



COMMUNITY PREPAREDNESS AND PREVENTIVE MEASURES FOR CYCLONE MITIGATION IN THE COASTAL AREAS OF WEST BENGAL

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ABSTRACT

Among the most devastating natural calamities in the world that have an impact on the coastal areas mostly are the cyclones, which are especially found in regions that are located along the Bay of Bengal. The coastal areas of West Bengal such as Sundarbans and adjoining districts are regular victims of severe cyclonic storms that due to their impact result in severe losses of human life, infrastructure, agriculture, and livelihood. The current research comprises of the community preparedness and preventive strategies against cyclone mitigation within the coastal regions of West Bengal. This paper will follow a descriptive research design and will be informed by the data obtained through conducting 90 recipients who live in cyclone prone communities. Qualitative and quantitative approaches were utilized in the analysis, where the frequency and percentage techniques were employed to analyse the responses. The results show that 80% of the respondents know about risks of cyclone, and 72.2% know about the systems of early warnings. About 64.4% of the respondents stated that cyclone shelters were accessible in their community, as compared to 35.6% who said they were not easily accessible. In the results, it is also observed that not all respondents (54.4%) have attended disaster preparedness programs though 45.6% have attended such programs.

Keywords: Cyclone, Disaster Management, Community Preparedness, Coastal Vulnerability, West Bengal, Mitigation

1. INTRODUCTION

Cyclones are strong tropical storms, which have a high wind speed, heavy rain, and storm surges that leave massive destruction in coastal areas. Bay of Bengal is a very cyclone prone region in the world and the eastern coast of India is a place where the severe cyclone storms occur very frequently. West Bengal is one of the regions that are particularly susceptible to such natural calamities and is situated along the Bay of Bengal.

Cyclonic storms are common in the coastal areas of West Bengal such as South 24 Parganas, North 24 Parganas and Purba Medinipur. This is particularly susceptible to the Sundarbans region because of the low elevation, deltaic terrain and closeness to the sea. There is also the destruction by the cyclones like Aila, Amphan, and Yaas which have destroyed houses, roads, embankments, and agricultural land in the region. Such calamities usually lead to population displacement and destruction of livelihood.

A number of circumstances make the coastal West Bengal vulnerable. There is a high population density in the area relying on agriculture, fishing and forest based activities. Most of the settlements are in the low lying regions which are very prone to flooding and storm surges. Moreover, the destruction of natural barriers that used to safeguard the area against serious storms due to environmental degradation such as disappearance of mangrove forests and coastal erosion has undermined natural defenses.

The risks to the coastal communities have also been escalated in the past few years by the growing severity of cyclones caused by climate change. Consequently, the preparedness of the disaster and preventive strategies have become the priority of the mitigation of the consequences of the cyclones. The community is very important in disaster management since, in most cases, they are first responders even when there is a disaster.

The proposed research is dedicated to learning about the community preparedness and preventive action in the mitigation of the cyclone in the coastal region of West Bengal. It emphasizes on awareness, early warning mechanisms, robust infrastructure, and environmental protection in minimizing cyclone-related risks.

1.1 Objectives of the Study

The major objectives of the study are:

1. To examine the vulnerability of the coastal areas of West Bengal to cyclones.
2. To analyze the role of community preparedness in reducing cyclone risks.
3. To identify preventive measures used for cyclone mitigation in coastal regions.
4. To evaluate the role of disaster management initiatives in strengthening community resilience.

1.2 Background of the Study

The cyclones are one of the most devastating natural hazards that hit the coastal areas of the world. Tropical cyclones form around warm seawater and are associated with a high rate of wind, numerous raindrops, and storm surges that may cause an extensive destruction of human communities, infrastructure and natural ecosystems. Bay of Bengal is among the areas that produce the most cyclone and the eastern coast of India is very often faced with major cyclone storms. Consequently, coastal countries like West Bengal are very susceptible to disasters caused by cyclones.

Cyclonic storms that are formed in the Bay of Bengal frequently hit the coasts of West Bengal especially the districts of South 24 Parganas, North 24 Parganas and Purba Medinipur. The Sundarbans delta, which is an important part of the coastal territory, is made up of low-lying islands, tidal rivers, and mangrove forests. The area is particularly prone to cyclones related to storm surges, flooding and breakages of embankments because of its geographical conditions and closeness to the sea. Such catastrophes usually result in fatalities, demolition of homes, crop loss and income derailment.

The severity and occurrence of cyclones in the region has been on the rise during recent decades and this is commonly associated to be caused by changing climatic conditions and hence high sea surface temperature. Aila in 2009, Amphan in 2020, and Yaas in 2021 are the examples of cyclones that have caused a lot of damage in the West Bengal coast and demonstrated the weakness of local residents. There are high populations that have been living in these regions and they rely on farming, fishing and forest cover as their means of living and this makes them especially vulnerable to environmental risks.

2. LITERATURE REVIEW

Ahmed et al. (2016) studied the resilience of the community in Bangladesh to cyclone disaster at the coastal regions. This research discussed the processes by which local communities were able to respond to regular cyclonic incidents with the use of social networking, livelihood practices, and disaster preparedness programs. The authors measured the levels of resilience and the mechanisms of disaster responses with the help of community surveys and qualitative analysis. The results revealed that community-based disaster management practices, local knowledge and better and better early warning systems played a significant role in enhancing the resilience of the coastal population. The paper highlighted that the efforts to enhance the community participation and sustainable livelihoods strategies were significant in lowering the susceptibility of cyclone.

Ahsan and Khatun (2020) examined the importance of community radio in disaster preparedness among people living on coastal areas in cyclone prone areas in Bangladesh. The research employed a

mixed methodology consisting of surveys and statistical analysis to assess the effect of radio-based communication in affecting community awareness and preparedness. According to the results, community radio was very instrumental in the transmission of early warning messages and enlightenment of the locals about the safety of actions during cyclones. The research found out that good communication networks, and especially Radio broadcasting, had a high degree of disaster preparedness and minimization of losses in cases of cyclones within vulnerable communities.

Chakraborty et al. (2016) undertook the study of effects of Cyclone Aila on rural coastal residents in Bangladesh, specifically the water supply, sanitation, and the situation of health. The paper was used to examine the impact of cyclone-related floods and the destruction of infrastructure on the availability of clean drinking water and sanitation. The researchers established that the cyclone had a devastating effect on the fundamental services causing additional health risks and environmental catastrophes. The paper indicated that it is essential to promote the development of disaster resilient infrastructure and enhancing adaptation mechanisms of communities to overcome post disaster health and sanitation challenges.

Garai (2017) carried out qualitative research on coping mechanisms that communities residing in cyclone-prone areas of Bangladesh embraced. The study was on the issue of how the households were able to adjust to the cyclic cyclone disasters by diversifying their livelihoods, through migration, as well as cooperation within the community. In the article, it was discovered that local communities used different coping strategies to deal with risks associated with disasters, such as constructing more resilient houses, stocking of emergency resources, and social capital. The results underlined the fact that, by making the local coping mechanisms stronger and intertwining them with the official policies of disaster management, the resilience of the community and its susceptibility to cyclone disasters might be improved.

3. RESEARCH METHODOLOGY

Research methodology gives the systematic structure of how the study is to be carried out and the research objectives are to be attained. It describes the research design, data collection process, sample size, as well as data analysis techniques that were used in this research. The methodology aids in making sure that the research process is structured, dependable, and has scientific validity. The methodology of the current research paper is based on the analysis of the community preparedness and preventive actions on cyclone mitigation in the West Bengal coastal communities. The review

uses secondary sources to learn the vulnerability of community living at the coastal areas, the level of disaster preparedness and the effectiveness of mitigation measures that are taken in areas with cyclones. The research design, sample size, data sources and methods of analysis of the research are described in the following subsections.

3.1 Research Design

The current research follows a descriptive research design, which will be used to investigate the community preparedness and preventive actions against cyclone mitigation in the coastal regions of West Bengal. The descriptive design will suit the study as the research focuses on discussing the current conditions, disaster management measures, and preparedness measures in cyclone prone coastal areas.

The paper is concerned with the study of the vulnerability of the coastal communities and the preventive measures applied to minimize cyclone impacts. The paper also examines how community participation, early warning systems and disaster management initiatives can be used to enhance resilience to cyclones. Through this research design, the study will be systematic in describing and interpreting different issues of cyclone preparedness and mitigation activities in the chosen region.

3.2 Sample Size

A population of 90 respondents has been taken into consideration in regards to cyclone prone coastal West Bengal communities on the purpose of the study. The respondents will be the local residents, community members, and individuals who have encounter with cyclone disasters and disaster preparedness activities.

The chosen sample depicts individuals in vulnerable regions of the coastal areas that cyclones are common. The respondents were selected in order to get to know their level of awareness, preparedness practices, and the experiences concerning cyclone disasters. The sample size offers sufficient coverage towards community views on cyclone risk, disaster preparedness and mitigation strategies.

3.3 Method of Analysis

Data gathered was discussed by applying qualitative and quantitative methods. Simple statistical analysis was conducted to analyze the responses that were generated by the respondents by the use of

frequency and percentage analysis. Such statistical tools assist in organizing the data in a clear and systematic fashion by the use of tables and charts.

Besides, qualitative analysis was done to explain information about community preparedness, factors of vulnerability, and mitigation interventions. This analysis is aimed at discovery of trends and relationships between various variables of cyclone risk and disaster management practices.

The combination of both qualitative interpretation and the quantitative representation enable the study to have a holistic picture of how effective community preparedness and preventive measure is in mitigating cyclone effects in the coastal regions of West Bengal.

4. RESULTS AND DISCUSSION

This section of the paper will give the analysis and interpretation of the data gathered on 90 respondents in cyclone prone coastal regions of West Bengal. Frequency and percentage were applied to analyse the responses to have an idea of the level of the awareness, preparedness, and preventive practices in place within the community to reduce cyclone risks. Tables are used to show the findings and then short discussions are made on the findings.

4.1 Awareness about Cyclone Risk

Table 1 shows the awareness of risk of cyclone among the respondents who live in cyclone-prone coastal areas of West Bengal. The data indicates the distribution of the respondents on whether they are aware of the risk of cyclones or not.

Table 1: Awareness of Cyclone Risk among Respondents

Awareness Level	Frequency	Percentage (%)
Yes	72	80%
No	18	20%
Total	90	100%

The table 1 indicates that of the total number of respondents 90, there are 72 respondents (80%) who are aware of the risks of cyclones whereas 18 respondents (20%) indicate that they are not aware of the risks of cyclones. This means that most people in the coastal regions have a basic level of knowledge on the risks of cyclones since these catastrophes are common in the area. Nevertheless, the

fact that some number of respondents had a little bit of awareness implies that there has to be an augmentation of awareness campaigns and community educational programs.

Figure 1 shows the proportion of the number of people that are aware and not aware of cyclone dangers in the study area.

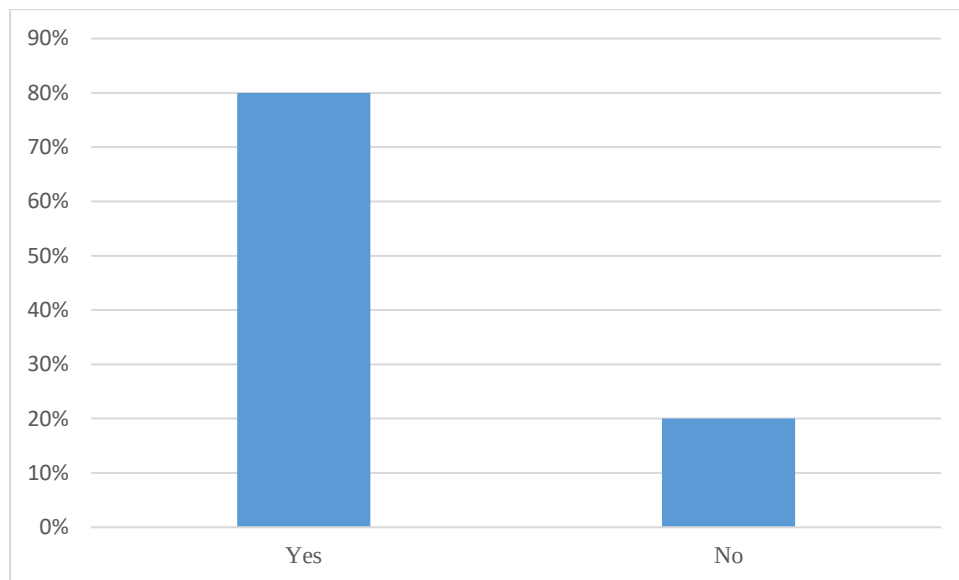


Figure 1: Graphical Representation of the Percentage of Awareness of Cyclone Risk among Respondents

The Figure 1 representation indicates, most of the respondents have knowledge of cyclone risks. High awareness percentage shows that previous experiences of cyclones and exposure to disaster management programs have led to better awareness by communities living along the coastlines.

4.2 Knowledge about Early Warning Systems

Table 2 presents the degree of knowledge of the respondents on the issue of early warning systems employed in prediction of cyclones and disaster preparedness.

Table 2: Knowledge of Early Warning Systems among Respondents

Response	Frequency	Percentage (%)
Aware of Early Warning Systems	65	72.2%
Not Aware	25	27.8%
Total	90	100%

The table 2 shows that 65 respondents (72.2%) are familiar with the early warning systems, and 25 respondents (27.8%) indicated that they have no knowledge about early warning systems. This implies that even though the number of the population who are knowledgeable about the early warning systems is high, communication and awareness still needs to be enhanced to ascertain that all households at risk are informed in time prior to disaster occurrence.

Figure 2 shows a graphical illustration of the knowledge held by the respondents on the early warning systems about cyclones.

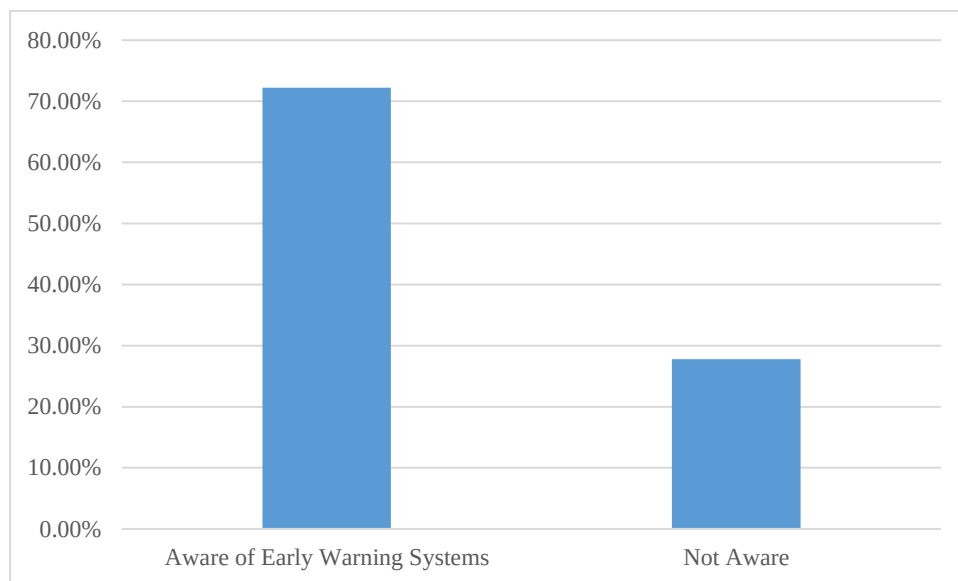


Figure 2: Graphical Representation of the Percentage of Knowledge of Early Warning Systems among Respondents

As it can be seen in the figure 2, the majority of respondents have knowledge of early warning systems that are crucial in disaster preparedness. The findings have shown that the community readiness can be even better stimulated by the better delivery of warning messages and the effects of disasters can be minimized.

4.3 Availability of Cyclone Shelters

Table 3 contains the data about the presence of the cyclone shelters in the study area based on the answers of the participants.

Table 3: Availability of Cyclone Shelters in the Study Area

Response	Frequency	Percentage (%)
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Cyclone Shelter Available	58	64.4%
Cyclone Shelter Not Available	32	35.6%
Total	90	100%

Table 3 indicates that 58 respondents (64.40%) respondents indicated that cyclone shelters exist in their area of residence whereas 32 respondents (35.60%) respondents said that there are no such shelters, or that they are too difficult to find. This shows that despite the presence of cyclone shelters in much of the regions there still exists a significant disparity in accessibility especially by the residents of remote or isolated coastal villages.

Figure 3 shows the percentage rendition of the respondents who reported the presence or absence of cyclone shelters in their locality.

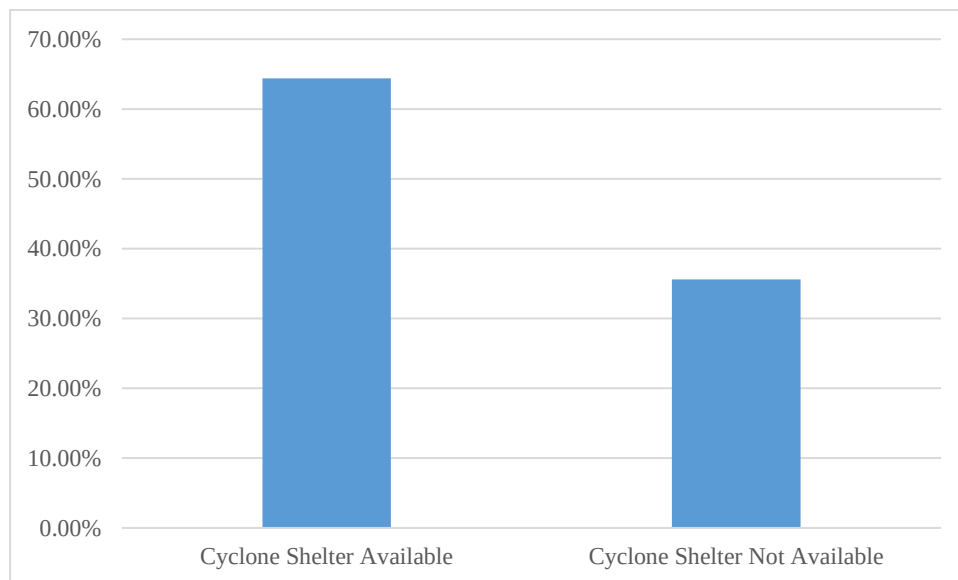


Figure 3: Graphical Representation of the Percentage of Availability of Cyclone Shelters in the Study Area

The Figure 3 representation emphasizes that most of the respondents are provided with cyclone shelters. Nevertheless, the fact that a large percentage of respondents were not able to do it suggests that more shelters should be built and infrastructure in the areas prone to the influence of the sea should be enhanced.

4.4 Participation in Disaster Preparedness Programs

Table 4 demonstrates the degree of involvement of respondents in the disaster preparedness programs arranged by the government agencies or community organizations.

Table 4: Participation in Disaster Preparedness Programs

Participation	Frequency	Percentage (%)
Participated	41	45.6%
Not Participated	49	54.4%
Total	90	100%

As it can be seen in the table 4, 41 respondents (45.6%) have attended disaster preparedness programs, and 49 respondents (54.4%) have not attended such programs. This implies that over fifty percent of the respondents are yet to undergo some disaster preparedness training, which underscores the importance of ensuring an increase in the number of people subjected to awareness creation and the need to have more people participate in disaster management activities.

The percentage distribution of the respondents who have attended or not attended disaster preparedness programs is shown in Figure 4.

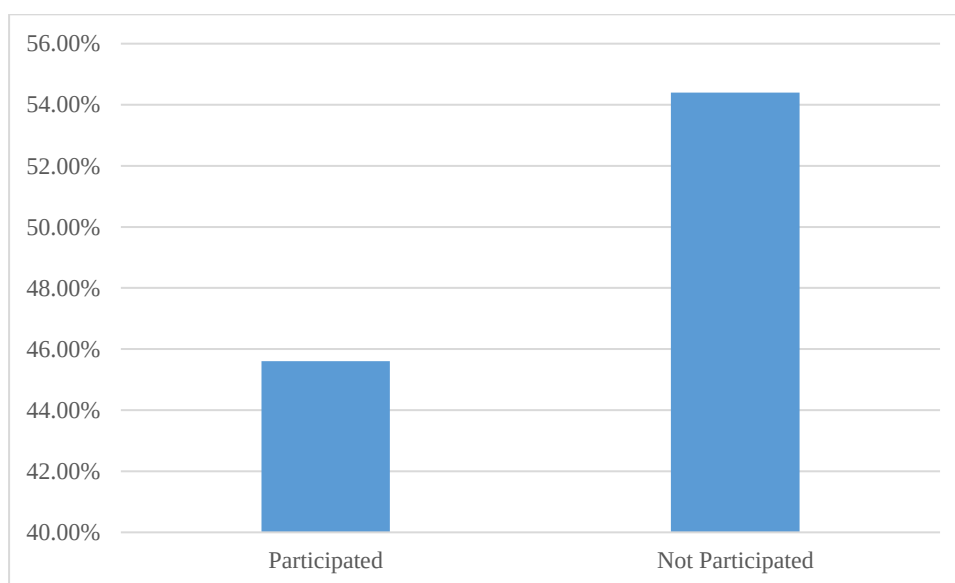


Figure 4: Graphical Representation of the Percentage of Participation in Disaster Preparedness Programs

The Figure 4 graph shows that a respondent participation in disaster preparedness programs is rather low. Enhancement of levels of preparedness and ability of communities to respond well during cyclone disasters can be improved by increasing community participation in such programs.

5. CONCLUSION

Owing to the geographical positioning of the coastline along the Bay of Bengal and the weak ecological environment associated with the Sundarbans delta, cyclones are still a significant threat to the coastal areas of West Bengal. This paper investigated the issue of community preparedness and preventive strategies to mitigate the effects of cyclones according to the responses of 90 people, which reside in places of increased vulnerability to cyclones. The results have indicated that most of the respondents are aware of cyclone risks and early warning system; this is evidence of prior experience of disasters and awareness campaigns by the government and disaster management services. Nevertheless, a number of challenges have also been encountered such as unequal distribution and access of the cyclone shelters and comparatively low involvement in disaster preparedness initiatives. These gaps indicate that a greater community involvement is necessary, better provision of early warning information and increased cyclone shelter facilities. Thus, effective disaster mitigation against cyclones requires the improvement of community-based disaster preparedness programs, greater awareness campaigns, and better coordination between the government agencies and the local populations.

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