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Cyclone Evacuation Scenario in Kutubdia, Bangladesh: Tropical Cyclone Komen in 2015

CHAKMA Swarnali

1. Introduction

The Bangladesh coast is well known for severe cyclones and induced tidal surges. The coastal zone hosts over 35 million people who face different calamities in the form of cyclones, storm surges, etc. (GoB, 2010). The coastal areas of the Bengal plain and offshore islands are low-lying and very flat. Cyclones are treated as the biggest natural disaster in Bangladesh because of their continuous impact on human lives and property (Shultz et al., 2005). Normally, cyclones occur during April and May (pre-monsoon), and October and November (post-monsoon), and the Bay of Bengal is the procreation center of cyclones in Bangladesh. Among the 64 districts of this country, 19 districts are known as coastal districts 36.8 million people, of which more than half are poor, live in high risk areas in the coastal zone (Parvin et al. 2009; DMB), and the coastal zone of this country is most susceptible to cyclones. Extreme climatic events in terms of intensity and frequency of cyclones have increased globally in recent years (IPCC, 2009). The number of cyclones reaching the coast and storm surges increased substantially. For example, super cyclone Sidr hit on 15 November 2007.

Historical records show that Bangladesh experiences one damaging cyclone every four and a half years (Paul and Dutt, 2010). From 1969-1990, an annual average of thirteen depressions formed in the Bay of Bengal and almost all of the resulted in disasters (Paul and Routray, 2013). In Bangladesh, three catastrophic cyclones in 1970, 1991 and 2007 caused deaths of about 300,000 and 138,882, and 3,363 people respectively (Paul, 2014). Tropical cyclones from the Bay of Bengal accompanied by storm surges are also one of the major disasters Bangladesh. The high number of casualties is due to the fact that cyclones are always associated with storm surges. For example, the 1970 cyclone was the deadliest cyclone that has hit the Bangladesh coastline with a wind-speed of about 224 kilometers per hour and an associated storm surge of 6.1 to 9.11 meters, it was responsible for the deaths of about 300,000 people (DMB, 2010). In recent years, the impacts of climate change have caused more intense and frequent natural disasters. The 2011 Climate Change Vulnerability Index put Bangladesh at top of the list of 170 vulnerable countries to the impacts of climate change (Maplecroft, 2011). Suffering due to extreme climatic events by climate change have already been experienced by Bangladesh, for instance Cyclone Sidr (15 November 2007), Cyclone Aila (26 May 2009), Cyclone Mohasen (14

May 2013), Cyclone Komen (30 July 2105) and Cyclone Mora (30 May 2017). The cyclone warning system of Bangladesh has improved its efficiency after the occurrence of the 1991 cyclone as a result of improved macroeconomic management, increased resilience of the poor and progress in disaster management and flood protection infrastructure (UNDP, 2004). However, existing cyclone warnings are still criticized for uncertainties in warning message, identifying accurate location and landfall timing, etc. Hence, it is very important to implement proper disaster management policy and adaptive measure for protecting loss of life and property. The geophysical characteristics of the Bangladesh coast, the poor socio-economic conditions of coastal inhabitants also contribute to increasing the vulnerability of inhabitants to cyclones and storm surges (Paul, 2009a). Table 1 shows the reasons of non-evacuation during Sidr-2007, Gorky-1991 and the Great Bhola Cyclone-1970 (Paul, 2011), (Frank and Husain, 1971), (Haque and Blair, 1992), (Haque, 1995, 1997), (Matsuda, 1993), (Ikeda, 1995), (Islam et al. 2004), (Paul, 2008), (Paul and Dutt, 2010), (Paul and Routray, 2013).

Table 1: Evacuation behavior to cyclone in Bangladesh

Reasons	Sources/ Authors
1. No Cyclone warning issued	Paul and Dutt (2010)
2. Disbelief of cyclone warning messages	Matsuda (1993), Haque and Blair (1992), Paul and Dutt (2010), Paul and Routray (2013)
3. Sudden changes in warning signals	Ikeda (1995)
4. Distance of Cyclone Shelters	Matsuda (1993), Islam et al., (2004), Paul and Dutt (2010), Paul and Routray (2013),
5. Public shelters were not in good condition and overcrowded	Maksuda (1993), Islam et al., (2004), Paul and Dutt (2010), Paul et al., (2010)
6. Fear of burglary	Haque and Blair (1992), Paul and Routray (2013)
7. Had no time to evacuate	Paul and Dutt (2010), Paul and Routray (2013),
8. Could not leave cattle behind	Maksuda (1993), Ikeda (1995)
9. Could not take along vulnerable	Ikeda (1995), Paul and Routray (2013)
10. River was a barrier to cross	Ikeda (1995), Paul and Routray (2013)

2. Research objectives and Methodology

The main objective of this research is to investigate why many people do not obey the evacuation orders to during cyclone Komen in 2015. The research also evaluates the coastal community's perception of evacuation to cyclone shelters. The research plan is qualitative and uses both primary and secondary data in order to achieve the objectives. Focused group discussion, field observation and random interview questions were conducted in order to achieved the objectives. At the community level, all questionnaires were conducted in Akbar Ali

Deil Union under Kutubdia sub-district. Primary data were collected using questionnaires aimed at 100 people, who were affected by cyclone Komen. Responders were from local communities living near the cyclone shelter and far from the shelter.

The study reviews the literature on disaster preparedness and evacuation behavior in response to the disaster. It reveals that major factors influence proactive evacuation decisions including the warning system itself, the reliability of the warning message, perceived public cyclone shelter problems and perceived risks from hazards and logistics of evacuation. Early warning of the cyclone is a linear process of communication between recipient people and issuing organizations. Hence, the effectiveness of early warnings depends on various factors such as appropriate hazard detection, information dissemination, and responses of people (McLuckie 1970, Rogers 1985, Sorensen and Mileti 1987, Quarntelli 1990, Haque 1997). Additionally, various socio-economic, psychological and cultural factors influence vulnerable people's response behavior to cyclone early warnings. In 2010, Paul and Dutt point out that reasons for not responding to evacuation orders fall into three broad categories: Public cyclone shelters; the warning message itself; and individual perceptions and beliefs. In addition, an individual's response characteristics and socio-demographic variables such as age, gender, household income, education and the level of preparedness as well as ethnicity play important roles on human evacuation behaviors.

3. Study area

The research considered Kutubdia, one of the most severely affected Upazila in Cox'sbazar of Bangladesh. The island Kutubdia is located at the boundary of Bay of Bengal. Most of the houses are located near to the embankment. Almost every year during pre-monsoon (April-May) and post-monsoon (October-November) periods, the embankment breakdowns and the communities are inundated by high tide. The height of the roof of a house is 3/3.5 feet from the ground. However, in general the housing structure height of roofs is 10/12 feet height from the ground level. This is one of the main reasons that, during cyclone time tidal surges also often hit these communities.

4. Results

In 2015, Tropical Cyclone Komen made landfall at the crossing Chittagong coast near Sandwip at 09:00 pm on 30 July 2015. The low-lying areas of the coastal districts and their offshore islands and chars reported to be affected. The Bangladesh government began to broadcast warnings on television and radio and issued an emergency situation. Local authorities, CPP volunteers, NGOs and emergency officers advised the people to evacuate to shelters. In this

section, the questionnaire survey results explain how people reacted to cyclone warnings and evacuation orders.

4.1. Warning and responses case of cyclone Komen

The results of the questionnaire survey reveal that 59% of respondents were aware of the cyclone warning and evacuation order prior to Cyclone Komen's landfall. The number of responders is 100. Table 2 shows that 38 men (69%) out of a total of 55 men received evacuation orders during Komen. The percentage of women who received the evacuation order is smaller than men. The rate is 47%. Those who did not received an evacuation order (41%) took evacuation behavior without evacuation order. These residents judge by themselves to leave for safe places even though they did not get early warning. On the other hand, 41% of people why they did not received evacuation order; the difference of gender is seen in the table 2. Data reveals that 84% of women who did not get evacuation order, maximum women are day seasonal worker and mainly they are the women headed and main earning members of their family. They have to move one place to another for searching job. So sometimes they skip to hear the warnings. Also 52% of men they did not received evacuation order and their occupation is fisherman. Fisherman who did not get evacuation order because of their occupation, they were far from the community and cannot hear the evacuation order. This result shows the limitation of CPP endeavor siren and signal flag system.

Table 2: Received an evacuation order during Cyclone Komen, 2015

Gender		Yes	No	n=Total			
Total		59 (59%)	41(41%)	100 (100%)			
Male		38 (69%)	17 (31%)	55 (100%)			
Female		21(47%)	24 (53%)	45(100%)			

Occupation (Male)	Received	Not Received	Total	Occupation (Female)	Received	Not Received	Total
Fisherman	10 (48%)	11 (52%)	21 (100%)	Housewife	18 (69%)	8 (31%)	26 (100%)
Others (Farmer, Small Business, Day Labour)	28 (82%)	6 (18%)	34 (100%)	Others (Seasonal work, Day Labour)	3 (16%)	16 (84%)	19 (100%)

4.2. Source of the evacuation order

The total number of residents receiving an evacuation order was 59 people. According to the figure 1, many respondents received cyclone warnings and evacuation orders from CPP volunteers, who disseminate the information door to door. The CPP activities such as using signal

flags and sirens were very effective in the coastal area. Mass media also played an important role to disseminate information. Almost 66% of male and 29% of female respondents received evacuation orders from the radio. Nearly 54% of respondents get warning information from family and relatives. For example; cyclone warning messages via mobile phones from family members or head of the family. Also, people act on evacuation to be together with their family, relatives or another “in-group”. Therefore, they inform evacuation information to each other. A high level of trust in early warning information from the relatives helps them to evacuate to safe places. Most of the men (18%) got evacuation order by the mosque. Normally, in religious customs men has access to mosque rather than women. By TV media 8% of men and 5% of women were received the evacuation information. Also, 8% of men received evacuation information from NGO’s officials. That means men’s received evacuation order quickly rather than women from different sources.

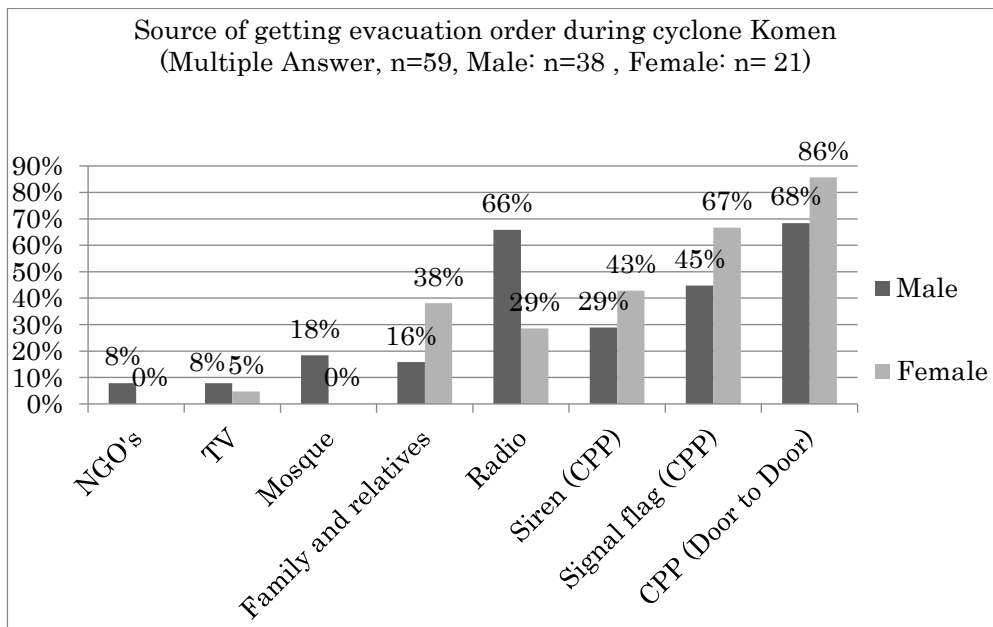


Figure 1: Source of the evacuation order

4.3. Evacuation site during cyclone Komen

Figure 2 shows respondent responses to evacuation orders during Cyclone Komen is approach. To follow the evacuation order, 32% of people took shelter in a school. But the majority of respondents did not leave immediately. Nearly 21% of all respondents did not take emergency action after receiving evacuation orders and they simply stayed home. This group is maximum are men and they feared that their homes could be robbed. Especially men stayed at home to take care of their belonging. Around 22% of all evacuees took refuge in public cyclone shelters. The remaining 25% took shelter either in neighbors’ houses, mosques or Government and NGO buildings that they perceived as being structurally sound.

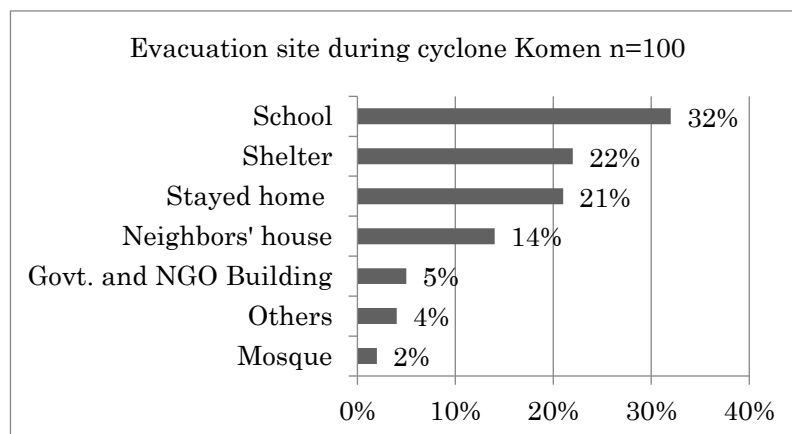


Figure 2: Evacuation site during cyclone Komen

4.4. Reason not to evacuate to a cyclone shelter the case of cyclone Komen

The below Figure 3 reveals the reasons what people want to evacuate or not to a cyclone shelter.

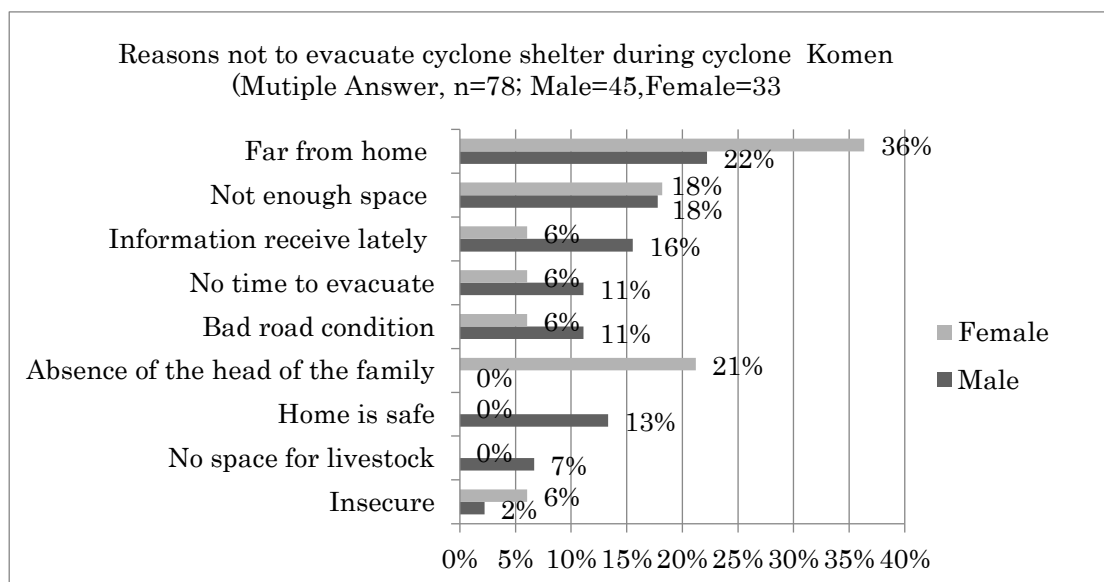


Figure 3: Reasons not to evacuate to a cyclone shelter the case of cyclone Komen

According to the data, resident responses for the reasons for not following to evacuation orders fell into different cases. 58% (male and female) of the respondents reported that the distance to the nearest cyclone shelter was the main reason for not leaving their home. Respondents answered that the distance to a cyclone shelter posed a barrier, and they were unwilling to walk roads in bad condition. And insufficient numbers of shelters is also evident from the fact that 36% of residents rushed to such shelters but were denied entry because of limited space. An informal conversation with respondents reveals that some respondents decided to take refuge in the nearest public building after water entered their areas. Unfortunately, they

could not reach the cyclone shelter because of high winds, extreme rain and high tides. 22% of non-evacuees (male and female) reported that they received the evacuation information lately and they did not have enough time to evacuate to a cyclone shelter. During Cyclone Komen, one of the most serious concerns about not evacuating to a cyclone shelter was the absence of the head of the family. 21% of women did not evacuate to shelter for this reason. This was particularly true for women, because in Bangladeshi culture, placing men and women who do not know each other under the same roof together is not comfortable or suitable. This reason also makes women feel insecure (6% of women) to evacuate to a cyclone shelter. Nearly 13% (men) non-evacuated respondents stated that they thought home was safe because they believed the cyclone was not strong or severe.

5. Effectiveness of early warning information and evacuation behavior for future cyclone

5.1. Source of information people trust

In order to enhance the effectiveness of evacuation behavior, it is very important to disseminate cyclone early warning information timely. Figure 4 shows the community trust the sources of warning information and evacuation orders for future disaster. People trust mostly the information announced from radio and TV. They cannot neglect the news because it is nationally broadcast. In the coastal area, during cyclone time, CPP volunteers have played a significant role in disseminating early warnings. The volunteers spread out in the villages and disseminate cyclone-warning signals almost door to door using megaphones, hand sirens and public address systems. However, many mistakes of disseminating cyclone information by CPP led people not to trust it. After mass media, 59% of people trust and rely on CPP volunteers. A large portion of people (40%) also trust their relatives and neighbors; women of which majority are housewives especially stay home and through their social gatherings they received the evacuation orders. 10% of men answered that a mosque is one of the most trusted sources.

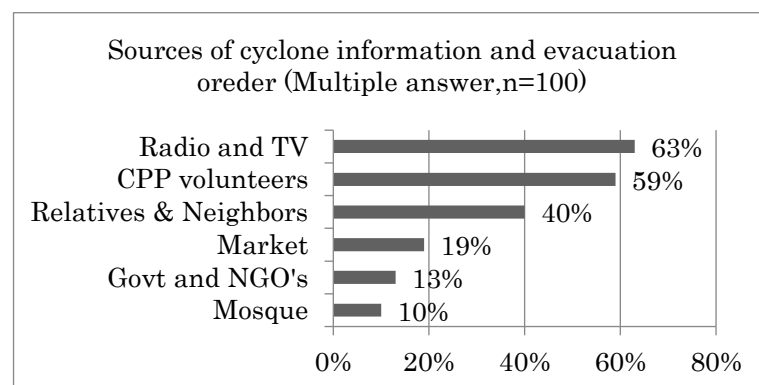


Figure 4: Source of information people trust

5.2. Timing need for future evacuation

Preparedness is a very important part for disaster risk reduction. The figure shows that

the timing of evacuation orders is very important in order to evacuate to a cyclone shelter. 58% of people responded that for future cyclone response, the best timing to receive an evacuation order is 6 hours before. After receiving an evacuation order, they need at least 1-2 hours for to prepare their valuable belongings and have to walk a long distance to a cyclone shelter. Before going to the shelter they must collect necessary and emergency goods. A few respondents claimed that they need at least two hours to prepare their valuable goods and inform their family members. Respondents also answered that during cyclone Komen they took their livestock to the shelter, so it took too long to reach the cyclone shelter. This factor cattle ownership also requires a lot of time for evacuation.

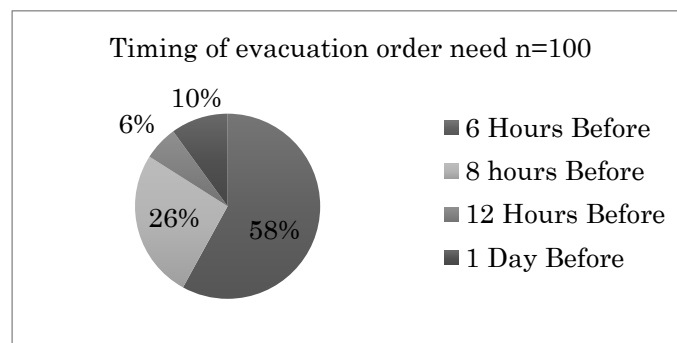


Figure 5: Timing of evacuation order need

5.3. Preference to evacuation site for future Cyclone

The below figure shows the place where people would like to evacuate during a future cyclone. The number of people who prefer the nearest cyclone shelter is very small, only 15% of men choose cyclone shelter.

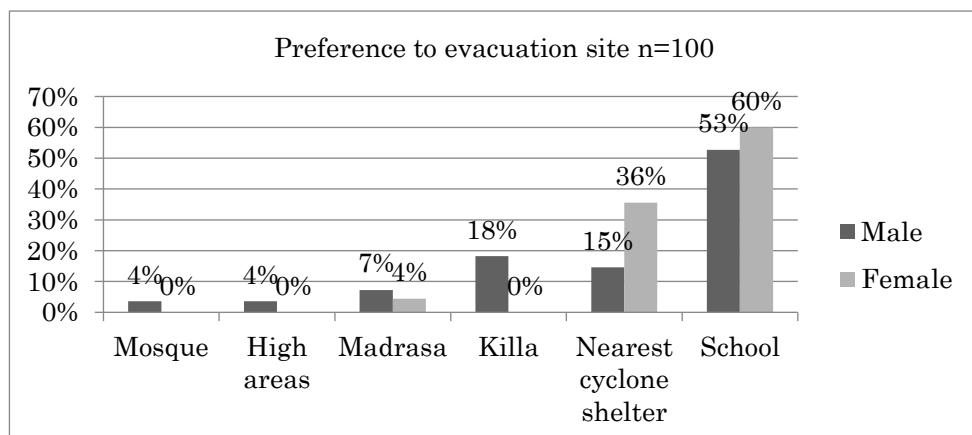


Figure 6: Preference to evacuation site for future Cyclone

A majority of people (especially women 60%) suggested a school is their first preference because schools are familiar and have more facilities is more than cyclone shelters, for example:

sanitation facilities, available space, etc. On the other hand, 18% of men prefer to evacuate “Killas”(Killa is a one kind of shelter which used for both human and livestock’s) because they keep their livestock at “Killas”.

5. Discussions and Conclusion

Community needs every step of warnings information for preparedness and safe evacuation. The results prove that easy access to a cyclone shelter plays an important role in evacuation behavior. Evacuation behavior during Cyclone Komen reveals that 41% of respondents did not receive evacuation orders. However 59% who receive evacuation orders, did not take them seriously. During Cyclone Komen, nearly 21% (figure 2) of all respondents did not take emergency action after receiving evacuation orders and simply stayed home. From the observation of evacuation behavior, it is also found that people did not start evacuation until observing the evidence of risk. These types of behavior reflect the general evacuation behavior of coastal communities in Bangladesh.

Many respondents received cyclone warnings and evacuation orders information from CPP volunteers. 86% of female & 68% of male respondents followed the CPP activities. However, 22% of respondents complained that they couldn’t evacuate because the warning messages delivered by the CPP volunteers and government were not timely delivered. So, there was a gap between the provider and receiver in the case of Cyclone Komen. In order to enhance early warning information we need to find out how and when evacuation orders are disseminated based on the local context

Vulnerability of the people in the study area and socio-cultural aspects also play an important role in whether to evacuate or not. Data also suggest that many women do not evacuate with unrelated men because they do not feel safe with the men in a single room. In constructing new cyclone shelters, the responsible authority or donor should consider local knowledge and customs such as having separate room facilities for men and women and for the provision of adequate lighting, water and sanitation facilities.

In the study area present cyclone shelters are not distributed sufficiently for local residents to evacuate. It reveals that distance appears to be an important factor in determining whether to evacuate or not. Considering this distance factor, construction of shelters must be done closer to vulnerable communities, especially within the distance of 1.5 km (Shelter policy, 2011) so that in times of disaster people can reach the shelters quickly. The road network between the community and cyclone shelters also need to be improving to facilitate the movement of people and goods during emergency periods. This particular issue should receive the highest priority in the Local Government Engineering Department.

Finally, The study area Kutubdia needs a village level community based disaster

preparedness programme. If the communities are mobilized and capable of accessibility their own risk through participatory work with local government, set up their own evacuation plans, repair village embankments and roads, coordination could then be managed with significant reduction of loss of life. In order to minimize damage caused by disaster, each of the following elements is important: “self-help”(individual protection), “mutual help”(individual in the community help each other), and “public help” (provided by government). For example, during the Great Hanshin Awaji earthquake, 1995 community members rescued many people. Additionally, an educational campaign by Government and NGOs is needed in coastal areas to improve the use of public cyclone shelters for future events. The awareness programme could target primary school children, following the Japan model, which represents an excellent example for Bangladesh. Local government and NGOs had assisted the local community to introduce this initiative.

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Swarnali CHAKMA

Abstract

Safe and secure evacuation during an emergency is very important to save lives. There are many features and obstacles of evacuation behavior during an emergency. The research was conducted in Kutubdia Upazila under Cox's Bazar district, Bangladesh to study grass-roots cyclone vulnerability and to find out the reasons why some people evacuate to cyclone shelter and why some people not. Based on survey data collected from the survivors, it was determined that while the majority of people realize the cyclone is coming and had received the evacuation information from the Cyclone Preparedness Program (CPP) volunteers or the radio, TV, but only 22% of respondents in this village responded to the warning by seeking protection in the nearby cyclone shelters. The major identified reasons for respondent's non-compliance with evacuation orders are long-distance of a cyclone shelter from home, not enough space to shelter and gender-related issues was the most important determinant in the decision to seek protection in safe places. It is also found that women did not start evacuation until consent from the head of family. These types of behavior reflect the general evacuation behavior of coastal communities in Bangladesh. Therefore, a high level of trust from residents in the warning system is important to real evacuation. Also, the community is the first responder to help each other's to evacuate safe places. It is necessary to raise awareness of disaster and provide real-time information on the vulnerability to cyclones at community levels. The local level may help decision-makers and other stakeholders to make a better decision on effective disaster management.

Keyword: Cyclone, Early warning, Evacuation, Cyclone Shelter