



Original paper

Factors Affecting the Cyclone Preparedness Programme Volunteers' Performance in Early Warning Dissemination in Emergency Response in Bangladesh

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Abstract Millions of people living along coastal Bangladesh are at risk from cyclones, and timely dissemination and social acceptance of effective early warnings could significantly save their lives. In recent years, the Cyclone Preparedness Programme (CPP) volunteers have gained considerable popularity among local community as the most reliable source for early warning and emergency assistance for evacuation during coastal cyclones. The sustainability of the CPP is threatened not only by limited funding but also by the difficulty of attracting and retaining committed and efficient volunteers. The purpose of this study is to identify factors that affect the activities of Cyclone Preparedness Programme volunteers regarding early warning dissemination during emergency responses. The research design of this study integrated both qualitative and quantitative approaches. The questionnaires were complemented by face-to-face interviews and Focus Group Discussion with 177 residents of the Koyra and Ukhiya sub-districts (Upazila) to investigate the respondents' responses to early warning information. In addition, a total of 23 CPP volunteers' opinions were collected through a questionnaire survey, to identify the factors influencing CPP volunteering performance. The obtained results also show that both of the study-area communities did not properly understand the cyclone early warning signal system delivered by CPP volunteers. Approximately 49% of the community said that they could not interpret the warning message. The low level of community contact with CPP volunteers also hinders trust in warning messages and evacuation decisions. The findings also concluded that the factors related to the effectiveness of volunteering were found to be individual volunteer's experience, training opportunities, lack of equipment and materials due to lack of budget, the social class of individual volunteers and in the absence of proper coordination. Maintenance of CPP volunteers engaged throughout the year is very challenging.

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These limited engagement features affect the cyclone preparedness and early warning activities of CPP. The government needs to implement policies that enable the mobilization of adequate resources and awareness campaigns to be mobilized toward the volunteers.

Keywords: Cyclone Preparedness Program (CPP), Community Engagement, Early Warning, Volunteerism, Disaster Volunteer

1. INTRODUCTION

Recently, the nature of cyclones in Bangladesh has changed in terms of frequency and intensity. On November 12, 1970, a strong cyclone struck the coastal area with a storm surge of six to nine meters high and more than 300,000 people died (Uclg 2019). According to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, more cyclones will occur in the future, making Bangladesh the most vulnerable country (IPCC 2007). Recent catastrophic weather events the west coast has recently experienced Cyclone Sidr in 2007, Cyclone Aila in 2009, Cyclone Bulbul in 2019, and Cyclone Amphan in 2020. Despite the fact that the country is attacked by almost the same category of cyclones every year, the number of people killed by natural disasters remains low. For example, Cyclone Sidr claimed 4234 lives in 2007, but 138958 lives in 1991(Haque *et al.* 2012). The improvement in the early warning system in Bangladesh and the community-based cyclone preparedness program (CPP) volunteers are believed to play an important role in significantly reducing the number of deaths caused by tropical cyclones, courtesy the dissemination of early warnings to the population.

In 1973, the Bangladeshi government introduced a community-based disaster management method through CPP (Habiba and Shaw 2012). The goal of the CPP is “to minimize the loss of lives and properties in cyclonic disaster by strengthening the capacity of the coastal people of Bangladesh in disaster management.” A joint management mechanism operates the Program through the “Policy Committee” program and “Implementation Board” program comprising of representatives from the Bangladesh Government and Bangladesh Red Crescent Society (BDRCS). The local government manages the administrative part and BDRCS has the mandate to manage the operational aspect of the CPP, which includes volunteer training, equipment, and distribution of manuals for operations.

CPP has a head office, under which there are seven zonal offices. The zonal offices are divided into Upazila (sub-district) offices, the Upazila offices are divided into unions, and the unions are divided into units. The "unit" committee consists of 15 volunteers (10 males and 5 females) divided into five groups. Each unit covers an area of 2.5 square kilometers and has a population of 2000 to 2500 people. A unit committee under a team leader is responsible for the dissemination of early warning information, rescue and relief operations, first aid, and evacuation shelter management. The BDRCS is responsible for recruiting volunteers for the

Unit committee in accordance with the 13 criteria; age between 18-30, strong commitment and attitude to serve people, permanent resident of the locality, ability to read and write and manually independent and self-supporting, *etc.* The CPP program covers 13 coastal districts of Bangladesh. A total of 55,250 volunteers, including 18,410 women and 36,840 men, are currently working in 3684 units (CPP 2021). CPP Volunteers are not paid. The Unit committee under the CPP program collaborates with local governments, NGOs, and communities in order to effectively implement early warning and evacuation plans and programs.

However, owing to the ongoing natural catastrophe crisis in Bangladesh and the circumstances surrounding CPP volunteers, the system does not appear to be working efficiently (Amin 2012; JICA 2013). Despite this, disaster response efforts and community training and awareness initiatives in Bangladesh have been insufficient. (Ahsan *et al.* 2016; JICA 2013; Mahmud 2013). The CPP does have a limitation and does not cover all the cyclone-prone districts in Bangladesh, especially the isolated islands (CPP 2020; JICA, 2013). In addition, the poor road networks in rural areas have made volunteers delay the early warning information. Mahmud (2013) reported that the local people have spoken about the low workforce of CPP volunteer and their incapability to provide logistical support. As a result, the evacuation rates during cyclone disasters remain low in the coastal areas of Bangladesh. Scholars argued the importance of cyclone preparedness program volunteer activities, which are related to conducting the evacuation of people to a safe place. For example, Paul (2009) found a high positive correlation between the rate of evacuation and the understanding of a hazard warning disseminated by CPP volunteers, which indicates that, if warnings are heard and trusted, they are highly likely to result in evacuation. Based on this perspective, hazard warnings can be considered as a social process consisting of interconnected activities: warning messages, information dissemination, message reception, previous experiences, preparedness, and response (Mileti and Sorensen 1990). During Cyclone Komen that hit in 2015, Chakma and Hokugo (2020) found some residents to not receive any cyclone warning information from the CPP volunteers. Amin (2012) in his work with the CPP volunteers in the southwest part of Bangladesh, which mainly focused on the factors affecting the motivation of volunteers. His research found that, there is a difference between males and females in physical formation, which sometimes indicates the negative position of the female volunteers during disaster time, and that social factors also affect motivation.

Studies have shown that training affects the motivation of volunteers, and differences between men and women have been identified in a number of areas, such as ethical behavior, social problem-solving (Goddard *et al.* 1998; Caplan *et al.* 1997). For the CPP, it was found that women were not involved in financial matters, such as relief work, which involves money. This is due to both gender power relations and gender stereotyped work divisions (Tanjeela and Rutherford 2018). CPP program facing some organizational problem such as equipment's problem, training *etc.* (JICA 2013). However, volunteers try to provide early warning information to the community. Since the CPP volunteers come from the community, and they are aware of their locality and can reach the community before any other organization, it is clear that CPP is effective to some extent and work can be put to draw higher potency from it.

2. CPP'S EARLY WARNING OPERATIONAL SYSTEMS IN BANGLADESH

The Hyogo Framework for Action progress reports highlight the success of developing early warning systems that correspond more closely to local needs. Early warning systems can save people's lives and reduce economic damage from natural disasters, such as cyclones, floods, landslides, and other events (United Nation Volunteer 2007). In Bangladesh, once a warning is issued by the Bangladesh Meteorological Department, the CPP headquarters collects information from the Bangladesh Meteorological Department, which is then transmitted to zonal offices and sub-district offices. The sub-district offices transfer this information to the unions (at the village level) through a very high-frequency radio and telephones. Unit teams then disseminate these cyclone warnings throughout the villages. The CPP's volunteers disseminate cyclone warning information to communities, assist with the evacuation of people, sheltering, and rescue operations, and provide first aid to the injured (ADRC 2020, JICA 2013).

Table 1. CPP's cyclone warning propagation process

Communication flow	Communication tools
Headquarters to the Zonal offices & Sub-districts	High-Frequency Wireless system (HF)
Sub-district to the Union level	Very High-Frequency Wireless system (VHF)
Union to the Unit leader	Cell phone
Unit leader to the CPP Volunteers	Cell phone
Volunteers to the Community	Door-to-door visits, using a microphone or megaphone, hoisting two/three flags, by walking, boat, or bicycle.

2.1 CPP's Flag Warning System

The Bangladesh Meteorological Department tracks cyclone movement and communicates with CPP via cell phone or wirelessly when it detects a cyclone formation that can affect the coastal areas. CPP volunteers then use a three-flag warning system (Figure 1) to inform the public of the level of risk. The figure below shows the meaning and use of each flag.

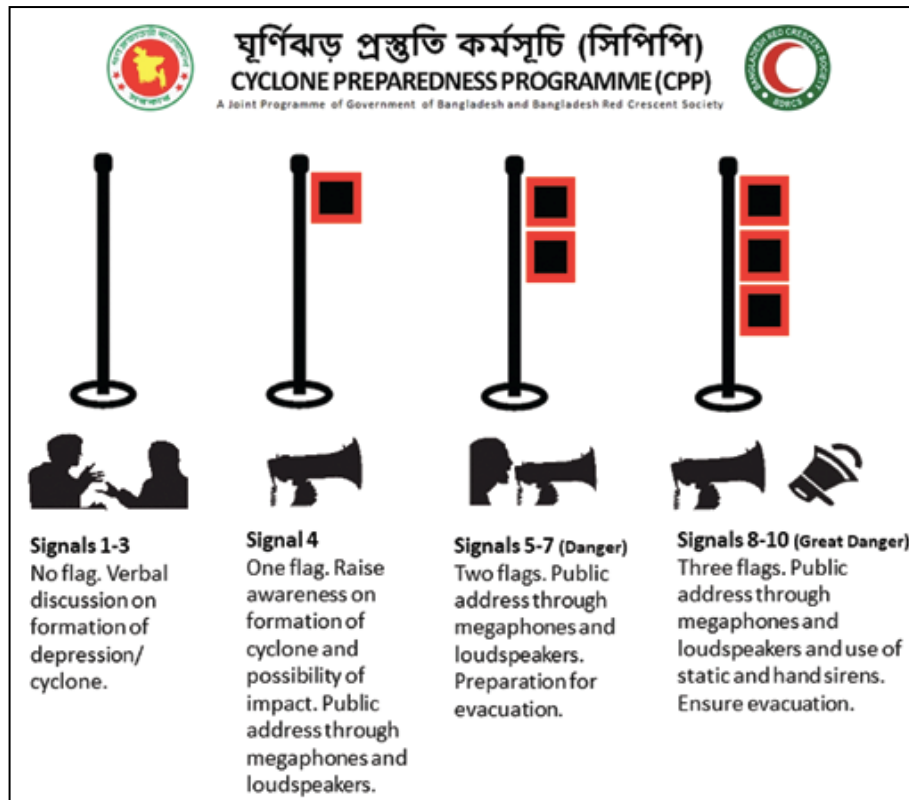


Figure 1. Use of flags in the CPP's warning system

- *Flag-1 (Warning Signal)* A storm has formed with the potential to turn into a cyclone. No megaphone will be used to play warning messages.
- *Flag -2 (Danger Signal)* A cyclone has formed and may come to this area. You have approximately 24 hours until the cyclone arrives. A megaphone will be used to play early warning messages.
- *Flag-3 (Great Danger Signal)* A cyclone has formed and will impact this area soon. You have approximately 10 hours until the cyclone arrives. A siren will sound, and megaphones will play early warning messages (CPP 2021).

3. RESEARCH OBJECTIVES AND METHODOLOGY

This research aims to examine the factors that affect the activities of Cyclone Preparedness Programme volunteers regarding early warning dissemination during emergency responses in Bangladesh. The specific objectives of this study are as follows:

1. To examine the current framework of CPP in Bangladesh and explore the strengths and weaknesses of CPP volunteers.
2. To understand the coastal community's perceptions of early warning information delivered by CPP volunteers

3.1 Methodology

The research plan used both primary and secondary data in order to achieve the objectives. Primary data were collected using a combination of approaches that included open, close-ended, and semi-structured interviews and focused group discussion (FGD). To identify the factors, challenges, and limitations of CPP volunteers in providing early warning dissemination, a total of 23 CPP volunteers' opinions, including both male and female volunteers, were collected through questionnaires. A total of 177 households were surveyed in the study areas (Koyra and Ukhiya sub-districts) using random sampling to assess the performance of the CPP volunteers in their community. Primary data collection by personal visits to the field from community people of the selected areas. If the randomly selected household was absent during the survey, then the neighboring household was interviewed. The questionnaire consists of 5 sections and a total of 30 questions. Questionnaire sections are 1. General Information, 2. Experiences of Cyclone 3. Early Warning information 4. Communication with CPP volunteers and 5. Conclusion. At the beginning of the interview, the researchers explained to the respondents the purpose and goals of the research. With their consent, the interviews took place in the respondents' homes during their free time. On average, each interview took half an hour. One FGD was conducted at the community level to get the qualitative data of the study because participants were free to express their view under this process. Ten participants have attended the discussion. The participants were CPP volunteers, students, household wives, fisherman and day labors. The secondary data used different types of literature, Government and Non-Government Organizations (NGOs) documentations, assessment reports, reports of community-based volunteerism, disaster volunteer, early warnings, scholarly articles, journals, and books. Furthermore, information regarding the CPP activities, policies, and challenges has been gathered from relevant expert bodies using an unstructured questionnaire to gain new or additional insights on the issues being studied, which is also not available in the literature as well as in the primary documents. The relevant expert bodies were the Operation Manager, Documentation and Logistic manager from CPP headquarter, District Rehabilitation and Relief officer, and team leaders from Bangladesh Red Crescent Society, in total 8 key informants were interviewed.

3.2 Description of the study areas

Historically, the coastal areas of Bangladesh have been recognized as a venue for disasters (Chowdhury *et al.* 1993). The sub-districts mentioned below are the most vulnerable areas and are under high-risk zones for cyclones. As cyclones frequently affect these areas, volunteer practices should be developed in these areas. The study areas were selected based on the CPP volunteers' activities and performance during the disaster. Further, there has been no specific research conducted in those areas previously. The Koyra and Ukhiya study areas were considered as study areas for a few reasons.

(1) The selected study area's geographical location is different. Koyra Upazila and Ukhiya

Upazila are located in the southwest and southeast regions, respectively.

(2) Both the areas are severely affected by cyclone SIDR 2007, AILA 2009, Komen 2015, and Bulbul 2020.

(3) In Ukhiya sub-district, it is the local and indigenous people who live in this area. People in this area use different dialects.

(4) In Koyra (sub-district), a CPP's unit was established after Cyclone Aila (May 2009). The Ukhiya CPP unit was under the Cox's Bazar District, which was established in 1973. Subsequently, the Ukhiya Upazila unit was separated from the Cox's Bazar Sadar unit.

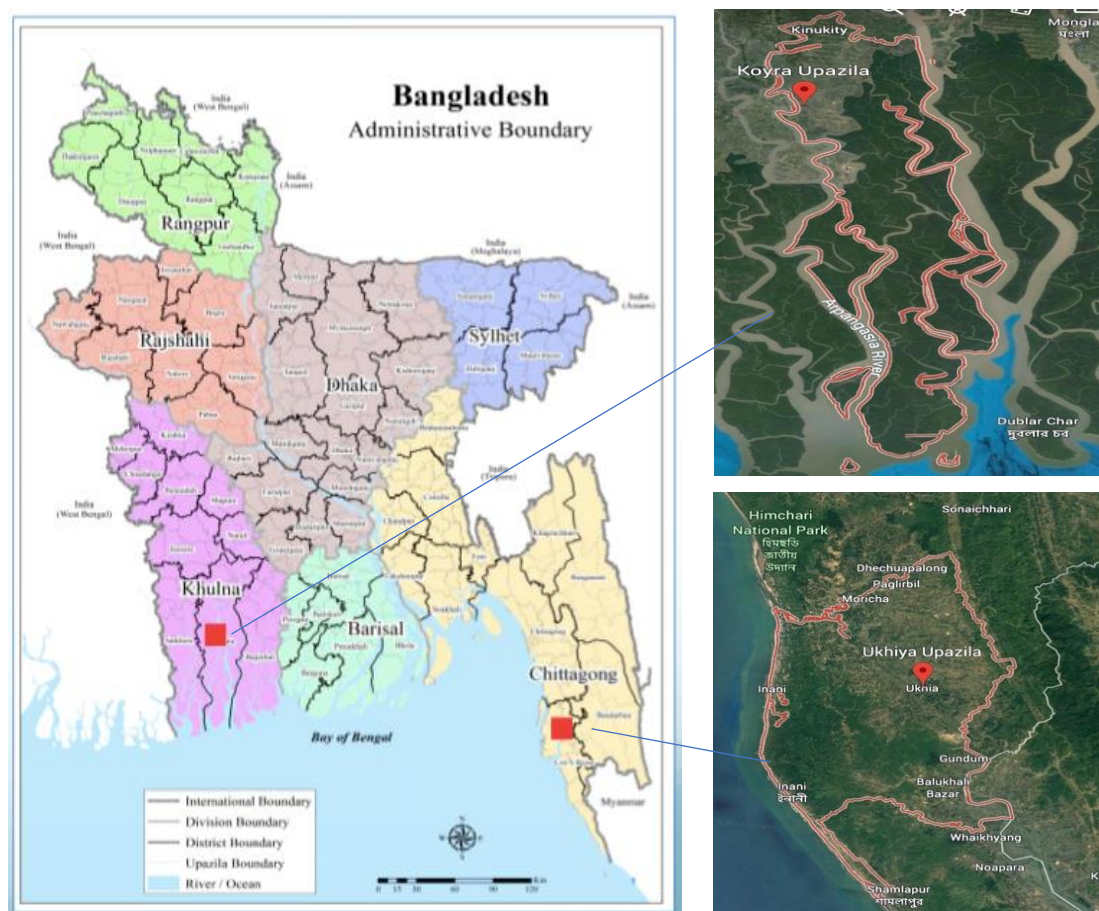


Figure 2. Map of the study areas

4. RESULTS

The results of the survey were classified into two main categories: (4.1) Identifying the challenges, and limitations of CPP volunteers in providing swiftly disseminating early warning, and (4.2) Assessment of the volunteer performance of CPP from a community's viewpoint.

4.1 Identifying the challenges, and limitations of CPP volunteers in providing swiftly disseminating early warning

4.1.1 Characteristics of the respondents (CPP Volunteers)

The respondents included 39% female and 61% male CPP volunteers who resided in their community. Only 9% had obtained a higher secondary qualification. The male volunteers (30%) were farmers and fishermen. More than 35% of female volunteers were housewives. The average age of the volunteers was 30.5 years.

4.1.2 Early warning information to the community

Table 2. Advantages and limitations of different early warning systems and other methods used for raising awareness of people at risk

Early warning methods	Advantages	Limitations
Early warning from radio and television	Alert the community and provide the latest information to prepare for evacuation.	Without electricity and battery, both assets do not work, especially in remote rural areas.
CPP volunteers' early warning information (face-to-face in every household)	Helps those who did not receive the evacuation order from any sources to evacuate to safe places.	Due to storm surge, wind, and poor road network, volunteers are unable to deliver information to remote areas in a face-to-face manner in time
CPP volunteers display a warning flag	The flags are easily visible in the coastal areas.	It is difficult to understand the meaning of each flag and see it from a distance.
Use of a hand siren by CPP volunteers	It is easy to understand and is able to alerts the community faster.	It is heavy to carry and it may function only toward the wind direction.
Use of a Megaphone by CPP volunteers	It is easy to communicate and provides clear-cut evacuation orders.	It has limited coverage and battery capacity.

Early warning helps in evacuating people to a safe place before the cyclone makes landfall to minimize the loss of life and property. The CPP has provided different early warning equipment: sirens, megaphones, and other devices that volunteers can broadcast as early warning signals (CPP 2021). Moreover, CPP volunteers are trained to operate an alarm system.

They receive early warning messages via wireless/mobile/radio/television; and organize preparatory meetings at the unit, union, and sub-district levels. They then start broadcasting warning messages, alerting people to actions based on the signal level, and listening to weather forecasts on the radio. This was followed by the door-to-door information provided to communities in remote rural areas.

Table 2 shows five early warning sources that have been used to notify people threatened by previous cyclones. The various sources include the CPP volunteers' actions, such as radio and television warning messages; warning information from governments and NGOs; and the use of flags, sirens, and megaphones.

4.1.3 Difficulties faced by the CPP volunteers during the operational time

The road network in coastal areas is not well-connected, and evacuees usually go to the nearest public cyclone shelter (Ahsan *et al.* 2016). Volunteers also note that there are no designated CPP for the char (isolation) areas (JICA 2013). According to the volunteers, the road network in the Koyra region is worse than that in the Ukhiya region. CPP volunteers typically visit each home to provide evacuation information and suggest evacuations to the nearby public cyclone shelters. At Koyra, 58% of the volunteers said that it took longer to disseminate early warning information due to poor road networks, and lack of manpower and equipment made it difficult to communicate information at night. They said that the community was not reachable at night due to storm surges, heavy rains, and winds.

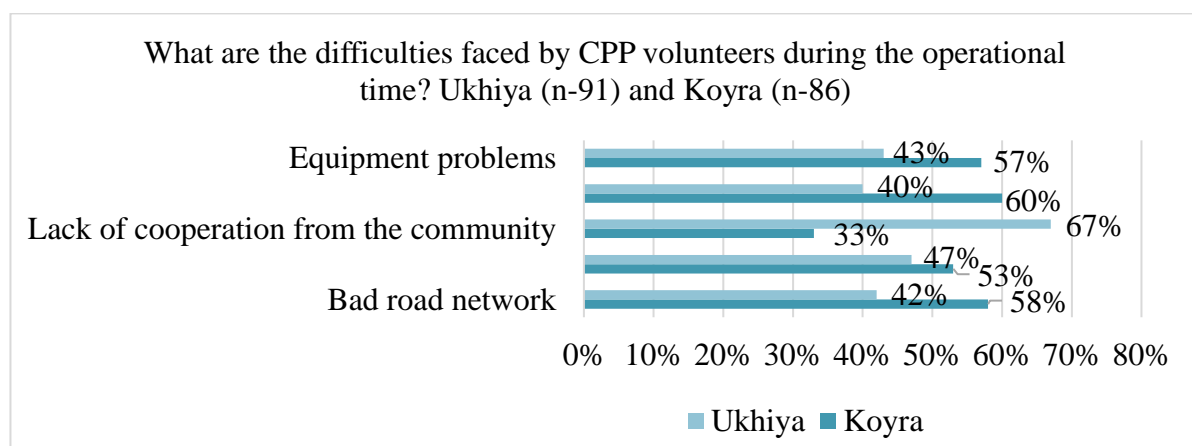


Figure 3. Difficulties during the operational time

Volunteers also pointed out that it is very difficult to deliver an early warning to fishermen who venture offshore. Even if fishermen have cell phones and walkie-talkies, communication offshore is impossible because of the limited mobile communication network signals. JICA (2013) reported that 25% of the deaths caused due to cyclone Aila in 2009 were of fishermen.

CPP volunteers distributed early warning signs and other materials for first aid and rescue operations by providing volunteers with early warning equipment such as megaphones and sirens. However, 57% and 43% of the Koyra and Ukhiya respondents, respectively, said they do not have sufficient equipment in case of an emergency. Some equipment is very old and unusable. For example, a high-quality battery is required to use a loudspeaker. This equipment is not updated sometimes, which leads to malfunctions in emergencies. In this case, the volunteers buy new batteries with their own money, although this is not their responsibility. Additionally, many volunteers did not receive personal items such as helmets, rubber boots, raincoats, life jackets, flashlights, and other necessary equipment. First, the CPP provides priority equipment to the warning and first aid teams. Dissemination of disaster information downstream of sub-districts is delayed due to CPP's lack of equipment. However, CPP volunteers are prepared to perform their duties even without appropriate experience and equipment. Volunteers also state that mobile phones helped speed up early warning information dissemination rates, especially during Cyclone Aila in 2009. However, mobile networks do not cover all coastal areas in Bangladesh. According to the results of the interview survey, 60% of the volunteers from Koyra and 40% of the volunteers from the Ukhiya sub-districts stated that intense winds and rains caused the phones systems to go down sometimes. They have difficulty communicating with other volunteers if the phone towers are damaged. Even though they receive the information from other sources, it slows down the dissemination of information to the community.

4.1.4 CPP training during the normal time

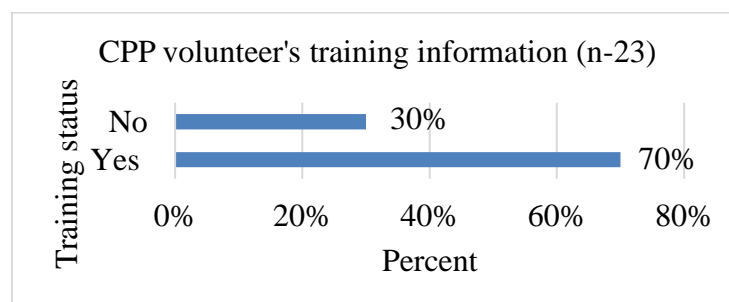


Figure 4. CPP volunteer's training information

Training of the CPP volunteers takes place twice a year, in April and September respectively (CPP 2021, JICA 2013). However, the training has not been conducted regularly, due to a lack of funding. Training of new CPP volunteers is conducted once a year before April, which has not yet been fully implemented (CPP 2021). Figure 4 shows that approximately 70% of the CPP volunteers have received basic training. However, 30% of the participants were not trained. Volunteers said that they took refresher courses without any basic training knowledge.

Additionally, some volunteers received the same training more than once. Early warning dissemination is one of the most important tasks of CPP volunteers, in addition to search and rescue, evacuation, sheltering, and first aid when a cyclone strikes. Volunteers who have not received training in search and rescue and first aid are members of the search and rescue teams. Therefore, these volunteers must be able to perform the assigned tasks in the areas for which they are responsible with minimal training.

4.1.5 Factors related to CPP volunteer motivation and volunteering

Table 3. Factors associated with the motivation for the performance of CPP volunteers'

Characteristics	Gender (Volunteers)			P values
	Male (n-14)	Female (n-9)	N-23 (%)	
Age (in years)				
20-39	9 (53%)	8 (47%)	17 (100%)	0.005*
40-50+	5 (83%)	1 (17%)	6 (100%)	
Knowledge about emergencies				
Yes	13 (72%)	5 (28%)	18(100%)	0.034*
No	1 (20%)	4 (80%)	5 (100%)	
Past experiences of working as a CPP volunteer				
0-4 years	1 (14%)	6 (86%)	7 (100%)	0.029*
Over 3 years	13 (81%)	3 (19%)	16 (100%)	
Received training				
Yes	12 (86%)	2 (14%)	14 (100%)	0.036*
No	4 (44%)	5 (56%)	9 (100%)	
Attended any awareness campaigns over the past years				
Yes	9 (100%)	0 (0%)	9 (100%)	0.002*
No	5 (36%)	9 (64%)	14 (100%)	
Individual equipment				
Yes	9 (90%)	1 (10%)	10 (100%)	0.012*
No	5 (36%)	8 (64%)	13 (100%)	
Insurance coverage				
Yes	3 (100%)	0 (0%)	3 (100%)	0.019*
No	5 (100%)	0 (0%)	5 (100%)	
No Idea	6 (40%)	9 (60%)	15 (100%)	
Recognition of responsibility				
Yes	9 (82%)	2 (18%)	11 (100%)	0.04*
No	5 (42%)	7 (58%)	12 (100%)	

*The chi-square test statistic was significant at the 0.05 level.

A socio-cultural approach is applied to explain the variation in volunteer participation and motivation as a volunteer. Focused group discussion and Key Informant Interviews were conducted based on the study objectives. The activities and motivation of the CPP volunteers are considered to have a significant influence on the process of disaster volunteerism. The characteristics are gender, age personal experience, training, personal equipment, awareness campaigns, awareness of liability, and insurance. The participation and motivation of male and female volunteers were positively related to previous disaster experience, training, personal equipment, disaster drills, awareness programs, insurance, *etc* ($P > 0.05$, Table 3).

Volunteers (male and female) stated that helping their community is their main motive behind volunteering. Most of the interviewees said that male and female volunteers make the same warning signals. Typically, while female volunteers broadcast the warning messages indoors, while men provide information outdoors and in remote areas. At the village level, due to religious practices and cultural sensitivities, the male volunteers are unable to enter some houses, while female volunteers can easily enter the houses and help to evacuate to a safe place. Women tend to listen to female volunteers rather than male volunteers. However, this changes from region to region and from community to community. Male and female volunteers do not see joint participation as an issue; rather, they see it as a complementary force. These emotions help improve the volunteers' motivation levels. It is also found that female volunteers had relatively less knowledge of their roles and responsibilities than their male counterparts. Many female volunteers work without having received any training. Gender issues should be addressed, and women's participation in disaster risk reduction should be increased to reduce the vulnerability of women.

4.2. Assessment of the volunteer's enactment of CPP from the community's viewpoint

4.2.1 Characteristics of the respondents (Community)

Of the total respondents were 59.9% males and 40.1% females. The average age of the respondents was 35 years. While most respondents were farmers, fishermen, and business owners, although 21.5% were housewives. Notably, their education level was not high. Of the respondents, 41.8% were uneducated. Furthermore, 48%, 9%, and 1.1% of the respondents attended primary and secondary schools, colleges, and universities respectively.

4.2.2 Communities' primary source of early warning information

In order to raise awareness about disaster risk reduction, communities need to be aware of the early warning systems and have easy access to early warning sources. CPP operations, such as the use of flags and sirens, are effective in coastal areas. Locals depend almost entirely on CPP for early warning of tornadoes. As shown in Figure 5, 43% and 37% of the Koyra and

Ukhiya respondents, respectively, received cyclone warnings and evacuation orders from CPP volunteers who disseminated the information via door-to-door visits. Radio is the main source of early warning for people living in the coastal areas of Bangladesh. Nearly 25% of those interviewed in Koyra and 29% in Ukhiya received an evacuation order on the radio. This is because there is no electricity in remote rural areas where battery-powered radios can be used. Nearly 28% of the respondents received warnings from their Neighbor and loved ones. In particular, women share information within their communities. People have also received warnings from the Bangladesh Meteorological Department, NGOs, elected members, television, religious sources, and more. However, NGOs can only provide information to their beneficiaries/stakeholders, which is a major limitation.

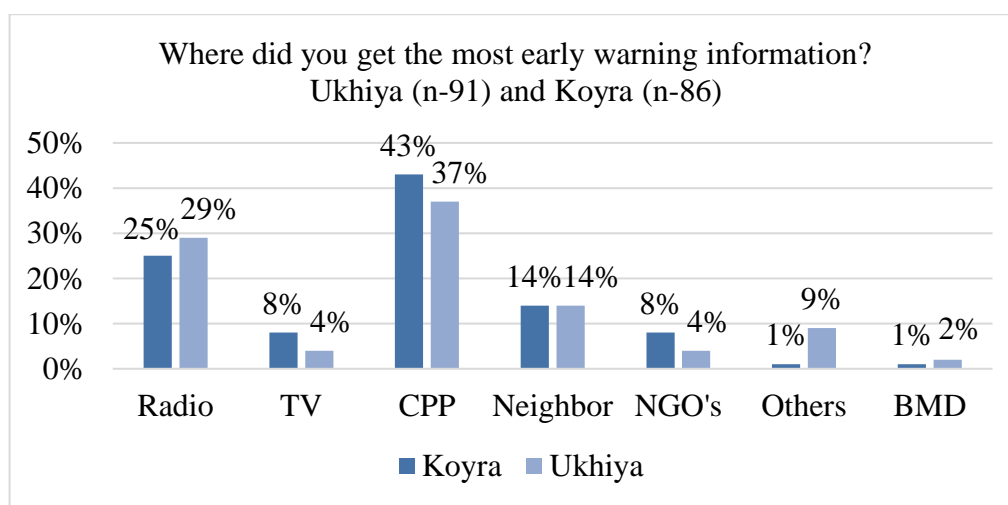


Figure 5. Early warning information

4.2.3 Understanding the signal disseminated by CPP (Flag System)

CPP volunteers use the “three flag system” to inform the community of the level of risk. In November 2018, the disaster warning system was revised following the amended Disaster Management Act (UNDP 2018). Research has shown that 42% of the community members understand the flag warning signals propagated by CPP volunteer. The cyclone warning signals in Bangladesh range from one to ten, depending on location, storm surges and wind speed. They divided these ten signals into three flag systems for easy understanding by the residents. The results show in the study areas, only 42% of both male and female respondents were aware of the national flag warning system. On the other hand, 37% and 21% of the male and female respondents were unaware of the flag warning system. The education level of the householders showed a high correlation with the awareness and understanding of the early warning system ($p > 0.05$, Table 4). This factor is an important reason for disaster preparedness and evacuation. It also shows that the socioeconomic factors play an important role in understanding the flag early warning system used by CPP volunteers. This question is especially important for

fishermen. Excluding radio, the flag warning system is the only source of cyclone early warning information for fishermen fishing in the offshore.

Table 4. CPP disseminated warning signal (Flag System)

Understanding of the CPP disseminated warning signal (Flag System)					
Characteristics	Yes (%)	No (%)	No idea (%)	n	P value
Gender					
Male	58 (55%)	31 (29%)	17 (16%)	106 (100%)	P= .000*
Female	16 (23%)	34 (47%)	21 (30%)	71 (100%)	
Total	74 (42%)	65 (37%)	38 (21%)	177 (100 %)	
Education level					
Not educated	16 (22%)	30 (41%)	28 (37%)	74 (100%)	P= .000*
Primary & secondary	41 (48%)	35 (41%)	9 (11%)	85 (100%)	
College	15 (94%)	0 (0%)	1 (6%)	16 (100%)	
University	2 (100%)	0 (0%)	0 (0%)	2 (100%)	
Total	74 (42%)	65 (37%)	38 (21%)	177 (100%)	
Occupation					
Farmer	28 (37%)	30 (40%)	17 (23%)	75(100%)	P= .000*
Business and job	23 (70%)	7 (21%)	3 (9%)	33(100%)	
Housewife	10 (26%)	15 (40%)	13 (34%)	38 (100%)	
Fishermen	11 (100%)	0 (0%)	0 (0%)	11 (100%)	
Others	2 (10%)	13 (65%)	5 (25%)	20 (100%)	
Total	74 (42%)	65 (37%)	38 (21%)	177 (100%)	

* The chi-square test statistic is significant at the 0.05 level

4.2.4 Understanding the early warning message delivered by CPP using megaphones

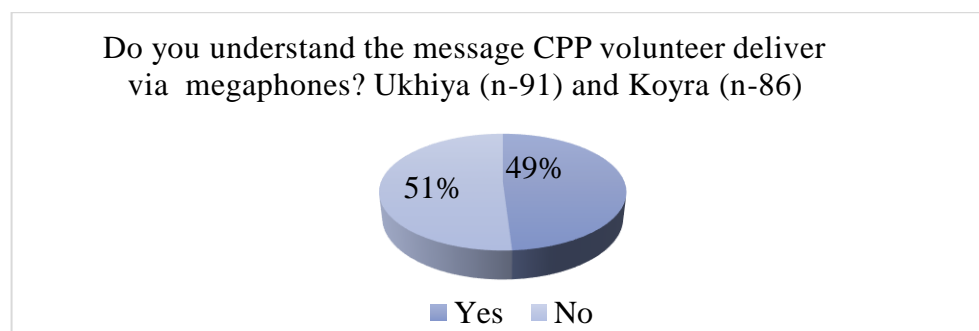


Figure 6. Understanding level of the early warning message provided by deliverers using megaphones

Table 5. Reasons not to understand

Sub-District	Reasons not to understand				
	Message content is not clear	Sound system	It does not reach us	Language issue	Total
Koyra	31%	44%	22%	3%	36 (100%)
Ukhiya	18%	40%	12%	30%	50 (100%)

CPP volunteers use megaphones to disseminate early warning information to the community. However, as shown in Figure 6, 91 (51%) of the respondents understood the information announced by megaphones. The remaining 86 (49%) did not clearly understand the message content. The reasons for this gap in understanding are shown in Table 5; the community members could not interpret the CPP volunteers' messages delivered through megaphones. Language is one of the most important issues. Cyclone warnings are usually broadcast in the official language of Bangladesh (Bangla), which is not always understood by people in vulnerable communities. The people of Ukhiya often use local dialects that are different from Bangla. In addition, people of different ethnicities have their own dialects. Therefore, those who are not well educated cannot interpret the warning messages. Moreover, the warning message does not always provide information about the severity of the events, preparation time, etc. This could be due to the lack of knowledge of the community members about the disaster, or the government's inability to handle it properly. Some respondents from Koyra and Ukhiya noted that the sound produced by the megaphones used by CPP volunteers only reached in the direction of the wind, whereas those on the opposite side had little chance of hearing such warnings.

4.2.5 Communication with CPP volunteers

A previous study indicated higher rates among the evacuee households in terms of both the percentage of early warning recipients and the understanding level of early warnings (Ahsan *et.al*, 2016). In addition to this scenario, the communities' low level of contact with CPP volunteers also restrains them from trusting on warning messages and decision making for evacuation, thus showing a significant positive correlation between the community members and their contact levels with CPP volunteers and evacuation decisions.

As illustrated in Figure 7, the Koyra community showed good communication skills with CPP volunteers (55%) than the Ukhiya community (45%). After 2007, many cyclones hit Koyra Upazila. Thus, the community became more aware than before. It is found that the percentage of evacuees was higher among those who participated in cyclone preparedness training before Aila. They attempted to maintain regular contact with CPP volunteers, especially during cyclone periods. It is found that, communication with CPP volunteers offers

households preparedness, an understanding of the early warning messages, and reliability in the received warning signal.

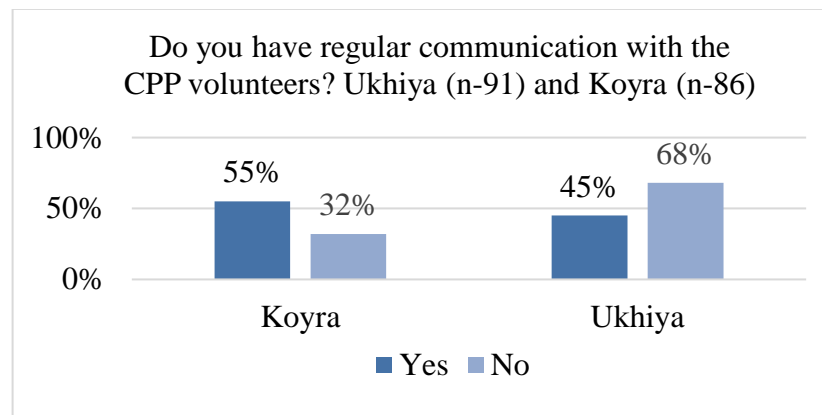


Figure 7. Regular communication with the CPP volunteers

5. FINDINGS AND DISCUSSION

This study examined the important factors that influence the scope of CPP volunteer's involvement in early warnings and the coastal resident responses to warnings. The survey results revealed that the communities in both the study areas did not properly understand the cyclone early warning messages. Accordingly, some researchers have studied the ways to improve the role of voluntary organizations in the field of disaster management from various viewpoints, such as management, participation, and organizational effectiveness (Wymer and Samu 2002, Jung and Ha 2021). However, this research acknowledges the factors affecting the volunteers' activities in early warning and communities understanding of the level of early warning methods. Besides on the results of the questionnaire survey, the key findings are discussed in the following sections.

5.1 Individual factors affecting the performance and motivation of CPP volunteers

People decide to engage in volunteering work for several reasons. People have for long been able to volunteer in traditional support networks based on the ideals of solidarity and reciprocity for a long time (Kaseke and Dhembe 2006). Evidence shows that the CPP volunteers' performance and motivation depend on factors such as age, individual work experience, education, and personal satisfaction. It has also been found that volunteer satisfaction is related to the involvement of BDRCS. During the normal times, there is no communication between the BDRCS and the CPP volunteers. According to Shi *et al.* (2018), training and education are the commonly used strategies to increase knowledge and awareness. Germany, Australia, and other countries have developed an emergency training system for

emergency volunteer services. Skoglund (2006) recommended that the volunteer organizations should develop a support group and ongoing training seminars. Emergency preparedness training can help people learn more about how to be safe and make better decisions. In the case of CPP volunteers, respondents admitted that they received basic training from BDRCS; however, volunteers who have not been trained in search and rescue continue to be members of the search and rescue team. It is, therefore, undesirable for these volunteers to carry out the assigned tasks without minimal training in the field they are in charge of. The research explores that volunteer who have experience working in emergencies are more eager to participate in volunteering. Previous studies have identified 30-50 years as the most active age for volunteering. Smith believed that this may be due to an improvement in the socioeconomic status of the middle-aged people. Evidence shows that age is the most consistent and strongest determinant of CPP volunteer participation; while emergency awareness campaigns appear to be a significant factor influencing volunteering participation (Table 3). The research examining the gender differences in volunteering has brought out differences. Other studies have indicated that gender makes a difference depending on the variable being measured, such as the amount of time and frequency of volunteering. (Rosenthal *et al.* 1998; Todd, Davis, and Cafferty 1984). The results of this study show the participation in emergency volunteering to be higher for male volunteers than for female volunteers. The female volunteers were not provided with safety gear (raincoats and gumboots) during times of early warning and rescue broadcasting. As a result, female volunteers performed lower than male volunteers during search and rescue operations. Presently, 34% of the CPP volunteers are women. Despite the many factors, in this case, a positive factor is that young people are more likely to participate in CPP. McGee (1988) notes that recognition can improve morale and productivity. This reward program has a greater significance than the monetary value of the prize; it fosters a positive attitude. We found that the willingness to volunteer was significantly influenced by the degree of recognition of responsibility (Table 3). Amin (2012) claimed that there was previously a provision for awarding certificates to the volunteers, which incentivizes other volunteers to perform better. A large number of male volunteers get recognition for their relief work. However, female volunteers have expressed their powerlessness and spoken about the fewer opportunities available to them in management capacity in the area of public work (Tanjeela and Rutherford 2018). The research reveals that a lack of proper safety issues also hinders their participation in CPP. The CPP volunteers' commitment to helping others was a sacrifice that ultimately claimed the lives of 26 volunteers (Amin 2012). The BDRCS and other volunteers learned a lesson in prioritizing safety and security in the aftermath of the tragedy. Volunteers are discouraged from being provided with microphones, however they must purchase batteries for these microphones with their limited personal resources. The lack of functional equipment makes it difficult for volunteers to provide warnings. It may even lead to them leaving with their families instead of staying and helping. However, in developed countries such as Japan, volunteer fire corps (Shobo-dan) are trained in disaster management, including how to use various tools such as handheld loudspeakers, fire bells, sirens, and fire engines loudspeakers to warn communities throughout the affected areas (Ishiwatari 2012). In the United States, Community Emergency Response Teams (CERT) were established following Hurricane

Katrina in the United States. These involved local volunteers trained in disaster preparedness and response, which became more vital to make disaster management as effective and safe as possible for both survivors and rescuers (CERT 2020). Therefore, it is necessary to have appropriate equipment. Unfortunately, in CPP equipment maintenance is an issue that must be addressed via the increasing of budget. However, resources are not available to satisfy this requirement. They are needed to not only increase volunteer participation, but also ensure adequate early warning equipment to disseminate warning information to the community in time.

5.2 Community factors

Development of a community-based disaster risk management plan is also important for clarifying the role of each participant in both routine and emergency situations. CPP volunteers and community members have realized that volunteering is mutually beneficial. Previous studies conducted in several countries have shown that people who have a strong awareness of the neighborhood and a sense of belongingness to the community are the most likely to participate in community volunteering activities. Rural residents are more likely than urban residents to engage in volunteer work (Shi *et al.* 2018). In Bangladesh, rural communities have stronger bonds and a stronger sense of community than urban communities do. This is not an exception in Asian countries such as China, India, and Japan. The study explores how the Koyra and Ukhiya's local communities have some knowledge and skills pertaining to early warning systems and response strategies. However, it is difficult to access this information. Currently, information is disseminated through social media and the internet, especially in the case of disasters such as frequent cyclones and floods caused due to climate change. They may have received this information after it was translated into the local language, for the information was delivered primarily in Bangla and English. In Ukhiya, 30% of the respondents answered that they could not interpret the language announced by the CPP. This is because of the ethnic communities having different dialects. It is vital that local people understand and access information through technology; however, their knowledge of accessing technology is limited. Communication between the various local NGOs and communities on disaster preparedness issues was lacking in both Koyra and Ukhiya sub-districts. One of the important aspects of the evacuation drills was unsatisfactory in both the study areas. Both communities were found to be highly vulnerable to cyclones, as they had never received any disaster drills and had minimal community awareness about preparedness before and during the disaster. The research found the sociodemographic factors such as gender and education to impact the awareness of risk and the ability to prepare for risk reduction. In particular, education level has a considerable influence on understanding the flag warning system. Women do know about the cyclone early warning signal dissemination. Unfortunately, they could not interpret them because of the lack of proper knowledge and there being a lower level of education. The results show 55 illiterate women to not know anything about the flag warning system signals (Table 4). The correlation between the lack of education and lack of knowledge about early warning signals was highly

significant ($p = 0.00$) (Table 4). They had to wait for someone who could disclose the existing early warnings and information regarding the preparations for evacuation. In the study areas, most of the existing access roads are made up of earthen materials, which become slippery during rainy seasons, and especially vulnerable people find great difficulty reaching the nearby shelter using these roads. It has also been noticed that most of the households are located in such a place, from where it will take approximately 20–60 minutes to reach a nearby shelter; however, it sometimes takes more time because of the unfavorable road and weather conditions that prevail during the cyclone.

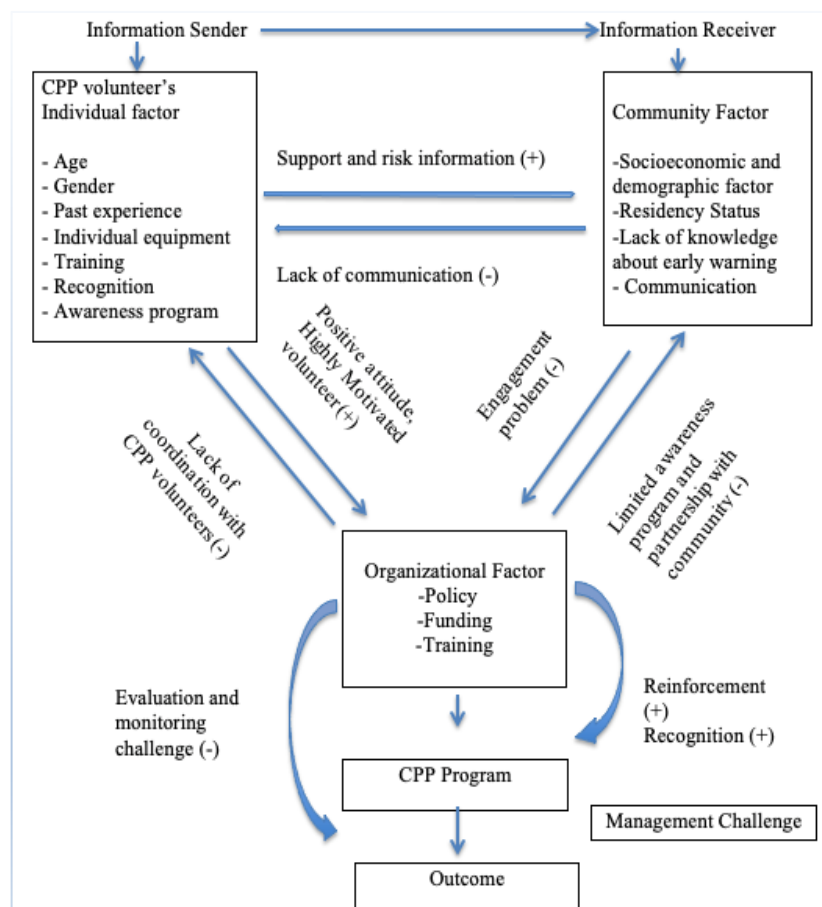


Figure 8. Framework for the factors associated with the scope of CPP volunteer involvement

5.3 Representative organizational issues

Countries with a well-established volunteer system have many volunteers. In the United States, 40% of the population is involved in volunteer services. Germany has a population of about 82 million, with 23 million volunteering and 1.8 million providing emergency volunteer services (Shi *et al.* 2018). A previous study reported that, while Bangladeshi government pays the salaries of CPP employees, there is no compensation provided to the CPP volunteers for

the program operation costs they incur at the field level, including their capacity building (Amin 2012). The program's operation is entirely reliant on external funds. There is no insurance coverage for the CPP volunteer's injuries. In Japan and Germany, a sound volunteer risk management system, such as a volunteer insurance plan, is used to encourage emergency volunteer services. In Germany, the government has a legal obligation to purchase insurance for volunteers (Shi *et al.* 2018). Despite the efforts of voluntary organizations for disaster management, the activities of these organizations have not always been successful. For example, when Hurricane Katrina hit the United States in 2005, volunteers were unable to seamlessly integrate into the disaster response phase (Jung and Ha 2021). The employees of voluntary organizations did not know how to manage volunteers or the work that had to be done at that time. However, after the experience of Hurricane Sandy in 2012, volunteers help to spread the early warnings information and help to evacuate to shelters. It is found that, developed countries like Japan, Australia, and New Zealand provide strong financial support to their emergency volunteering (Mackwani and Sullivan 2016; Jung and Ha 2021). This regular emergency training can ensure that personnel with qualified skills can be effectively deployed to participate in emergency volunteer services during disasters. Training and regular communication stimulate volunteer action. Despite the fact that Bangladesh has not yet developed a community-based emergency training program, it does not have volunteers with specific knowledge and skills to respond to emergencies. According to CPP, the government has its disaster management strategies and objectives keeping with the government policy. In addition, CPP lacks a specific monitoring and evaluation system. Evaluating the program provides the ultimate justification for a volunteer program. Brudney (1996) defined evaluation as "the systematic collection of information about the processes and outcomes of a volunteer program and the use of that data to evaluate the program and hopefully improve it." The study discovered that although there is a union disaster management committee at the union level that is supposed to disseminate cyclone early warnings, it is not functional. There is a lack of accountability and insufficiency in the financial, logistical, and training resources available. To sustain the program, it is important to strengthen the accountability of volunteers by ensuring follow-ups at all levels, including from the headquarters to the CPP units at the village level.

6. CONCLUSIONS

In Bangladesh, CPP volunteers are gradually becoming the most reliable source of early warning, in addition to them assisting communities during cyclones in evacuation shelters (Ahasn *et.al*, 2016; Rahman, *et.al*, 2021). The CPP volunteers managed to significantly reduce cyclone casualties from 300,000 in the 1970s to 190 in Aila 2009 and to just 17 in Mahasen in 2013 (IFRC 2017). Volunteers are accepted by the community members in the coastal regions. However, the present study results show that the volunteers of the preparedness program are unable to disseminate warning information in a timely manner because of their limitations, such as lack of human resources, lack of modern gear, and poor transport systems to reach

remote areas. Interviews with the BDRCS and CPP volunteers revealed that they faced some challenges during the operational time. First, it was difficult to take appropriate and prompt action in an emergency situation where no operational manual was available, and unexpected events occurred one after another. This is one of the reasons why some people receive timely evacuation information and some people do not. The volunteers just follow the higher level authorize the decision. It's a top-down approach. During cyclone Mahasen in 2013, an early warning and evacuation order issue from the district level was delayed by 2-3 hours, being transmitted CPP to Upazila (sub-district) level due to the time required to obtain get permission to deliver the evacuation information at each level (JICA 2013). The above framework shows that individual stakeholders (CPP, Community, and the Organizations) could make a significant contribution, but multiplier effects are still missing. The networking process, especially during normal periods, is expected to result in a shift in pre-disaster risk management. This study argues that the Bangladesh Red Crescent Society should concentrate on providing equipment and training to all volunteers so they can disseminate the warning information on time. The study also uncovers the details of gender-based involvement and issues working as a CPP volunteer that has not been widely reached in the past. The CPP program should provide equal opportunities (training, relief work) for both male and female volunteers to revive the program.

Residents of Bangladesh's coastal areas are poor and have little access to radio or television. As a result, they must rely entirely on the CPP volunteer's information. According to the findings, the community did not fully comprehend the cyclone early warning signal system. The problem that exists on the receivers' side is that they wait until the last minute to evacuate (Paul 2009; Ikeda 1995). When the flags are displayed, people may use their view to understand that the intensity and severity of the hazard event are increasing, but they do not know the depth of the signals. The warning signals also do not provide adequate indications of when people should evacuate, seek shelter, or remain in their home. When signals are provided, they can be difficult for coastal residents to understand because knowing the wind speed is insufficient. This clarification is required to improve the effectiveness of the warning system. This could be due to community members' lack of knowledge about the disaster or to the government's failure to manage it properly. There are not enough cyclone shelters and embankments in the study areas, despite the fact that thousands of people live there. Also, the road network is very poor that's the reason CPP volunteers did not disseminate the warning information to the community on time. Finally, a large-scale awareness program among the locals, capacity building of the responsible authorities, and increasing the facilities provided to vulnerable groups can introduce a change in the current scenario and lead to the emergence of disaster-resilient communities in both study areas.

REFERENCES

- Ahsan, Md. N., Takeuchi, K., Vink, K., and Ohara, M. (2016) A systematic review of the factors affecting the cyclone evacuation decision process in Bangladesh. *Journal of Disaster Research*, 11 (4): 742-753. <https://doi.org/10.20965/jdr.2016.p0742>
- Amin, R. (2012) Motivating volunteers: A case of cyclone preparedness programme volunteers in Bangladesh. Dissertation, BRAC University, Dhaka.
- Asian Disaster Reduction Center (2017) Country Report: People's Republic of Bangladesh. Retrieved from: http://www.adrc.asia/countryreport/BGD/2013/BGD_CR2013B.pdf
- Bangladesh Red Crescent Society (2008) Working to Improve Disaster Preparedness.
- Brudney, J. (1999) The effective use of volunteers: Best practices for the public sector. *Law and Contemporary Problems*, 62 (4): 219-255. doi: 10.2307/1192274
- Caplan, P J., Crawford, M, Hyde, J. S, & Richardson, J. (1997), *Gender Differences in Human Cognition*, Oxford University Press, New York. <https://doi.org/10.1093/acprof:oso/9780195112917.001.0001>
- CERT (2020) Community Emergency Response Team Program. Retrieved from: <https://community.fema.gov/PreparednessCommunity/s/welcome-to-cert>
- Chakma, S., and Hokugo, A. (2020) Evacuation behavior: Why do some people never evacuate to a cyclone shelter during an emergency? A case study of coastal Bangladesh. *J. Disaster Res.*, 15 (4): 481-489. <https://doi.org/10.20965/jdr.2020.p0481>
- Chowdhury, A. M. R., Bhuyia, A. U., Choudhury, A. Y., and Sen, R. (1993) The Bangladesh cyclone of 1991: Why so many people died. *Natural Hazards*, 17 (4): 291-304. <https://doi.org/10.1111/j.1467-7717.1993.tb00503.x>
- CPP (2021) CPP at a glance. Retrieved from: <http://www.cpp.gov.bd/site/page/39599343-77e6-45e7-9e8d-491270f56690/->
- Dash, N. and Gladwin, H. (2007) Evacuation decision making and behavioral responses: Individual and household. *Natural Hazards Review*. 8 (3): 69-77 [https://doi.org/10.1061/\(ASCE\)1527-6988\(2007\)8:3\(69\)](https://doi.org/10.1061/(ASCE)1527-6988(2007)8:3(69))
- Goddard, L., Dritschel, B., and Burton, A. (1998). "Gender Differences in the Dual-Task Effects on Autobiographical Memory Retrieval During Social Problem Solving," *British Journal of Psychology*, 89(4). <http://doi.org/10.1111/j.2044-8295.1998.tb02706.x>
- Habiba, U., & Shaw, R. (2012). Bangladesh experiences of community-based disaster risk reduction. In R. Shaw (Ed.), *Community-Based Disaster Risk Reduction* (pp. 91-111). (Community, Environment and Disaster Risk Management; Vol. 10). [https://doi.org/10.1108/S2040-7262\(2012\)0000010012](https://doi.org/10.1108/S2040-7262(2012)0000010012)
- Haque, U., Hashizume, M., Kolivras, K. N., Overgaard, H. J., Das, B., and Yamamoto, T. (2012) Reduced death rates from cyclones in Bangladesh: What more needs to be done? *Bulletin of the World Health Organization*, 90 (2): 150-156. <https://doi.org/10.2471/BLT.11.088302>
- IFRC (2017). Early warning, early action save thousands as Cyclone Mora Strikes Bangladesh. <https://reliefweb.int/report/bangladesh/early-warning-early-action-save-thousands-cyclone-mora-strikes-bangladesh> [Accessed online 19 December, 2021].

- Ikeda, K. (1995) Gender differences in human loss and vulnerability in natural disasters: A case study from Bangladesh. *Indian Journal of Gender Studies*, 2 (2): 171-193. <https://doi.org/10.1177/097152159500200202>
- IPCC (Intergovernmental Panel on Climate Change) (2007) Summary for policymakers. In: Parry ML, Canziani OF, Palutikof JP, van der Linden PJ, and Hanson CE, (eds.), *Climate Change*. Cambridge University Press: Cambridge, UK
- Ishiwatari, M. (2015) *In Community-Based Disaster Risk Reduction: Community, Environment and Disaster Risk Management*. Emerald Group Publishing: United Kingdom, pp.19-33.
- JICA (2013) Data Collection Survey on Early Warning and Disaster Information System in Coastal Area Final Report. Retrieved from: https://openjicareport.jica.go.jp/pdf/12125548_01.pdf
- Jung, D. Y. and Ha, K. M. (2021) A comparison of the role of voluntary organizations in disaster management. *Sustainability*, 13 (4). <https://www.doi.org/ss10.3390/su13041669>
- Kaseke, E. and Dhemba, J. (2006) Five Country Study on Service and Volunteering in Southern Africa, Zimbabwe Country Report. Center for Social Development: St Louise; Washington University.
- Mahmud, M. S. (2013) Identifying gaps, challenges and limitation of access of women, children and PWD of Nijhumdip to cyclone early warning towards rendering improved early warning services through CPP dissemination mechanism/system. https://scholar.google.ca/citations?view_op=view_citation&hl=en&user=zg-dUcEAAAAAJ&alert_preview_top_rm=2&citation_for_view=zg-dUcEAAAAAJ:qjMakFHDy7sC
- Mackwani, Z. and Sullivan, C. (2016) International Best Practices for the Use of Organized and Technically Trained Volunteers. Canadian Red Cross: Canada. https://cradpdf.drddc-rddc.gc.ca/PDFS/unc276/p805399_A1b.pdf
- McGee, L. F. (1988) Keeping up the good work. *Personnel Administrator*, 33 (6): 68-72.
- Tanjeela, M. and Rutherford, S. (2018) The influence of gender relations on women's involvement and experience in climate change adaptation programs in Bangladesh. *SAGE Open*, 8 (4): 1-9. <https://www.doi.org/10.1177/2158244018812620>
- Paul, B. K. (2009a) Why relatively fewer people died? The case of Bangladesh's cyclone Sidr. *Natural Hazards*, 50 (2): 289-304. <https://www.doi.org/10.1007/s11069-008-9340-5>
- Paul, B. K. (2010) Human injuries caused by Bangladesh's cyclone Sidr: An empirical study. *Natural Hazards*, 54 (2): 483-495. <http://www.doi.org/10.1007/s11069-009-9480-2>
- Rahman, M. A., HOKUGO, A., OHTSU, N., and Chakma, S. (2021) Evacuation preparation scenarios of households during early and emergency evacuation: A case study of Cyclone Bulbul in Southwestern Coastal Bangladesh. *IDRiM Journal*, 11 (2). <https://doi.org/10.5595/001c.29128>
- Rosenthal, S., Feiring, C., and Lewis, M. (1998) Political volunteering from late adolescence to young adulthood: Patterns and predictions. *Journal of Social Issues*, 54 (3): 477-493. <https://doi.org/10.1111/j.1540-4560.1998.tb01231.x>
- Shi, M., Xu, W., Gao, L. et al. (2018) Emergency volunteering willingness and participation: A cross-sectional survey of residents in northern China. *BMJ*, 8 (7) 1-11. <https://doi.org/10.1136/bmjopen-2017-020218>

- Skoglund, A. G. (2006) Do not forget about your volunteers: A qualitative analysis of factors influencing volunteer turnover. *Health and Social Work, 31* (3): 217-220. <https://doi.org/10.1093/hsw/31.3.217>
- Smith, D. H. (1994) Determinants of voluntary association participation and volunteering: A literature review. *Nonprofit and Voluntary Sector Quarterly, 23* (3): 243-263. <https://doi.org/10.1177/089976409402300305>
- Todd, M., Davis, K. E., and Cafferty, T. P. (1984) Who volunteers for adult development research? Research findings and practical steps to reach low volunteering groups. *International Journal of Aging and Human Development, 18* (3): 177-184. <https://doi.org/10.2190/ayk2-qrij7-n8pu-m9b5>
- Uclg ASPAC (2019) Bangladesh: Saving Lives through Cyclone Preparedness Programme. Retrieved from <https://uclg-aspac.org/en/bangladesh-saving-lives-through-cyclone-preparedness-programme/>
- UNDP (2018) Extreme Weather and Disaster Preparedness in the Rohingya Refugee Response: Retrieved from: Cyclone Preparedness Lessons Learnt, Dhaka, Bangladesh. <https://www.undp.org/bangladesh/publications/extreme-weather-and-disaster-preparedness-rohingya-refugee-response>.
- UNV (2007). Practical Notes Contribution of Volunteerism to Disaster Risk Reduction. Retrieved from: <https://www.preventionweb.net/publication/contribution-volunteerism-disaster-risk-reduction-practice-note>
- Wymer, W. W. and Samu, S. (2002) Volunteer service as symbolic consumption: Gender and occupational differences in volunteering. *Journal of Marketing Management, 18* (9-10): 971-989. <https://doi.org/10.1362/0267257012930358>