phase will build and expand on phase one. It involves the management of both risks and consequences of disasters that would include prevention, emergency response and post-disaster recovery, with a major focus on community involvement for preparedness programs to protect lives and properties. The Plan involves local government bodies as an essential part of the strategy and maintains that self-reliance should be the key for preparedness, response and recovery. The Corporate Plan also prioritizes non-structural mitigation measures such as community disaster preparedness, training, advocacy and public awareness (Khan and Rahman 2007). During 2006 the MoFDM Framework of Action expended to integrate the Programs, Priorities and Resources of Government, NGOs and Private Sector in one consolidated Plan of Action (CDMP 2008).

## 2.7 Early Warning Systems

Early warning systems and the dissemination of their information are imperative for saving lives during a natural disaster. This is especially critical in high-density, low-income developing countries. While Bangladesh currently has an early warning matrix within the country, it is ineffective in both reaching all at risk citizens, as well as it is once the warning is received, the message generally fails to evacuate and properly protect its intended targets. It is becoming more widely recognized that a community's response to a warning involves a complex set of sociopyschological, socioeconomic, and cultural variables (Haque 1995). Therefore, warning systems need to be community-level issued and understood in order to be effective. The objective of people-centered systems, as identified by the United Nations/ International Strategy of Disaster Reduction ([UN/ISDR]) (2006), is to empower the individuals and communities immediately threatened by hazards so they may act in sufficient time and in an appropriate manner to reduce the possibility of personal injury and loss of life.

The Indian Seas are the only area with such a well-defined double-cyclone season (Haque and Blair 1992), that aids in monitoring and predicting cyclones, but a lack of

confidence in Bangladesh's cyclone warning systems compromises their effectiveness. The cyclone of 1991 killed 142,169 people and injured 139,149, although numerous weather satellites were able to detect extreme low-pressure weather systems before the system hit (Haque 2003). The warnings for climatic disturbances were accurate 15 hours before the cyclone hit the coast (Ahmed and Afreen 1992). Interpersonal communication was relied on for almost half the warnings before the 1991 cyclone (43.3 percent.), radios made up 37.3 percent of the warnings and the remaining 19.4 percent of the warning came from megaphone communication (Chowdhury et al. 2003). The use of multiple communication channels is necessary to ensure everyone is reached and to avoid the failure of any one channel, as well as to reinforce the warning message (UN/ISDR 2006). During the 1991 cyclone almost everyone on the offshore islands of Kutubdia and Sandwip heard the warnings, while only an estimated 60 percent of the coastal areas of Chakoria and Banshkhali heard the warnings, with substantial variation between unions (Chowdhury et al. 2003). Chowdhury et al. (2003) surveyed cyclone survivors from the 1991 cyclone, and of the respondents who did not take refuge, 70 percent of respondents indicated that they did so because they did not believe the warning, and did not believe the cyclone and storm surges of that magnitude would not come. Haque and Blair (1992) suggest that it is also a fear of burglary, coupled with the disbelief of the warning system, which creates passive reactions in those vulnerable persons.

Warning services lie at the core of an effective warning system (UN/ ISDR 2006). They must have a sound scientific basis for predicting and forecasting weather patterns, and must be reliably operated and monitored in order to produce accurate warnings in a timely fashion (UN/ISDR 2006). Currently, mass communication and relevant technology already has a significant impact on how the public learns of and perceives the impact of natural disasters (Rattien 1990). Media is important to inform the public, and illicit responses for, activities of: risk assessment, avoidance measures, early warning, public awareness and education, and organization for self-help and effective response to risk (Rattien 1990).

A complete and effective early warning system must include elements of: risk knowledge, monitoring and warning service, dissemination and communication, and

response capabilities (UN/ISDR 2006). The dissemination of this research must be based on clear protocols and procedures (UN/ISDR 2006).

| Risk Knowledge | Monitoring & Warning Service |
|---|---|
| Systematically collect data and undertake risk assessments<br>Are the hazards and the vulnerabilities well known?<br>What are the patterns and trends in these factors?<br>Are risk maps and data widely available? | Develop hazard monitoring and early warning services<br>Are the right parameters being monitored?<br>Is there a sound scientific basis for making decisions?<br>Can accurate and timely warnings be generated? |
| **Dissemination & Communication** | **Response Capability** |
| Communicate risk information and early warnings<br>Do warnings reach all of those at risk?<br>Are the risks and the warnings understood?<br>Is the warning information clear and useable? | Build national and community response capabilities<br>Are response plans up to date and tested?<br>Are local capacities and knowledge made use of?<br>Are the people prepared and ready to react to warnings? |

Figure 2.3: Four elements of people-centered early warning systems. *Note:* From UN/ISDR Platform for the Promotion of Early Warning 2006, reprinted with permission.

A wide range of participation is necessary for the development and implementation of an effective early warning cyclone system. Currently, it is being realized that public participation is needed, in the planning and creation stage of cyclone early warning policy, to make early warning systems more effective in both targeting those persons highest at risk as well as creating suitable, understandable and trusted warning messages. Haque (2003) points out that because disaster management is a newly emerging area in most Asian and Pacific countries, including Bangladesh, these countries have not paid serious attention to 'disaster management'. Cooperation between communities and each level of government is necessary to communicate effective warnings. Vulnerable communities are central to local level early warning systems (UN/ISDR 2006). Local governments are expected to have considerable cyclone knowledge and must be actively involved in the design and maintenance of early warning systems. They must also be able to advise, instruct or engage the local population to maximize local safety (UN/ISDR 2006). National governments create the policies and framework that facilitates early warning. They have a responsibility to ensure the warning are disseminated to the vulnerable communities and to translate early warning knowledge into local risk reduction practices (UN/ISDR 2006). Regional institutions, as well as international bodies, are necessary for creating early warning systems between adjoining countries (UN/ISDR 2006). Non-government organizations (NGOs) "help to

raise awareness among individuals and organizations involved in early warning and in the implementation of early warning systems, particularly at the community level" (UN/ISDR 2006: 3).

Disaster shelters are only constructed, physical infrastructure in Bangladesh to aid in protection from cyclones. Currently, there is no systematic policy to promote the construction of concrete building for public cyclone protection (Chowdhury et al. 2003). Elevated shelters are a necessary part of risk reduction as it is believed that up to 97 percent of cyclone deaths are caused by drowning associated with storm surges (Murty 1988).

# Chapter 3: Methods

## 3.1 Introduction

Research follows a standard set of steps throughout the research cycle. These steps include: plan, action, observe, reflect, interpret and conclude (O'Brien 2002). This study followed all those steps, with the planning, reflection, interpretation and conclusions drawn in Canada, and the action and observation completed in Bangladesh. This study was designed to answer both intellectual and practical goals. Intellectual goals focus on understanding something, such as gaining insight into what is going on and why it is happening. Practical goals include policy and administration goals and are focussed on accomplishing a specific task, such as changing a situation. (Maxwell 2005). Intellectual goals are generally an appropriate starting point for formulating research questions, while practical goals can't normally be used in such a straightforward way (Maxwell 2005). A combination of these two goals were used in this study since the objectives aim to address and change the current situation, by understanding and influencing current cyclone policies.

Maxwell (2005) suggests that a researcher does not have to adopt one single research paradigm, and encourages the researcher to find a paradigm or theory that fits with the conceptual framework, research questions and methods, which should also be compatible with the researcher's pragmatic stance. This research has followed the critical social science research paradigm. Guba and Lincoln (1994) define a paradigm as "a set of basic beliefs that deal with ultimates or first principles. It represents a world-view, that defines for its holders, the nature of the 'world'" (107). The critical social science paradigm explores the social world, critiques it, and seeks to empower the individual to overcome problems in the social world. This paradigm seeks to critique and transform historical insights (Guba and Lincoln 1994). The social science research paradigm enables researchers to understand how society functions, while incorporating participatory research and political empowerment for the local level people (Neill 2006). Hiles (1999) argues that once a paradigm for research has been chosen, it is by no means settled what strategies and types of data collection and analysis are to be employed. A qualitative

study was chosen for this study because a survey method will be used to collect data. Latent content analysis, which measures unobservable and uncountable concepts, was used to analyze said data (Neuendorf 2002). Content analysis has attempted to measure all variables as they naturally and normally occur. Random sampling was used for data collection in order to make the finding generalizable to the entire population (Neuendorf 2002).

The critical social science paradigm requires a “dialogue between the investigator and the subjects” (Guba and Lincoln 1994, p. 110), therefore this study was executed through a qualitative research study of both governmental policy makers and the local-level community members in Bangladesh. Guba and Lincoln (1994) argue that knowledge in the critical social science paradigm “grows and changes through a dialectual process of historical revision that continuously erodes ignorance and misapprehension and enlarges more informed insights” (p. 114).

This study aimed to use a dialogue between the researcher and the persons at risk in order to address current issues and create new insight that will address current misapprehensions regarding early warning systems. Qualitative research was chosen to properly understand individual situations and vulnerability and what is significant to each individual household. Sherman and Reid (1994) define qualitative research as "research that produces descriptive data based upon spoken or written words and observable behavior" (p. 1). Qualitative findings result from 1) in depth open-ended interviews, 2) direct observation, and 3) written documents (Patton 2002). This study used many open-ended interviews at all three levels of interviews. Since direct observation during a cyclone is impractical and dangerous, the observation portion were of current vulnerable housing structures within the village communities, current early warning system infrastructure, cyclone shelters and exit routes from affected villages. Written documents were used both in the literature review and collected from libraries, local universities and government agencies.

## 3.2 Surveys and focus groups

The first research objective, of examining the evolution and ability of current cyclone policy was achieved by conducting one-on-one interviews with national policy makers in Dhaka, Bangladesh. Before any local level interviews were completed, nine national level policy makers and related NGO personal were interviewed or met with informally to get an understanding of the current local level vulnerabilities and in force policies. After doing the village interviews and local government, an additional 25 interviews were done at the national level to compare and contrast themes and ideas observed while in Cox's Bazar. Some of the same agencies were re-interviewed after the village interviews in order to compare their views and beliefs of the local situation with what was discovered in the field.

The second research objective addressed local level governance in Cox's Bazar, Bangladesh. This part of the study was conducted with local-level policy makers to identify the strengths and weaknesses of cross-governmental communication. Individual surveys were done with local government officials and related NGOs. A total of 12 individual meetings were held to understand the vulnerability and local policy. This part of the study investigated the relationship and partnership between the two levels of government. This research examined cross-scale partnerships designed to reduce vulnerability and the use of early warning systems for risk reduction.

The final portion of this study was conducted in the area surrounding Cox's Bazar. This portion of the study was aimed at providing an accurate representation of the vulnerability and risk issues faced by local-level community members. The questions in this part of the research were be designed to better understand the issues surrounding cyclone vulnerability. Ninety interviews were administered to six communities surrounding Cox's Bazar, three on the coast and three more inland to compare and contrast vulnerability issues, address different levels of risk, and better understand where further policy changes need to be made. Fifteen questionnaires were administered to households in each of the six towns, and were administered to the heads of the households. These questions were designed to elicit responses regarding distrust, misuse and general complacency of cyclone warnings, behaviors in past cyclones and intensions

for future ones, government action and evacuation options during a cyclone storm. Town selection was based on areas where a local NGO was able to facilitate interviews. Selection of participants within each town was done on a random basis. A local NGO representative facilitated communication with the coastal villages, while a local business owner facilitated communication with inland villages and aided in the navigation of those villages.

The responses from the three groups were compared and contrasted and content analysis was performed on the responses from each group to analyze similarities and differences of opinions between groups. The responses from the national policy makers in Dhaka and the local-level policy makers in Cox's Bazar were compared and contrasted to identify any disconnects in policy creation, popular opinions and attitudes, as well as risk perception between the two groups of government officials. The two government groups also aided in the policy assessment part of the study, as they were crucial in identifying gaps in current cyclone policies. A comparison and contrast were done between the responses of the policy makers and the community members to assess similarities and differences in attitudes, opinions and understanding of current cyclone policies and risk management. This part of the study helped determine where policies are failing to protect local-level community members. It also assessed attitudes regarding hazard mitigation and the distrust that currently impairs proper cyclone protection for the local people. After analysis of the responses was completed, the information gathered was used to suggest policy changes and create a framework for future cyclone risk mitigation in rural, coastal Bangladesh. Through the policy analysis it was possible to address current issues with the early warning systems, and by addressing distrust and cultural issues, it was possible to make recommendations that would help make early warning systems more effective, thus reducing cyclone vulnerability.

### 3.3 Content Analysis

Content analysis is possibly one of the most important research techniques in current social sciences (Krippendorff 2004), and is used only in social science generalizations (Berelson 1952). Busch, De Maret, Flynn,, Kellum, Le, Meyers, Saunders, White, and

Palmquist (2005) maintain content analysis is used to identify the intentions, focus or communication trends of an individual, group or institution, in this case, the different levels of cyclone policy makers and the people that hear the cyclone early warnings. Content analysis is used to refer to any qualitative data reduction effort that takes a volume of qualitative material and attempts to identify core consistencies and meanings (Patton 2002) and is performed by searching test for recurring words or themes. Core meanings are often called patterns or themes and identifying patterns within responses can identify themes within the research (Patton 2002). Krippendorff (2004) identifies that both the messages and the channels with which those messages are presented are important in the current belief in media. These may be patterns within the local-level responses and it may identify a need to alter current early warning messages. Content analysis generally refers to analyzing text, such as interview transcripts, rather than observation-based field notes (Patton 2002).

In this research focus group and survey responses to open-ended question were assessed and analyzed for patterns within the responses. Content analysis identifies patterns and themes and then attempts to accurately quantify the presence of these in an objective manner (Busch et al. 2005). The finding of patterns, themes and categories is also referred to as inductive analysis (Patton 2002). Although finding patterns may be difficult as communication content is so rich with human experience, and so varied to do to individual causes and effects (Berelson 1952). Analysis of these types of responses are difficult because the responses are neither systematic nor standardized (Patton 2002). To minimize this problem both categories of content analysis, conceptual and relational analysis was used in this study (Busch et al. 2005). Conceptual analysis is vital to establish the existence and repetition of concepts in a text. Relational analysis builds on conceptual analysis by examining the relationships among those concepts in the text (Busch et al. 2005). Conceptual analysis seeks only to quantify themes or patterns in the text without concern for how they are related. Relational analysis aims to put context to the relationships found in patterns in the text (Busch et al. 2005).

Emic-analysis was also used. This type of analysis was used to research categories that indigenous people involved in the survey have created to make sense of their world and practices they engage in that can only be understood within their worldview (Patton

2002). Content analysis was important for this study as it examined data, in this case current cyclone early warning systems, in order to understand what they mean to people, what they enable or prevent, and what the information conveyed by them does (Krippendorff 2004). Content analysis provided insight into relationships between human thought and communication use (Busch et al. 2005).

# Chapter 4: Vulnerability of Local Communities to Cyclones

## 4.1 Demographic Characteristics of the Population

Interviews were conducted in coastal villages of Rastar Para, Rahkain Para and Del Para in the Khurushkul union and the inland villages of East Muktar Kul, West Muktar Kul and Kurulia Darja Para in the Jhilwanja union. Houses in the coastal villages ranged from one-quarter kilometer to one and one half kilometer from the coast water. Houses in the inland villages ranged from seven to eight kilometers from the coast. Fifteen interviews were done in each of these villages with participants from throughout the villages. Ten men and five females were randomly selected from each village.

Picture 5: A group of gentlemen from a local NGO that facilitated my interviews through the coastal and inland villages. To the far left is Chitta Shil, he accompanied me into the field daily.

Of the three villages, Rastar Para was visually less developed than the other two, without electricity in the homes. Del Para had basic electricity that powered light bulbs. Rahkain Para was the most developed village with all homes having power and TVs and radios could be heard while conducting the interviews. Rastar Para and Del Para were predominantly Muslim, with Rahkain Para, a tribal community, following Buddhist beliefs. The traditional tribal construction greatly aided this village as their houses and temple is built on stilts, which, it was discovered, was because of their tribal customs, not specifically for cyclone and flood mitigation. The houses in Rastar Para and Del Para were all of thatched construction, but some of the ones in Rahkain Para had concrete pillars and were much more sturdy in design, and therefore much more wind resistant.

Rahkain Para was also the only community with a temple that could be used as a cyclone shelter directly in their village.

Below: Picture 6:Home in Rastar Para. Across: Picture 7: House in Rakhain Para. They are built on stilts for cultural reasons, but aid in cyclone mitigation.

Development was similar between the inland villages, with a combination of concrete houses, tin and thatched houses. East Muktar Kul and West Muktar Kul were one kilometer apart, with West Muktar Kul being farther from the Bay of Bengal, but both right along a river. Kurulia Darja Para was directly across a road from West Muktar Kul, but was considerably farther from the river than the other two villages. All the inland villages surveyed were predominantly Muslim.

Pictures 8 and 9: Both above pictures are homes in inland villages. The majority of homes in these villages are built with concrete and are storm resistant.

People under 24 years of age were excluded from the study because they had to be able to recall the events of the 1991 cyclone, although many people could only provide an age range when asked their age and it was found that generally people tried to reduce

their age. When an age range was given, the age used was the median of the range. The average age of participants in the coastal villages was 43 years and the average age of the inland villages was 45 years. A similar range or people were used in each area, reflecting answers from all ranges of previous cyclone experience. This range of age also included younger people who had always been taught to evacuate and elderly who indicated they would rather die at home than battle the storm and risk dying elsewhere.

Of the total people surveyed, 54% were the heads of the household and the primary decision makers while the other 46% were expected to follow the decisions of another household member. Within the people surveyed, the other persons who were household heads included husbands, sons, brothers, fathers and father-in-laws. It was beneficial to have an almost equal representation of both heads and non-heads of the household as then it was possible to see what decisions were made for the people who were not the heads of the household during a cyclone and find trends in who were taken to safer places versus who were expected to stay at home and protect the family's property.

Picture 10: Man in Rastar Para who lost his home in the last cyclone. He is still without a new home.

Education levels were much lower in the coastal villages than the inland villages. In the coastal villages two thirds of people interviewed had no education, 20% had primary and the remaining 13% had secondary, with no one attending post-secondary education. Just over half the people interviewed had no education, with a slightly decline split between people who had completed primary, secondary and post secondary. People in the coastal villages had less access to school, which would also indicate that they had less access to a building that could be used as a school cum cyclone shelter. Cyclone preparedness is now being adopted into primary school lessons meaning that if this education trend continues, fewer children in the coastal villages will be exposed to proper education regarding cyclone response. Lack of

education also makes it difficult for people to properly understand cyclone warnings or read posters or written material that is distributed around the village to increase cyclone awareness.

Of all the people surveyed 90% of them were married, with 8% not married and living with their parents and one person either divorced or widowed and living with family. Of all the married persons, there was only one participant in both the coastal and inland villages that did not have children. This meant that 79 out of the 90 interview participants had to add the vulnerability of their children during their decision to evacuate before a cyclone. The majority, almost two thirds, of participants indicated that they had between four and seven children. Both the coastal and inland villages had the average number of children at 4.4 and 4.7, respectively. Women are the family member responsible for evacuating the children and most had more children than they had hands, making it difficult for women, especially those with many small children, to get all their children to a safer place during high winds. While some participants indicated that some of their children had gotten married and moved out of their home, the parents still wanted all their children to be together if they were moving to a safer area.

Of the households surveyed, 70% had no elderly (65 years and older) persons living with them, 21 households had one elderly person, 5 households had two elderly and one household had four elderly persons living in the household. Of these elderly, over half were either an elderly respondent or their spouse. This indicated that the majority of households would have to worry about evacuating children rather than elderly. Elderly persons are more resistant to evacuation and generally prefer to stay in the house regardless of warnings received. If they are the heads of the household this may mean that the entire family stays in the home during a cyclone, but generally elderly have given the head of household position to their sons and are expected to follow the decision made for them.

Picture 11: This man indicated, while being interviewed, that he had 18 people living in his home, the home we are sitting in front of.

Almost two thirds of households interviewed had between six and 10 people in the house. There was an even split between households that had between one and five persons and that having 11 to 15 persons. There were 3 households having over 16 persons in the house, with the highest value being 37 persons in a single household. The number of persons per household was crucial to the decision of how to evacuate during a cyclone as it was found that families were reluctant to evacuate to a place where they could not guarantee that their whole family, including extended family, could be together.

In coastal villages it was found that there were generally more females in the average household than men, with females comprising an average of 52% of household members. In inland villages that number dropped to an average of 44% members of the households interviewed being female. This number included all female members, including children. The average of females was highest in Rahkain Para where women are in charge of the households and doing the daily work. Over 90% of families had a range of one to seven females living in the home, with 7 households having more than seven females in the household. It is acknowledged on all levels of disaster management, from policy to household planning, that females are more vulnerable during cyclones because they are weaker, slower and their clothing makes it more difficult for them to get through water. Since they are also the ones responsible for children this increases the difficulties faced by them immensely.

Picture 12: Men in Rahkain Para spend their days at the temple.

The majority of all women interviewed indicated that they were housewives. The percentage of housewives in the coastal villages was 60%, compared to 87% in the inland villages suggesting that women in coastal villages were forced to work outside the home to generate additional income. The majority of the men on the coast interviewed indicated that they were either fishermen, fish brokers or day laborers, although a total of 13

professions and retired status were identified in the coastal villages. Men in inland villages were dominantly farmers, but a total of 12 professions and retired status were indicated by the male respondents.

Of all the persons surveyed 92% indicated that the village they were currently in was the same one that they had been born in. The 7 persons who had moved had all indicated that they had done so for the purpose of marriage. No persons interviewed had changed villages to mitigate the effects that they had to face because of cyclones.

When asked about the last cyclone 57% of the coastal population identified 1997 as the last cyclone they were affected by, one third of people indicated that the Aila cyclone of 2009 was the last cyclone to affect them and one respondent 1999 and 1991 as the last cyclone that affected them. One respondent indicated that they were unsure of the year of the last cyclone. In inland villages 20% of total respondents indicated that the 1994 cyclone was the last cyclone to affect them, 18% indicated it was the 1997 cyclone, 15% indicated that the 1991 cyclone was the only cyclone they could recall, 11% identified Aila in 2009 to have affected them, 9% indicated that 1998 was the last cyclone they had faced. Three respondents identified cyclone 2008 as the last cyclone they faced, two respondents cited 2001, 1996 or 1995 as the last cyclone that had affected them and one respondent identified 2007, 2006 or 1999 as the last time they had been affected by a cyclone. After referencing historical cyclone data it was confirmed that there were cyclone events in the Bay of Bengal for all years mentioned, except for 2006 (Weather Underground 2009).

## 4.2 A Historical Account of Cyclones in the Study Area

Since 1960 the Bangladesh Meteorological Department has created a Major Cyclone Storms list which identified 29 major cyclone storms that made landfall along the Bangladesh coast (Table 1). The 1970 cyclone is often considered the first major cyclone of Bangladesh, though there were ten storms that could be considered cyclones, prior to the November 12, 1970 cyclone, on record at the Bangladesh Meteorological Department, including one on October 24, 1970. In the decade prior to the first recognized cyclone in 1970, there were storms that, at least in some of the, can be

considered unidentified cyclones. Since there are no records prior to 1960, there is no way to determine how long, or how frequently, these storms that may have been cyclones have been occurring.

The storms prior to November 12, 1970 include three in October of 1960, two in May of 1961 and three in 1965, one in May and two at the end of the year, occurring five and a half weeks apart. Of the ten storms prior to November 12, 1970, only a cyclone storm on December 15, 1965 had comparable wind speeds. The cyclone on November 12, 1970 had tidal surges of between 10 and 33 feet in height, all of the storms prior to that have recorded maximum tidal surge heights are the same or higher than the minimum tidal height of November 12, 1970. The cyclone of 1966 had a minimum recorded tidal height of 20 feet. Two of these cyclone storms made landfall at or near the Cox's Bazar area, including one that hit between Cox's Bazar and Chittagong. In addition to the cyclone that hit between Cox's Bazar and Chittagong seven cyclones that made landfall at or around the Chittagong area. The remaining cyclone hit the Khulna area.

After 1970 there are no years with multiple cyclone storms. This may be due to changes in weather patterns, or a change in determining criteria to term cyclones as such. There were only seven cyclones identified in the 21 years between the 1970 cyclone and the devastating 1991 cyclone. The cyclone preceding 1991 was on December 18, 1990, just four months prior to the cyclone in the spring of 1991. None of the storms within those two decades had wind speeds similar to either of the major cyclones, though half of them had maximum wind speeds that were more than the minimum wind speed of both the 1970 and 1991 cyclones. Three of the cyclones made landfall around Cox's Bazar, two were around Chittagong and the remaining two were in or around the Khulna area. Both the 1970 and 1991 massive cyclones hit the Chittagong coast.

The most recent ten cyclones that occurred after 1991 occurred in the 15 years between 1994 and 2009. The only year with multiple cyclones was 1997, with one in May and one in September. Both of these cyclones struck the Sitakundu coast. Three of these cyclones had similar if not stronger wind speeds as the cyclones of 1970 and 1991. Half of the cyclones after 1991 had tidal surge heights of at least 10 feet or one storey in the average building. This means that people along the coast must be in a cyclone shelter or a strong house that is over one storey tall in order to be safely evacuated from their

homes. Three cyclones hit the Cox's Bazar area. Only one cyclone, in 1998, made landfall around the Chittagong area. That cyclone is listed as having landfall in the Chittagong area, near Sitakundu, meaning that this area received three cyclones within one year, all of which had wind speeds of 150 km/h or more. Two of these had tidal surges up to 15 feet, or 5 meters. One of these cyclones occurred in the Khulna area. Two of the remaining cyclones were listed as having landfall in the Sundarban area, with the most recent cyclone listed as having landfall in an area west of the Sundarban coast.

When examining the historical cyclone data it is possible to suggest that cyclones are occurring in a more spread out time frame recently, as opposed to the beginning of the data, as there is only one year after 1970 that had multiple cyclones. It appears that cyclones historically made landfalls concentrated around the Chittagong area. Within the last decade we have seen a shift in landfall that now includes not only the mid to southern coast of the country on the east side of the Bay of Bengal, but now also the western part of the country, near the mouths of the Ganges on the north side of the Bay of Bengal. While the last two cyclones have had wind speeds higher than those seen at the beginning of the decade, there is no distinct pattern for cyclone storm wind speeds. There is also distinct pattern observed in tidal surge height. When comparing wind speed versus tidal height, it cannot be concluded that stronger winds produce higher tidal heights. There is no direct correlation between the maximum wind speed and the tidal surge that is produced by the storm.

As with all natural disasters it cannot be assumed that there is any pattern to the events, therefore storms will continue to occur at random intervals, with varying effects. Since there are no patterns that can be definitively determined, prediction becomes very difficult. Climate change is only exacerbating this problem as it is changing historic patterns in weather trends. Climate change is not only changing weather patterns, but it is affecting seasonality, compounding difficulties in prediction and preparedness. The randomness of hydrological phenomena cannot be controlled, and thus must be mitigated through early warnings. Early warnings are difficult because a storm must form before a warning is considered. Warnings are generated and disseminated as soon as the risk becomes a hazard. Due to the unpredictability of these storms, coupled with a lack of forecasting technology, these early warnings can also disseminate information that, while

accurate at onset, may become inaccurate as the weather, and storm, changes course or strength.

Table 1: List of Historical Cyclones

| Date of Storm | Landfall Area | Max Wind Speed (km/h) | Tidal Surge Height (ft) |
|---|---|---|---|
| Oct. 11/60 | Chittagong | 160 | 15 |
| Oct. 31/60 | Chittagong | 193 | 20 |
| May 9/61 | Chittagong | 160 | 8-10 |
| May 30/61 | Chittagong(near Feni) | 160 | 6-15 |
| May 28/63 | Chittagong/Cox's Bazar | 209 | 8-12 |
| May 11/65 | Chittagong-Barisal Coast | 160 | 12 |
| Nov. 5/65 | Chittagong | 160 | 8-12 |
| Dec. 15/65 | Cox's Bazar | 210 | 8-10 |
| Nov. 1/66 | Chittagong | 120 | 20-22 |
| Oct. 23/70 | Khulna-Barisal | 163 | moderate |
| Nov. 12/70 | Chittagong | 224 | 10-33 |
| Nov. 28/74 | Cox's Bazar | 163 | 9-17 |
| Dec. 10/81 | Khulna | 120 | 7-15 |
| Oct. 15/83 | Chittagong | 93 | unknown |
| date not known | Cox's Bazar | 136 | 5 |
| May 24/85 | Chittagong | 154 | 15 |
| Nov. 29/88 | Khulna | 160 | 2-14.5 |
| Dec. 18/90 | Cox's Bazar | 115 | 5-7 |
| April 29/91 | Chittagong | 225 | 12-22 |
| May 2/94 | Cox's Bazar/Teknaf | 278 | 5-6 |
| Nov. 25/95 | Cox's Bazar | 140 | 10 |
| May 19/97 | Sitakundu | 232 | 15 |
| Sept. 27/97 | Sitakundu | 150 | 10-15 |
| May 20/98 | Chittagong-near Sitakunda | 173 | 3 |
| Oct. 2/00 | Sundarban-near Mongla | 83 | unknown |
| Nov. 12/02 | Sundarban – near Raimangal River | 65-85 | 5-7 |
| May 19/04 | Cox's Bazar – between Teknaf and Akyab | 65-90 | 2-4 |
| Nov. 15/07 | Khulna-Barisal Coast near Baleshwar River | 223 | 15-20 |
| May 25/09 | Sagar Island, West Bengal | 100 | 15 |

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## 4.3 The Impacts of the 1991 Cyclone on Local Communities

It was difficult to determine what the effects of the 1991 cyclone, specifically, had on the coastal villagers because local villagers were able to identify the first “big storm”, as they called it, or cyclone they could remember, but they could not guarantee that it was for sure in the year 1991. Therefore responses to current cyclones could be compared to how they responded the first time they experienced a large storm, but in many instances, it could not be guaranteed that the first storm was, in fact, 1991. They did respond that the first big storm they experienced was a learning experience for them and did effect how they responded to cyclones, to date. The general consensus was that now the coastal villagers will evacuate for every cyclone warning because they do not want to go through the fear they experienced in 1991. They also indicated that they now take more valuable possessions so that there is less risk of the storm leaving them with no possessions.

One respondent from Rastar Para indicated that during the 1991 cyclone, he left when the water was at his doorstep. At that time he put his children on his shoulders and ran to the closest taller house. He took shelter in a concrete (Saudi) house, where he stayed for two days and then he returned home. He has nothing after returning home and was forced to re-build his life as a day-laborer. To date, he does not own land and is still forced to work on other people’s land as a laborer. Another respondent from Rastar Para indicated that in 1991, around 25 to 30 people that he knew within the village died because they did not have time to evacuate at the water came too quickly. He stated that many fishermen died in the sea, and around 500 bodies total were found in the area, although most of them were non-villagers.

One survey participant from Rahkain Para indicated that they did not know how to prepare to the cyclone in 1991. After 1991, but before they could settle down again, a cyclone in 1997 took everything, so now they take everything with them so that all their possessions won’t be washed away in the flood.

One respondent from Del Para indicated that after 1991 they felt that storm was a big disaster so it wouldn’t happen again soon, but he suffered through a severe cyclone in 1997 and lost everything, so now he runs at any warning. One elderly male, who

participated in a case study, gave a detailed account of his experience during the 1991 cyclone. He stated,

> During 1991 it was all stormy and cold so it was hard for them to get to the hills. The wind was very strong and they were afraid a tree would break and kill them all on the way to the hills. His kids were small back then and there was no way to make them warm because they were all soaked in rain and shivering. It was hard to reach their relatives' house. When they got there, their relatives are also poor and didn't have any extras so they didn't have any food. Their house was so small they didn't have room to pray together so they lit a fire in the center of the room so they could get dry. They prayed to god to make the night be over as soon as possible. After they came back, his house was gone and he had no roof to sit under. With cloth they made a tent and lived under it for 25 days. The broken walls of the house were used as toilet walls for the women. As he had no food, he had to take loans from the richer people under the promise to pay them back in a week or so. He went to the big bazars to buy food. The conditions of the roads were so bad they had to walk for miles and miles to go get food and come back.

There was a range of responses when inland villagers were asked if the 1991 cyclone affected their current behavior. Some felt that the 1991 cyclone made them aware of how powerless they are against a storm of that magnitude. This feeling of powerless either manifested itself into a fatalistic attitude, or encouraged people to react to early warnings. Those who felt they could do nothing and that "God would save them", if that was how it was supposed to be, indicated that they would choose to stay home during the next large cyclone and pray for safety. One respondent from East Muktar Kul indicated that even after seeing the storm of 1991, and how dangerous it is during a cyclone, he would not leave his house. He feels that if he is going to die, he wants to die in his house. Another respondent from East Muktar Kul responded that even after seeing the cyclones of 1991 and 1997, he would stay home and protect his family. He would not leave his house and go anywhere because he feels the situation would be the same elsewhere. A third gentleman from the same village stated that he saw a lot of people get injured in 1991, while trying to get to a cyclone shelter in a nearby village. He stated that he wouldn't go to any shelter that was far away and where he would have the change of having to come back to his home. One respondent from West Muktar Kul responded that he had never seen a storm prior to 1991, so he never previously cared about the signal system. After 1991 he now places a greater importance to the TV and monitoring what

the weather is doing. A respondent from Kurulia Darja Para indicated that after 1991 he made his house strong, and even with a strong house he would still leave his home and try to reach a cyclone shelter if the storm gets bad. Those who felt that they would react during the next large cyclone indicated that they would either evacuate to a cyclone shelter, or take shelter in a local concrete building.

Both coastal and inland villages felt the losses of the 1991 cyclone were greater than any of the more recent cyclones. That was due, in part, to the fact that there were few, if any, cyclone shelters in the affected areas in 1991. There was also a lack of awareness, since an event of that magnitude had not happened in many years. Capacity building and local cyclone shelters have helped local villagers react in appropriate ways before a cyclone.

## 4.4 Reception of Cyclone Early Warnings

Early warnings can never be guaranteed to be completely accurate. Storms can change paths or disperse before reaching the coast. Due to this, the Bangladesh Meteorological Department issues warnings to the best of their ability, but in order to increase warning lead times, and ensure that warnings are disseminated if a risk is identified, warnings for pressure systems or cyclone storms can become inaccurate and considered “false” by the people who receive them. While they are not false warnings, and are “inaccurate” because of a shift in the storm’s direction, this is difficult to explain to local villagers and they tend to believe the warnings were simply untrue. One of the concerns raised when discussing “false” warnings cause complacency among people who are forced to evacuate their homes and risk losing property to looters when no storm materializes. In interviews coastal respondents indicated that they were willing to leave their homes no matter whether they felt the warning would become a storm or not. Past cyclone trauma experience by individuals, families and communities as a whole act as motivation to evacuate. This is generally not the case in inland communities, as their cyclone flooding generally comes from river flooding and not from direct storm surges. The lack of visual stimuli, caused by impending storm surges, fails to invoke the same sense of urgency. Also, the more structurally sound homes of inland villages receive less

damage and there is a much lower loss of lives in these areas. Therefore the collective memories of these communities have less total loss and less fear regarding the next cyclone event. Complacency caused by incorrect warnings is much higher in inland communities and is often used as an excuse to avoid evacuation.

The Bangladesh Meteorological Department has begun compiling early warning signal information in order to analyze past early warnings. To date they have identified all warnings issued from the beginning of a low pressure system or depression until the storm dissipates. There are generally multiple warnings issued each day the storm is a risk. During the period of 1998-2009 there were six major cyclones to affect Bangladesh, as stated by the Major Cyclone Storm list provided by the Meteorological Department. Within the 1998-2009 that there is warning data for a total of 26 storms with warning periods of three or more days and had an average of two or more warnings per day. One storm, in 2002, that only had warnings for a period of two days, but was identified as a major cyclone by the Major Cyclone Storms list. These storms include the six major cyclones, 14 storms that became cyclones and had landfall within the Bay of Bengal and seven storms which had numerous days and signal updates, but no storm formed. When examining the differences in numbers of warnings for each event and total numbers of days that there were warnings created, the six major cyclones had an average of 14.7 warnings per storm. These warnings are spread out through an average of 4.5 days per storm. This means that there was an average of 3.6 warnings per day on days where there is an increased storm and cyclone risk. In the 14 storms that were not deemed to be major cyclones, seven of the storms, or half, were named cyclone storms, including Bajli in 2009 and Nargis in 2008. In this group of storms/cyclones, there was an average of 15.4 warnings per storm over an average of 4.4 days. This translated into 3.5 warnings per day during the cyclone threat. In the seven situations where multiple warnings were issued and no cyclone made landfall, there was still an average of 14.6 warnings per risk, which is almost identical to the rate of warnings issued during major cyclones. These warnings were spread out over an average of 5.7 days, meaning that there were less warnings issued per day, but the average of warnings per day was still 2.6. This average is only an average of one less warning per day than the major cyclones and less than an average of one for the less severe storms.

The information provided by the Bangladesh Meteorological Department, for the period of 1998-2009, indicates that the area in and around Cox's Bazar only received a level nine cyclone warning twice in that time frame (Table 2). These signals were for the major cyclone of 2007, Sidr, and the major cyclone occurring in the spring of 1998. There were two storms that received a signal number seven, which indicates that a storm is coming directly toward that area although evacuation is not necessary at that time. These two cyclones include cyclone Akash in 2007, and the 2004 cyclone that made landfall in the Cox's Bazar area. There were four cyclones that had a maximum signal value of six in the Cox's Bazar area. These include the major cyclone of 2009, Aila, and the major cyclone of 2002, as well as Bilji in 2009 and Rashmi in 2008. Nargis in 2008, Mala in 2006, as well as four other cyclones that occurred in 2002, 2000, 1999 and 1998 all received a maximum signal number of four in the Cox's Bazar area throughout the storm. Nargis averaged 4.2 signals per day, indicating that the Meteorological Department was keeping close watch on the storm, but at no time did they feel it was enough of a threat to that area to increase the signal number. There also was a storm in 1999, with an average of 5.6 warnings issued per day, and a storm in 1998 with an average of 5.2 warnings issued within each day of the storm, which did not get upgraded past a level four signal. The rest of the storms did not receive cyclone warning signals above the level three, including the seven storms that did not materialize into cyclones with landfalls. One storm of interest is a storm in 1999 which received a maximum of a level three signal, but had an average of four signals issued per storm day. It can be concluded that these warnings are issued from the Meteorological Department in order to keep all stakeholders aware of the current situation, but they do not increase the level of signal unless it is considered necessary for the safety of the grass-roots communities.

Table 2: Cyclone warnings of signal 4 or higher in Cox's Bazar from 1998-2009

| Date | Number of Signal 4 or Above | Maximum Signal Number | Resulting Storm |
|---|---|---|---|
| May 19, 1998 | 10 | 9 | **Unnamed** |
| May 20, 1998 | 2 | 9 | **Unnamed** |
| November 21, 1998 | 5 | 4 | **Unnamed** |
| November 22, 1998 | 4 | 4 | **Unnamed** |
| October 27, 1999 | 5 | 4 | none |
| October 28, 1999 | 6 | 4 | none |
| October 27, 2000 | 3 | 4 | none |
| October 28, 2000 | 2 | 4 | none |
| November 12, 2002 | 3 | 6 | none |
| November 26, 2002 | 1 | 4 | none |
| November 27, 2002 | 1 | 4 | none |
| May 19, 2003 | 1 | 5 | none |
| May 20, 2003 | 1 | 5 | none |
| May 18, 2004 | 4 | 6 | none |
| May 19, 2004 | 3 | 7 | none |
| April 28, 2006 | 2 | 4 | **Mala** |
| April 29, 2006 | 1 | 4 | **Mala** |
| May 14, 2007 | 2 | 7 | **Akash** |
| May 15, 2007 | 1 | 7 | **Akash** |
| September 22, 2007 | 1 | 7 | **none** |
| November 13, 2007 | 1 | 4 | **Sidr** |
| November 14, 2007 | 1 | 9 | **Sidr** |
| November 15, 2007 | 3 | 9 | **Sidr** |
| May 1, 2008 | 5 | 4 | **Nargis** |
| May 2, 2008 | 1 | 4 | **Nargis** |
| October 26, 2008 | 3 | 6 | **Rashmi** |
| April 16, 2009 | 3 | 4 | **Bilji** |
| April 17, 2009 | 7 | 6 | **Bilji** |
| May 24, 2009 | 2 | 4 | **Aila** |
| May 25, 2009 | 7 | 6 | **Aila** |

Information from the Bangladesh Meteorological Department, reprinted with permission.

Picture 13: Waters of a Level 3 cyclone warning along the coast at Cox's Bazar, October 2009.

There was an average of 13.25 groups of total warnings and signals issued per year in the period of 1998-2009, although 2009 data extends only to September. The least amount of signal groups were issued in 2009, up to September, and 2004. The highest amount of signals was issued in 2007, when 25 separate groups of signals were issued within the year. In 2009 there were six groups of warnings issued, two of them, or one third of these became storm events. The highest ratio of warnings to storm events, in a complete year of data, occurred in 2005 when one-quarter of all the total warnings generated resulted in storm risks that were monitored for more than two days and resulted in at least two warnings being generated per day. Of those four storms, two of them did not end up making landfall, and dissipated before they became true threats. Therefore, half of the threats that were identified within that year can be considered "false" warnings. The lowest ratio of total warnings resulting in storm risks was in 2007. Of the 25 groups of warnings generated, only two of them resulted in cyclones. These were the Akash and Sidr cyclones. The signal numbers for these two cyclones were the only instances in that year that generated warning signal numbers above three. In 2006 there was only one storm, out of a total of 11 groups of warnings that received any warnings about a level three. That one storm was cyclone Mala. Therefore, while warnings signals were generated, only when the risk became a hazard, were those warnings upgraded to a level that requires wide-spread dissemination.

In all storms that made landfall, the total average lead time from initial warning signal to landfall is 3.2 days before landfall. The lead time within the six major cyclones was an average of 3 days, while that number increased slightly to 3.3 days for the other 14 storms that made landfall. Although it is a small difference between the two, it amounts to an extra eight hours of evacuation time. The longest lead time for warnings before any of the major cyclones was in 2007, when the first warning was generated five

days before the cyclone made landfall. The shortest lead time was in 2002, when the initial warning was only generated one day before cyclone landfall. Although the information indicates that there is generally, on average, ample lead time before cyclone landfalls, it is not known at what point during the warning generation, if at all, it is disseminated at the grass-roots level.

This information is limited in the fact that it is issued by the national government in Dhaka, and there is no similar database at the local government level to compare to. When examining the early warnings produced and disseminated during these storm events, we can examine the amount of warnings given, but there is no guarantee that all, or even most, of these warnings made it down to the local level of government. While the warnings are stated, no indication of how, or when, they were disseminated was given, making it difficult to understand the effects that these possible warnings had on the people they were intended to reach. Also, this information accounts for warnings issued by the government, but does not account for warnings disseminated by NGOs and/or local organizations.

It is difficult to make definite conclusions about the effect of false warnings without having grass-roots information about the quantity and nature of the warnings disseminated at the local level. While there were seven groups of warnings identified a risk and resulted in a storm that did not make landfall, none of these groups of warnings were upgraded past a level four. Therefore no evacuation was ordered with these warnings and they were used solely to identify a possible risk. There are no distinct patterns between the intensity of a storm and the amount of cyclone warnings issued per day during the storm. Only two of the six major cyclones were given a level nine warning signal, also making it difficult to draw conclusions about major storms and warning signals. There was no notable difference between signal numbers issued for major cyclone events and storms that had landfall, and were, in some cases, named as cyclones. Therefore it is difficult to examine differences between these two categories of cyclones and any differences in warning creation and dissemination. It is also difficult to determine what, if any, signal number was required for each of the cyclones, as storms can affect different parts of a region differently. While the information provided indicates where the landfall was, it does not indicate wind speed or tidal surge heights for each of the storms

in the area of study, Cox's Bazar, making it difficult to determine if the signals provided were appropriate or not.

All persons interviewed that identified a cyclone other than the 1991 cyclone as the last cyclone to affect them indicated that they were in their current villages at the time of the cyclone. A total of 98% of coastal village dwellers interviewed received an early warning before the last cyclone they experienced. Only one respondents of the people interviewed in the coastal areas indicated that he did not receive an early warning prior to the last cyclone event. The respondent indicated it was in 2007 that he did not receive a warning. A total of 60% of inland people received early warnings before the last cyclone that affected them. This number was highest in West Muktar Kul with 11 of 15 participants receiving warnings, followed by East Muktar Kul where two thirds of people received warnings. The lowest warning incidence was in Kurulia Darja Para where only 6 persons received warnings before the last cyclone that affected them. Half of the people who identified 1991 as the last cyclone that had affected them did not receive an early warning prior to the cyclone's landfall. It is known that there was little early warning infrastructure and manpower to disseminate early warnings before the 1991 cyclone. When those responses were removed from the respondents who did not receive an early warning in 1991, it was found that seven respondents did not receive early warnings during the period of 1995 to 1998 and three respondents did not receive warnings for cyclones between 2001 and 2009. When these numbers were compared to the total number of people who identified cyclones during the period of the 1990s and the most recent decade, the proportion of people who did not receive warnings in these decades decreased from 37% in the 1990s to 25% in the most recent decade. This indicates that there a steady improvement of early warning dissemination in the inland villages since 1991, with similar improvement rates through both the decades. In the last decade half as many people have gone without warnings as compared with 1991, but when compared to the coastal area, the amount of people who do not receive warnings is over five times higher than the coastal areas. The risk to life is greater along the coast, but both areas face loss of property and livelihood.

Of the people who received the warnings, the average time before the storm hit that the villagers received the early warning was 11 hours for coastal villages and 8 hours

for inland villages. Eleven respondents from coastal villages received a warning at least one day in advance and only 5 respondent in the inland villages had a day or more warning. Only one respondent in the coast indicated that they had received an early warning at least 2 days prior to the cyclone's landfall.

Of the interviewees who did receive an early warning the majority of both coastal and inland the majority of people indicated that the warning told them that they were to leave and go to a safer place. The majority of warnings did not specify a cyclone shelter, but told the people to evacuate and take refuge in a safer place. Almost all the evacuation orders along the coast also included the information that a storm was coming and their homes would be filled with water. There were less warnings that included this information for inland dwellers, but it was still the second most common warning disseminated. Signal numbers were also told to the respondents and the number of people who received signal information was similar in the coast and inland. Three people in both coastal and inland villages received any instruction on what to do with livestock or possessions or to conserve food or water for after the storm. Only two people in both coastal and inland received information about an increase in wind speed.

All but one of the people along the coast who received early warnings indicated that they believed the warning. The one gentleman who did not believe cited that he did not believe it because there had been many false warnings. When asked about false warnings, the other members of coastal communities indicated that false warnings did not deter them from leaving their homes and they would continue to leave for every warning that instructed them to evacuate. All of the people in the inland area who received the warning believed it to be true.

Some people indicated that they received an early warning from more than one media, but the majority of people in coastal villages indicated that they received the warnings via megaphone. A local miking system was the second most frequent response. Six persons indicated that they received a warning from radio, five from either television or flags and four persons heard a warning from either neighbors or by hearing a local warning bell rung. Only one person indicated that they received a warning from a cell phone. Two respondents indicated that they were dependent on an external warning because they did not have access to television or radio in their homes. The most common

method of dissemination in inland villages was the local miking system, followed closely by television and radio. Megaphone warning dissemination was cited less than 20% as often in the inland villages as it was on the coast. Three respondents indicated they received the warning from their neighbors and only one person indicated that they had seen a flag system that alerted them of the early warnings.

When asked who had disseminated the warnings the majority of people in the coast indicated that it was the Red Crescent Society that had disseminated early warnings to them. No person indicated that the CPP had disseminated the warnings, but since the equipment used by the CPP bares the Red Crescent logo, it can be assumed that some, if not all, of that dissemination was done through the CPP. The second most common response was that interview participants did not know who had disseminated the warning. The government and World Vision were also credited with disseminating warning, with one person also indicating that there were other NGOs that disseminated the early warnings. Of the people in the inland villages that had received warnings, the majority of people could not identify who had disseminated warnings. Of the people who could identify organizations, the government was the most common response, followed by the Red Cross/Red Crescent Society. No other organizations were mentioned in the inland villages.

## 4.5 Responses to Early Warnings by Local Communities

In Rastar Para 14 of the persons interviewed left their homes before the cyclone hit, while one gentleman who did not receive a warning, stayed at his home. He sent his family to the hills when he saw his neighbors evacuating and he stayed and climbed onto his roof and then held to a tree. While the whole household evacuated before the storm hit, not all family members did so immediately. Six households indicated that the whole house evacuated immediately. Six households indicated they, personally, stayed back in their homes until the storm got worse and then they left at the last moment. Two females indicated that either their husband or brother stayed back to protect the house and left when the storm got worse. Thirteen household in Rahkain Para left immediately after hearing the early warning and two left when the storm got worse. Ten household in Del

Para indicated that they left immediately after hearing the warning, while one person indicated that they left when they saw their neighbors leaving even though they had not received an early warning. Two households left once the storm got worse and two households chose not to leave even after receiving an early warning. The one man indicated that he did not believe the warning and went to the market in Cox's Bazar. When he returned he realized that his family had evacuated because the storm had hit. The other woman indicated that it was her wish to stay home and that she only faced wind and not water. In East Muktar Kul three households evacuated immediately after receiving an early warning. Six households did not leave even though they did receive an early warning. Five households did not receive warnings and did not leave their homes and one man left to go to the cyclone shelter and returned home when there was no room for him at the shelter. In West Muktar Kul four households evacuated after hearing the early warning. One female left with her family, but left her son at home to take care of the house because her husband was not home and her son was the second in charge. Her son came to the shelter when the storm got worse. One household left to go to the shelter, but returned to their home when there was no room for them at the shelter. Four households heard the warning, but did not leave until the storm got worse. Three households heard the warning and chose not to leave their homes even after receiving an early warning. Two households did not receive early warnings and did not leave their home. In Kurulia Darja Para only one household left after hearing the early warning. Two households left for a safer place even though they had not received an early warning. Five households did not leave their homes even after receiving an early warning. Of those households, two men sent their families to a safer place and they, personally, stayed back to watch their house and those of their neighbors'. Seven households did not receive early warnings and did not leave their homes (Tables 3 and 4).

Table 3: Response of local villagers, by village, to cyclone early warnings, by number

| Village | Left Immediately | Left When Storm Increased | Stayed in Home | Left, but Returned due to Lack of Room in Shelter |
|---|---|---|---|---|
| Rastar Para | 6 | 8 | 1 | 0 |
| Rahkain Para | 13 | 2 | 0 | 0 |
| Del Para | 11 | 2 | 2 | 0 |
| East Muktar Kul | 3 | 6 | 5 | 1 |
| West Muktar Kul | 4 | 5 | 5 | 1 |
| Kurulia Darja Para | 3 | 0 | 12 | 0 |

Table 4:Response of local villagers, by village, to cyclone early warnings, in percentage

| Village | Left Immediately | Left When Storm Increased | Stayed in Home | Left, but Returned due to Lack of Room in Shelter |
|---|---|---|---|---|
| Rastar Para | 40.0 | 53.3 | 6.7 | 0 |
| Rahkain Para | 86.6 | 13.3 | 0 | 0 |
| Del Para | 73.3 | 13.3 | 13.3 | 0 |
| East Muktar Kul | 20.0 | 40.0 | 33.3 | 6.7 |
| West Muktar Kul | 26.7 | 33.3 | 33.3 | 6.7 |
| Kurulia Darja Para | 20.0 | 0 | 80.0 | 0 |

The coastal people face cyclone disasters on a regular basis and are willing to evacuate every time they receive an early warning because they understand the risk that they face. The inland people are more resistant to leaving their homes and possessions. When asked why they chose not to leave, the majority of interview participants in East Muktar Kul indicated that they had nowhere else to go. The closest cyclone shelter is one to one and a half kilometers away and they do not feel that they can safely reach the shelter safely or be guaranteed space within the shelter once they arrived. Three people indicated that their house was safe enough, as many of them have concrete houses. One

person indicated that because they did not receive an early warning, buy the time they realized the storm would be bad enough that they should evacuate, it was too late and they could not safely travel anywhere. Every person who did not evacuate in the last cyclone indicated that they would do so if there was a cyclone shelter nearby. One person in West Muktar Kul also indicated that they not left their home because they did not receive an early warning and by the time they realized they might be at risk it was too windy and they were unable to evacuate. The other reason given for not evacuating was that the respondents felt that their houses were strong enough and they would be safe by staying home. All but one respondent indicated that they would go to a shelter if there was one nearby, and one respondent said that he had previously been to a shelter during a flood. In Kurulia Darja Para the majority of people indicated that they did not evacuate because they had nowhere to go. Some felt they had nowhere to go because they could not find a safe place in close proximity or they felt there would be no room in a cyclone shelter if they went there. The majority of respondents indicated that they would go to a cyclone shelter if there was one nearby, though two participants felt that their houses were strong enough and they would stay in their house even if a future warning instructed them to evacuate.

Two of the respondents from Rastar Para indicated that when they evacuated, they did so to a cyclone shelter, another two households went to a local hospital that was used a cyclone shelter. The remaining ten households that evacuated chose to go to the nearby hilly area. When asked why they chose that place, three people indicated that a cyclone shelter was too far away, while seven people indicated that they did not feel that there would be enough room for them at the shelter. Three of these households had previously been to a cyclone shelter, but had been turned away because there was not enough room, so now they choose the hills as their first option so that they do not waste time checking a shelter. It was mentioned by one respondent that they went to the hills because they are perceived as safe while another respondent indicated that they preferred the hills to a man-made cyclone shelter. One respondent indicated that he would prefer to go to a cyclone shelter because it is hard to run to the hills in a storm and he has previously been wounded trying to get there. Rahkain Para has a raised temple in their village, which acts as a cyclone shelter during cyclone storms. Twelve interview participants went to the

temple after receiving the early warning. Two participants went to Cox's Bazar to stay at the Rahkain village there and one participant went to a higher area near Del Para because he felt that the temple was too close to the water to be safe. One of the participants who went to Cox's Bazar said he chose to do so instead of evacuating to a neighboring cyclone shelter because he is Buddhist and there were lots of Muslims in the cyclone shelter and he feared that they may not give him space, or cause trouble for him. In the coastal village of Del Para twelve of the respondents evacuated to the hilly area, while two people went to a local school that is used as a cyclone shelter and one evacuated to a local mosque. The participant that had gone to the mosque did indicate that they have gone to a cyclone shelter in previous storms. Of the ten people who evacuated to hilly area, nine did it because there was no cyclone shelter nearby, while one indicated that they chose to go to the hill to stay with family members.

## 4.6 Evacuation of Homesteads and the Use of Cyclone Shelters

When evacuating, there are groups of people within the at risk population that become more vulnerable to cyclone storms. These persons generally include women, children and the elderly. Within each village five women were interviewed to receive and accurate and complete account of vulnerability faced by members of that population. Elderly were also interviewed, although a set number of elderly was not sampled within each village. The first female in Rastar Para indicated that she had so many kids to worry about that it becomes difficult to evacuate. The next female indicated that it is harder for females to evacuate because they are responsible for the children and they cannot run as fast. She felt that women are also responsible to make sure everything is in the proper place, but she did state that women are never left behind while men evacuate. This female respondent indicated that she never feared for her safety when evacuating, as she felt everyone was too scared for their own safety to do harm to others. Another female respondent from Rastar Para also indicated that she had no concern that herself or her children would be harmed by other people since everyone was too concerned for their own safety. She said that her fears were that women are not as good swimmers and their dresses make it harder to swim and evacuate. She stated that men do no help carry the children and it is the responsibility of the women. She did not fear being left behind, but

was concerned that she would not make it to the shelter in time. She indicated that women from other homes would round up children for local mothers if she left one behind.

The first female respondent in Rahkain Para indicated that she felt that females face more difficulties when evacuating since they are not as strong and it is harder for them to survive. She also identified a concern that their hair may get stuck in something, making them unable to escape, because they don't worry about pulling it back before they evacuate. The next female respondent indicated that she had heard that in other villages "bad people" will steal pretty girls as they flee the area, but for her, saving her life is more important than safety concerns. The next female respondent also indicated that she had heard of people running for shelter and girls getting harassed on the road. She stated that it was difficult for her to evacuate because she cannot go out alone, as their might be "bad guys" around. She also said that her clothing is hard to run in and she is concerned that she fears that it will act as a barrier when moving. There was another respondent who indicated that she feared being harassed when going to the shelter. The fear of harassment was surprising in these set of responses, as the temple and cyclone shelter that Rahkain Para females evacuated to was right within their village walls. It would be expected that females would consider themselves safe within the confines of their village.

The first female respondent from Del Para does not feel an increased risk associated with being female. She feels that her husband will not leave her or the family behind, he will take care of his family. The second respondent indicated that she is scared that there is bad people along the way that might take them or a tree will break and block their path and trap them. The other three respondents did not report any increased vulnerability felt because they were female.

Four female respondents from West Muktar Kul indicated that they did not feel any increased vulnerability because they were female. One respondent indicated that she cannot swim as fast as her husband, or fight back against a robbery. None of the female respondents from East Muktar Kul indicated that they felt an increased vulnerability because they were female. No females from Kurulia Darja Para indicated that they faced greater cyclone vulnerability because they were female, although one did state that she

faced more problems because she is female. The homes she lives in does not get inundated during the flood and so during this time she still must do the housework and feed the livestock in the lowlands, which is flooded. The food for the livestock gets wet and she is forced to deal with the issues that arise from the flooded yard.

It can be expected that female coastal respondents feel more vulnerable to cyclones than inland females since the entire coastal population is more vulnerable to cyclones than their inland counterparts. Also, female inland villagers do not, generally, evacuate their homes during a cyclone storm. They do not face evacuating their children or gathering their possessions, therefore their pre-disaster concerns are unlike those of coastal villagers.

Picture 14: The newly built cyclone shelter in Rahkain Para that stands beside the temple, in the middle of town.

When asked about their perception of cyclone shelter safety the majority of people in the coast believed the cyclone shelters to be safe, but did not evacuate to them because they feared there would be no room for them. Of the 15 people interviewed in Rastar Para 12 persons felt the cyclone shelter was safe. One person indicated that it was not safe because it was too congested and they had been forced to leave it in the past because it was too full and two people had never been and didn't know. When asked if there was segregation for males and females 12 respondents in Rastar Para said yes and three didn't know. Two people did not know if there was enough room in the shelter because they had never been and 13 people responded that there was not enough room. It was also indicated that many people are forced to stand outside or leave and often people are sent away due to lack of room. In Rahkain Para there is a small cyclone shelter building being built, but the people generally evacuate to the temple which is beside the cyclone shelter and much bigger. The cyclone shelter is still in construction and was not around for any of the previous cyclones, so it has not been used by the Rahkain Para village during cyclone events to date. Many of the

community members put their trust in the temple because it is a building of God and they feel that God will protect them in it. Two households did indicate that they have chosen to go to a cyclone shelter in a nearby village because they feel that the temple is getting old and may no longer be safe. There is a fear that because the temple was hit so hard in 1991 and 1997, it may break and not protect the people next time a cyclone tidal surges hits the structure. Of the three respondents that indicated that they did not feel the temple was safe, the reasons given was that there were too many people who had to fit in it, that it was getting old and that it used to be safe, but was not anymore. The majority of people indicated that the temple did not segregate men and women, but this practice was not necessary in their religion. There was almost an even split between people who did and did not believe there was enough room in the temple and new cyclone shelter for them in Rahkain Para. The respondents who indicated that there was enough room said that this was because they would make, or at least try to make space for everyone or that the men would stand outside to make sure there was enough room inside for women, children and elderly. Of the respondents who did not feel there was enough room to accommodate everyone, they responded that there were too many people with too little room in the buildings or that the population had increased and now they could not fit everyone, plus survival supplies, inside the temple. Almost all the respondents in Del Para indicated that although they had not evacuated to a cyclone shelter, they did feel that they were safe and would be willing to go to one in the future if there was one nearby. Only one respondent indicated that he felt that even if there was one in a neighboring village that those villagers would fill it and he still would not receive space. Only one respondent did not feel the cyclone shelter were safe and his reason was that they were too congested and people were suffocating each other in there. The respondents either indicated that there was no gender segregation or that they did not know, as well they indicated that either there was not enough room in the shelter or that they did not know because they had not evacuated there.

Pictures 15 and 16: Cyclone shelters in the Cox's Bazar area.

In the inland villages people had less experience evacuating to cyclone shelters and some had done it during floods, not cyclones. In East Muktar Kul only four persons had any previous experience evacuating to a cyclone shelter for any natural hazard. All but one of the respondents in the village indicated that they considered shelters to be safe and would evacuate to one in the future if there was one nearby. One man said that he would stay in his house. Of the four respondents that had previous cyclone shelter experience, two said that there was gender segregation and two indicated that there was not. Of those four respondents three felt that there was not enough space at the shelter to accommodate all that needed shelter, while one respondent indicated that there was enough room. This male indicated that it was his opinion that in the future there would not be enough room for everyone during a cyclone so he would find alternate shelter during a cyclone and use the cyclone shelter as his first choice for evacuation during a flood. In West Muktar Kul 60% of the population believed the cyclone shelters were safe, while the additional 40% said that they had no previous experience with them. Only one person indicated that they segregated men and women, while 40% of the population did not know and eight people said that they did not. Of those eight people only one person said that they wish they did while the rest indicated that they would prefer to not be segregated so they could stay with their families. One person also indicated that having segregation would take up more space and the shelter would be able to fit less people so they were glad there was no segregation. Seven persons said that there was enough space in the shelter, while two respondents indicated that there was not and 40% did not know. It was told that it was difficult to make space, and the shelter was generally crowded, but

they did make space for all that needed it. One man said that he would only use a shelter in the future if he could guarantee that his family, as well as his brothers' family could all stay in the shelter together. Otherwise they would stay at home where they could be together. In Kurulia Darja Para one person had been to a cyclone shelter during a cyclone and one person had been there during a flood. All but two of the persons who had not been indicated that they would be willing to evacuate to a cyclone shelter in the future if there was one nearby. Of the two that indicated that they still would not evacuate, one sited that she would stay home because her house was strong enough to protect her, while the other respondent did not state a reason, just indicated that they would not be willing to leave their home. There was a split on opinions about the adequacy of space for evacuating people, with one respondent saying that it was very congested, but everyone made enough space for the evacuees (Tables 5 and 6).

Table 5: Perception of cyclone shelter safety, by village

| Village | Feels shelter is safe | Feels shelter is unsafe | Do not know | Have never been | Have never been, but would go if one was closer |
|---|---|---|---|---|---|
| Rastar Para | 12 | 1 | 2 | 0 | 0 |
| Rahkain Para | 12 | 0 | 3 | 0 | 0 |
| Del Para | 3 | 1 | 1 | 3 | 7 |
| West Muktar Kul | 9 | 0 | 2 | 3 | 1 |
| East Muktar Kul | 4 | 0 | 0 | 1 | 10 |
| Kurulia Darja Para | 3 | 0 | 0 | 2 | 10 |

Table 6: Villagers' perception of the available space within local cyclone shelters

| Village | Enough room | Not enough room | Do not know |
|---|---|---|---|
| Rastar Para | 0 | 13 | 2 |
| Rahkain Para | 5 | 7 | 3 |
| Del Para | 0 | 4 | 11 |
| West Muktar Kul | 7 | 3 | 5 |
| East Muktar Kul | 0 | 4 | 11 |
| Kurulia Darja Para | 2 | 1 | 12 |

The majority of inland respondents in inland villages did not evacuate to a cyclone shelter because they houses could withstand the flooding. One respondent in West Muktar Kul explained that there was a brick field in the nearby town of Ramu and they could go there and buy concrete and contractors would build houses for them for a cost of approximately 150,000 taka (approximately $2150 USD). One respondent from West Muktar Kul, indicated that if the water level rises too high they do go to the cyclone shelter when needed, although they can tolerate two to two and a half feet of water in their homes. They put bricks under the furniture and raise the furniture to above the water level. He did state that the floods are getting worse and the frequency has increase because of river bank erosion. Because the river is closer to the village, any excess rain can cause instant inundation. One respondent stated that they flooding they experience is flash flooding from the hilly areas, and not salt water. They are effected more by the wind of a cyclone, not the water. Therefore, this respondent felt that the shelters in the area are good and much less needed than those within coastal villages. Another respondent also indicated that he was effected by wind and not water. He stated that he had mango, beetlenut and coconut trees that are greatly affected by cyclone winds, but he acknowledged that there was nothing he could do to protect them.

One respondent in East Muktar Kul indicated that he felt the cyclone shelter will be too crowded during a cyclone and he would make the local bank his first choice for cyclone evacuation. Multiple respondents within this village expressed a need for a bigger, stronger embankment to protect them from cyclone flooding.

Respondents in all three inland villages experience flooding anywhere from two or three times a year to seven or eight times a year. Consequently, they do not differentiate between floods caused by hill water inundation and cyclone water flooding. Regardless of the cause, inland people tend to stay in their homes during a flood for as long as possible. Most homes are equipped to tolerate between two and two and a half feet of flood water and people tend to put their furniture on bricks, live either on their beds or on the roads surrounding their homes, and cook on portable wood stoves until the water recedes. There are very obvious differences between cyclone evacuation procedures within coastal villages and inland villages. These differences can be attributed to the marked differences in cyclone risk between the two groups of villages. Inland villages must only deal with the wind associated with cyclones, making it unnecessary to evacuate from homes, which were commonly constructed of concrete. The coastal villagers must deal with the wind and water associated with cyclone storms. Their homes are unable to withstand these storms and evacuation is necessary. It is not possible to draw parallels between the two sets of responses, as the vulnerability and risk is completely different based on location.

## 4.7 Coping with Cyclone Impacts: Personal Loss and Compensation

When asked about evacuating during the last cyclone, all people in coastal villages, with the exception of three respondents. The three respondents that did not evacuate chose to do so because the first respondent did not believe the warning, the second chose to stay home regardless of believing the warning and the third person did not receive an early warning. Of the people that did evacuate they were away from their homes for an average of just shy of one day, or 22.3 hours. Of the inland village respondents, only one third evacuated their homes. The majority of respondents did not feel that they needed to leave their homes and decided to stay in their villages and wait out the storm. Of the respondents that did evacuate, they were displaced from their homes for an average of just over one day, or 28.8 hours. It is hard to say if this slight difference in evacuation times were due to a longer lead time in inland village warning times, or less of an urgency to return to inland village homes.

After the cyclone subsided and villagers either returned to their home or resumed their lives, coastal villagers faced much greater loss than inland villagers. Just short of seven percent of coastal villagers returned to intact homes, while 53 percent returned to busted house structures and 40 percent of respondents returned to homesteads where the houses were gone completely. Of the inland villages, 36 percent of respondents had homes that remained intact, while 38 percent had homesteads were the house was damaged, but still there. In inland villages, 22 percent of respondents suffered roof damage to their homes, but had little to no structural damage to the rest of their homes, and only 4 percent of respondents, or two persons, returned home to find their houses gone.

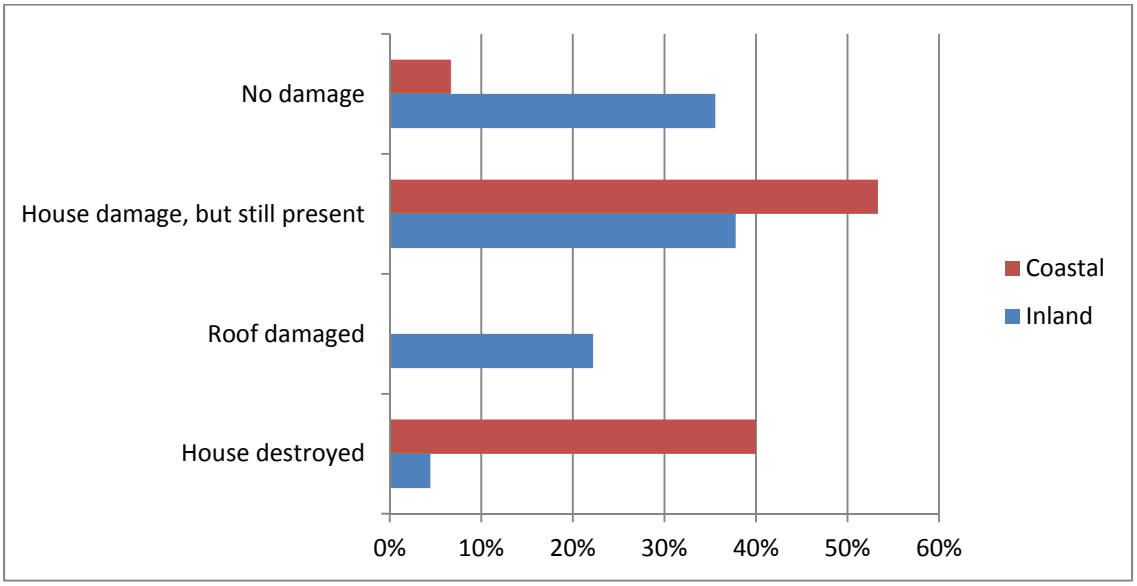



Figure 4.1: Graph of damage to homes, coastal versus inland.

There were substantial losses suffered by both coastal and inland villagers besides their homes. While it is unable to calculate the total monetary loss of all those affected, loss was cited by survey participants as including livestock, including goats, cows, ducks and chickens, trees, crops, boats, fishing nets and a rice shop. Loses in inland villages were similar, but were cited as chickens, goats, a cow farm, trees, crops, a beetle leaf garden and a barn.

When asked about post-disaster relief funding, all respondents from Del Para stated that they did not receive any money to help rebuild their homes and lives. One respondent even added that he was forced to take out a loan to rebuild his home. When surveying Rahkain Para, nine persons, or 60 percent of respondents indicated that they did not receive any monetary assistance after the latest cyclone. Three respondents indicated that they did not receive money, but that local leaders provided food when it was requested. Three respondents from Rahkain Para also indicated that they received assistance from local NGOs in the form of building supplies. All Rastar Para respondents also indicated that they did not receive any relief money. They indicated that they did not receive any food, clothing or money to help them rebuild after the cyclone. All respondents, from all three inland villages, indicated that they did not receive any monetary compensation, or any other form of reimbursement.

All respondents from Del Para also indicated that there was no community leader that provided assistance to the local villagers after the last cyclone. Two respondents from Rahkain Para indicated that there was no community leader that provided post-disaster assistance. Nine respondents indicated that local chairmen provided them with food, while one survey participant indicated that the union parishod supplied food and water. The remaining three respondents either indicated that a combined effort was used to distribute relief or that undefined local leaders provided relief money and manpower to help rebuild houses. All respondents from Rastar Para also indicated that there was no relief provided by local leaders. Two respondents indicated that aid money was distributed to the local level, but it was never dispersed to the local villagers and rather it was kept by the chairmen and other community leaders. Ninety-one percent, or forty-one of the inland village respondents indicated that there was no local village leaders that aided them in recovering from the last cyclone. These respondents that did not receive assistance included all respondents from Kurulia Darja Para. Of the inland survey respondents that did receive assistance, two received dry food from neighbors, one received a day’s worth of dry food from a community leader and the other respondent received a few kilograms of rice from the local union leader.

When asked if the government provided any post-disaster assistance, eleven survey respondents from Del Para indicated that they did not receive any government

assistance, one emphasized that it took them around two months to rebuild their home. Two additional respondents indicated that the government did not give them any assistance, but they did receive food from local NGOs. Two villagers from Del Para stated that the relief money makes it to the local chairmen and members, but it never makes it to the local villager level. One respondent, after the last cyclone, personally brought sacks of rice and dry foods, clothes to the village storage area. The next morning half was gone, and the other half they were told was for sale, not for free. He believed that members took the first half, took what they wanted, and sold the rest for personal profit. One third of the respondents from Rahkain Para stated that the government did not provide them with any assistance. The remaining two thirds of respondents indicated that NGOs such as World Vision, Red Crescent, HARBON, URBAN, UTTARAN and BRAC provided them with food and building supplies after the cyclone, although they did not directly help them rebuild the structures. All survey participants in Rastar Para indicated that they did not receive any government assistance following the last cyclone. One participant indicated that they could not even access assistance of fried corn, which costs two taka, or about three cents Canadian. Three participants from Rastar Para emphasized that any relief money provided by the government and intended for local villagers is taken by the local chairmen and it never reaches the marginalized populations it is intended for. When the inland villages were asked if the government assisted them in any way after the last cyclone, 44 respondents, or 98 percent of respondents indicated that they did not receive any assistance. Only one participant from Kurulia Darja Para indicated that they had received some rice.

Picture 17: Local World Vision volunteers provided much valuable information and willingly shared all their learning resources. In return for their kindness and time, they were gifted school supplies for local children.

## 4.8 Anticipation of Future Cyclones and Concerns

Future cyclones are a part of Bangladeshi reality that cannot be ignored. Government and villagers alike understand the need to address vulnerability and mitigate it to decrease future losses.

Survey participants, both in coastal and inland villages, offered a variety of responses when asked how their experience during the last cyclone would affect their actions in future cyclones. Coastal villagers indicated that in future cyclones they would try harder to save more of their livestock. Some respondents stated that in the future they would take more expensive possessions when they evacuate. A few respondents indicated that they would try to take some food with them to the shelter, while others felt that taking water slowed them down and food got wet and rotten before they could eat it at the shelter so it was not beneficial to take food. Many respondents said that they would either continue to do the same things, or that they would decrease their reaction time. Previous cyclone experience has emphasized the importance of quick reaction times and coastal villagers realized that once they hear the warning, they must move quickly to evacuate. Among the respondents there were also some fatalists that believed that there was nothing they could do in the future and that if God wanted them to survive the cyclone, it was in his hands to decide to save them. The predominant theme among inland villagers is that in future cyclones they will make sure that they evacuate to cyclone shelters. There was much less concern for removing personal possessions from the home before cyclones within inland village respondents. This may be because the houses are much more sturdy and secure so there is much less risk of losing the home and everything in it. There is also a fatalistic attitude in inland village respondents as well. One respondent stated that he believes that “everything depends on God”, while another replied that “everything is in God’s hands and if he saves them, then they will survive”.

Both sets of villages were also asked about how past cyclones have affected the behaviors and responses of local villagers regarding future cyclones. Few participants felt that no changes will be made by their neighbors. Many coastal villagers felt that their neighbors would react and evacuate quicker and try to seek shelter in a cyclone shelter sooner after receiving the warning. Many participants reflected their changes in behavior

as how they feel the community would respond as a whole. These participants believed that villages as a whole would also take more of their valuable possessions with them in the future. Coastal villagers are more responsive to cyclone early warnings after experiencing the effects of recent cyclones. Community awareness campaigns have helped local villagers understand the risks associated with cyclone storms. The coastal village respondents also indicated that recent experience has made them more cooperative with their neighbors and they are now more willing to help disseminate warnings and help people evacuate when a warning is issued. Inland villagers indicated that their losses don't generally come from cyclones, that is it more the flood water associated with the cyclones that causes the loss. Recent cyclone experience has caused inland villagers to change the construction of their homes. They now construct their homes out of concrete, rather than bamboo and tin, so that they are more resistant to the strong winds associated with cyclone storms. This is not an option for coastal villagers, as they do not have the financial means to purchase concrete and other sturdier materials. One respondent indicated that their village could not make any changes regarding current cyclone practice because if the government would not help them, they had little options of how to mitigate the effects on their own. Similar to coastal villagers, inland villagers also acknowledged that recent cyclone experience has made their communities more willing to help each other disseminate early warnings and help neighbors evacuate to a safer place.

When asked about the greatest concerns regarding future losses, both coastal villagers and in-land villagers expressed the greatest concern for their lives and the lives of their children when it comes to future cyclones. Other major concerns included the loss of their homes or livestock and making it to a safe place in time. One coastal person was concerned about old or pregnant women, while that was not a concern expressed by any inland respondents. One person in a coastal village, and five in inland villages reported that they have no concerns regarding future cyclones.

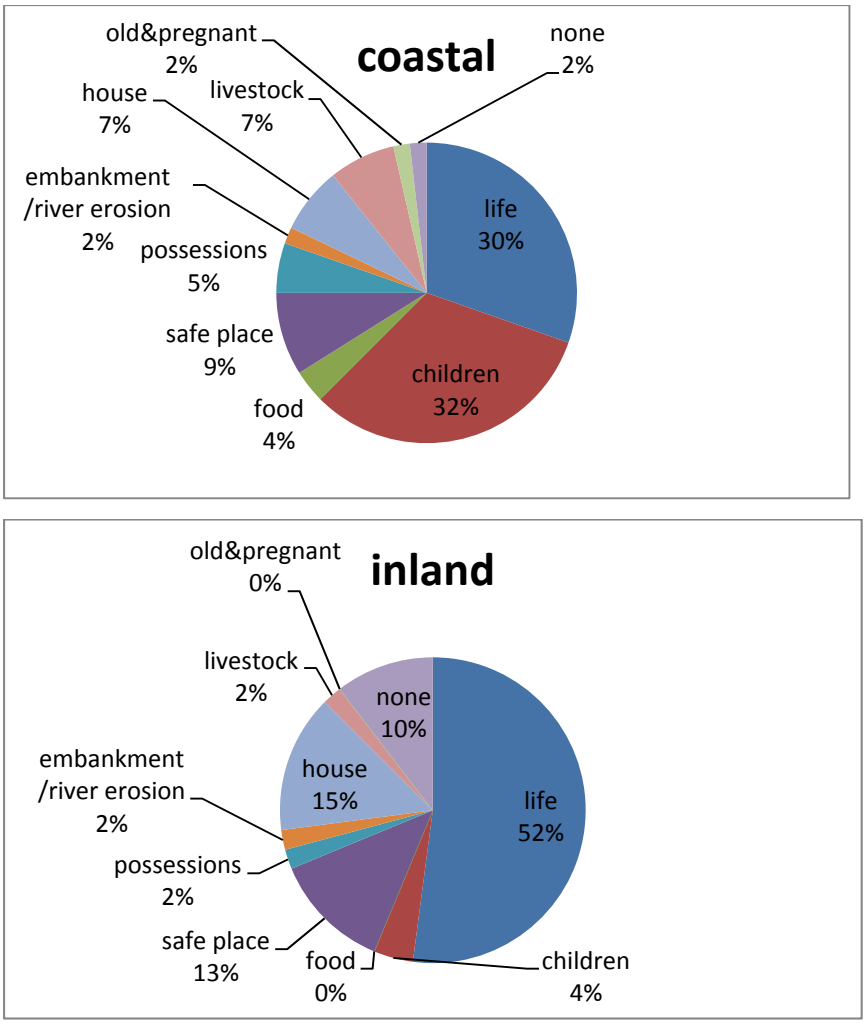



Figure 4.2 Greatest concern for next cyclone, coastal versus inland.

It was not surprising that more people in coastal villages are concerned about their livestock versus inland villages because it is more likely that coastal villagers are more susceptible to livestock loss. Also, the coastal villages generally have a lower income level and it is more difficult for them to replace lost livestock. It was unexpected that the percentage of people that were concerned about their homes was higher among inland villagers. There is generally very little loss of property in inland villages and houses are built to withstand flooding and storms in inland villages, making the loss of one's home very rare in inland villages. Concern for homes may be higher in inland villages because coastal people are used to losing their homes and are more concerned with simply escaping the storm alive.

## 4.9 Climate Change Concerns at the Local Level

While local level villagers do not know the term “climate change”, they acknowledge that the weather in their area, and the weather patterns that they are used to, and that they base their agriculture practices on, are changing. An interview with the President of the Village Conservation Group in Rastar Para, a member of the CPP, feel that climate change have serious repercussions for local villagers. He feels that climate change prevents villagers from fishing because of the storms, at the high winds kill vulnerable crops. There is also a shift in seasonality, with both the different seasons, and the climate experienced within each of the seasons changing. The Present of the Conservation Group indicated that there have been meetings organized to mitigate climate change effects, but they need national level training. He feels that they must also make people understand climate change to adapt and build capacity, although there are currently no programs to address climate change. One man indicated that the climate was changing, as now there was no longer a season for storms. He responded that now the rain comes anytime. He also indicated that although there are more storms now, there are less cyclones. A female from this village expressed the opinion that she felt God was blessing them with less rain and storms. Two females indicated that the number of storms has reduced, but the winds have increased. She explained that this is a concern because it makes it harder for local fishermen to catch fish and sometimes villagers are forced to go without food or money. Another male villager in Rastar Para indicated that he could feel the change in climate. He stated that it was hotter in the fall than it has been historically, as well it was affecting the storm pattern and increasing the occurrence of storms. The participant stated that before the first four months of the year historically were storm months, but no there is no fixed time for storms. The concern with the change in storms is the impact this change in weather will have on agriculture.

One male from Rahkain Para indicated that he felt that the weather in his community was changing as well. He felt that there is now less rain, and he attributed this phenomenon was caused by deforestation in Bangladesh that was making the environment unhealthy. Another male in Rahkain Para felt that there was also less rain, but felt that this was a good thing since the lack of rain helped in fish drying. A third man in Rahkain Para also believes that the weather is changing and that it is no longer raining

during the rainy season, but it is now raining after the rainy season. He felt that the trees don't get rain during the rainy season and, in turn, do not grow properly. He was unsure as to the cause of climate change, but felt that it might be caused by the deforestation happening in the hilly areas which is causing soil erosion and increased soil in the river. This man's neighbor echoed his concerns, saying that it doesn't rain when it is supposed to and the winter season is not happening at the same time as previously which affects trees and peoples' health. Another male repeated the same weather concerns, although he felt that it has been raining too much, not too little. He felt that increase in storms affect fishing and make it harder for fishermen to go into the sea, decreasing yields and increasing local poverty. One male survey participant felt that the weather is changing and now there are too many cyclone warning signals in the sea. He felt that it rains too much and that rain acts as a barrier for work. He stated that due to the signals, fishermen end up with less income, and that decreases local income. All of these respondents were between 50 and 60 years old and, therefore, it can be expected that they are very familiar with local climate patterns and historical seasonality.

The first interview conducted in Del Para was with a gentleman who also believed the weather was shifting, saying that there was less rain and less storms. He credited God for the change and feels that there is nothing that can be done to change the trends. The next respondent felt that the weather is changing, with a decrease and rain and an increase in sun, which is good for local crops. An 80-year-old respondent from Del Para indicated that the climate is changing and now there is less storms. He believes that when God's water is coming down, the trees and crops grow better, but when water from the outside comes, it kills everything. He stated that water from outside comes less often, although he did not elaborate on where the outside water came from or who was responsible for it.

One respondent from the inland village of West Muktar Kul indicated that they too felt that the weather was changing. He said that according to historic Bangladeshi years there are six weather season. In the summer it was hot and stormy, in monsoon season it is supposed to rain in a patterned process, a process that is very good for agriculture. Winter is to be in the winter season and is characterized with cold and foggy weather. Now it is too hot in summer and there is not storm to balance the heat out. In the monsoon seasons they no longer get rain in time. The rain comes at the end of monsoon

season and it no long follows the same pattern. This is very bad for agriculture and sometimes local crops die due to too much heat or too much rain. In winter it is no longer cold, but some winters get exceedingly cold and people die. The duration of winter has decreased as well. This respondent feels that climate change is the effect of deforestation.

One respondent from East Muktar Kul indicated that he did not feel that the weather was changing. He stated that sometimes it rains more, but that was not different from before. A second respondent from the village also did not believe that the weather was changing. These responses may be attributed to the fact that the respondents who indicated there was no change were between 35 and 50 years of age and worked as laborers, not fishermen who are directly impacted by changes in weather.

A male respondent from Kurulia Darja Para indicated that the weather is changing, but that it is a positive thing since there is now less rain. Another elderly male respondent indicated that he did not believe that the weather was changing. A third elderly male indicated that the weather was changing, but he could not determine if it was a positive or negative thing for the people of his village. He indicated that it rains more now and summer weather is still present during the weather season.

Although a definite weather change pattern cannot be determined through the surveyed villages, it can be determined that there is a common belief that the weather is, in fact, changing in one form or another. It is more predominantly a concern through coastal villages, as opposed to inland villages. That is not to say the coastal villagers do not acknowledge a change, it does not to appear to be as serious as a concern, nor do they view the change as a completely negative thing. This may be due to the fact that coastal fishermen are more susceptible to climate fluctuations that effect fishing season. Coastal villages are also more vulnerable to the damage caused by any cyclones, storms or sea level rise that may occur due to changes in local and global weather patterns. Inland villagers are better off financially and may not feel the effects of decreased agricultural production caused by a change in seasonality, causing them to not be as mindful to any changes that may be occurring. Climate change is a relatively new problem, which currently in Bangladesh is only being addressed at the national level. Local villagers have no risk mitigation educational material for climate change and currently attribute this change in climate to either deforestation or God. Climate change policy must also include

grass-roots planning in order to adequately increase capacity building in the areas it is needed most.

# Chapter 5: Disaster Management and Governance Issues: The role of Local Government

## 5.1 Cyclone Vulnerability and Preparedness at the Local Level

While drastic improvements have been made to cyclone vulnerability and local early warning systems, there are still areas of improvement in current government programs, policies and local partnerships. Much of the existing vulnerability issues are geological and hydrological in nature. The Cox's Bazar area a low lying flood plain. The Khurushkul chairman feels the biggest concern is having the tide come in when a cyclone hits, affecting people on the west side, mainly in Del Para and Rahkain Para. Another weakness occurs when untrained people are expected to take charge during a cyclone. During a cyclone the LGED office of Cox's Bazar is left in charge. The people in this office have no prior training and are left to do what they think is best in the situation.

Much of cyclone mitigation and warning dissemination is possible because of local volunteers. These volunteers are given little, if any protective gear, are sometimes expected to use personal funds to supply megaphones with batteries and these volunteers must risk their lives during cyclone storms to instruct their neighbours to evacuate. Often they are unable to assist their own families in evacuating because they have to stay back and disseminate warnings. There are little benefits for these volunteers and monetary compensation is never offered. It is feared that volunteers will leave the program and it will be difficult, if not impossible, to find replacements and the programs, and the people who depend on them will suffer. Currently the CPP has 42,700 volunteers who work along the southern coastline. While the CPP maintains that their volunteers are very active, it is the opinion of the local people that many of the volunteers fail to mobilize during a cyclone. A presentation given in Dhaka during my research indicated that an average of 64% of CPP volunteers are active, or could even be located when a census was done. This number was an average and some areas were much lower for volunteer percentages. This results in some areas of the CPP's 15 person volunteer units will not have people reporting to their needed areas during a cyclone storm.

One major weakness in the coastal areas is that there are not enough shelter space for all the coastal people who require shelter. Currently there are 72,000 people living in the Khurushkul union and only five to seven shelters. There is a need for at least 10 more, just in that one union. There are 546 shelters in the district, with capacities from about 100 to 300 people, and there are 2.5 million people in Cox's Bazar. There is one shelter for every three to four villages, but with current population numbers, there needs to be one shelter for every village. The government claims that there is adequate shelter space as most shelters can fit 1,000 – 5,000 people, but the LGED officer says that most shelters can only accommodate between 250 and 300 people. The CPP believes that some shelters can hold up to 700 – 800 people, but over 2000 people will try to find shelter there during a cyclone. Often times shelters are forced to fit many more people than their capacity, forcing people to stand for extended periods of time and forcing men to the outside of the shelters. Increased people within these shelters put an increased strain on already poor sanitary facilities. Often people are instructed to go to neighbouring strong houses and people farther away from the coast are more likely to have the resources needed to build cyclone resistant homes, which they can stay in during a storm.

There are 125 new shelters planned, but the timeframe for building is unsure. A World Vision representative stated the timeline for the building of new shelters is dependent on the Minister of Disaster Management and Relief. One of the problems associated with the building of new shelters is that the high population density in coastal areas leaves little land for building. The government is expected to purchase land for cyclone shelters from local land owners. It has been said that instead, the government asks for land to be donated for shelters. Sometimes the local land owners cannot afford to donate prime land and the land that does get donated is less valuable, less useable land farther from the coastline, or land that they cannot use anymore, such as on the top of a hill where it is inappropriate for a shelter. In these instances cyclone shelters are built farther from the coast, and farther from the vulnerable people that need to evacuate to them. Sometimes these shelters are up to two kilometres from the village they are intended to protect. During the heavy rains and winds of a cyclone storm it becomes almost impossible for people to reach the shelter, making the shelter an inappropriate mitigation measure. Another problem with the shelter being that far from the village is

that no one maintains the shelter and it can quickly go into disrepair and become unable to shelter villagers and unsafe for evacuation. Also, no one maintains the roads leading up to the shelters and it can be difficult to access these shelters, as the roads are in poor condition, broken or absent. These shelters often have no area for livestock and people are forced to find any higher ground to take their livestock to before evacuating to a shelter. There is very little raised ground along the coast and killas need to be built near shelters as a place for livestock. Poorly placed shelters and poor roads exacerbate problems related to livestock evacuation. Livestock must be a consideration in newly designed and built cyclone shelters.

Ensuring complete evacuation on entire villages is also difficult. Some elderly people refuse to face danger to evacuate their homes, feeling that “it will be up to Alla if they survive”. They state that they would rather die at home than evacuate and refuse to leave with the rest of their families. While this was less of a problem with coastal villages, more inland village dwellers were more reluctant to leave their homes, no matter what their ages. While the houses inland were of better construction and more sturdy materials, it has become more difficult for the local government officials and volunteers to force people to evacuate, often because they do not have a shelter to go to and must climb a hilly area. Theft was also a concern and it was discovered that some women don’t have support of their husbands so the gain attachment to belongings and during a cyclone will stay home to protect them. Since women are part of the most vulnerable members of a community, this only compounds their vulnerability.

One weakness that is resounded through all local and non-government officials is the lack of funding available for training, mitigation measures or warning dissemination supplies. There is little funding available from the national government budget and little more can be generate within the country by local NGOs. External, international funding is critical for disaster management in Bangladesh. At the local level, funding for supplies and training programs is necessary. Mock demonstrations, information material for circulation through schools and women’s training materials are needed to reduce vulnerability in coastal villages. Without external funding improvements in these areas will not be possible. Funding is also necessary for proper early warnings. Forecasting equipment cannot be bought or maintained without funding and often adequate local or

national funding is not available. Without proper equipment forecasting abilities are limited and lead times for early warnings cannot be increased. It is also more difficult to detect a shift in cyclone path or the change in strength of a cyclone.

The government is addressing these vulnerabilities and weaknesses. A local union chairman maintains that cyclone vulnerability is being reduced by providing local fishermen with lifejackets and health benefits. When these measures were mentioned to local fishermen, none could confirm that either of these practices were in place. The union chairman also stated that during a cyclone the government provides food for the evacuees, at least for one day and after the cyclone the government provides house to house relief. When speaking to the villagers, the villagers indicated that they did not receive food from any external source and the only food that they got to eat was anything that they had the chance to grab before they evacuated their homes. They indicated that they did not receive any water or other provisions while in the shelter. The villagers also indicated that very few of them received any assistance after the cyclone, and the ones that did tended to cite a local non-government organization such as the Red Crescent or World Vision as the donors of the aid, not the government. Local coastal villagers did not feel that the local government provided them with adequate support after the cyclone.

The local TNO officer was ready to admit that because Bangladesh is a small country it is impossible to shift people during a cyclone, so they must be evacuated to a cyclone shelter in order to be safe during a calamity. He stated that it is not only necessary to build new cyclone shelters for people to evacuate to, but existing shelters need to be repaired and made accessible to the disabled, pregnant women and children. Weaknesses in training are being addressed at the local level by providing training to union parishods and assistants throughout the year in disaster management, specifically how to save food, medicine and save lives. The local LGED office also raised concerns about the condition of current cyclone shelters. They feel that current shelters are too small and that current disrepair make them unsuitable as shelters. Dilapidated or broken stairs make shelters unusable. The LGED office also stated that miking systems often provide incomplete coverage. The microphones are often attached to motor vehicles that travel down local roads. These vehicles travel down the roads disseminating early warnings, but turn back at the end of the road, leaving all villages without road access

without an early warning. Continued increased training to government officials ensure that they are properly prepared for future cyclone events. Training also helps government officials understand the vulnerabilities of local communities.

Bangladesh's shared boarder with Myanmar creates a fair amount of refuge drift. This becomes a large problem during a cyclone because the refugees become as vulnerable as the Bangadeshi people, and because the government does not have the resources to help their own people, these resources become even more strained when they have to help people who are in the country illegally. It can be difficult to distinguish between refugees and Bangladeshis as local people often do not have their national identification card.

The local government is constantly creating and updating programs to address local cyclone management. In the Cox's Bazar area committees have been set up at the community, upazilla and district levels. At the union level, meetings are held every month. At the upazilla level meetings are held quarterly, if not monthly. Although the levels of government are active in planning and policy, it is felt that the government still does not have the cyclone management knowledge needed to properly address local vulnerabilities.

One of the survey participants indicated that it is the local NGOs that have the expertise and that the NGOs frame the plans for what the government is to do to address local vulnerabilities. CARE, a local NGO, was operating Shouhardo, that was funded by USAID, in collaboration with the government and local NGOs. This project worked in four villages around the Cox's Bazar area. This program finished in February 2010, therefore during my study, this project was preparing to end. This project must transfer their knowledge to the local governments and any successors. They must also make recommendations about future needs in the areas covered by this project. CARE is concerned about creating awareness and ensuring that the work that was done by the project will be continued in the future. CARE's program worked only in areas that World Vision did not work in and it appeared that in the Cox's Bazar area World Vision was the most active NGO. Local NGOs, specifically World Vision, work very closely with the local government. Therefore the NGOs must also have monthly meetings to ensure accurate cyclone management. World Vision also does monthly training programs and

demonstrations for the local villages. There are also seminars in which the local LGED office is asked to attend. CARE is also currently working with the Red Crescent to develop contingency plans and emergency preparedness plans for every upazilla in Cox's Bazar. They develop risk and resource maps that are hung in public places to increase local awareness. World Vision is also included in the creation of these risk maps and World Vision is working to create publications that include all risk information.

The local level risk managers are realizing that large demonstrations and drills carried out by school children prove to be the most affective in increasing local awareness. These children understand the risk and when there is a cyclone warning, they tell their mothers about the dangers they face. While these demonstrations are effective, they generally are held at the upazilla level, where people must travel to receive the information. This information would be most effective if it could be done at the union level where more people would have access to the information. There also must be more training for the field officers and any local volunteers. The local Deputy Commissioner believes that if local educated students can be financially helped and placed with the local government, their knowledge would be beneficial during a cyclone.

Gender training is also provided to the local women. These training programs aim to make women aware of their rights, especially in time of disaster. These programs take into account their safety, security, food aid, sanitation and health and try to make women aware of their capacities and how they will be able to use them.

Local level government officials in the Cox's Bazar area work with non-government organizations, as well as international agencies, in order to address cyclone mitigation needs. Partnerships are formed between these organizations to facilitate information sharing, work toward collective goals and assist in community disaster mitigation. CARE has been working on disaster management in Cox's Bazar since 1949. CARE started in the disaster preparedness field. In 1977-78 CARE began working in development fields and then moved more into relief and rehabilitation. The Department of Food and Disaster Relief has been working on issues concerning cyclone disasters since 1975. A representative for the Local Government Engineering Department (LGED) office did not know how long they had been working in Bangladesh as they did not know of any cyclones in Bangladesh prior to 1991, but he believed they began working in the

Cox's Bazar area sometime after 1991. The Cyclone Preparedness Program (CPP) has also been working on cyclone preparedness since after the 1991 cyclone. World Vision has been working in Cox's Bazar to mitigate cyclone risk, as well as to provide relief and rehabilitation after a cyclone since 2000. These government and non-government organizations work in partnership with the local government chairmen and committees to comprehensively address cyclone hazard and risk.

Each of these organizations also play a specific role within disaster management to address certain needs and concerns. The upazilla chairmen are members of the government and are directly connected to the district and upazilla offices. The upazilla chairmen help to develop contingency plans/emergency preparedness plans for every upazilla in Cox's Bazar and are responsible for cyclone shelter management. They are responsible for cyclone early warnings and evacuating all members of the community, men and women equally and are responsible for reporting who was there, what happened and what was done as a result of a cyclone. Upazilla chairmen in the Cox's Bazar area work to improve the union disaster management committee by building capacity in disaster management, preparedness and planning. They aim to provide mass awareness that will build capacity at the local level. This is done through training programs with the Asian Disaster Preparedness Center (ADPC), as well as work done with the Red Crescent. The local LGED office is also a member of the government. It is part of the union parishod department. The union parishod is responsible for letting people know about cyclone warnings and for controlling warning dissemination. The LGED office receives the early warning from the UNO officer, and is responsible for passing the warning on. After a cyclone a member from the LGED office accompanies the UNO officer to see the effects of the cyclone. The Department of Food and Disaster Relief is another government agency working in the Cox's Bazar area to mitigate cyclone damage, as well as disseminate early warnings. They are responsible for giving warnings before the cyclone, helping people get to cyclone shelters during the cyclone storm and helping to locate people after a cyclone. The CPP is a joint venture between the Red Crescent and the Government of Bangladesh, through the Ministry of Food and Disaster Management. They receive their early warning information from the Meteorological Department, to the zonal office and then down to the 33 upazilla offices. When the CPP receives an early

warning in the Cox's Bazar area they immediately warn the Deputy Commission, who heads the District Disaster Management Committee. World Vision works primarily with post-disaster relief and rehabilitation, although, World Vision aims to create strong network linkages with disaster committees to create early warnings and create preparedness.

## 5.2 Early Warning Dissemination by Local Government

The local early warning systems work on two different number systems. There is a one to four number system for outer sea ports, and a one to ten number system for inland sea ports. The number one to ten system is also the one used for coastal village warnings. The language of these warnings is intended to be understood by ship captains and often misunderstood by coastal village persons. This number system also does not address storm surges. The numbers one to three mean there is a slight cyclone warning, but people need not evacuate. It is in this stage that people should consider storing food and water, stashing valuables and deciding where to take livestock if the warning gets worse. A number four warning means that there is a cyclone forming in the Bay of Bengal and that although people do not need to evacuate yet, they should stay alert because a cyclone may be coming toward their area. A number five warning means that a cyclone is coming to the left of that area, a six is to the right and a seven is right at that area. A number eight warning also means that a cyclone is coming to the left of that area, but that it is closer than a number five. A number nine means that a cyclone is coming to the right of that area, but it is closer than a number six. A number ten warning means that a cyclone is coming right at that area and people should evacuate immediately. Currently a flag system accompanies this number system. A flag pole stands in each of the coastal communities and flags are raised to disseminate early warnings. One flag is raised for a warning signal numbered one to four. A second flag is added if the warning is numbered five to seven and a third flag is raised if the warning is numbered eight to ten. This flag system was created to decrease dependency on mobile warning disseminations (Table 7).

Table 7: Current inland sea port, and coastal village, warning system

| Warning Number | Warning Meaning |
|---|---|
| 1-3 | Rough waters, but no need to for concern. |
| 4 | Cyclone forming, no need to evacuate at that time, but people should remain alert, and begin to plan for possible evacuation. |
| 5 | Storm is coming to the left of that area. |
| 6 | Storm is coming to the right of that area. |
| 7 | Storm is coming directly at that area. |
| 8 | Cyclone is coming to the left of the area, now closer than when signal 5 was issued. |
| 9 | Cyclone is coming to the right of the area, now closer than when signal 6 was issued. |
| 10 | Cyclone is coming directly at that area, people should pack up belongings, food and water and evacuate immediately. |

This warning system is very confusing for local village people who often have little education and limited training in cyclone warnings and the appropriate response. These early warnings are often misunderstood and villagers often believe that the higher the warning number, the more danger they are in. They do not understand that they may receive a warning that indicates that cyclone is headed left or right of their location and that a number seven warning does not necessarily mean that they need to evacuate. Also, villagers do not understand why a cyclone warning may jump from a five to a eight. They do not understand that these are very similar warnings, of the same direction and that an early warning of numbers between five and eight would not be appropriate as the storm would not be changing directions. It is possible for the storm to sometimes change directions, changing the number issued during a cyclone warning.

If villagers do not understand what the directions mean, a change in signal and then no cyclone event can be misunderstood as a false warning. While coastal village people indicated that they evacuate every time they hear the warning, people farther from the coast do not and become more complacent when there are “false warnings”. Evacuating when there is a cyclone warning is very important and coastal people continue to do so in order to save their lives and the lives of their family members. False evacuations can lead to loss of property if looters come into the village after the people

evacuate, loss of livestock if they are let go in order to be saved, disruption of livelihoods and unnecessary fear.

A new early warning number system is currently being tested in Bangladesh. It is not yet adopted as the new, standardized early warning system, but it is expected to begin as early as 2010. The new early warning system must be in a language and number system better understood by coastal villagers, as well it must address storm surge vulnerabilities.

The government is responsible for mobilizing people and non-government organizations before a cyclone. The National Government receives the warning from the Meteorological Department. They must then disseminate the warning down to the local government. They are not only responsible for issue initial warnings, but they must also update the warnings any time a different number signal is issued. Some people with access to technology can monitor updates from Dhaka via national television stations or government radio. People without access to technology are dependent on local government officials and NGO personnel. Initially, emergency meetings are held. The first flag is also raised in coastal villages, as well miking via mobile megaphones is done to warn all coastal villagers of possible danger. At this point the ward, union and upazilla committees are mobilized and entrusted to disseminate initial warnings.

At this time the CPP is also mobilized. They have one unit of volunteers in each of the nine wards within a union. Each unit has 15 volunteers, 10 male and five female. There are five sub-groups within each unit, with five different areas of concentration. Each area is assigned to two males and a female. One of the sub-groups deals with early warning dissemination and must take megaphones, sirens and any other available equipment out to the villages to mike warnings.

At a signal four the disaster management committees at the union and upazilla levels form a disaster plan. It is at this point that they suggest to people to pack up dry food and water and keep it in their homes in case the warnings increase. At a signal five these committees sit down for a formal meeting and contact the Meteorological Department. At a signal five and six the local control room is opened and more miking is done to ensure that people understand that the signal has gotten worse and that evacuation may be necessary. It is at this time that a second flag is raised in the villages. Cars are

also taken out to open secure buildings and cyclone shelter in anticipation of evacuation. At a signal eight local committees and volunteers urge villagers to evacuate and sometimes these people will also take personal vehicles to collect people who refuse to evacuate. At this point livestock are either taken to higher ground or let free.

The Deputy Commissioner stated that every union has the ability to get the warning. He also indicated that is also enough procedures in place at the local level that villagers are aware of the warning. His concern is that the current warning system and the creation of early warnings is very week. He stated that it takes too long to analyze the data and the warnings do not get disseminated early enough to be fully effective. The Deputy Commissioner feels that they need to coordinate with neighboring countries to minimize time for data analysis and to create stronger projections.

The Bangladesh Center for Advanced Studies BCAS states that while there is union disaster management committee within each village, designed to disseminate cyclone early warnings, they are generally, actually not functional. BCAS feels that there is a lack of accountability, as well as a lack of finances, logistics and training. BCAS feels that “everyone’s responsibility is no ones’ responsibility”. BCAS stated that while CPP unit leaders have a wireless set, many of them are not functional.

## 5.3 Implementation of Evacuation Procedures

The Standing Order on Disasters mandates all procedures of evacuating local vulnerable populations once the early warning has been issued. The local control rooms are opened and there is a constant cross-scale communication that ensures that all persons receive the most accurate forecast and warning possible. Local CPP volunteers, along with local government officials and NGO volunteers issue the early warnings and assist people in evacuating their homes. Sometimes people must be convinced of the danger and encouraged to leave while it is still safe. The evacuation of local villages is a partnership between many organizations and requires cooperation and timely execution.

Evacuation can be negatively affected by the lack of accessible cyclone shelters in the Cox’s Bazar area. As of 2009, the Khurushkul Chairman indicated that there was 72,000 people in his union, but only five to seven shelters. He feels that the area requires

around 10 more to properly address the needs of the area. Due to the lack of shelters, men will stay in their homes instead of risking being turned away at the shelter. He indicated that it would be difficult to change the face that men will stay back. He explained that they wanted to evacuate, and knew they should, but did not have any safe evacuation options. The Chairman indicated that he felt that large scale drills, directed at children, is the best way to influence evacuation procedures. He explained that by educating the children about the dangers they take the knowledge home and influence their mothers. The LGED Officer feels that there is currently one shelter for every three or four villages, although one shelter is needed for each village in order to adequately address local vulnerabilities. The Officer suggested that the early warning system needed to be changed in order to improve evacuation. Local villagers do not, at this point, accurately understand the differences in meaning between signal numbers in the current warning scheme. The Project Implementation Officer for the Department of Food and Disaster Relief stated that the local villagers understood when a cyclone was coming better than the government can forecast. These villagers have received previous warnings that did not come to fruition, so the villagers now react based on what their intuition tells them will happen.

## 5.4 Types of Government Assistance During and After a Cyclone

During a cyclone all levels of government are active and supportive at the local level. There is communication between all levels of government and everyone works toward cyclone mitigation. This communication and cooperation is a direct result of advances in technology. Television and radio enable mass one-way communication and the recent advancement in cell phone technology and SMS messaging has opened many cross-scale communication linkages, as well as enabling local hazard partnerships.

One union chairman feels that if there were more activity before a cyclone, less work would have to be done during the disaster. The example he gave was that if a portion of an embankment breaks, only that portion will be fixed even if other portions are severely damaged and will break during the next storm surge. This issue may arise from a lack of funding, making it possible to only repair the current damages. In a

country so dependent on international aid, maintenance is difficult and often levies must break and international funding must come in order for this infrastructure to be fixed.

The Deputy Commissioner explained that any government money given after a cyclone goes from Prime Minister, to the Disaster Management Committee, and down to the District Commissioner.

## 5.5 Lessons Learned on Local Governance Since 1991

There have been many changes made not only to cyclone early warnings, but to evacuation practices and issues related to differential vulnerabilities among at risk populations in the Cox's Bazar area. Prior to 1991 Bangladesh did not have a history of cyclones. The 1991 cyclone, and the fear it caused, is still very fresh in the minds of many coastal village dwellers. The helplessness they felt, coupled with the loss of loved ones and neighbours, influences them to leave their homes every time there is a cyclone warning because they do not want to re-live a cyclone like 1991. The vast majority of cyclone shelters were built after 1991. NGOs started working in the area to increase awareness and now all agencies understand that they must work together during cyclone events. There has not been a cyclone since 1991 that has resulted in near comparable numbers of deaths.

It is now realized and accepted that women, children and the elderly are most vulnerable and an effort is made during any evacuation to evacuate them to the cyclone shelter first. If women and children arrive after a shelter is full, men will move to the outside of the shelter or find another safe place to accommodate the more vulnerable. Women are involved in the cyclone training so that they better understand the risk themselves and their children face and what to do in a cyclone situation to lessen their vulnerability. Within the past 10 years there has been a shift in attitude regarding cyclones. Previously the government was not ready for possible events, now they are more alert and concerned. The government now considers cyclone vulnerability throughout the year in the Cox's Bazar area. Also, previously there was no coordinated effort between government agencies, now during the early warnings different departments meet at the control room, with the permission of the District Commissioner,

and everyone takes shifts disseminating the early warnings. Awareness has increased through all involved parties, from coastal communities, through NGOs and up to local government officials. Coordinated training of all levels is helping to reduce loss of life and property. Local volunteers who participate in training and become active when an early warning is issued are instrumental in the continued improvements to vulnerability reduction.

## 5.6 Relationship with National Government

Much of the disaster mitigation done in the Cox's Bazar area would not be possible without the continued support of the national government. Currently there is communication between the local and national governments, as the national government must send national and international aid to the areas in need during and after a cyclone. A local chairman believes that there is a need for continued, systematic communication to continue to improve the relationship between the local government and the national government.

There is also assistance from the national government to the local government in the form of disaster relief and emergency provisions. Unfortunately, many of the local government officials do not make a wage suitable for supporting a family and it is not uncommon for relief provisions to be given to the families of the local governments, with little to none available to the local village people. This causes many of the local people to believe that the national government is not helping them at all. Some locals know that the relief comes, but does not make it to them, causing hostility toward the local government. The issue of emergency relief creates stress between the local people and both levels of government.

While there is a continually improving relationship between local levels of government, it is difficult to change current situations with the current lack of resources. The local Deputy Commissioner feels that in the Cox's Bazar area the weakness in the government lies in the Meteorological Department and the limitations they have with funding. He feels that during the last cyclone, Aila, it took too long to analyze the forecasting data and the warnings did not get out as soon as necessary. He feels that there

was faulty forecasting because of timely data analysis. Projections are needed to accurately forecast cyclone tracts and landfall times, as Aila made landfall four hours prior to the estimated landfall time. The Deputy Commissioner feels that coordination with neighbouring countries is necessary to minimize the time needed in each country for data analysis.

These statements by the local Deputy Commissioner call for not only a relationship between each level of government within the country of Bangladesh, but also between the national governments of neighbouring Bay of Bengal countries. These partnerships are necessary not only for forecasting information, but to mobilize any available aid when a disaster hits. It is necessary to keep in mind, when considering the combined capacities of the countries to forecast natural disasters, that all neighbouring countries are also developing countries with limited resources and Japan is currently the only full-time forecasting partner from a developed country.

## 5.7 Relationship with Local Villages

### *5.71 Government Relationships*

The local Krurushkul chairman feels that the relationship between his level of government and the villages in his jurisdiction is fine, but he did acknowledge that villages along the eastern side are hard to reach by road communication, so there is not much access, and little relationship, with that area. He stated there are constant union, upazilla and district level cyclone meetings. He insisted that union meetings are called monthly, with upazilla meetings occurring quarterly, if not monthly. The stated that there are meetings every two seeks during emergency times. Although he spoke of constant meetings, he did admit the government “officials at the local and district level felt no sense of responsibility to the people affected by the cyclones”. He admitted that in actuality, there is a meeting when there is a need for one, and not before.

When asked about local government and cyclone management programs, the TNO officer was very willing to admit that he felt that the local “NGOs were more interested in the public and cyclones in [that] area”. He stated that there “was a lack of cyclone expertise at the government level” and it was the NGOs that had the expertise.

The Officer explained that the NGOs work with the government in order to frame cyclone early warning and evacuation plans for the government to follow. He stated that the NGOs do the public awareness building training programs.

The Union Parishod office is in the middle of the union and that office maintains communication between all wards, and especially to the females within the wards. The Union Parishad Chairman of Jilonza indicated that he goes to different villages and talk to the villagers. He also knows that the control room gets opened at disaster time, but could not advise what happened after.

The Water Development Board is responsible for flood protection, irrigation, drainage, coastal protection and addressing river erosion. The Board is responsible for a large coastal region and must maintain the 595 kilometers of coastal embankments around the Cox's Bazar area. While the Board has the independence to fix embankments when needed, and do not need to wait for the government, but they are dependent on limited financial resources allotted by the government. The Water Development Board is protecting the lives and properties of the coastal people by overseeing the construction, maintenance and operation of coastal embankment projects. They maintain that they frequently visit local sites to talk to local people to see where embankments are needed and will offer the most benefit to the locals.

The TNO officer for the Cox's Bazar area feels that the limitation in the relationship with local village people is the lack of literacy. The local literacy rate is only about 30% , which makes it difficult to educate these people before hand and make them understand the risks of not evacuating their homes. The Department of Food and Disaster Relief feels that they have no relationship with the local villages. Although they have an office in Cox's Bazar, they feel that the government works in a step-wise fashion and that the ward committees are the ones that have a relationship with the local village people.

*5.72 NGO Relationships*

Often non-government organizations, such as the Red Crescent and World Vision act as liaisons between the local government and the grass-roots level. These organizations are able to assess the needs of the local people and approach the local governments on their behalf. Often the NGOs are the ones to create programs that can be

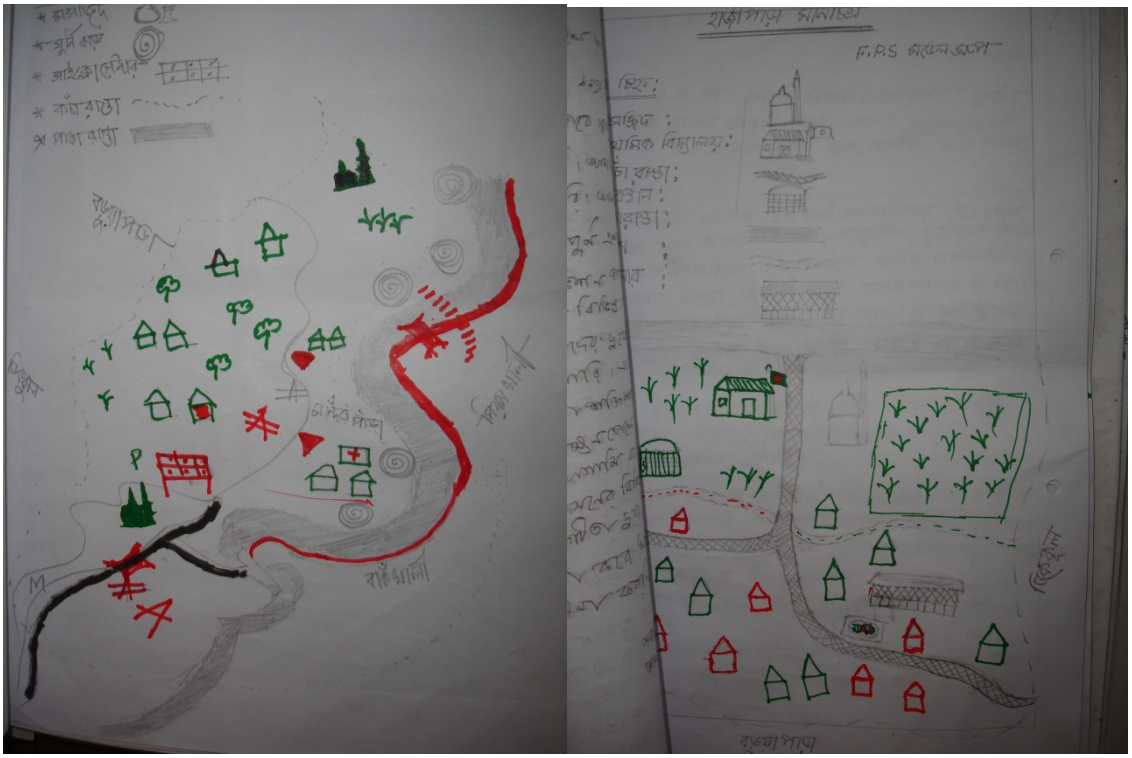
implemented by the government to address these needs. It is often these NGOs that are the cornerstone of stake-holder relationships at the local level. Without the partnerships between the local NGOs and local villagers there would be a lack of trust in local mitigation plans and no cooperation in executing any plans or programs.

The CPP is a joint venture by the Government of Bangladesh and the Bangladesh Red Crescent, through the Ministry of Food and Disaster Management. The CPP receives their information from the Meteorological Department, which is then sent to their head office, to the zonal and upazilla offices. There are six zonal offices which control the 33 CPP upazilla offices. When the CPP receives the warning, they immediately advise the deputy commissioner's office, which also gets the message straight from Dhaka via wireless radios. Each upazilla has union leaders, and the union is divided into units, which do not follow government units. Each unit is comprised of 15 volunteers, 10 male and five female. Each unit has a team leader which is supplied with a megaphone, radio, siren and rain coat. The team leader has a radio to ensure that they receive the warning signal. They are responsible for taking action and do not need to wait for the CPP's orders. The CPP disseminates warnings at five and above. At five the people are told to prepare to evacuate and although they don't need to leave at that time, they should get ready. The warning that is issued includes the distance of the storm from shore, the speed and direction of the storm and the expected landfall. At warnings eight, nine or 10 the local villagers are told that landfall will occur in six to seven hours and that people are to evacuate at that time. One volunteer disseminates the warning via megaphone while the other 14 people in the unit help in other ways. Almost all at risk communities are covered by a CPP unit. The local villagers are almost completely dependent on the CPP for their cyclone early warnings.

The local Red Crescent coordinates with the district disaster management committee. The Red Crescent has over 500 local volunteers, including school students. Their volunteers are responsible for helping vulnerable people, specifically the pregnant women, children and disabled people, to local cyclone shelters. They also prepare books and other print information for local community people.

The World Vision branch in Cox's Bazar is predominantly concerned with relief and rehabilitation. World Vision began disaster management practices in Bangladesh in

2000, and involve many stakeholders. World Vision believes that the Cox's Bazar area is most vulnerable to cyclones and, therefore, they work with the vulnerable communities through student education, local peoples' organizations, and the government at the union and upazilla level. The World Vision spokesperson feels that they have strong network linkages with disaster committees to create early warnings and increase preparedness. He felt that the CPP trains their volunteers, but it does not work to decrease vulnerability at the local level. This is due to the fact that volunteers receive training on how to react, but there is no risk reduction training in the village. The Department of Food and Disaster Relief stated that World Vision is increasing awareness, but there is generally a lack of participation among CPP volunteers. The aim of World Vision is "to find out the real needs of the people and work toward that immediately". World Vision is compiling a contingency plan. Currently there is a contingency plan at the family and union level, based on the season. World Vision enacts plans for both flood and cyclone season and prepare families accordingly. The union contingency plan explains the rules and responsibilities of the union officers involved in the Union Disaster Management Committee as per the Standing Order on Disasters. The Disaster Management Committee is mentioned in the SOD, but the government has not facilitated that committee. Therefore, the local villagers rely heavily on NGOs to fill gaps left by policy and government. Before World Vision develops the union level contingency plan they conduct sessions at the village and ward level to prepare risk and resource maps. World Vision uses a participatory rural assessment approach and does social mapping and wealth ranking to identify hazards and resources.



Photos 18, 19 and 20 are vulnerability maps created by local villagers in cooperation with World Vision's risk and resource mapping.

World Vision uses participatory rural assessment tools to generate maps to identify hazards and resources. They first completed it at the word level and then compiled it to make a union map. This map is made through discussion with and input from union committee members. Finally, a contingency plan, or disaster counter plan, is compiled for the local villagers. World Vision also provide Family Preparedness Sessions, which have direct beneficiaries, such as sponsored children and development group members. There are also indirect beneficiaries, such as school, college and

madrasa children which receive orientations and drills which act out cyclone events. World Vision aims to create communities that are economically stable that can teach children their rights during and disaster and that know what to do during that disaster. World Vision also addresses gender vulnerability and aims to make females more aware of their rights. They take into account safety, security, food aid, sanitation and health, and try to make women aware of their capacities and how they will be able to use them. During the training sessions World Vision teaches the entire village that the villagers must take care of the elderly, disabled and pregnant.

CARE is a short term program, started in 1949, that provides training programs in partnership with the Asian Disaster Preparedness Center. They work with livelihood improvement, health and nutrition, female empowerment and disaster management. They also aim to improve the Union Disaster Management Committee by building its capacity. CARE works with the Red Crescent, and also organize mock demonstrations to increase awareness. CARE also exchanges information with World Vision for contingency plans and risk and resource maps. They then post the risk and resource maps in public places. CARE is helping to develop a contingency plan and emergency preparedness plan for every upazilla in Cox's Bazar.

There has been an ActionAid team in Cox's Bazar since September 2009. This team is heading a project aimed at teaching disaster risk reduction through schools. They work in primary and secondary schools, working with teachers and parents. ActionAid is working with the national government to integrate risk reduction into local school curriculums. ActionAid is also working with the government to create a flexible school schedule that coincides with the cyclone seasons. This would minimize the length of time students would be out of school. Currently, students can be out of classes for up to three months a year. ActionAid also conducts participation vulnerability analyses. These analyses identify needs of people from different levels of government, identifies local vulnerabilities and create an action plan to reduce those vulnerabilities. One concern of ActionAid is that students cannot return to school directly after a cyclone, as often there is still water on the paths, or the paths have been washed away. ActionAid works at the union level, where they have formed a disaster management committee, since they found that the union level is generally not functional when responding to disasters. They are

also working with the union leaders to increase pre-cyclone response awareness by creating and distributing leaflets to locals and broadcasting the distributed info so that illiterate people will hear the information if they cannot read the brochure.

The Bangladesh Disaster Preparedness Center (BDPC) indicated that there is a Disaster Preparedness Program. This Program works at the union level, each union has nine wards. Each ward has two to three villages. The BDPC has formed ward disaster management committees, which consist of 15 members. Each committee is headed by an elected member of the ward. All people in the ward disaster management committee have access to the union disaster management committee.

## 5.8 Concerns for Future Cyclones

There were many different concerns expressed when asked about the next cyclone. The Khurushkul Chairman's biggest concern was the local embankments and the people living next to those embankments. The Chairman is concerned with increasing forests on the outside of the embankment to help strengthen weak embankments. He also feels that money needs to be raised and there needs to be support from organizations to strengthen and repair existing embankments.

The local TNO feels that they will follow the Sidr plan and pray that God saves them again. He feels that the local government must overcome the lack of management ability. The TNO also indicated that they have a problem with refugees coming from Myanmar, which hampers cyclone mitigation. He feels that because many local villagers lack proper Bangladesh identification and voting card, it is impossible to know who are local citizens in need and who are refugees.

The LGED officer feels that cyclone shelter space and road access to the shelters is the biggest concern for the next cyclone. The local Department of Food and Disaster Relief echoes the concerns of the chairman stating that there is a need for more embankments and cyclone shelters to reduce risk. He also feels that more education is needed and as long as these people live off the sea and their children are in need of education, there will be no change. CARE feels that food storage must be increased to

help people during and after a cyclone and that relief money must be increased to affected areas.

## 5.9 Issues of Climate Change and Cyclones

Climate change is not always termed as such by the local people or local government, but that does not mean that these people to not see it happening. While it may be more difficult for them to predict what the outcomes of these changes will be, they see their sea and weather patterns changing and realize that trends have changed from their historical context. There currently is no local-level policies to deal with climate change, with the majority of the focus on this issue at the national level. Many of the hazards faced by climate change cannot be controlled at the local level and the local government is forced to mitigate against hydrological and atmospheric changes as best as possible without proper education and training.

While the local CPP believes that the problem of climate change is one created by the West and then left for Bangladesh to deal with. The CPP believe that the west is warming up the weather, and sending the worst environmental problems to Bangladesh, while they expect Bangladesh to decrease population and plant more trees in order to mitigate the problem. The CPP representative indicated that their used to be six season, but now they see three seasons. The majority of the time Bangladesh experiences summer weather, with their autumn season now warm and similar to summer. He feels that this change has been going on over the last 15 to 20 years. He also believes that there is a higher frequency of cyclones, stating that more are created, but not all hit the coastal areas. The cyclone seasons have also been changing. He explained that cyclones used to come in April/May and October/November. Now cyclones also form in June and December. He feels that the period of risk has increased over the last 5 to 6 years. The CPP representative is concerned that if the global warning trends continue, Bangladesh could face cyclones year round. A concern for the CPP if this becomes the trend, is that volunteers will no longer be willing to work for free.

The representative for World Vision believes that climate change is a very difficult issue, as there is no way to stop climate change. They try to reduce the risk of

negative impacts by not cutting down trees and by using pesticides and insecticides at a normal level. He acknowledged that the seasons have changed, there is no longer rain in the rainy season. He believes that the number of cyclones has not changed, but the intensity of the cyclones has. The cyclones are increasing in power and strength, and therefore, the number of cyclones per year that cause a problem is increasing. The tidal surge caused by these cyclones is also increasing.

The local Khurushkul Chairman stated that climate change and its effects are a result of local activity. He feels that it is a result of tree and hill cutting. He acknowledges that local khals have dried up because of run off soil from the hills filling them up. He knows that water routes are changing and has seen that birds are no longer coming to the area because the wetlands are fewer in number. The Department of Food and Disaster Management has seen the beaches eroding away and also states that there is less rains during the monsoon and the winters are not cold enough.

Change in climate is a re-occurring concern when discussing climate change. The union parishod of Jilonja stated that the seasons are no longer the same. He also stated that the winters are not cold enough and rains no longer come during monsoon season. He explained that the farmers plant crops according to traditional rain patterns, and now the rain does not come when it is supposed to and the farmers lose their crops. CARE also stated that there was no rain in the rain season and less cool weather now. They also stated that this is creating increased salinity in the soil, compounding concerns for farmers. Climate change, in CARE's opinion, is affecting agriculture production and causing problems for natural living organisms of all kind. CARE also described how climate change is creating difficulties in cyclone prediction. Ten to 15 years ago people knew the heavy rain period and the cyclone period, but now it is harder to guess.

The local CPP also spoke of seasonality when discussing climate change. Historically, there were six seasons, now there are generally three seasons and most of the year is now summer-type weather. During the survey period it was supposed to be autumn climate, but it was too warm. The seasons have been changing in the last 15 to 20 years. There has also been an increase in cyclone formation frequency. Although not all these cyclones hit the Bangladesh coastline, more are being formed within the Bay. The cyclone seasons have also been changing within the last ten years. Historically cyclones

seasons ranged from April to May and October to November. Recently, cyclones have been forming in June and December also, making Bangladesh vulnerable to cyclones for half the calendar year. The CPP volunteer interviewed feels that if climate change continues, Bangladesh is at a risk of year-round cyclone hazards. A Red Crescent staff member added that there has been an increase in small earthquakes in Bangladesh in the last few years as well.

The local volunteer for World Vision that was interviewed feels that the number of cyclones is not increasing, but that the intensity of these storms are. He stated that the tidal surges are increasing in intensity. He feels that the cyclones are increasing in power and strength, and therefore, damage caused. He also stated that more of the cyclones that form are making landfall, causing an increase in cyclone events.

# Chapter 6: National Government Policy on Disaster Management

## 6.1 Interest Groups and Policy Makers

Interviews at the national level were done with interview participants from ActionAid, Asian Disaster Preparedness Center (ADPC), Bangladesh Centre for Advanced Studies (BCAS), Bangladesh Disaster Preparedness Centre (BDPC), Bangladesh Meteorological Department (BMD), BRAC NGO, BRAC University, Centre for Global Change (CGC), Center for National Resource Studies (CNRS), Comprehensive Disaster Management Programme (CDMP), Cyclone Preparedness Programme (CPP), Department for International Development (DFID), Department of Relief and Rehabilitation (DRR), Disaster Management Bureau (DMB), Ministry of Food and Disaster Management (MoFDM), Save the Children, Space Research and Remote Sensing Organization (SPARRSO), and United Nations Development Programme (UNDP). The BMD, CPP, CDMP, and DMB were interviewed both informally before and formally after the interviews were completed at the village and local government levels. Informal interviews with ActionAid and BRAC University were also done before the local field research in order to better examine the perceived current conditions at the local level. Informal interviews were done after the field work in Cox's Bazar with the rest of the participants, with formal interviews done at UNDP. A total of 31 interviews were conducted, either formally or informally, within these 18 organizations.

There was a range of experience within their jobs within respondents ranging from one respondent being within his role at the organization for one month to a respondent who had been working at the same position for 12 years. Respondents varied from the heads of a Departments and Programmes and the Director General to meteorologists, program officers and a computer programmer.

When asked what work the organizations did with natural disasters, in particular, cyclones, the Bangladesh Meteorological Department indicated that their main responsibility was to monitor all natural disasters and issue warnings. They are to monitor the atmospheric state and find any weather systems that could generate abnormal weather phenomena. This is done through the analyzing of all available meteorological data, as

well as analyzing all sorts of real time data to detect any type of meteorological event. The BMD must issue four warnings updates per day, every day, for inland river navigation, even if there is no warning. They are also responsible for generating different types of forecast warnings for daily forecasting, farmer forecasts and forecasts for fishing/shipping. The Disaster Management Bureau indicated that it was the focal organization for the government. The DMB is to act as a liason to the other government departments, NGOs and international organizations and maintain coordination of all disaster related organizations. The DMB's main role is to "make concept and content of disaster management, which is to be disseminated to local levels and policy makers", therefore it is to advise the government on all disaster policy issues. The DMB receives warnings from the Meteorological Department and is responsible for disseminating it to all concerned parties, including the Minister of Food and Disaster Management. The DMB is also responsible for the creation and dissemination of print/electronic media and training and public awareness. The UNDP is the governing body for the CDMP, in partnership with the government, and has the Disaster Response Facility (DRF). The DRF works with 39 pre-qualified NGOs, which all needs to be facilitated by the national government. The DRF is responsible for mobilizing assistance when the cyclone occurs. The CDMP, was formed seven years ago, and is primarily funded by the UNDP and DFID. It was originally formed when the government was concerned with emergency response, but with the paradigm shift to risk reduction, the CDMP is now responsible for early warning capacity building, dissemination and emergency response. The UNDP is responsible for supporting the CDMP in the development and implementation of their programs. They are also responsible for supporting the government in early response and providing advice to the government, through the Local Consulting Groups (LCG). The UNDP is responsible for mobilizing assistance in the forms of drinking water, non-food assistance packages and emergency shelter materials during high risk incidents. The UNDP is also focused on Disaster Emergency Response (DER) and performed immediate loss and damage assessments after Sidr and Aila, and tend to focus on core family shelter kits after the cyclone event The CPP is partnered with government and local NGOs and is responsible for the program's management, organization, recruitment and termination of volunteers, training and equipment needed for warning dissemination.

The CPP is responsible for disseminating early warnings to the field level volunteers through wireless, and then opening the control room at the local level. The CPP must also arrange for funding to keep the equipment functional and do field visits. At elevated risk times the CPP organizes emergency meetings with the government and stakeholder agencies. At a signal 7/8 the CPP organizes an inter-ministry coordination meeting where all involved ministries are present and emergency measures are planned. Subsequently, the field organizes the upazilla disaster management committee which takes the decisions from the national level and conveys the action plan to the volunteers. They are then responsible for evacuating people to safe places, like cyclone shelters. After the cyclone the CPP must send damage reports, assess deaths and provide emergency relief. The Department of Relief and Recovery supervises disaster prone areas, prepares cyclones shelters, monitors embankments and constructs culverts. The DRR receives early warnings from the Meteorological Department and disseminates it down to the local level, but does little in the way of pre-disaster planning. Although the DRR does not do much pre-disaster work, they must understand cyclone risk in order to efficiently do relief and rehabilitation. The DRR do Community Risk Assessments (CRA) so local people understand hazards. After the CRA the DRR disseminates the findings to be used in future planning. It cannot be determined if the goals of each of these departments/organizations are followed right down to the grass-roots level, as representatives for these organizations were not available for interviews in Cox's Bazar. It may be suggested that since there are no representation of these priorities and responsibilities at the local level, there is a break in the pre-disaster preparedness chain that there is not the personnel needed at the local level to execute these goals.

## 6.2 Review of Current Cyclone Management Policies: Strengths and Weaknesses

### *6.2.1 Historical Changes in Disaster Policy*

There have been marked changes in national disaster management policies. The Disaster Management Bureau indicated that from the early 1970s, the government developed the cyclone code 1985, an amendment of the code of 1970. This code is one of the oldest measures of cyclone mitigation in Bangladesh and both the public and

government are bound to follow it. After the 1991 cyclone the national government realized a unique department needed to be created for disaster management planning, policies and management and created the Disaster Management Bureau. In 1994 the Bureau drafted the national Disaster Management Policy and the CDMP drafted the Disaster Management Act. Although the Act has been drafted, it is still waiting for approval by parliament. Currently, the government reforms the Policy and Act on a monthly basis, although they have not been approved by parliament. The UNDP states that they have recently added their support to the Act for its approval. The Standing Order on Disaster (SOD) was completed in 1997, detailing the responsibilities of each level of government during a disaster risk. The SOD has the force of an Act and mandates all disaster responses. There is also a National Disaster Management Plan and a Local Disaster Action plan. Every upazilla and union is believed to have a copy which details "who is responsible for each thing". The DMB stated that the SOD is in response to the government's desire to reduce the effects of disasters. The government wants to "reduce the life/property loss of disasters and bring it to a tolerable level". The UNDP and CDMP also named the SOD as a main policy that has been adopted. When asked about cyclone policy, the Meteorological Department stated that it was not their concern, but did state that cyclones were the biggest weather event in Bangladesh. They stated early warnings and effective management systems decrease loss of life and that their Department felt that there is "an excellent hierarchy from top to root level". The CPP stated that the government has their own disaster management policies and they own objectives in line with government policies. The recent policies, as outlined by the CPP, include educating school children, religious leaders and village leaders. The government wants to disseminate information and empower people to decrease life/property loss.

### *6.2.2 Main Pillars in Current Disaster Policy*

When asked to discuss the main pillars of cyclone management policies, there was a range of main themes cited. The Disaster Management Bureau feel that a main pillar is the improvement of early warning systems. They stated that the warning systems have been revised and improved and that new signals will be introduced soon. Although, it was also stated that the forecasting needs to get to everyone and there needs to be a

mechanism for better understanding of the early warnings. They also stated that they feel there has been an acknowledgement of the vulnerable coastlines and that there is currently a reforestation project underway. The DMB stated that there are to be 800 new shelters built in the coastal areas, although 4,000 are needed. Currently there are 3,000 shelters, of which 2,700 are useable and 300 are unusable. The DMB acknowledged a paradigm shift in the late 1990s from relief to risk reduction. The UNDP that cyclone management is no longer a single responsibility and that there are various sectors involved in disasters. There is now a coordination role played by the Minister of Food and Disaster Management, in partnership with the Director of the DMB and the Director of Relief and Rehabilitation. They stated the SOD outlines 12 committees, from top to district levels, to deal with cyclone management. The Meteorological Department responded that they felt there was more preventative measures and public awareness. The CPP also felt that preparedness and community awareness was a main policy pillar.

*6.2.3 Paradigm Shift in Current Policy Formation*

When asked about the shift in recent policy from a top-down approach to a paradigm that supports grass-roots approach, which enables the local level government to be part of the decision making process, the DMB stated that they feel that it is still primarily a top-down approach. Although, they did feel that the shift was partly successful so far, as local people are involved in the creating of their Action Plan, which goes to the government, and is helpful in preparing the national plan. The DMB also stated that since the village people are illiterate it must be a top down approach. Another member of the DMB stated that there has been very little development regarding a paradigm shift, since the "British administrative system, modern approach, has no meaning in their governing system". The UNDP feels that there has been a considerable shift in the last 10 years, but that the shift has not been as good as possible. They feel that more needs to be done, and although the SOD empowers people, responding to cyclones is still a very centralized approach. The UNDP feels that although a major role should be played by the local government, very little money is allocated to the local level and the local government must rely on the national government for post-disaster budgeting. The Meteorological Department feels that community-based disaster management is currently

in place and that the local government committees are very active in risk reduction. The Meteorological Department stated that the main problem with disaster management is infrastructure, as the people in the coastal belt are very poor. BCAS credits the CDMP with stressing pre-disaster measures and supporting the current paradigm shift.

### *6.2.4 Strengths and Weaknesses in Current Disaster Policy*

When asked about strong and weak areas within recent policies, the DMB stated a strength is the government's motivation, increased capacity building and the committees under the SOD. The government has also begun to change the signaling system. The weakness lies in people's perception of risk and the lack of understanding of scientific interpretation/knowledge. The government has introduced new policies, but has had problems implementing them at field level. Although they stated that there are already many committees involved with disaster management under the SOD, these committees are not active pre-disaster, just during. A major weakness is that there is financial support needed to implement policies. The UNDP stated that the CPP is very strong, but has limitations with equipment/coordination/management capacities. They also stated that there is a human cost to evacuation and that false alarms cause complacency. The UNDP also stated that the SOD is the basis of disaster policy and that it is a very comprehensive document. If it is followed properly, the SOD is a strong point, as everything is spelled out and it is a strong mechanism. A weakness is the coordination at committee levels. The committee members need training and capacity building. The DRR feels that there is a lack of reliable manpower. The Meteorological Department feels that there is too much poverty and population. Poor people have less access to sustainable living and they need capacity building, as increased capacity will decrease loss. The CPP also feels that the vulnerability of communities is the main problem. This vulnerability stems from people being poor and staying on the land, or settling in areas beyond the embankments, because they cannot afford land in a better area. There are no shelters or embankments in these areas and there are thousands of people in these areas. The government cannot force them to move, and although the government has addressed these issues, they cannot arrange anything different. The CDMP states that there is a strong presence of volunteers. They

feel the weakness lies in the lack of the Disaster Management Act, and therefore, a lack of accountability.

## 6.3 Addressing Local Level Vulnerability

The Disaster Management Bureau stated that early warnings do not, and cannot, address each individual communities in their early warnings, the warnings address vulnerable people as a whole. This is to be expected, but it does not address the villages with increased vulnerability and aids them in their increased need to evacuate. The DMB discussed the cellular telephone pilot project that is being tested in the Cox's Bazar area. It is being tested at the micro, or union, level and will broadcast a message to 2,023 numbers. This message will automatically be broadcasted on the telephone screen, and will not need to be opened like an SMS text message. This project aims to provide immediate early warnings as soon as they are generated and hopes to reach a larger audience so that quicker dissemination around villages and neighboring areas is possible. The Meteorological Department feel that if the village people understand the early warning process in more detail, and have an increased capacity to react to the warnings, the whole process will be more effective. They acknowledge that if these village people do not have anywhere to evacuate to, the warnings cannot be effective. Currently, the BMD admits that the local villagers do not have suitable homes to protect them from the storms and have little options when it comes to evacuating. The BMD stated that they try their best to provide accurate early warnings. Their primary concern, at this point, is local capacity building, and they are requesting funding in order to execute this objective. The UNDP credits the CPP with taking national level cyclone warnings and translating them to language that is understood at the grass-roots level. The UNDP feels that fishermen are still at an increased risk, even with current warning systems, as financial pressure will force them onto the waters at a level three warning. It is then difficult to communicate a change in warnings to them, since most boats do not have radios on them. The fishermen are also at an increased risk as they must travel further into the Bay, and farther from the safety of the shore, to catch fish. Their boats have not improved and so they are at great risk when a cyclone is approaching. The UNDP also stated that the chars are more

vulnerable, as not only are they unsturdy land masses out in the Bay of Bengal, but it is also difficult to get the cyclone early warnings out to these islands. The CPP feels that the current early warning system does not adequately address local vulnerability as the warning system is a 100-year old British system that emphasizes boats and ships rather than coastal people. The CPP does acknowledge that there is a new system being formulated, although it is being implemented in the field level. This new system will be more human oriented and will state information regarding tidal surge, the areas that will be affected and what those villagers should do in response.

When asked if current cyclone policies acknowledge certain subsets of the population, such as women, children and/or elderly as being more vulnerable than the average person, the Disaster Management Bureau acknowledged that women and children are most vulnerable to disasters. They also put extra emphasis on helping the elderly, lactating mothers and widows. The UNDP feels that at an institutional level it is easy to realize that women, disabled and elderly persons are more vulnerable, but it is difficult to translate this to the grass-roots level. The UNDP feels that although women are more vulnerable, they are not always able to leave the house during a cyclone storm, for culture reasons. This is a problem that was identified in their Community Risk Assessments (CRAs). All other organizations interviewed also cited women, children and the elderly as more vulnerable. It was also a common theme that women and children need to be segregated in shelters and that these shelters need to be accessible to disabled persons.

Currently, when asked what is being done to address these identified vulnerable populations, the DMB indicated that “everything looks good on paper”, but in reality the attitudes need to change to have effective mitigation of increased vulnerability, as there is currently a lack of local citizen awareness. The DMB feels that most vulnerability policies are not known well known to the grass-roots first respondents. The UNDP has recognized these subsets of increased vulnerability through their CRAs and feel that this information is known at the national level. There is a move to a multi-purpose shelter that can also be used as a school, but the cost is around 120 million USD. The CPP feels that the addition of female volunteers to the CPP program helps address vulnerability and

helps women mobilize during a cyclone storm. Currently 33 percent of CPP volunteers in each volunteer group are female.

## 6.4 Formulation of Early Warnings and Dissemination

### *6.41 Forecasting and Early Warning Creation*

It has been the Bangladesh Meteorological Department's job to generate cyclone early warnings since 1935. The BMD must constantly monitor cyclone activity and provide weather bulletins at every stage of the storm. Methods of forecasting include conventional methods, subjective methods and close observation of synoptic methods that provide real time observations. The BMD must predict and track weather changes and then use that information to decide what the weather outcome will be and where an early warning should be issued. The BMD has access to forecasting information from World Meteorological Organizations, Japan Meteorological Organization's satellite imagery, as well as the Tropical Storm Risk website, run by the University of London. They can only forecast 24 to 30 hours in advance, as anything beyond that is not very accurate.

The lead time for the cyclone before landfall depends on the intensity and strength of the cyclone, as well as the movement and distance from the coast. First a low pressure system is detected, that will intensify into a depression and if that increases, a cyclone eye will form. Forecasting systems can identify a depression up to a week before it becomes a cyclone. Generally, a depression can exist, and be forecasted, three to four days before a cyclone forms, although there is only between 12 to 36 hours of lead time on warnings once a cyclone has formed in the Bay. If the Meteorological Department detects a depression, they must issue warnings 18 hours ahead for the safety of coastal people. According to the Standing Order on Disasters, the Meteorological Department must issue appropriate warnings at least 10 hours before landfall.

### *6.4.2 Early Warning Messages*

The Meteorological Department receives information regarding the position and distance from shore of the center of the cyclone, wind intensity, trend, movement,

precautionary measures and warning number. The Disaster Management Bureau receives information about scientific data, characteristics of impeding hazard, location and impact of hazard, path, landfall, associated secondary hazards, such as water surges, data and precautionary measures. The Disaster Management Bureau receives the report through fax and send it to the field level. They create an understandable message and send it down through the CPP and mass media. The message received from the CPP includes information regarding the location of the cyclone, direction it is traveling and speed of movement. When an early warning is disseminated to the local level the Deputy Commissioner makes the decision to tell the community what to do. This is because no instruction is given at the national level to community members as what to do. Early warnings include location, wind speed and when it will hit. Early warnings advise fishermen not to go into the Bay to fish, and advises villagers to remain in their homes.

### *6.4.3 Warning Dissemination*

When disseminating early warnings, the Meteorological Department uses fax, email and telephone. They also have a LAN connection with the Prime Minister's office, government departments and television stations. Disaster Management Bureau uses faxes and emails. The Deputy Commissioners must rely on megaphones and miking, while the CPP must rely on strictly megaphones. Local NGOs and volunteers use a wide variety of dissemination media including the warning flags, television, megaphones, radio, newspaper, fax, cellular phoning, local PA systems and mosque miking systems. There is also the pilot cellular project that aims to disseminate warnings quicker and more widely than other media forms.

Early warnings by television have been found to be ineffective because strong winds blow down power lines before the warnings are disseminated. Also, two to five percent of local villagers have access to television. Radio, miking and megaphones are considered very effective. Cellular warnings are anticipated to be effective as there is significant amounts of the population in every village that have cellular telephones. Although huge storms will cause some cellular towers to fall, the towers are built to withstand storms and initial warnings will be issued early enough to be received before the severe storms so people may at least receive an initial warning prior to disrupted

service. The general consensus throughout all governing bodies is that early warning dissemination is very effective. The partnership between the levels of government, NGOs and local volunteers ensure that most, if not all, villages receive early warnings. The effectiveness of these early warnings is confirmed in the drastic decrease in the loss of life throughout the more recent major cyclones.

### *6.4.4 Infrastructure to Reduce Cyclone Loss*

The Government of Bangladesh is "very committed to building cyclone shelters" and to the creation of multi-purpose cyclone shelters. There is currently a plan to build 800 additional cyclone shelters and embankments in vulnerable areas. There is also a commitment to repairing current cyclone shelters. The UNDP is also building 8,000 concrete houses that are designed to withstand a category 5 cyclone. These houses are being designed so that the entire community may evacuate to the houses. The Meteorological Department has also been computerized for receiving and analyzing data. This is designed to increase lead time, but will depend on data collection and sharing. As with many initiatives for risk reduction, funding plays a major role in how successful the proposals will be.

## 6.5 Community Risk Assessment Under CDMP

Community Risk Assessments (CRAs) are multi-hazard risk assessments designed to map people's perception of local level risk. These risk assessments are not cyclone specific. These assessments are ongoing and still in the formative stage, and have therefore not proven how effect they will be at communicating grass-roots needs to national policy makers.

Phase 1 of the CRAs has currently been completed. There were 500 CRAs, in seven districts, completed in Phase 1 from 2004 through 2009. During Phase 1, of the seven districts that were used, two of them being along the coast, namely Satkhira and Cox's Bazar. A CRA takes five to seven days within each village. The first step is to build rapport to ensure accurate and complete answers. The NGOs provide facilitation for this process as the upazilla government people are already overburdened and lack the

time. The UNDP enter a district to be assessed, introduce themselves with a letter from the government, and then meet with the upazilla chair and the disaster management committee. The UNDP then requests that the Disaster Management Committee to identify the primary stakeholders and people at risk. This group of people generally includes women, farmers, fishermen and laborers. The CDMP requests that the Disaster Management Committee make these people available for the assessments. The villagers are asked to identify local hazards. Often this includes salinity in the fields and drinking water which affects agriculture on a daily basis. Hazards also include damage to shrimp farms during cyclones and the effects of decreased mangrove forests. Issues related to fishermen being forced out onto the sea also arise. The CDMP, during the CRAs, is told that fishermen must go out during storms because the fish come to the top of the water and the catches are increased during that time. Since most fishermen are laborers and do not own their boats, they do not make the decision when they go out into the sea. The boat owners do not give the fishermen radios because then the fishermen will hear that the sea is dangerous and come back, instead of catching the maximum amount. The CDMP works on ways that local hazards can be minimized; sometimes they are able to offer recommendations, but sometimes they are not.

The Satkhira pilot provided members of the disaster management committee with mobile phones that will receive early warning messages that are to be disseminated to the local villagers in their local language. This plan proved effective during Aila, as there was no electricity to be used to disseminate warnings. TeleTak and Grameen are assisting a similar pilot project in Cox's Bazar. An additional 2,000, in 40 districts, are to be completed in Phase 2. Phase 2 is to last from 2010 to 2015, with four years to cover the 40 districts and the fifth year for consultations and action plans. The objective of Phase 2 is to provide support to the CPP and ministry to recruit volunteers and train them.

Current issues raised with Phase 1 was predominantly regarding funding. The CRAs identified community needs, such as embankments, but there is no funding to implement solutions and address risk reduction. The CDMP has also found that it has been difficult to get the government to provide funding to support the CRA findings. The DMB feels that although there has been extensive spending on the CRAs, they are only being done in seven districts, and these districts are in northern Bangladesh, not in

cyclone proned areas. The BMD explained that in Bangladesh, current disaster management systems are based on vulnerability mapping, not risk mapping, and quantifying risk is a different job than what is currently being performed.

A CRA was done in Gabora, a 15 village union located along the coast 400 km from Dhaka, with the assistance of the Center of Natural Resource Studies (CNRS). The union was affected by both Sidr and Aila. The CRA found the following risks associated with cyclones: riverbank erosion, virus infection in shrimp farm, damage to shrimp by over embankment flooding. embankment breaching and saline water inundation, virus infection of shrimp farm, riverbank erosion and salinity. The CNRS indicated that damage to local houses is caused by increased velocity of wind, non-reinforced homes, a lessened number of trees in the area, and ultimately, climate change. The CNRS concluded, from the CRA, that risk reduction must be done on a variety of time frames. Short-term measures include tying down the roof with wire and supporting the house with bamboo poles on the exterior of the home. Medium-term measures include stronger houses and regular maintenance of said homes. Long-term measures include mangrove reforestation and houses that are made to withstand one in 100 year storm winds. The weaknesses found by the CRA were that the embankments have not been maintained and homesteads need to be raised. In Gabora, five kilometers of embankments were broken. This caused saline water to enter and inundate the entire union, houses were inundated five to seven feet with saline water. The local canals also need to be dug out so that sediment does not impede drainage flow.

The CRA is begun at the union level. At this level a Risk Reduction Action Plan is compiled that prioritizes the risk needs. This plan is only successful if it is implemented by the Disaster Management Committee. There are also upazilla and district Risk Reduction Action Plans formulated. The challenge is to pursued upazilla and district level leaders to incorporate these Risk Reduction Action Plans into their decision making processes. In order to accomplish this goal, the CDMP feels there needs to be greater emphasis put on the Action Plans. There also needs to be cohesion between all areas of government, as cyclone risks are a cross-cutting issue that impacts agriculture, fishing, livestock, education, public health and many other sectors of public and government concern. When the findings of the CRA are implemented, it creates a sense of ownership

among local villagers. This sense of ownership increases support for the CRAs and its goals.

## 6.6 Partnerships and Cross-Scale Linkages

The Disaster Management Bureau stated that the government is active through the district level administration and through disaster management committees at the district, upazilla, and union levels. They stated that there are many government departments involved in early warning dissemination, including the BMD, DMB, Prime Minister's office, Deputy Commissioner's office and CPP office. The DMB also indicated that there were many NGOs that helped with cyclone early warning dissemination and local capacity building. There are also members of local NGOs on the local disaster management committees. The DMB credits the CPP and all its volunteers for being a serious force in warning dissemination. The UNDP also indicated that the CPP is the primary means of warning dissemination, and they indicated that volunteers risk their own lives to disseminate the early warnings. They did emphasize that the government and NGOs work together to disseminate early warnings through their individual channels. The CDMP indicated that its organization, along with the UNDP partner with local NGOs to disseminate early warnings.

There are also international partnerships that make forecasting and early warnings possible. The World Meteorological Department facilitates a good, working relationship between the Bangladesh Meteorological Department and neighboring countries. The World Meteorological Department provides constant support in the form of bilateral grants. These grants are all donations, not loans. The World Meteorological Department also provides the BMD with technical support and training. The Japan Government provided the BMD with five or six radars for the generation of early warnings. The Japan Government has also provided constant support to Bangladesh over the past 22 years, supporting capacity building, infrastructure and forecasting. The South Asian Association for Regional Cooperation Meteorological Department and the Asian Meteorological Department work with the BMD to provide early cyclone warnings.

Non-Government Organizations play a crucial role in the bridging gaps and building relationships between government organizations and local residents, not only at the grass-roots level, but at the national level as well. There are many very active NGOs at the national level that aid in information collection and dissemination, emergency plan creation, warning dissemination and many other aspects of cyclone disaster management. While there are only a few NGOs within the Cox's Bazar region, there are many NGOs working from Dhaka, many with a very long, vast reach to grass-roots villages.

ActionAid works at the national level as well as the local level. ActionAid has helped to build 107 individual shelter homes, that were made like bunkers, where neighbors could come and lock up their possessions. ActionAid is currently working with the Government and international donors to help them understand the importance of such a program. Previously, there has been no tracking system for boats, as no log books have been kept. There is also no data on fishermen lost/ types of boats/ number of boats/ who goes where, therefore there is no way of knowing how many fishermen are lost during a cyclone. ActionAid is piloting a program to track fishermen. This pilot has been tested in two areas and tracks both the boat and the crew. In this program, the first step is to assess the fishermen's current cyclone knowledge. Their knowledge building aims to include all fishermen and their wives, as the females are the caretakers of the home. ActionAid is also facilitating water rescue and providing lifejackets for fishing boats. Fishermen do not want to register their boats because of the fees and bribes they have to pay to secure the registration. Fishermen must currently go to five departments to get the registration. In order to facilitate the piloted project boat registration is necessary. ActionAid is pushing for policy helps fishermen register their boats and there is a movement to make relief dependent on registration.

ActionAid is also concerned with local level water salinity. Many coastal villagers have saline ground water. Water that inundates embankments and sits on the land creates salinity in all water, degrading the soil to a point where it is "desert-like" soil that is unable to support agriculture, vegetation or livestock. Women are forced to wash clothes and menstruation cloths in saline water. These clothes sit on the skin and the salt is absorbed into the body. Salinity is a major health concern, especially for women, in particular pregnant women. There is an increase of birth defects in children born to these

conditions. Birth defects cause increased stress as there is one more mouth to feed, but not one more set of working hands. This stress can manifest itself into violence against women. ActionAid is supporting government to integrate policies with health, development and agriculture. ActionAid also feels that they" need to make the Government understand the need for partnerships with the NGOs." They also believe that the national government needs to decentralize the power and delegate power to the local governments to make decisions, which is currently not being done. ActionAid feels that budgets must first be prepared at the local level, by elected people from the community who are trained. These budgets must travel upwards to affect change.

## 6.7 National Policies on Climate Change and Disaster Management

The Bangladesh Meteorological Department states that based on meteorological data, they can confirm, with certainty, that the local climate is changing. They are encouraging people to change their habits, and some of their cultural practices, to adapt to climate change. The BMD also stated that the ecosystem changes due to climate change and that government needs to observe the local ecosystems. The BMD feels that the country, alone, cannot properly address the issues caused by climate change, and that international governments must come to a consensus that it is a world-wide problem and deal with those issues appropriately.

The CPP feels that climate change is increasing the number of cyclones. It is also increasing the areas affected by cyclones, and the tidal surges that follow cyclone storms. The Department of Environment, within the Bangladesh Government, is assessing the risk that climate change poses, and is preparing an Action Plan accordingly. The Prime Minister has submitted a proposal to the World Committee. The proposal details how developed countries are the major contributors to climate change and they should be responsible for providing monetary compensation to help less developed countries like Bangladesh to help them cope with the increased effects of climate change that they are suffering from. The Disaster Management Bureau agrees that the frequency of both floods and cyclones have increased due to climate change. The UNDP agree that Bangladesh is not one of the major contributors to climate change, but they are a major

victim of its effects. This believe is also echoed by the Department of Relief and Rehabilitation.

The Disaster Management Bureau indicated that there have been climate change adaption policies adopted at the local level. These policies detail changes within community, families, house building and embankment construction. There is also agriculture diversity being explored to address increases in soil salinity. There have also been changes within local agriculture because of increase salinity and coastal inundation. Some farmers are switching from agriculture production to fishing, which will prevent issues of salinity, but with increased cyclones, will not aid in the creation of a livelihood that is not affected by climate change.

BCAS indicated that the government is looking at six pillars for cyclone issues and climate change issues climate change strategies. There are 44 programs within the six pillars. The initiative will run from 2009 to 2018, with pillars that include (1) food security, social protection and health, (2) comprehensive disaster management, (3) infrastructure development, (4) research and knowledge management, (5) mitigation and local development and (6) capacity building. Although, BCAS did admit that at this point, there are no new policies regarding climate change. Generally, climate change policies are integrated into other sector's policies. Climate change is either addressed through disaster management policies issued by the Ministry of Food and Disaster Management, or with disaster risk reduction strategies.

The Center for Global Change (CGC) has trained 18 parishod in an annual development plan and budget including elements related to adaption to climate change, including a vision on how to respond to future climate change, as they admit that there is already effects of climate change felt. The GCG states that the sea surface temperature is rising gradually. The surface temperature has increase by 0.6 to 0.7$^{o}$C. The CGC feel that climate change will increase flood conditions, increase both salinity and moisture stress and exacerbate cyclonic storm surges (Ahmed and Neelormi 2008). The CGC, as indicated in their interview, feel that temperature rise is the primary element that can change the occurrence of cyclones, or even the frequency of depression formations. The CGC indicated that there has been a "tremendous increase" in the frequency of high-intensity flooding over the last 35 years. While the CGC admits that this phenomenon

cannot be completely tagged as climate change, they maintain that they cannot deny the influence. The CGC explained the effects of increase sea level rise as follows:

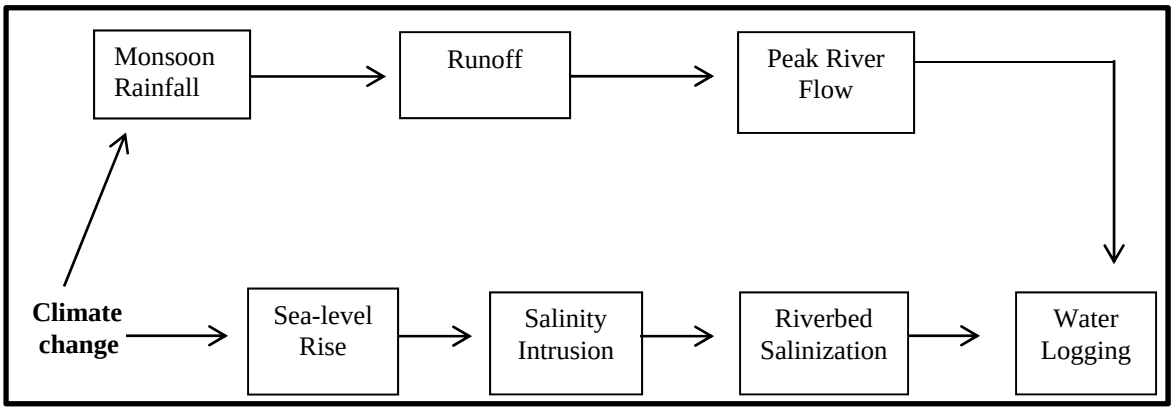



Figure 6.1 Effects of increased sea level on coastal villages. *Note:* From Ahmed and Neelormi 2009. Copyright by Centre for Global Change.

The UNDP indicated that the national government takes climate change very seriously, and that it is on the national agenda. They look at climate change adaption, and although it is on everyone's mind, it cannot be predicted or forecasted. It is also difficult for the government to determine what the most cost efficient way to mitigate the effects of climate change will be. The UNDP began a project in 2004 that has a climate change component, mainly through the climate change cell under the Ministry of Environment. The climate change cell is a service and support unit under the MoFDM. This program is using the findings of CRAs to improve risk reduction. Since all levels are addressed in the Risk Reduction Action Plans, these plans must be formulated to include climate risks. The UNDP indicated that things haven't changed drastically, but things have become more uncertain. There are concerns about the uncertainty and the effects that will have on the ability to forecast future storms. The UNDP indicated that the Bangladesh Climate Change Strategic Action Plan is aimed at showing climate change needs and priorities. The Action Plan supports the idea that adaption is anticipatory. The Plan is to detail the limitations of future adaptation and create a realistic scope of climate change needs. The UNDP also feels that stakeholders must be involved in the climate change planning, as currently many things stay in the books and few actions plans get put into practice. It is

also imperative that the government adopts a long-term vision when creating its action plans and policies regarding climate change.

When consulting the Bangladesh Climate Change Strategy and Action Plan (BCCAP) (GoB 2009), it forecasts an increase in cyclones and storm surges due to climate change. The International Panel on Climate Change, within the BCCAP, predicts a global temperature increase of between 1.8 and 4.0$^{o}$C by the end of the 21$^{st}$ century. The BCCAP forecasts a worst case scenario, if current embankments are not reinforced, of the displacement of millions of "environmental refugees" from coastal regions (GoB 2009) due to sea level rise and increase cyclones. It is believed that if the sea level rise is higher than expected, and embankments are not improved, six to eight million people could be displaced by 2050.

The Climate Change Action Plan is a 10-year programme, running from 2009 to 2018, aimed at capacity building and increasing resilience in order to meet the risks associated with climate change (GoB 2009). The BCCAP (GoB 2009) elaborated on the six pillars of the Plan, as initially outlined by the CDMP, indicating some of the main action plans for each pillar. They are as follows:

- Food security, social protection and health
    - Develop climate resilient cropping systems
    - Implementation of drinking water and sanitation programmes in areas at risk of climate change
- Comprehensive disaster management
    - Strengthen the government's capacity and that of civil society partners and communities to manage natural disasters, and ensure that appropriate policies, laws and regulations are in place
    - Strengthen community-based adaption programmes and establish them in each of the disaster prone parts of the country
    - Strengthen their cyclone, storm surge and flood early warning systems to enable more accurate short, medium and long-term forecasts
- Infrastructure
    - Repair and rehabilitate existing infrastructure and ensure effective operations and maintenance systems
    - Plan, design and construct urgently needed new infrastructure
- Research and knowledge management
    - Monitor and research the impacts of climate change on ecosystems and biodiversity
    - Research the linkages between (a) climate change, poverty and vulnerability and (b) climate change, poverty and health (disease incidence, nutrition, water, sanitation) in order to identify possible

interventions to increase the resilience of poor and vulnerable households to climate change

- Mitigation and low carbon development
  - Develop a strategic energy plan and investment portfolio to ensure national energy security and lower greenhouse gas emissions
  - Expand the social forestry programme on government and community lands throughout the country
  - Expand the 'greenbelt' coastal afforestation programme with mangrove planning along the shoreline
- Capacity building and institutional strengthening
  - Review and revise, where appropriate, all government policies (sector by sector) to ensure that they take full account of climate change and its impacts
  - Build the capacity of key government ministries and agencies to take forward climate change adaption
  - Build the capacity of the government to undertake international and regional negotiations on climate change

One impact of climate change that will greatly affect local villagers is an increased shortage of local drinking water.

When discussing adaption, the BCCAP (GoB 2009) stated that "while adaption and mitigation are the main tasks, finance and technology are the means to achieve them" (p. 31). This believe has been a main theme throughout all sectors when discussing feasible adaption measures. The infrastructure pillar is one that is especially dependent on finance in order to create changes. Current cyclone shelters and embankments cannot be improved or retrofitted without the necessary financial contributions. The BCCAP (GoB 2009) indicates that the "Government of Bangladesh recognizes that tackling climate change requires an integrated approach involving many different ministries and agencies, civil society and the business sector" (p.19).

# Chapter 7: Discussion

## 7.1 Data Regarding Past Cyclones

Past written information on cyclones in Bangladesh is accurate, although incomplete. Little has been written regarding the Aila cyclone, which occurred in May 2009. The media states that the people in the Aila affected areas have been able to return to normal living following the cyclone, while the truth is that many of these affected villagers are forced to live on embankments and are unable to return to their homes. Many areas in the Aila effected areas suffered from embankment breaches and since these areas lack the technology to remove the water, it has remained within these villages adding salinity to both the ground water and the land, permanently affecting local agriculture opportunities.

Past research supports the fact that coastal Bangladesh is comprised of low lying coastal plains, making cyclone mitigation difficult. This was evident in the field, as many areas were still inundated with past cyclone water. Bangladesh is comprised primarily of flood plain, and as such, is very dependent on the embankments along coastal areas. There is little data regarding the state of current embankments and the amount of embankments that are in need of repair. There is also information regarding the amount of cyclone shelters placed along the coast, but no surveying of these shelters have been done to determine how many are in disrepair and cannot be accessed, or are not safe to stay in, during a cyclone. Without proper information regarding embankments and cyclone shelters, it is difficult to accurately assess current risk at the local village level. Immigration and migration also make it very difficult in this region to take an accurate census in order to quantify how many vulnerable persons are living in the area and are in need of proper cyclone shelters.

The Bangladesh Meteorological Department has kept excellent records of past cyclone storms and cyclone early warnings. This information enables research on the creation of, and decisions around the dissemination of, early warnings. Unfortunately, most of the information from the BMD is still in print form and can only be accessed locally. While this information is so valuable, it does not to be put in an electronic

database to be accessed by other countries and organizations. Lack of man power and access to proper computers makes this difficult for local government workers. The country is at risk of losing a great deal of very valuable information if it is not secured electronically.

## 7.2 Vulnerability

Population density compounds coastal village vulnerability. Marginalized populations are forced into coastal areas and hilly areas along the lower areas of the country. Burmese refugees flee their country and take shelter in the same areas, compounding population densities and exacerbating vulnerability. Local government officials are finding upazilla-level vulnerability mitigation difficult because the addition of refugees mean more people must be evacuated into already strained shelters. Local Bangladeshi residents often lack proper identification, as do Burmese refugees, making it difficult to determine who is eligible for government assistance and food rations. If Burmese people are receiving assistance, there is less for eligible local villagers.

Options for vulnerability modification can be grouped into the following categories: (i) forecasting and warning; (ii) community preparedness; and (iii) land-use planning (Smith 1992). Forecasting and warning is the primary method of vulnerability mitigation in Bangladesh. This practice is used at the grass-roots level, as well as all levels of government. Although, as previously shown, forecasting can be difficult because there is a lack of technology required to increase lead times on cyclone early warnings. Also, because cyclone storms can change paths, cyclone early warnings can become inaccurate and people consider them “false”, causing complacency in the future. Community preparedness is attempted through early warning systems. It is also attempted through school preparedness programs and local village training seminars. Community preparedness is one of the main pillars of the cyclone mitigation plans created by local NGOs. These NGOs work continuously with local villagers to increase their awareness regarding cyclones. Mock demonstrations, risk mapping and Community Risk Assessments are used to work with local villagers to decrease their vulnerability. Land-use planning tends to be more difficult as few options for land that is saturated with

people. Embankments are built to try and protect agriculture land and villages directly along the coast. Unfortunately, ideal embankment land is not always available and shelters can be placed on land that is too far from the villages and inaccessible during cyclone storms. Past research in these areas depict current, realistic accounts of efforts being put forth, and recognize struggles to overcome vulnerability issues.

## 7.3 Current Paradigm Shift

Past research supports a shift from a reactive, post-disaster relief and rehabilitation focus, to a proactive, pre-disaster preparedness approach. Research in the field supports this shift in practice. The national government is also realizing that it is more cost-efficient to try and mitigate losses before they occur. National relief is dependent on external donations from other countries, and vary from disaster to disaster. Therefore, regular disaster budgeting is not possible and post-disaster funding and rations cannot be considered a reliable, constant means of rehabilitation. Relief at the local level is sparse, if any is provided, and local villagers are better off to try and prevent loss, rather than rely on relief to replace lost property after a storm.

The shift away from single-silo to a grass-roots, village inclusive way of thinking is important for early warning dissemination as all levels of government and individuals must work together during a cyclone storm to effectively disseminate cyclone early warnings. The MoFDM is credited for initiating this paradigm shift, although there was no organization that credited this department of the government for the shift. Although the paradigm shift states that there is a decentralization of power among policy makers, the practice has yet to happen as quickly as print media indicates that has.

Local Disaster Action Plans were implemented, through CDMP, in high risk areas to cope with cyclones (ADRC 2003). Intended primary beneficiaries of these plans are local villages, as they are aimed to increase the role of local villages and lower level government. The research showed that it is often difficult to implement action plans as meetings to update and review these plans are often few and far between as all officials are busy with other work. Also, the plans rely the proper function of all organizations

involved. In reality, often different government and NGO persons must work according to the current conditions and situation, not according to standardized procedures.

## 7.4 Cyclone Early Warnings

The Bangladesh Meteorological Department works very diligently at continually providing accurate forecasts and early warnings. Forecasting ability is limited by funding, and in turn, up to date equipment, but information sharing with neighboring countries and Japan forecasting tools enables Bangladesh to recognize depressions forming in the Bay of Bengal earlier and issue warnings with longer lead times. The Standing Order on Disasters also outlines each departments responsibilities and expected actions, making it easier for early warnings to travel down the chain of command and to the local level.

Literature in this area indicated that cyclone early warnings do not reach all intended vulnerable populations. This was found to be accurate as washed out roads and lack of proper dissemination tools, such as megaphones and miking systems, inhibit local volunteers from spreading the warnings. Literature also found that early warnings failed to evacuate vulnerable persons. This was not found to be true, as past personal experience, combined with continued capacity building and awareness campaigns, helped people understand the dangers of a cyclone storm and the need to leave their homes and move to a safer place.

There is a theme within cyclone literature that indicates that cyclone early warnings are made easier by the fact that Bangladesh has two distinct cyclone seasons. While this is currently correct, climate change is changing weather patterns and affecting cyclone seasons. The two seasons now start earlier and go later into the summer and winter. It is difficult to predict what effect climate change will have on the cyclone seasons and the ability to predict them.

Changes to the current warning system will prove to be beneficial to local village people. Currently many people do not understand the warnings and believe that the numbers only reflect intensity and not direction. It is not well understood that five or six warning level is not a large threat to the area it is being issued for, but a level seven refers to the area of issue. Unfortunately, a switch in warning systems may cause confusion at

the local level, but it is important to formulate two different warning systems, one for inland and one for fishermen on the water.

## 7.5 CPP Participation

The Cyclone Preparedness Programme (CPP) is credited as being the major factor in cyclone pre-disaster warning dissemination. The CPP has over 42,000 volunteers, although it has been shown in local research, that average volunteer participation is around 60 to 65 percent during cyclone storm time. Currently the CPP covers 11 coastal Districts, which encompasses 32 Upazilas and 274 Unions (Bangladesh Red Crescent Society). Currently, there are two committees that jointly administer and implement the Programme. A 15-member Implementation Board is responsible for implementation and administration. A seven-member Policy Committee, headed by the Minister of Food and Disaster Management (Bangladesh Red Crescent Society). Although these committees are in place, it cannot be guaranteed that the organization is present before a cyclone to ensure that all members are included in the planning process. “Volunteers are given training on the Red Cross and Red Crescent movement (Bangladesh Red Crescent Society), but often these training seminars are in locations inaccessible to many volunteers. It is stated that a three-day basic training course is given to all volunteers (Bangladesh Red Crescent Society), but often volunteers are too busy with personal work to attend the sessions. Also, training sessions are offered in lengthy intervals, with some volunteers going years without formal training. Each group of volunteers are responsible for two to three villages and approximately two square kilometers. They are responsible for disseminating early warnings to approximately two to three thousand people (Bangladesh Red Crescent Society). Short warning lead times makes it difficult, if not impossible, to reach all the households before the cyclone reaches landfall.

CPP participation is also hindered by the lack of proper equipment. Volunteers become discouraged when they are provided with megaphones, but are expected to purchase the batteries for these megaphones with the limited resources they have for personal use. A lack of functioning equipment makes it difficult for volunteers to disseminate warnings, and can sometimes cause them to choose to leave with their

families, rather than stay and help out. Proper equipment is needed, not only to increase volunteer participation, but also to ensure complete and timely dissemination of the early warnings. Unfortunately, equipment maintenance is one more issue that needs to be addressed by an increase in budget, although there are no resources available to fulfill this need.

## 7.6 Standing Order on Disasters

The Standing Order on Disaster identified three councils/committees as responsible for policy formulation and coordination of Disaster Management at national level. These include the National Disaster Management Council (NDMC), the Inter-Ministerial Disaster Management Coordination Committee (IMDMCC) and the National Disaster Management Advisory Committee (NDMAC).

The National Management Council includes 30 members that range from the Prime Minister who acts as chairman, 10 Ministers, Chiefs of Staff of the Army, Navy and Air Force, 14 Secretaries and two other members. The council is to meet at least twice a year, and is responsible for formulating policies regarding Disaster Management and issue appropriate guidelines, examine the recommendations set forth by the IMDMCC and NDMAC and issue directives for their implementation and approve the Standing Orders on Disasters and National Disaster Management plans. They are also responsible for ensuring the coordination of civil administration, Defence Forces and NGOs in the planning process of disaster management, oversee the framing of laws to ensure disaster prevention, mitigation, preparedness and response, and frame guidelines for distribution of relief materials and assign priority of steps during pre-disaster, disaster and post-disaster periods.

The Inter-Ministerial Disaster Management Coordination Committee includes 30 members as well, including 14 Secretaries, three Director Generals and three other members. Meetings for this committee are not on a regular schedule and will include guests from the public service. The responsibilities for this committee are multi-faceted and include implementing the policies and decisions of the NDMC, coordinate the activities of the government agencies concerned with disaster management, and

scrutinize the disaster preparedness of different Ministries and Agencies every six months.

The National Disaster Management Advisory Committee also includes 30 members and is lead by a chairman that is experienced in disaster management and nominated by the Prime Minister. This committee consists of eight members of Parliament, experienced persons from government agencies, universities, NGOs, donor organizations and other organizations with experience in water resources, infrastructure development, education and other related fields. Responsibilities of this committee include advising the National Disaster Management Committee, alerting the Committee to risks of disaster and mitigation possibilities, the recommending of releasing of funds and proposing long-term rehabilitation plans.

The SOD is a very thorough and concise document that details responsibilities at every level of government and planning. While it sounds like a solution to pre-disaster planning and the effective dissemination of early warnings, the reality is that it is document that all government bodies use to justify their actions at disaster time, but do not follow as it is intended. Meetings that are mandated in the SOD are not called as often as required, communication does not run as smoothly as outlined and partnerships do not form as easily as detailed within the document.

## 7.7 A Comparison of Government Policy and Current Practice

When asked about current policy, the general theme through the levels of government was that it didn't need much change because the SOD provides all mandated responses for every level of responding bodies. All government levels responded that current policy was sufficient and that the government was doing everything within its power to effectively disseminate early warnings. The BMD does, in fact, seem to be doing everything within its capacity to address grass roots vulnerability and provide accurate and timely forecasts and early warnings. As previously stated, the SOD provides strict mandates, but this document is more effect on paper than in practice. The meetings mandated within the SOD are not scheduled in the frequency expected by the SOD, which causes a breakdown in communication and pre-disaster planning.

While there is many policies in place, within the different levels of government, but it is the local NGOs that truly make the biggest impact on cyclone mitigation at the local level. These NGOs are also major influences within the creation of new cyclone policies. These NGOs are responsible for translating these policies into a language the local villagers can understand. Without the liason work of the local NGOs, cyclone mitigation would not have made the progress at the local level that it has.

There is also a discrepancy in the purpose of post-disaster aid, and how it is actually being used, or in many cases abused. Aid, when provided, often does not make it to the most vulnerable populations and rations are often sold for profit after being donated, or kept by local government officials. This becomes a major concern when grass roots villages are repairing and rebuilding after a cyclone. This lack of aid also affects the experience of the villagers after a cyclone and then does not accurately depict what resources are deployed for local villagers in the form of relief. Therefore, government and NGO post-disaster aid cannot be accurately measured.

## 7.8 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) predicts that global temperatures will rise between 1.8 $^{o}$C and 4.0 $^{o}$C by the last decade of the 21$^{st}$ century. This is especially detrimental to Bangladesh as two-thirds of the country is less than 5 meters above sea level (Ministry of Environment and Forests). Bangladesh has been identified, by the United Nations Development Plan (UNDP) as being the most vulnerable country in the world to tropical cyclones (Ministry of Environment and Forests). “Climate change is increasing the strength and frequency of storms, cyclones, floods and droughts. The impact of these disasters depends on peoples’ vulnerability and their ability to cope” (ActionAid) Bangladesh is among the countries that are expected to be worst affected by climate change, as it is one of the most climate vulnerable countries in the world (Ministry of Environment and Forests).

Local villagers understand that the weather is, in fact, changing. Although, there is no one certain consensus of how these changes will affect the villagers. Some villagers embrace the fact that there is more rain, sighting that it is a gift from God. Other villagers

feel that the changes in seasonality have a detrimental effect to fishing and agriculture practices. There is a common belief that changes in sea level temperature and sea level rise will have negative impacts on not only the fishing practices, but the safety of those fishermen who are forced into the Bay of Bengal during rough seas, or who are out fishing when unseasonal storms hit. Inland villagers are less concerned about climate change, but they do voice severe concern regarding the erosion that has been occurring along their riverbanks. This erosion is causing houses to “fall into the river”, creating a different type of land loss, and climate change vulnerability.

# Chapter 8: Conclusions and Recommendations

## 8.1 Summary of Study Techniques

This thesis was done as part of a larger project lead by Dr. Ended Haque's, in partnership with the Canadian International Development Agency, called Building Environmental Governance Capacity in Bangladesh. The purpose of this study was to examine disaster governance in Bangladesh from the grass-roots level to the national government and NGO level, with a focus on cyclone early warnings. Cyclone early warnings were chosen as Bangladesh has formed some of the best cyclone early warning dissemination networks in the world. Bangladesh's early warning system can be used as a model, not only for neighboring countries, but for countries around the world. Policies within each of these levels were examined and assessed, with a focus on how they contribute to the generation and dissemination of early warning systems. The study also examined cross-scale linkages between local and national governments, as well as the partnerships that facilitate these relationships. To properly and completely address these objectives, a literature review was completed. A field session in Bangladesh was conducted and surveys were conducted at the village, local government and NGO and national government and NGO level. Case studies were also done at the grass-roots level in order to better understand specific responses by villagers to cyclone early warnings. Government policies, including the Standing Order on Disasters, as well as meteorological data supplied by the Bangladesh Meteorological Department and printed material provided by the local NGOs was examined. This material provided insight into the current cyclone vulnerability situation and in place, as well, proposed national policies. As a result of the research completed, several conclusions were drawn regarding the options available to local villagers before and during a cyclone storm and the strengths and weaknesses between cross-scale government relationships and communication. Policy recommendations were also made to address underlying issues related to effective and appropriate pre-disaster hazard mitigation.

## 8.2 Assessment of National and Local Policies

The Standing Order on Disasters is the axis point for any cyclone policy action or formulation. The SOD was created as a nation-wide response to cyclone vulnerability. It dictates actions for all areas of government during “normal times”, “alert and warning stage”, “disaster stage” and “rehabilitation stage”, indicating a list of expected responses and actions during each of these times. The SOD has the force of an Act and is considered the main pillar in other policy formation and cyclone hazard mitigation. The general opinion of this policy is that it is effective in dictating expectations of all areas of government and ensuring consistent responses through each of subsequent cyclone events. The strength of the SOD is that it does, indeed, clearly mandate all responses for all involved level of governments and areas of each level of government. The SOD provides instruction for an extensive group of departments and is very exact in the expectations of each department.

While the SOD is a very solid, concise document, it works better on paper than in practice. The weakness in this document lies in the fact that it cannot be fully enforced and therefore the committee meetings that are mandated and expected, are rarely scheduled in the time frames mandated. The SOD relies on large-scale coordination of continual meetings and the reality is that many of the involved interest groups do not have the time to meet on such an interval and therefore, information is not generated and shared on the level that is expected. The consequence of this is that the committees mandated within the SOD are ill-prepared and uninformed at cyclone storm time. They rely heavily on any current information they can receive, from the national government, during the time of the storm and do not have the expected local disaster plans in place. While the SOD is a well-written document, it does not fare as well in practice and falls short of its expected results when put into place.

There is also a National Disaster Management Plan and a Local Disaster Action Plan. Every upazilla and union is to have a copy that details the responsibility of each key

shareholder, but the correctness and current information of these plans cannot be guaranteed. Some information is outdated and does not accurately reflect current vulnerabilities or needs of local villages. Each cyclone is unique and often “best practice” rather than dictated policy. The risk maps created by the local NGOs, and their resulting action plans tend to be more effective than the Plans created at the national level and then sent to the local level. The NGOs are more aware of what is occurring at the local level when a cyclone storm hits, and they are in a better position to assess risks and appropriate responses.

In 1994 the Disaster Management Bureau drafted the national Disaster Management Policy. The CDMP also drafted the Disaster Management Act. The government reforms the policy and the Act on a monthly basis, but still, after many years neither of the two documents have not been approved by parliament. It is difficult to create change in any level of government policy when there seems to be little urgency on the part of the government to address proposed bills and pass them to aid in the addressing of cyclone vulnerability. Until the government chooses to make cyclone policy a priority in their policy and act formation and passing, there will be no ability to change the current situation and properly address local level vulnerability.

## 8.3 Cross-Scale Concerns

There are many partnerships and linkages that must be formed and maintained to ensure effective early warning generation and dissemination. The Standing Order on Disasters mandates how and when each and every government agency is to respond during a cyclone storm. This process begins with the analysis of data and creation of an early warning by the Bangladesh Meteorological Department. These early warnings are quite consistently disseminated to the village level. Communication at this level can often decrease, due not only to the amount of people who must be warned, but also due to the lack of technology and equipment required to disseminate the warnings. There is little trust between villagers and local government officials due to past experiences with pre- and post- disaster response. Local villagers maintain that government officials do little, if anything, to help them before or after a cyclone. They also feel that previous disaster

relief that was dispensed to the local government officials, and intended for villagers, has been either kept by local officials for use by themselves and their families, or has been sold to local villagers for profit, when it was donated to be given for free. Villagers stated that they do not receive any relief after a cyclone and the national government does nothing to help them. Villagers feel that any help, of any form, received is provided by local NGOs. Local government officials responded that they have a strong relationships with the national government, and that there are no gaps in the priorities of the local government and that of the national government. Unfortunately, it is difficult to tell if that is the true response, or that of loyal government employees. The Standing Order on Disaster dictates how both levels respond to cyclone hazards, and each levels of government adamantly maintain that the Order is followed closely during all cyclone storms. At the National Government level, all involved agencies feel that they are providing as much support to local villages as possible. A general theme is that this support is limited by the lack of financial means available to Bangladesh for hazard mitigation. National government officials feel that insufficient forecasting equipment can result in inaccurate storm warnings that unnecessarily force people from their homes and cause distrust in future warnings.

Greater accountability and transparency within local government is needed to create the trusting relationships required between grass-roots level villagers and their local government representatives. Without the trust, any changes proposed by the government will be met with resistance in the local villages. Although the national government cannot police each local village, corruption at the local level impairs the trust required to implement any future changes within cyclone policy. This issue must be addressed as there is ever increasing vulnerable populations along the coast, and with climate change, their vulnerability will only increase. A positive, functioning relationship is needed to enable two way communication with villagers and government.

## 8.4 Addressing Cyclone Vulnerability

At the local level the CPP is heavily relied on to disseminate early warnings. Although this program has many volunteers, a presentation done at the time of the field

work, by the CPP, indicated that the volunteer's participation tends to average around 65%. This is due to a concern for the volunteer's own safe and that of their families, a frustration caused by no supply of the batteries required for the warning megaphones or a lack dissemination technology, or the inability to reach affected communities due to poor roads or path obstructions. Ever increasing populations also mean that these volunteers must reach more people in more homes.

Local cellular phone company, Grammeen Phone, is trying to create the technology to broadcast an SMS text message that will be displayed directly on the screen of every phone on their network. This message will alert all cellphone users of the generated cyclone warning. This technology will provide wide spread warning distribution, but would only be accessed by people who have a cellular telephone or receives the warning from a neighbor with the appropriate technology. The concern with this technology is that currently the villages that do not receive early warnings, do so because they are remote and often have poor access roads in order to deliver the early warning. Poor roads are generally found in villages that have the least financial means. This means that these villages are likely to have a large concentration of people with cell phones. Therefore, even with the SMS message, the warning runs the chance of still not reaching the vulnerable populations.

Upazilla level government officials, as well as local level NGOs, are implementing local level education initiatives to educate school aged children, women and entire communities about cyclone early warning systems and appropriate evacuation options.

The national government has committed to building more shelters in the near future, but again, financial constraints will dictate the success of that initiative. Construction of additional shelters is not the only concern, restoration of current shelters must be completed in order to assure that they can be accessed in response to an early warning. Often international governments or agencies will build a cyclone shelter, but they do not maintain it after the initial construction, and stairs and wheelchair ramps are dilapidated or absent over time. Current shelter designs also incorporate a place where cattle and other livestock can be kept, so people are more willing to evacuate to the shelter without fear of losing their food or revenue supply.

Due to the repetitive nature of cyclone storms, the local village people can understand when a cyclone is forming, without the use of cyclone warnings. The warnings help them understand the direction and strength of the cyclone and when there is a need for them to evacuate. Therefore, the local people are capable of understanding the risks and vulnerability associated with cyclone storms. The weakness comes in their ability to evacuate. For coastal villagers there are little options for safe evacuation. There is a limited amount of shelter space and many villages do not have access to a functioning, useable shelter. These people are often forced to evacuate to higher ground, which can be difficult to get to and are not always much safer than the flood plain region they reside in. Early warnings that are understood by all, combined with capacity building workshops that help villagers understand local vulnerability are needed to decrease local vulnerabilities. This, combined with more shelters, will greatly increase local villagers' ability to properly cope with cyclone storms. Unfortunately, education programs and shelters require funding, which tends to be the shortcoming for all vulnerability reduction.

## 8.5 Partnerships in the Formulation of Early Warnings and Dissemination

The partnerships required to create cyclone early warnings and effectively disseminate those warnings are multi-tiered and many fold. Initially, early warnings are created at the national level. The Bangladesh Meteorological Department relies on information from external, international weather forecasting stations, specifically Japan's meteorological information. This information is used, along with local information, to formulate appropriate warnings. Once it is decided that a warning is needed, it is then disseminated laterally, to other government offices and organizations, and down to the local government levels. The Upazilla level government is responsible for organizing themselves, opening the local control room, and ensuring that local CPP, as well as other NGO organizations, are properly informed of the level of warning. These partnerships are very strong and productive. International organizations are very willing to help Bangladesh with cyclone early warnings. There is also strong communication between the different government stakeholders. The weakness in this area lies in the fact that not

all vulnerable communities receive an early warning. This is not due a lack of partnerships, but more accurately, the inability to access these villages during a storm. It should be recommended that roads and local infrastructure need strengthening, not the partnerships that create the initial warnings.

World Vision is another NGO that is credited by local government officials and village people as instrumental in warning dissemination. There is a strong presence from World Vision in Cox's Bazar and local World Vision workers often personally aid in warning dissemination. NGOs at the national level and the local level aid greatly in the dissemination of cyclone early warnings and in evacuating vulnerable people. Often the local villagers trust the NGO persons more than their local government officials and are more willing to evacuate when told to do so by an NGO representative. NGOs act as a liason between the government and the villagers and are most effective in conveying the seriousness of the current cyclone situation and, in turn, necessary precautions for safety.

## 8.6 International Assistance

There are very strong partnerships formed between Bangladesh and those of its neighbors, and other international countries. Any forecasting information that is available is provided to Bangladesh immediately. The Japanese government has also provided the country with numerous forecasting radars. Japan and Germany have built cyclone shelters in vulnerable areas, but unfortunately provide the initial shelter, but no upkeep, rendering some shelters unusable after time and wear.

It is difficult to quantify cash donations to the Government of Bangladesh. Many government officials live below a comfortable income level, and international support can often be used to subsidize their own living expenses, rather than being dispersed among the target recipients. There are many international NGOs that provide monetary support, food and supply rations and assistance in the form of volunteer participants, although the actually monetary amount of any of these things is unknown.

There are little that can be improved within the relationships with international weather agencies. Bangladesh is given access to all relevant information in order to aid their early warnings and decrease vulnerability. Neighboring countries are very

cooperative in helping Bangladesh by providing real time information as soon as possible. International aid is also given in good faith, and it would be difficult for these international organizations to disperse it at the local level to ensure that it is being properly dispersed, which once again speaks to the accountability of the government. The aid is not the concern, how it is being used is the problem.

## 8.7 Climate Change Concerns

A major concern of the national government was that population growth and increasing population density, coupled with land loss due to climate changed induced sea level rise, is exacerbating the vulnerability of the village people. Climate change is also changing the current weather patterns, making cyclones harder to predict. Currently, both the spring and fall cyclone seasons are starting earlier and continuing later than previously experienced. Also, instead of being six weather seasons, there is a shift in weather to only four seasons, with an increased length of the rainy season. Local villagers are noticing that the weather has been shifting and that it is staying warmer longer, with a shorter winter season. This not only makes weather prediction difficult, but also affects agriculture practices. Fishing is affected as fishermen cannot go out during cyclone seasons, and with the increased length of the seasons, it means less time for these already struggling fishermen to meet their quotas and pay off their debts.

It is difficult to determine just how dramatic the effects of sea level rise will be on coastal village displacement and landlessness, but it can be stated, with certainty, that increasing populations, increasing poverty and decreased land will prove to be devastating to Bangladesh. A holistic, whole world approach is needed to address this problem, as the countries that are mainly responsible for creating exacerbated climate change, are also the countries with the financial and technological means to combat the problem and offer relief to developing countries like Bangladesh. Partnerships are required with neighboring, more developed countries, in order for Bangladesh to fully understand the impacts that climate change is having on the country and Asia as a whole. Information sharing is required and since Bangladesh is one country set to feel major

impacts due to climate change, it is imperative that Bangladesh be included in international round table discussions and climate change planning.

## 8.8 Recommendations on Local Level Disaster Management

There is no one solution that will help Bangladesh mitigate against cyclone storms and disasters. An improved, more understandable, early warning system for vulnerable communities, with a separate warning system for fishermen on the water is a must. Education that allows local villagers to properly understand the warnings is essential for the success of a new warning system. Continued, routine education of local villagers, especially school children is imperative for increased capacity building at the grass roots level. Consistent, complete communication between different levels of government and local village leaders must be strengthened to understand local risks and mitigate the effects of fast onset storms. Meetings at each level of government need to be routine and mandatory, not just as per the SOD, but should be enforced by upper-level governing bodies. Regular meetings are necessary to address changes in vulnerability, but also to ensure that all necessary partners are in place to disseminate early warnings and effectively evacuate all vulnerable community members.

While the CPP is effective at warning dissemination, average volunteer participation averages around two thirds during any cyclone storm. Volunteers will choose to evacuate themselves and their families, instead of disseminating warnings, during a storm, or they will be frustrated with the lack of proper equipment or batteries to power the equipment which will cause complacency among volunteers. There needs to be a greater presence of other NGOs in the Cox's Bazar area, to decrease the reliance of villagers on the CPP and to relieve pressure on the CPP to disseminate to every vulnerable village, and to aid in that dissemination, thus creating more effective early warning plans.

A lack of funding is the limiting factor in capacity building and enabling CPP volunteers. The lack of budget also is responsible for the washed out roads and weak, unrepaired embankments that cause flooding and limit warning dissemination. It is difficult to make recommendations knowing that budgeting and lack of funding is a

severe limiting factor in any measure proposed by the Government of Bangladesh for cyclone mitigation. Increasing population, decreasing land use caused by climate change, corruption within the levels of government all negatively affect any progress made toward more sustainable living and cyclone storm mitigation. Mismanagement of aid is also a very serious concern that must be addressed by the national government, not only to ensure that the vulnerable local villagers receive the assistance they deserve, but also to ensure that all aid resources are being used in the best possible way. Aid is critical to the rebuilding of villages after cyclones and it would be detrimental to these villagers survival if aid was revoked due to inefficient use.

## 8.9 Policy Recommendations

The SOD is the main pillar of cyclone disaster policies at all levels of government. The SOD mandates all responses by all involved parties at every part of pre-disaster response to during cyclone actions. Unfortunately, the SOD is just a policy and cannot ensure that it will be followed before a cyclone to ensure adequate pre-disaster planning or during the disaster to ensure complete and appropriate hazard mitigation. A decision to prioritize the local level meetings mandated within the SOD is required to ensure that current local vulnerabilities are identified and properly addresses so that they can be understood and planned for when the next storm forms.

There is also a need to prioritize the passing of the Disaster Management Policy and Disaster Management Act. At the time of the study's field research they had been sitting in parliament for fifteen years. Timely assessment of vulnerability and a response to the vulnerability is crucial to cyclone mitigation and the SOD requires back up from other policy documents to complete cyclone mitigation planning and identify current vulnerabilities not identified in the SOD.

More grass-roots input is required to properly identify local cyclone vulnerability within cyclone policy. While the national government does its best to understand the local level risks, there is still a gap within what they understand and what is going on at the local level. While the local villagers understand their vulnerabilities, CRAs are just beginning to document their concerns and assess their needs. While it is difficult to

compile all the local information received, it is these local villagers that can better detail the pre- and during storm events and how the SOD and other policies actually function to reduce vulnerability. While the paradigm is shifting, more of an emphasis on grass-roots involvement is needed to reduce risk. New policies need to include CRAs and input from local NGOs regarding accurate risk assessment and mitigation.

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**APPROVAL CERTIFICATE**

01 September 2009

**TO:** **Tiffany Bisson** (Advisor E. Haque)
Principal Investigator

**FROM:** **Wayne Taylor, Chair**
Joint-Faculty Research Ethics Board (JFREB)

**Re:** **Protocol #J2009:112**
**"An Assessment of Cyclone Mitigation Policies of Bangladesh: A Focus on Early Warning Systems"**

Please be advised that your above-referenced protocol has received human ethics approval by the **Joint-Faculty Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement. This approval is valid for one year only.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

**Please note:**

- **if you have funds pending human ethics approval, the auditor requires that you submit a copy of this Approval Certificate to Eveline Saurette in the Office of Research Services, (e-mail eveline_saurette@umanitoba.ca, or fax 261-0325), including the Sponsor name, before your account can be opened.**

- **if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

**The Research Ethics Board requests a final report for your study** (available at: http://umanitoba.ca/research/ors/ethics/ors_ethics_human_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

*Bringing Research to Life*

## Instructions to Interviewer

At the beginning of every interview, before the interviewee is asked any questions, the following statement must be read to the respondent:

This is a student from Manitoba, Canada and attend a Canadian University. For her degree requirements, she is studying the current changes in Bangladesh's cyclone policies and cyclone early warning systems to save lives and property.

I am from _____ University here in Bangladesh. My name is _____. You are one of the 25 households being interviewed in this region. Everything you say will be confidential, and your name and/or address will not identified in any way. Information is being collected in two village towns and in both Cox's Bazar and Dhaka. It will be used by a Canadian Development Agency and suggestions may be made to improve Bangladesh's cyclone policies.

I would like to talk to you about your experiences before and during a cyclone and how well you are aware of the disaster before it happens. I would like to ask you about your responses to cyclone early warnings and those of your household. I want you to be completely honest, but if you are not comfortable with a question, you are welcome to say you prefer not to answer it. We sincerely appreciate your help and thank you for your time.

Questionnaire for Cox's Bazar Community Members

Demographic Questions

FIRST, I WILL ASK YO UA FEW QUESTIONS ABOUT YOUR HOUSEHOLD AND WHO LIVES IN IT.

Questionnaire # _____

Village:_____

1. What is your age?
2. Gender of Participant:_____
3. Are you the head of the household?
4. Are you married?
5. How many children do you have?
6. Do you have elderly people (65 years and over) living in this house?
7. What is the total number of people living here?
8. How many women are in the household?
9. How many years of schooling do you have?
10. What is your primary occupation?
11. Were you born in this village?
12. If not, where were you born?
13. If you left your place of birth, why did you leave?
14. How far is your place of birth from the coast?

NEXT, I WOULD LIKE TO ASK YOU ABOUT YOUR EXPERIENCES IN PAST CYCLONE EVENTS AND CYCLONE EARLY WARNINGS.

15. When was the last major cyclone in this area?
16. Did you live here at that time?
17. Did you receive an early warning?

18. If yes, approximately how long before the storm did you receive the warning?

19. What kind of warning information did you receive?

20. Did you believe the warning?

21. If no, why did you not believe the warning?

22. Who gave you the warning information?

23. Through what media did you receive the warning?
    Megaphone
    Radio
    Television
    Mobile phone
    Community organizer
    Religious leaders
    Neighbors
    Others (specify)_____

24. Did you receive any help from your neighbors or other villagers during the cyclone?

25. If yes, what kind of help did you receive?

I WOULD NOW LIKE TO ASK YOU SOME QUESTIONS ABOUT WHAT YOU DID TO RESPOND TO THE EARLY WARNINGS YOU RECEIVED.

26. What did you do after receiving the early warning?

27. Did you, personally, leave your home?

28. If you did not leave, why not?

29. If you did leave, did you take all family members with you?

30. If not, who did you leave at home?

31. Why did you decide to leave them at home?

32. Where did you go?

33. Was the place you went to, the same place you were told to go by the early warning?

34. If not, why did you choose the place you went to?

35. Do you feel that cyclone shelters are safe?

36. Do the shelters segregate men and women?

37. Do the shelters have enough space for all the people who evacuated there?

38. How long were you out of your home?

39. What was the experience like coming back to your home?

40. Did you lose property as a result of the cyclone?

41. If yes, what kind of property did you lose?

42. Did anyone in your family die or get injured as a result of the cyclone?

43. Did your experience in the last cyclone change how you would react to future cyclone warnings?

44. Who was the most helpful community leader to get you back to your normal life after the cyclone?

45. Did you receive any money to help in the re-building of your life?

46. Did the government help you after the cyclone?

47. Has your community changed to deal with cyclones since the last one?

48. What is your biggest concern for future cyclones?

I WILL NOW ASK YOU A FEW QUESTIONS ABOUT THE 1991 CYCLONE.

49. Did you live in this village during the 1991 cyclone?

50. If yes, did you receive an early warning before the 1991 cyclone?

51. Did you leave your home before the 1991 cyclone?

52. Where did you go?

53. Did you behavior during the 1991 cyclone affect your reaction to the latest cyclone?

54. Did the early warning system improve since 1991?

Questionnaire for Cox's Bazar Municipality Officials

FIRST I WOULD LIKE TO ASK YOU ABOUT YOUR WORK WITHIN NATURAL DISASTERS AND SPECIFICALLY, CYCLONES.

Questionnaire #:_____

Organization name:_____

1. What does your organization do regarding cyclone early warnings, response and recovery?

2. How long has your organization been working with issues concerning cyclone disasters?

I WOULD LIKE TO ASK YOU SOME QUESTION ABOUT THE POLICIES INVOLVED WITH DISASTER MANAGEMENT.

3. What is the role of the local government in cyclone warning dissemination?

4. What changes have been made in the past 10 years with regard to cyclone management at the local level?

5. What areas do you think are weak in current cyclone programs?

6. What actions are currently being taken at the local government level reduce cyclone vulnerability?

7. What are the current government programs at the local level regarding cyclone management?

8. What are the current non-governmental programs at the local level regarding cyclone management?

9. How can current cyclone management programs be improved at the local level?

THE FOLLOWING SET OF QUESTIONS WILL DEAL WITH YOUR RELATIONSHIP WITH BOTH THE LOCAL VILLAGES AND THE NATIONAL GOVERNMENT.

10. What issues regarding vulnerability do you feel are not being adequately addressed by the national government?

11. What policies or agencies could be strengthened to decrease risk and increase the effectiveness of early warning systems?

12. How supportive and active is the government during cyclones?

13. What was the government's response after the last cyclone?

14. How has this response changed at the local level since the cyclone of 1991?

15. What do you see as weak areas in the relationship between yourself and the national government?

16. What actions, in your opinion, could be taken to strengthen the partnership between different stake-holders at the local level?

17. What do you see as weak areas in the relationship between your organization and local villagers?

18. What actions, in your opinion, could be taken to strengthen the relationship between your organization and the local villagers?

I WILL NOW ASK YOU SOME QUESTIONS ABOUT THE CYCLONE EARLY WANRINGS, WHO RECEIVES THEM AND HOW EFFECTIVE THEY ARE.

19. Who issues cyclone early warnings at the local government level?

20. What types of local organizations are being used to disseminate early warnings?

21. Are there subsequent (second and third) warnings?

22. Generally, what is nature of response from the villages/villagers?

23. Are there enough cyclone shelters for everyone in this upazila (municipality)?

24. Why don't some people leave their homes after hearing the warning?

25. What kind of knowledge can improve response behavior to early warnings?

26. What is being done to raise awareness about cyclone vulnerability and to reduce loss of life and property?

27. Relative to the 1991 cyclone situation much fewer people are dying now. What has changed since then that shows such an improvement in dealing with cyclones?

28. Are you aware of any climate change effects in this area?

29. How will climate change affect the safety and risk of shore-dwelling people?

30. What is your biggest concern regarding the next possible cyclone?

Questionnaire for National Policy Makers

FIRST I WOULD LIKE TO ASK YOU ABOUT YOUR WORK WITHIN NATURAL DISASTERS AND SPECIFICALLY, CYCLONES.

Questionnaire #:_____

Organization name:_____

1. What is your role within this organization?

2. What work do you do with natural disasters, with cyclones in particular?

3. How long have you been working at this job?

I WOULD LIKE TO ASK YOU SOME QUESTIONS ABOUT THE CYCLONE POLICIES THAT YOU ARE INVOLVED IN.

4. What are the main disaster management policies the government has adopted?

5. What are the main pillars of the cyclone management policies?

6. What areas were identified as strong/weak within recent policies?

7. What has been done regarding a shift in policy from a ‘single-silo’ governing approach, to a more grass-roots approach in order to involve the local level government in decision making?

8. What government and non-government agencies get involved to help with cyclone warning and dissemination?

9. How are current warning systems created to effectively address the vulnerability of each individual community and its unique risk issues?

10. Do current disaster policies, in particular, cyclone policies identify certain population groups (ex. children, the elderly or women) as having increased vulnerability above the average population?

11. What has been done to address these issues?

I WILL NOW ASK YOU SOME QUESTIONS ABOUT THE CREATION AND ISSUING OF CYCLONE EARLY WARNINGS AT A NATIONAL LEVEL.

12. How are early warnings generated?

13. What is the lead time before the cyclone hits for initiating the early warning?

14. What is the standard message sent in the warning systems that are being issued?

15. Who sends the message to the local government?

16. What media do you use for dissemination?
    Megaphone
    Television
    Mobile phone
    Community organizer
    Religious leaders
    Neighbors
    Others (specify)_____

17. Do you think these media are effective in reaching the local-level villages?

18. From a national perspective, is there a gap between the priorities of the national government, and that of the local government?

19. What issues does that raise?

20. What is being done regarding the Community Risk Assessment (CRA) under CDMP?

21. How is CRA being utilized for cyclone preparedness?

22. If not, what are your suggestions for increasing effectiveness of dissemination?

23. What types of infrastructure development have been or are being undertaken by the government to increase effectiveness of these warning systems?

24. What partnerships have been created between the national government, the local government and NGOs to strengthen the early warning systems?

25. How effective do you feel the cross-scale linkages between the different levels of government and NGOs currently are?

26. Are there international partnerships that aid in the creation and dissemination of early warning systems?

27. If yes, what kind of partnerships are they?

28. What role does funding play in early warning systems?

29. How much funding is spent on cyclone warning systems?

30. Related to the 1991 cyclone situation, less people die now. What has changed since then that shows such an improvement in dealing with cyclones?

31. What is being done to address the increased risk that climate change brings?