

Research Paper

Assessing the impact of risk perception of a community on cyclone vulnerability: A case study of Pratapnagar, Satkhira

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Abstract

The purpose of the article is to investigate how cyclone vulnerability is triggered by a community's sense of risk. A study on this issue was conducted in Pratapnagar, Satkhira district in southern Bangladesh. The study is focused on assessing the perception of cyclone risk, the degree of adaptation of coping mechanisms, and the disparity of losses and damage resulting from the disaster. Focus group discussions and a closed-ended questionnaire survey were used in a mixed approach of study to investigate the level of the community's perception of risk and its relation to adoption of coping mechanisms and damage. The subjects were categorized in two groups. One group had a negative propensity to risk while the other had a positive inclination. The results show a significant difference in the degree of adoption and loss between these two groups. The economic losses between these two groups were considerably different. The group with negative propensity to risk needed comparatively less resources for recovery. People become oblivious to the risk of disaster due to several factors, including prior experience, a lack of trust in early warning systems, disregard for risk, etc. These results suggest that a person's risk assessment is a critical factor in determining whether they adopt the right defences to lessen the disaster's negative effects.

Keywords: Disaster risk, vulnerability, risk perception, risk attitudes, damage assessment.

1. Introduction

Due to its geographic location, Bangladesh is a nation that is extremely vulnerable to hydro-meteorological disasters like cyclones and floods (Nirupama, 2012). Because of its location on the Ganges and Brahmaputra River Deltas, the nation experiences a lot of flood flash flood damage every year. The districts of Khulna, Shatkhira, Jessore, Patuakhali, Barisal, Noakhali, and Chittagong are the most vulnerable to floods and cyclones in the southern part of Bangladesh (Toufique & Yunus, n.d.). Among these districts, coastal districts such as Satkhira, Noakhali, and Chittagong also experience periodic, devastating cyclones. Initiatives to reduce risk have been put in place, but they have not been able to adequately diminish the damage caused by disasters. For risk reduction to be effective, risk mechanism factors are crucial. However, when creating a method for risk reduction, the public's understanding of the risks is often disregarded (Lee et al., 2015). A severe catastrophe was created in Bangladesh in 2020 because of the coincidence of COVID-19, Cyclone Amphan, and monsoon flooding. This crisis was further intensified by irregular weather patterns, including continuous severe rain and floods. The inundation that the country faced because of the extreme rain was the worst

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flooding since 1988 and lasted the longest. The damage of electric grids, schools, bridges, embankments, roads, drinking water sources, local administration, and community infrastructures amounted to around US \$832 million (cyclone Amphan at US \$130 million, monsoon flood at US \$702 million), which exacerbated the country's already-fragile economy caused by the COVID-19 (Ellis-Peterson & Ratcliffe, 2020).

Risk perception is referred to as a certain mental state in which people worry about the potential harm or the risk of losing money from a particular calamity (Messner & Meyer, 2006). How people react to risk factors differs from person to person (Thomalla et al., 2006). Risk perception is always important when using a coping technique to build capacity. The need to develop efficient adaptation strategies is driven by risk perception (Bhattacharya-Mis & Lamond, 2016). It refers to one's overall strategy for catastrophe preparedness. When it comes to the stages of disaster management, preparation is considered to be the most important because the efficiency of the other stages of disaster management, such as response, mitigation, and recovery, depends on the level of readiness (Heijmans, 2001). As a result of the preparedness programs' development of pre-disaster activities that save lives and lessen damage, these elements are dependent on readiness. Additionally, it improves disaster response operations by highlighting the crucial elements that can be turned on in an emergency (Vatsa, 2004). This can be accomplished through engaging in a variety of activities that increase the capacity of communities, organizations, and individuals. Appropriate response, damage mitigation, and recovery will all be affected if the community lacks effective preparedness strategies.

In view of the above discussion, it is clear that public perception of disaster risk can play an important role in devising disaster management plans and enhancing people's preparedness levels. Not many studies have been done in Bangladesh on this aspect of disaster management. This study aims to contribute to filling this gap by studying impact of cyclone risk perception of a community. The goal of this study is to comprehend how people perceive the risk of disaster and to establish a connection between risk perception, disaster response, damage, and losses because of the hit of the cyclone. Protapnagar union, in Assasuni *upazila*, Satkhira district (Figure 1), has been selected as the study area, Satkhira, as a coastal district, has been repeatedly subjected to cyclonic storms and storm surges. It is also vulnerable to waterlogging because of tides, cyclones, monsoon floods, etc.

The objectives of this study are to:

- Identify the variables that influence the community's perception of catastrophe in the study area.
- Examine the relationship between risk perception and a community's susceptibility and resilience to disaster.

2. Literature review

Despite efforts made by the government, NGOs, and other organizations to build community resilience through hazard mitigation, the level of preparedness for disasters remains low due to poor levels of risk communication, risk knowledge, risk perception, awareness, etc. (Nirupama, 2012). The perception of disaster risk and the risk faced by a community are inextricably linked (Nathan, 2008). Perception and awareness have

always been seen as key components of preparedness. Risk perception, according to many experts, can both increase and decrease a community's susceptibility. It can be characterized as a person's or a group's attitudes and methods for evaluating a risk scenario in a practical or problematic way and acting accordingly (Figure 2). Thus, the basic determinants of risk perception are risk inclination and risk aversion. It added that, High risk propensity can cause risks to impact. On the other side, risk propensity makes proper risk management as well (Rohrman, 2008).

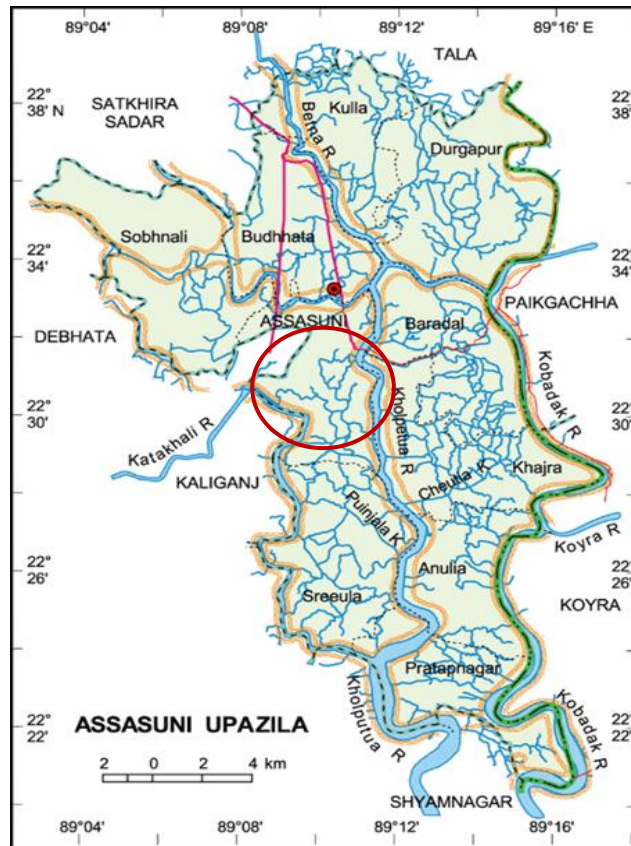


Figure 1. Map of Pratapnagar, Assasuni. Source: Protapnagar Union (2023).

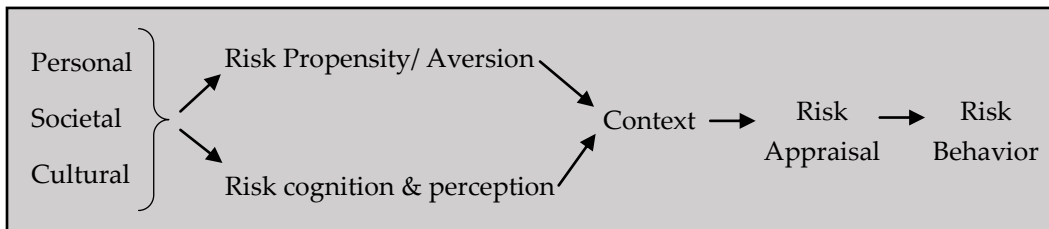


Figure 2. A model on role of risk perception in risk attitude. Source: Rohrman (2008).

If one person has unfavourable expectations about risk management, such as that the devastation caused by a disaster would be so great that risk management would not be able to mitigate its effects, this implies that risk management is unlikely. On the other hand, if a person anticipates a positive outcome (the risk management will lessen the impact), this view encourages them to be more prepared (Paton et al., 2008). One of the most important components of the entire mitigation strategies is preparedness (Collins & Kapucu, 2008). Concern and risk propensity are important risk characteristics that have a big impact on awareness. A person's or a community's ability to take precautions will be compromised if they are unaware of the risk (Heijmans, 2001). Higher levels of readiness can lead to greater levels of awareness (Raaijmakers et al., 2008; Miceli et al., 2008). The study of risk perception is important because how individuals react to dangers determines whether the negative impact on communities reach the level of a disaster. The key to improving risk reduction efforts and preparedness is understanding how people perceive risk from natural disasters (Tanner & Árvai, 2018). Tanner & Árvai (2018) attempted to understand how the community in the study area perceived risk, and how it led to vulnerability and had a negative impact on their resources and way of life. Additionally, an attempt was made to highlight the contribution of risk perception to damage and loss, with a particular emphasis on the connection between risk perception and disaster vulnerability.

2.1. Conceptual framework

A community can improve its ability to cope by modifying coping mechanisms, improving risk awareness, acting on early warning signs, and communicating risks effectively, among other things. These actions must be taken to improve readiness and decrease vulnerability. The two dimensions of risk perception are shown in Figure 3.

Cycle 1 shows the effect of positive perception, and cycle 2 does the same for negative perception. As mentioned, there are two important factors that determine disaster risk. (i.e., vulnerability and ability to cope). Cycle 1 shows that raising awareness of the disaster would increase a community's ability to cope by implementing risk-reduction initiatives. This would keep the impact during and after the hazard event below the community's capacity level, ultimately saving the community from being negatively impacted in an excessive manner.

When a community is unwilling to address the danger of disaster, and lack of awareness influences the lack of adaptation of coping mechanisms, the impact of the disaster exceeds their capacity level (cycle 2). This causes a great deal of destruction. It has been revealed that perception is important for risk management. These socio-psychological elements, such as perception, awareness, and worry, have a significant impact on effective disaster risk management. Risk perception can affect a community's susceptibility to risk-triggering events. Positive perspective has an impact on adaptability, but negative perception is related to a lack of seriousness and preparedness for catastrophe risk reduction. Disaster perception might impact a person's vulnerability in this way.

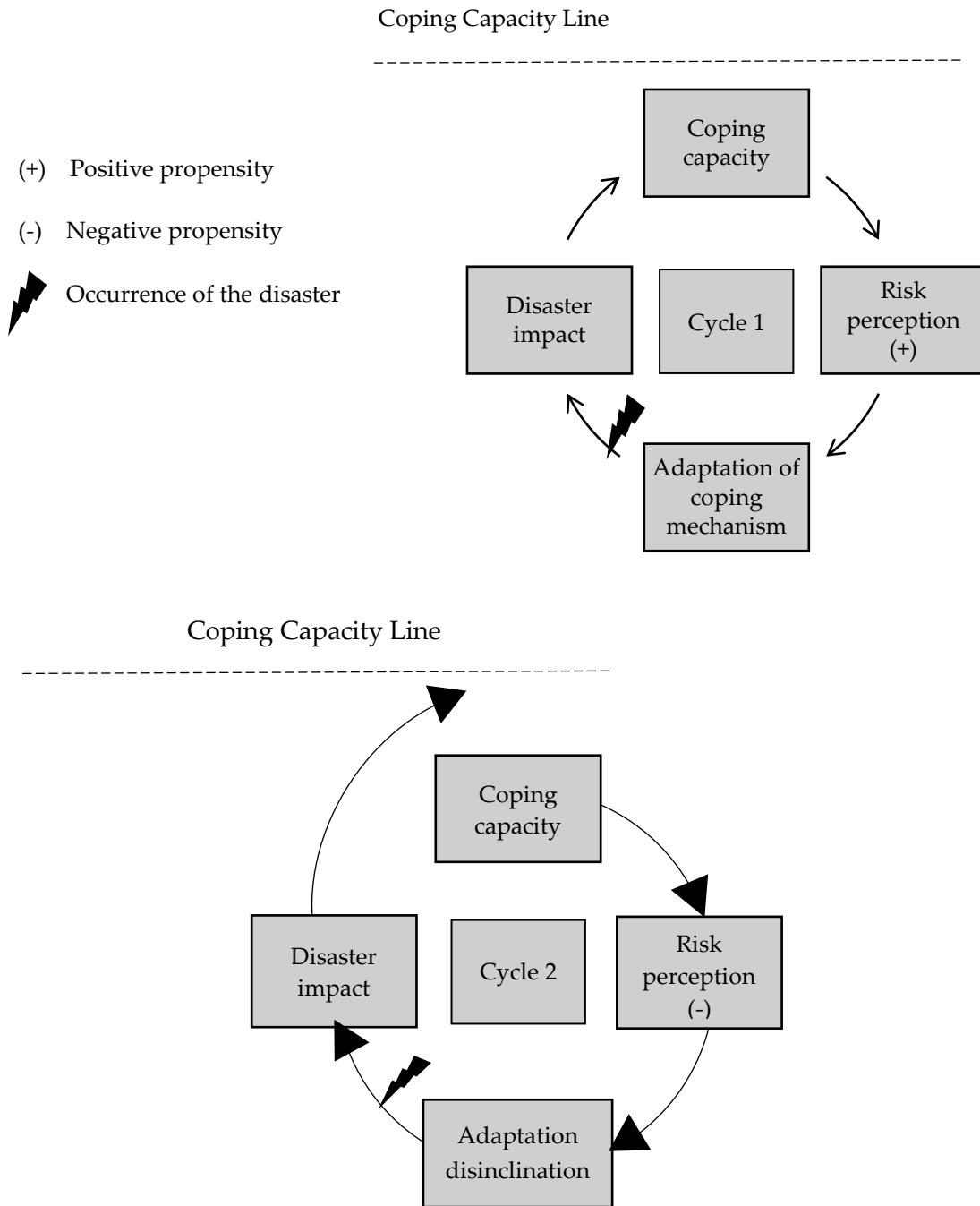


Figure 3. Conceptual framework.

3. Methodology

This article is based on a study using both quantitative and qualitative data. Discussions in focus groups were conducted and responses to a closed-ended questionnaire were

recorded to gather the information. The participants were chosen using a purposive sampling method to identify relevant participants for this study. There were 25 participants in total, representing various social classes, educational levels, and socioeconomic origins. Two groups of people were identified according to their adaptation level and damage and loss level caused by the cyclone.

The questionnaire was constructed based on the damage and loss assessment in terms of a. property damage, b. physical injury, c. human loss, d. displacement, and e. loss of livelihood. Initially the participants were asked about the damage and loss they had experienced during the cyclone. Fifteen questions were constructed to examine their damage and losses. The participants responded on a 5-point Likert scale where 1 indicates minimal damage and 5 indicates extreme damage (Table 1). A cumulative threshold value of 40 was set to divide the 25 participants into two groups based on their response. There were 15 people with a cumulative score of 40 or lower who were less affected (group 1) and 10 who experienced high damage and loss (group 2).

After finding the groups, focus group discussions were conducted separately to assess their perceptions. The object of the focus group discussions was their attitudes on disaster preparedness as well as their preparedness ability, risk communication, risk mentality, coping mechanism, damage and loss, risk knowledge, and other topics to assess their mindset and possibility of experiencing the disaster. To identify their level of adaptation, they were instructed to fill up an adaptation identification form. Adaptation measures included were prepare for sheltering, moving the family to a higher place, moving the cattle to a safer place, following early warning, and risk communication. Their response to the adaptation were recorded on a 5-point Likert scale where 1 indicates 'did not adapt' and 5 indicates 'properly adapted' (Table 1). Fifteen questions were constructed in this section. The cumulative response to adaptation was categorized into three groups. The response below 30 was considered as low level of adaptation, 30-50 as moderate level of adaptation and more than 50 counted as high level of adaptation.

Table 1. Likert scale of measuring damage and loss, and adaptation level.

Scale Item	5	4	3	2	1
Damage and loss	Very High	High	Moderate	Low	Very low
Adaptation level	Adapted properly	Slightly adapted	Had knowledge but did not apply	Did not have any knowledge	Did not adapt

3.1. Data analysis

The adaptation levels of the two groups experiencing different levels of damage were analysed to explore if there was any relationship between adaptation, as a result of adequate risk perception, and damage incurred. The first aspect is how individuals viewed and processed information about the potential of cyclone occurrence. The second step is determining the connection between perception and the severity of the loss and destruction the disaster caused when it interacted with the community.

4. Results and discussion

4.1. Results

The subjects were found to have two different sorts of mental preparation for the disaster. The first group (group 1) exhibited a high propensity for disaster risk, while the other group did not take risk seriously. Their efforts to develop coping mechanisms were initially distinct (Table 2). The ability to adapt has been ranked from high to low on the scale in Table 1. The highest scores denote the highest level of adaptation, while the lowest scores indicate the lowest level of adaptation. These criteria assume that, in comparison to the others, those with positive perceptions will adopt preventive measures. According to the table of coping strategy characteristics, group 1 individuals were more cognizant of danger of hazard than group 2 members.

Table 2. Evaluating level of different coping mechanism between two groups.

Characteristics of coping mechanism	Group 1 ($n_1=15$)	Group 2 ($n_2=10$)
Prepare for sheltering.	High	Low
Follow the early warning.	High	Moderate
Risk Communication	High	Moderate
Movement of the cattle to a safer place	Moderate	Low
Movement of the family to a higher place	Moderate	Moderate

Their perception motivates them to adapt coping strategy initiatives, which eventually lessen that group's exposure and vulnerability. On the other hand, group 2 was discouraged from using mitigation strategies because of their perception of the danger. That makes them vulnerable and exposes them to risk. It was found in the study that about 65–75% of individuals were aware of the disaster coping mechanism, while in group 2, 45%–55% of people thought the coping mechanism was a crucial aspect. The integration of such tasks as risk identification, risk monitoring, and protective response is necessary for a risk reduction process. These elements are missing, which increases danger for both the individual and the community. The damage and loss evaluation were essential after learning about their various modes of perception and coping.

The study demonstrates the contrast in losses and damages between the two groups. Compared to group 2, group 1 suffered less damage. It is better to remember that members of group 1 took the possibility of a disaster more seriously than the rest. They took additional coping mechanisms because of this perspective, which has the benefit of making them more resilient to disaster risk. The second group, on the other hand, lacked disaster planning, and as a result, suffered worse damage than group 1 did. Therefore, it would not be incorrect to suggest that one of the determining elements that can be used to manage the negative effects of a disaster is perceived risk. These two group's economic losses have been calculated. The many areas of economic loss, such as housing loss, crop damage, livestock loss, etc., have been classified. For each form of damage, the average amount of monetary loss is calculated. Each group member had financial losses from various forms of damages that needed to be made up. Shrimp culture and fish hatcheries make up most of the study area's agricultural industry. When a cyclone strikes,

agriculture is constantly at risk. Most of the houses are of flimsy construction. If the homeowner does not take action to protect the house from the high wind (tethering the roof to the ground, appropriate angle of slope of the roof, etc.), it will cost between Tk. 10,000–15,000 to rebuild the house. Figure 4 shows that group 2 experienced a significantly higher impact from the tragedy in their home as well as in every other area that needed a significant financial investment to recover, compared to group 1, which had a lesser impact. After making all these comparisons, it is clear that vulnerability is influenced by risk perception. The question is, how? The answer is perception of danger has an impact on how a community or an individual responds to a crisis. In the same way, if a community is unwilling to take risk seriously, they will also be unaware of the preparedness as well as the coping mechanisms; if their mentality allows them to take the disaster risk more seriously, they will enhance the coping mechanism and preparedness to build resilient themselves.

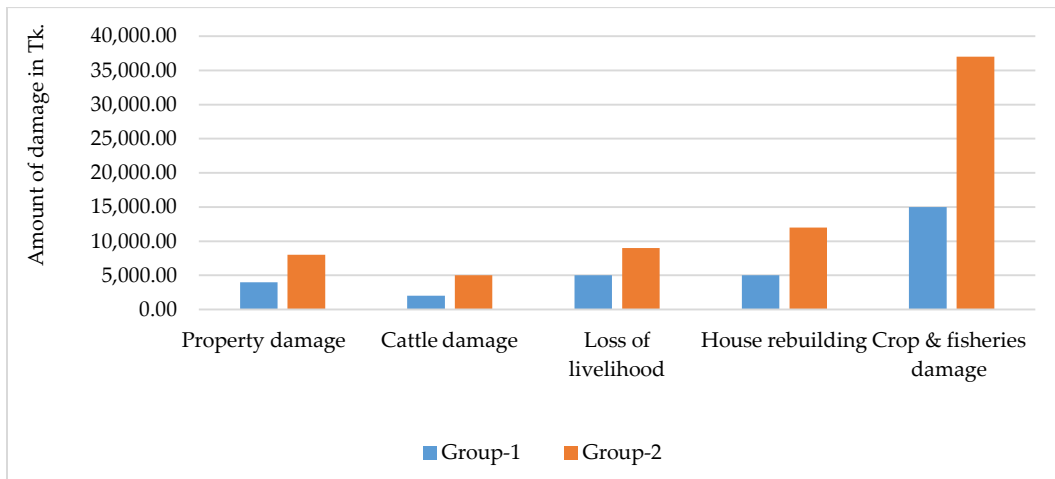


Figure 4. Economic loss assessment between two groups.

4.2. Discussion

Risk perception is found to be a significant element in determining awareness, which in turn affects the mobilization of risk reduction measures and preparedness capacity. This predisposition forces a person or a group of people to use their coping mechanisms. Table 3 demonstrates how a person's capability varies depending on their mentality about a calamity. The finding suggests that if someone is concerned about a calamity, it will prompt them to use the available resources to deal with the disaster. Once more, people who downplay the potential severity of a disaster also reduce their own awareness of it, which makes them reluctant to participate in preparedness programs. This is how risk perception affects the amount of preparedness. A key component of being effectively prepared is awareness. Weak preparedness increases vulnerability and raises the likelihood that a disaster will have a significant and severe effect on the community. The level of asset destruction induced by the crisis varies across the two groups, as shown in Figure 3, and it is much lower for the group with more awareness and a high level of adaptability to preparatory activities. The reason is because they were

more adaptable and aware, they were able to take better precautions, develop emergency plans, use efficient tools and equipment, and implement other risk-reduction measures to lessen the impact. On the other hand, the other group had to deal with extensive damage and disruption as a result of their lack of preparation. One of the key factors affecting the post-disaster operations is the preparedness actions. It analyses the kind and scope of the risk and mobilizes the emergency operation plan in addition to other logistics plans for a successful recovery program. According to Figure 5, the group of people with better risk cognition and adaptation readiness suffered lower loss in various sectors. During the study, some factors affecting the risk perception of the community were found as discussed below.

Overconfidence

They deal with disasters of varying sizes almost every year. Sometimes they anticipate a small-scale threat and believe they can manage it using their native skills and resources, but later the incident develops into a disastrous event that causes severe harm to their lives and way of life. Their failure to take the appropriate actions and the reliability of the warnings prevent them from being as prepared for the calamity as they could be.

Early warning credibility

The focus groups discussions revealed some problems with the early warning system. For instance, residents often do not receive the warning in time, therefore, any potential initiatives fail for lack of time. The credibility of the warning is another factor. Many times, they heeded the warning, but the hazard event did not materialize to the forecast degree. Due to this, the community develops a habit of ignoring warnings. It had occurred in the instance of Cyclone Amphan. The community had responded to and heeded the warning for the earlier cyclones (i.e., Cyclone Fani, Cyclone Bulbul), but it turned out that the severity of the storms was not that high. This led many to subsequently ignore the warnings for Cyclone Amphan and they suffered badly.

Risk knowledge

One of the key factors affecting mentality toward hazards as well as awareness and readiness is risk knowledge. These preparatory efforts can be strengthened with understanding of risks. The right information enables choosing the optimal strategy and instruments, mobilizing the community's resources to their fullest potential, and implementing the catastrophe response that is most protective. The residents of the village have some basic knowledge about disaster management.

Risk communication

Better risk communication enables the identification of personal talents, efficient and timely warning distribution, a suitable strategy and structure, an evacuation route, and the augmentation of awareness, among other things. Their understanding of risk is impacted by a lack of communication, which affects the effectiveness of the response and recovery stages. They do not receive the appropriate information in a timely manner due to a lack of communication, which also increases their risk.

Experience

Disaster experience can reveal the weaknesses and lack of readiness and enable better rebuilding of the entire system. In reality, the community in the study region deals with a

variety of natural disasters virtually every year. For them, problems like flooding and waterlogging are nothing unusual. They are reluctant to participate in hazard impact mitigation measures since they are regularly harmed by disasters.

5. Recommendations

Some suggestions can be made to improve the community's perception of risk considering the aforementioned observations.

- Rather than just being a natural occurrence, the hazard event must be treated as an obstacle to growth. This perspective can increase people's awareness of the likelihood of disaster risk management, their readiness, and their ability to cope with disasters.
- Explain the four stages of disaster management to the community. They ought to receive instruction on how to continuously manage risks and manage calamities.
- For the maximum strengthening of their disaster management efforts, the technology terms in the mitigation and response phases must be in alignment with perception.
- The early warning credibility needs to be strengthened. While disseminating early warning, accuracy, effectiveness, and timeliness must be maintained.
- Risk communication must be improved. Lack of adequate risk communication reduces awareness and capacity. A community emergency operations center is required (EOC). From this point on, the risk information, awareness campaign, warning distribution, and other plans will be coordinated so that the community can be informed properly about the risk.
- The community should be made more knowledgeable about risks. Organization of training, exercises, and introduction to tools and equipment should come from government organizations. Documentaries and educational programs can be broadcast on a national television network, where the public can learn more about disaster management.
- The government and other organizations should plan various programs to raise awareness. This will lessen the community's residents' unfavorable predisposition toward disasters and increase their awareness of such events.

6. Conclusion

The impact of risk perception on vulnerability Risk perception is revealed to be extremely important because it affects risk knowledge, risk management, risk communication, etc. It can both push for coping mechanism adaptation and pull away from risk-reduction actions. Initially, the government and associated organizations adopted a variety of strategies to help vulnerable individuals build risk resistance. However, it must be kept in mind that none of the approaches to disaster management that are currently being highlighted (such as paradigm shift, structural, non-structural community-based disaster management, indigenous way to disaster management, etc.) will be properly effective unless the most vulnerable people have developed their perception and mentality toward the disaster and driven their propensity for adapting the risk reduction mechanism. Because none of the efforts that can be offered will be successful unless the people are prepared to put them into practice, adapt them, and

apply them. Therefore, when creating a risk management strategy for a community, the involved parties must consider how the community members perceive risk and put in place the right initiatives to increase their propensity for risk awareness, which in turn increases their susceptibility to disaster risk reduction strategies.

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