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ASSESSMENT ON SOCIAL VULNERABILITY AND RESPONSE TOWARDS NATURAL DISASTER IN A DISASTER-PRONE COASTAL VILLAGE: AN EXAMPLE FROM BANGLADESH

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Abstract

Due to geographical locations, the Southwestern coastal region of Bangladesh is frequently experiencing climate change induced disasters such as cyclones, floods, and tidal surges. However, local communities at this region have a long history of coping with the adverse effects of these disasters. Consequently, this research assessed the social vulnerability towards natural disasters through local peoples' perception and identified the existing immediate response against natural disasters at Kazirchar village in Muladi Upazila of Barishal district of the coastal region. In this study, a well-structured questionnaire survey, and focus group discussions were conducted to collect primary data. The collected data were processed and analysed to present the existing impacts of natural disasters. Besides, the immediate responses were categorized into different sectors. The study found that, the most prevalent coastal disaster in Kazirchar village was cyclone. About 48% of surveyed respondents opined that high cost of living was the main reason for increasing the vulnerability towards disasters. To adapt with disaster impacts, 58% respondents of this village need to travel long distances to collect drinking water. On the other hand, during flood, 26% people took shelter on government-owned high lands, whereas 40% shifted temporarily to their neighbors who are living in house with a high land elevation. This research concludes that the village has a low prior preparedness against various disasters, less knowledge about disaster, less coordination and poor collaboration between government organization (GOs) and non-governmental organizations (NGOs) regarding disaster risk reduction. It is expected that this study will act as a source of information for taking natural disaster management initiatives and the findings of this study will push the policy makers to develop and implement long term adaptation strategies in coastal areas of Bangladesh particularly in Barishal district.

Keywords: Bangladesh; Climate Change; Disaster Management; Adverse Impacts; Coping Strategies.

INTRODUCTION

The frequency and intensity of hydro-meteorological disasters has been increasing at an alarming rate all over the world due to anthropogenic changes in the climate (UNISDR, 2007; IPCC, 2013). Historically, Bangladesh has been facing different calamities in the form of floods, cyclones, droughts and the frequency and intensity of these events have increased over the past decades (GoB, 2010). Now, Bangladesh is ranked as the most climatically vulnerable country in the world (Nokrik and Alam, 2011) which has been receiving of about two-fifths of the world's total impact from different natural disasters (Dasgupta, et al., 2009). The vulnerabilities of the coastal areas are aggravated by climate change and its impact (GoB, 2010). Located only a few meters above the mean sea level, this region is threatened by climate change impacts such as increasing the frequency and intensity of floods and cyclones, severe coastal erosion, sea level rise, saline water intrusion and tidal inundation (Minar et al., 2013; Payo et al., 2016; Dasgupta et al., 2017).

Bangladesh is a South Asian country with 1,47,570 km^2 of deltaic land and a population density of about 936 persons/km^2, which is regarded as one of the most vulnerable countries

to climate change (World Bank, 2013; GoB, 2011; IPCC, 2007). The country experiences different climate change induced natural disasters such as flood, drought, tidal storm surges, riverbank erosion, drinking water scarcity, salinity intrusion and water logging which cause large-scale loss of lives, damage to infrastructure, social, natural and economic assets (Alam et al., 2017; Jordan, 2015; Thomas et al., 2013; Pouliotte et al., 2009; Huq and Ayers, 2008; IPCC, 2007). Particularly, coastal households are the most susceptible to the impact of climate-driven natural disasters which contribute to the loss of land and properties (Alam et al., 2017). Adaptation strategies are crucial to help the disaster affected local communities to cope with associated climatic extremes (Alam, 2016; Gandure et al., 2013; Rosenzweig et al., 2013; Adger et al., 2003). The long-term adaptation strategies are, however, unlikely to be effective without an understanding of the peoples' perceptions of natural disasters and its immediate response.

Previous disaster-related records of Bangladesh also showed that, the number of cyclones tripled over the last 50 years (Islam, 2004). A total of 508 cyclones have affected the Bay of Bengal region over a period of 100 years, of which 17% caused serious land erosion (GoB, 2008). Hence lives and properties in low-lying coastal districts along the Bay of Bengal are highly vulnerable to inundation from cyclone-induced storm surges. Cyclone Sidr in November 2007 and Cyclone Aila in May 2009 triggered the storm surge of 3 m (10 ft.) height impacted western regions of Bangladesh which is signature of devastating disaster (Hafizi, 2011).

Due to geographical disadvantages, the south-western region of Bangladesh is commonly subjected to cyclones, floods, river erosion and tidal surges (Dasgupta et al., 2009). During the months of April-May and September- November, different disasters have a profound and lasting impact on lives and livelihoods of the poor people, particularly in 13 districts of the South-West coast, including Barishal (Nokrik and Alam, 2011). As a low laying area, these areas are highly vulnerable to natural disasters (MoWR, 2005) and particularly Barishal is more exposed to natural disasters such as floods, cyclones (see Fig. 1 for the geographical location). The intensity and frequency of cyclones in this region has been increasing (Climate Change Cell, 2009). For example, in a period of 5 years i.e. from 2007 to 2012 there have been 3 super cyclones with high wind speed, while in the past almost 20 years, i.e. from 1998 to 2006 only one super cyclone event has been reported (in 1991) (Rahamn and Tiwari, 2013). Besides, projected flooding for Barishal (2005 – 2040), total flooded area will increase by around 3.1 % and areas under flood depth 0.8 to 1.9 meters will increase by almost 86% and 1.9 to 3.6 meters will increase by almost 92% at the end of this century (BCC, 2013). Therefore, people in Barishal district are more vulnerable to disasters because of their deep dependency on nature for their livelihoods. Most of them do not have their own homestead land and are often forced to live on low lying flood-prone land. Very often they lose their homes due to river erosion, but they are often too poor to buy land elsewhere to relocate as a coping mechanism (TEARFUND, 2005).

In disaster studies the term 'coping strategies' acts in much the same way as the term 'adaptive strategies' is used in the climate change literature (Jaben et al., 2010). In simple words, coping refers to the short term and immediate measures implemented by individuals and communities, while adaptation must involve 'livelihood progression beyond reactive responses' (Shafie and Rahman, 2015). There are a lot of research works on disaster impacts and its coping strategies of the coastal areas of Bangladesh. Parvin et al (2009) suggested an integrated approach for managing coastal hazards at Noakhali district in Bangladesh whereas traditionally practiced technologies of floating agriculture were highly recommended for sustainable livelihood adaptation to waterlogging in the low-lying coastal areas of Bangladesh (Hossain, 2010).

Recently, some research focused on coastal people's improved understanding about the vulnerabilities to climate change and responses against its adverse impacts (Rahamn and Tiwari, 2013; Huq and Ayer, 2008; Rashid, 2009; Sarwar, 2005).

Coastal households in Bangladesh are the most prone to the impact of natural disasters. Understanding of existingimmediate response activities will be of immense contribution if it is supported by relevant government and non- government organizations (NGOs), and if the research is placed in the national context. Several researchers have argued that local level response is a key to promoting the resilience of such vulnerable communities (Hiwasaki etal., 2014; Alexander et al., 2011; Green and Raygorodetsky, 2010). Most coping strategies and response studies are focused on drought (for example, Alam, 2015; Alauddin and Sarker, 2014; Sarker et al., 2013; Habiba et al., 2012; Ahmed and Chowdhury, 2006). A few studies focus on low-lying and saline-prone areas in coastal Bangladesh (Rashid et al., 2014; Anik and Khan, 2012; Hossain et al., 2012; Rawlani and Sovacool, 2011; Ayers andHuq, 2008). However, there is limited research on in-depth empirical research on how natural disaster-prone households perceive disaster impacts and how their perceptions are linked to their immediate response.

This study concentrates on local peoples' perception about different natural disasters, social vulnerability assessment, immediate response activities in different sectors against natural disasters at Kazirchar village in Muladi Upazila of Barishal. This study will add value for the policy makers and practitioners to develop and implement long term adaptation strategies in the coastal areas of Bangladesh particularly in Barishal.

METHODS

Description of the Study Area

Southwest area of Bangladesh is very much vulnerable to various natural disasters. This area has been experienced prolong flooding in the recent years, longer than the previous flood years, especially part of Khulna,Jessore and Satkhira districts. During the monsoon-2012 other flood affected most of the south- western coastaldistricts of Bangladesh (BWDB, 2013). Cyclone Sidr 2007 erupted from the Bay of Bengal packing winds of 240 kilometers per hour, swept through the southwestern coastal areas within 155-miles radius of its eye with heavyrain and storm surges reached up to 15-20 feet high in some places on 15th November' 07 (BMD, 2010). The coastal districts of Barishal Patuakhali, Borguna, Pirojpur, Jhalkthi, Bhola, Bagerhat, Khulna, Satkhira, Shariatpur, Chittagong and Cox's Bazar and their offshore islands and chars received the major destructions by the super cyclone Sidr. Out of 12 severely affected districts, four are the worst affected, these are Bagerhat, Barguna, Pirojpur and Patuakhali. As of the reporting period, it was observed that 3,363 peoples are dead and 55,282 are injured. Approximately 563,877 houses were fully destroyed, and 9,55,065 houses were partly damaged. It is alsoreported that 186,883 hectares of crop areas are fully and 498,645-hectare area partly damaged by Sidr (BMD, 2010).

The study was conducted in Kazirchar village (an island village), Muladi upazila, Barishal district, Bangladesh (Fig. 1). The total area of this village is 2.70 sq km. It has a population of 1,225 of which, 54.95% is male and female 45.05%. Literacy rate among the village is 40% (UNO,2014).

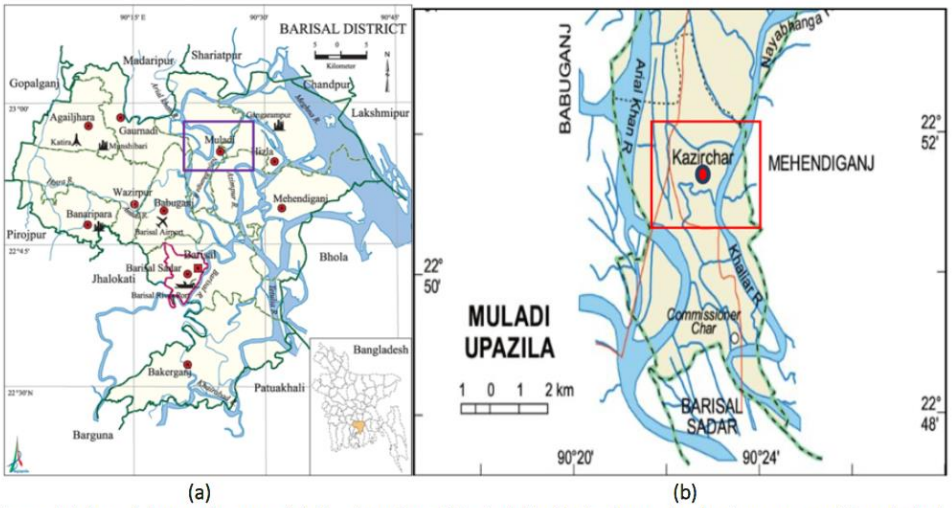

Figure 1. Map of the study area. (a). The location of Barisal district is shown by the inset map of Bangladesh on the right bottom corner of this panel. The Muladi Upazila is indicated by the purple square on the map. (b). The location of Kazirchar village is indicated by the red square, bounded by two main river system, i.e., Khaliar and Arial Khan rivers.

Total cultivable land is 240 hectares of which 73% under irrigation. Among the present 20% of the total population is landless, 10.09% marginal, 27% small, 27% intermediate and 1.09% rich. Main agricultural crops include Paddy, wheat, sweet potato, pulse, brinjal, and betel leaf. Main fruit-tree species are Mango, Jackfruit, Coconut, Litchi, Palm, Betel nut. NGOs who are working with different disaster management issues are Bangladesh Rural Advancement Committee (BRAC), Homeland, Meghna, Association for Social Advancement (ASA), PROSHIKA, Disha.

Sampling Procedure

The study area was selected at Barishal district which is the one the most vulnerable districts due to natural disasters. One Union Parishad- a rural administrative unit, subdivision of a sub-district (Upazila) which is composed of several villages, was selected purposively and from this union one village was selected called Kazirchar village. Among the about 300 households of this village, we selected 50 households systematically based on their closeness to the river and char areas (Fig. 2).

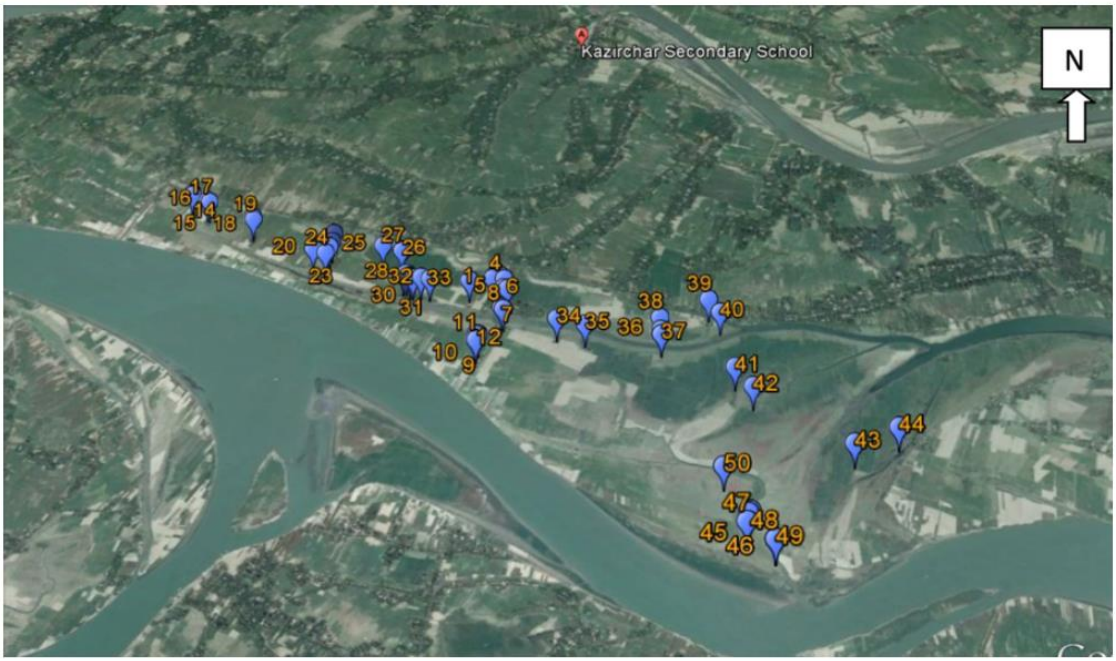

Figure 2. Geo-location of surveyed households in Kazirchar village, Muladi Upazila, Barishal. (Source: Google Earth)

Collection of Primary Data

A well- structured questionnaire was prepared for the purpose of the data collection. A pilot survey with 10 households was undertaken to scrutinize the survey design and finalize the questionnaire. It was used for two purposes - firstly, to amend questions to ensure that they would be better understood by the respondents (in some cases, sentence structure and wordings were changed); and secondly, to amend the interviewing technique so that the methods could be improved and standardized. The pilot survey findings resulted in several adjustments to the interview schedule, mostly changes in the wording of some questions, changing the timing of the survey, identifying unclear or ambiguous questions and assessing the adequacy of response choices.

The final questionnaire was consisted of three sections i.e. socio-economic status of the respondents, perception about the natural disasters and social vulnerability, and immediate responses taken in different sectors towards natural disasters. Data on monthly average income, educational status of the respondents, household type, occupational status, perception about disaster, adaptation strategies to drinking water, shelter, protect portable water; livelihood, agriculture etc. were collected through interviewing of the respondents by using the questionnaire. The socio-economic information provided by the households was cross-checked by key informants, such as school teachers and religious and political leaders. The questionnaire survey was conducted in 2015.

Collection of Secondary Data

Secondary data were collected from various published papers, gray literature, and union council office. Information related to history of disasters in Kazirchar village, population, income, crop types, fish, total cultivated land were collected from Union parishad of Kazirchar. From different non-governmental organizations (NGOs) such as Association for Social Advancement (ASA), Bangladesh Rural Advancement Committee (BRAC), PROSHIKA,

Disha provided information about the poor area of village, loans and aids to the villagers. These data were collected through personal communication and visiting the respective office.

Data Analysis

The collected data were compiled and collected information were coded to summarize the impacts, social vulnerabilities, and immediate response to natural disasters in Muladi Upazila. After screening the information in questionnaire, descriptive statistical analysis was conducted using SPSS and Microsoft Excel software. Besides this, qualitative information was double checked and presented in tabular form. Finally, the analyzed results were presented in different graphical forms.

RESULTS AND DISCUSSION

Socio-Economic Profile of the Respondents

Demographic information influences the perception and immediate response activities against different natural disasters. In Kazirchar, we found that there was a diversity among the respondents (Figs. 3-6). The average income of 46% people in study area was Bangladeshi Taka (BDT) 2000 (USD 24) and 44% people have BDT 2000- 4000 (USD 24-50) as their monthly income. The rate of illiterate people was 56% in the study area and education level at primary school was 32%.

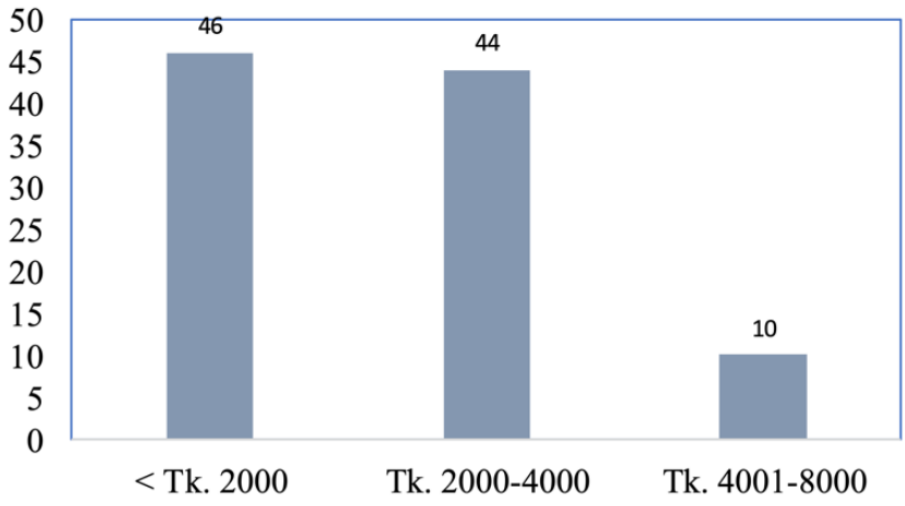

Figure 3. Monthly income percentage status of the respondents in the Kazirchar village.

Another important variable that influences the adoption of immediate response is the occupation of the household head. The study found that 28% of the household head was day labourer (people who earn money daily basis) which was followed by 26% farmer and 18% fisherman. Routray (2010) reported that food is available to the high and upper-middle income groups during the disaster period, while most of the low-income groups do not have sufficient food to overcome the situation. Consequently, ability to cope with various disasters, in terms of the storage of food is greater among high and upper-middle income groups than that of income groups and such evidence was exampled in the study area. The study also revealed that borrowing during and after a disaster is highest among laborers and fisherman, followed by farmers. As result, the labourer class becomes jobless during the disaster and mostly borrows from moneylenders at a high rate of interest to meet food consumption requirements, increasing vulnerability due to a catastrophe.

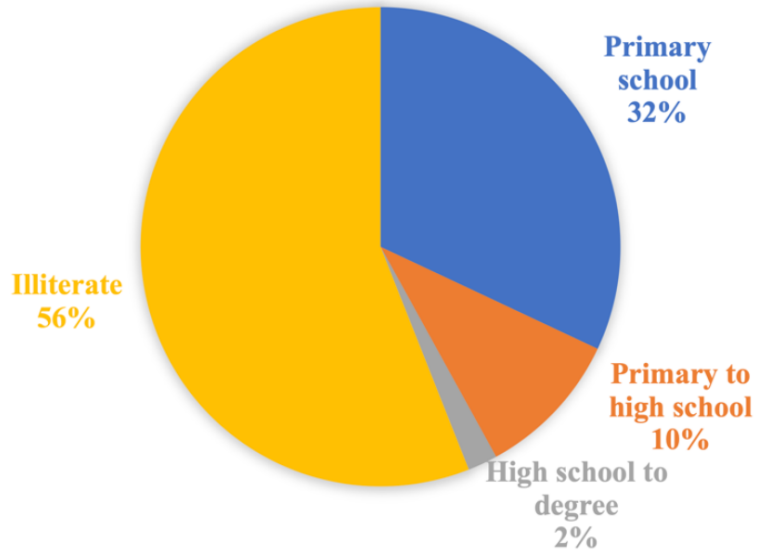

Figure 4. Educational status percentage of the respondents in the Kazirchar village.

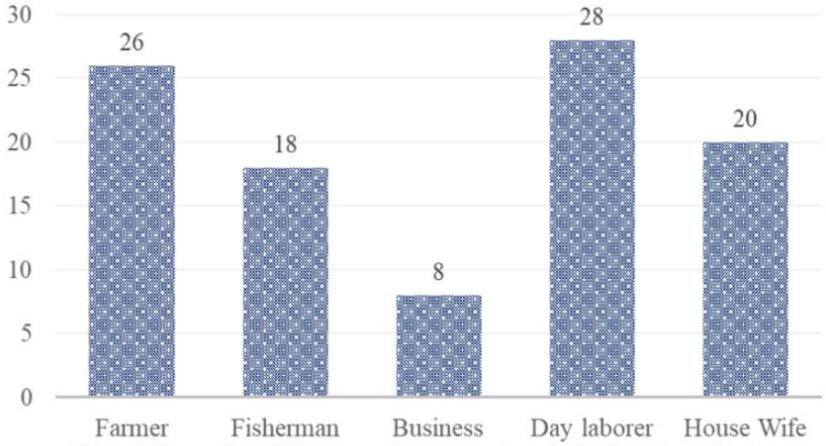

Figure 5. Occupation of the respondents percentage in the Kazirchar village.

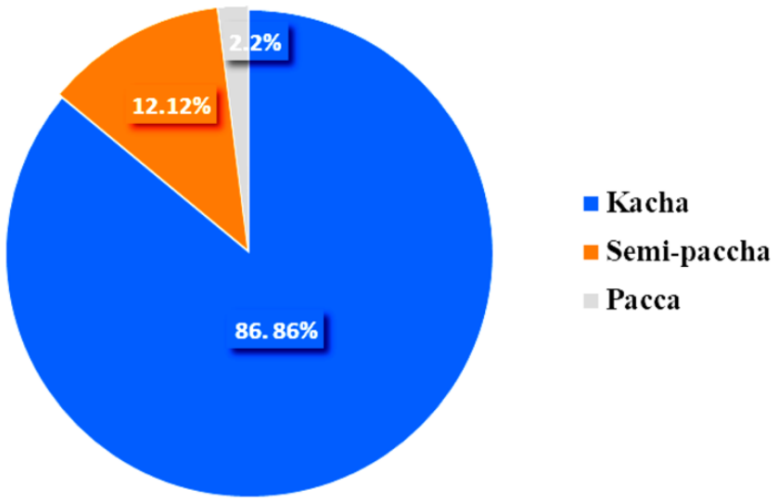

Figure 6. Hosing conditions percentage of the respondents in the Kazirchar village (Here, Kacha means houses made of mud and straw, semi-paccha means houses made of both bricks and tin, and Pacca means houses made of full bricks and concrete).

Perceptions about Natural Disasters and its Impacts

One of the prime concerns of this study was to investigate community's immediate response for different disasters. However, it is necessary to understand the community's perception and know how people respond to different natural disasters in order to vividly depict the picture of diversified immediate response of a community. The respondents opined that the most prevalent coastal natural disasters in Kazirchar village was cyclones (66%), flood (24%), riverbank erosion (8%) and drinking water scarcity (2%) (Fig. 7). It is clear that floods and cyclones are the major disasters in the Kazirchar village.

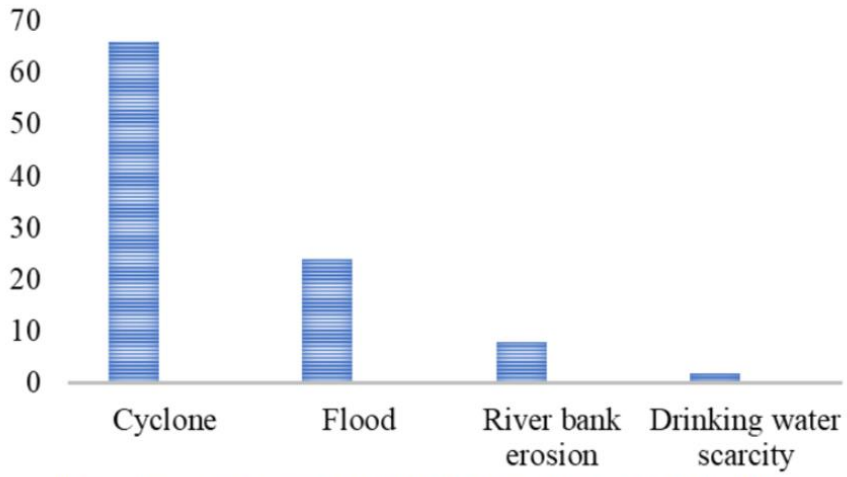

Figure 7. Perception percentage of different natural disasters in Kazirchar village.

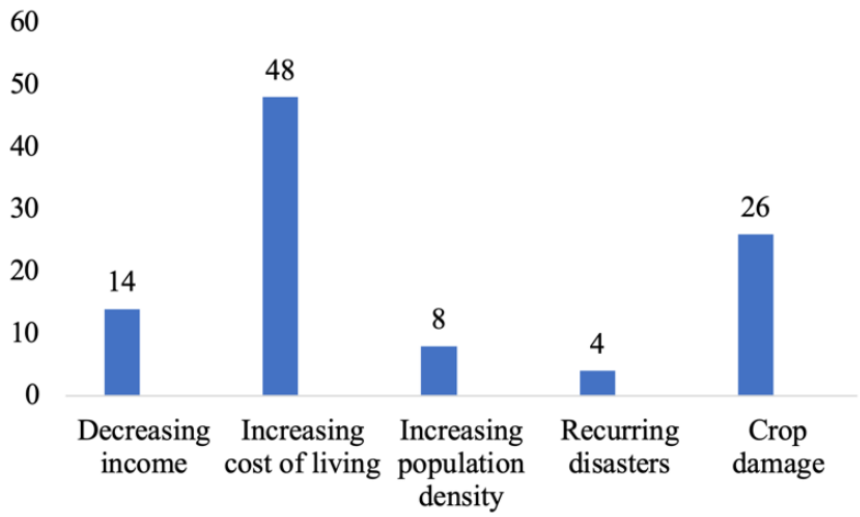

Figure 8. Socio-economic factor responsible percentage for increasing vulnerability to natural disasters in Kazirchar village.

The main reason for these recurrent disasters was its geographical location. Barishal is located in a cyclone prone area and regular flooding has enhanced vulnerabilities to coastal village in Barishal (Tiwari, 2013). Whatever the hazards existing in Kazirchar, people have noticed from their experiences that some changes in the intensity of those and at the same time various factors are enhancing their vulnerabilities to it. From the studied area, 48% people opined increasing cost of living and 26% people thought crop damage was the main reason for increasing the vulnerability (Fig. 8). In addition to this, 8% people thought that the rapid increase of population density and the scarcity of employment opportunities are responsible for increasing their vulnerabilities to coastal natural disaster. Along with the socio-economic factors, the study found that 30% and 40% of respondent supported that the location of cyclone shelters (a multipurpose building used for relocating the cyclone affected people temporarily) and closeness of house to the river, respectively is considered as the reasons of their increased vulnerability (Fig. 9). Practically, losses and damages from cyclone and flood disasters were always very much high in Kazirchar village. Data from the Union parishod, NGOs and focus group discussion the average impact of disaster was large than other area. About 40% (Fig. 10) of the respondents opined that cyclone and flood had the most destruction of the livelihood, crops, and houses (Fig. 11). Regarding the intensity of disaster in Kazirchar, almost all people (more than 90%) perceived that both the intensity of the hazards and vulnerabilities of the people have increased over the last few decades.

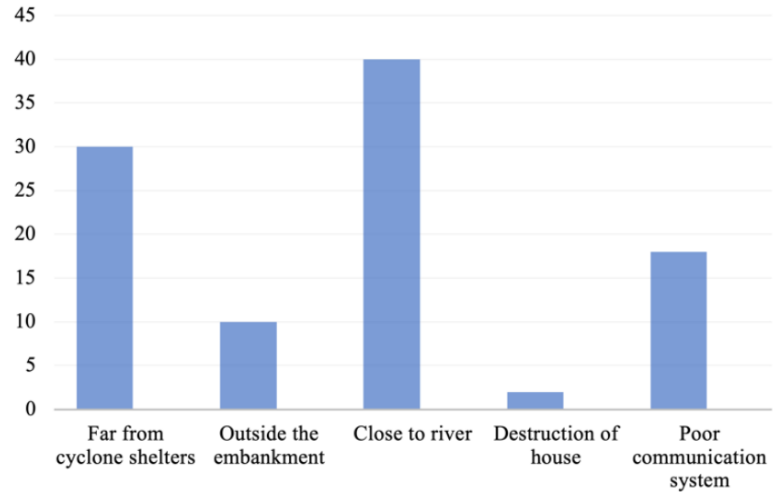

Figure 9. Physical factors percentage for increased vulnerability to natural disasters in Kazirchar village.

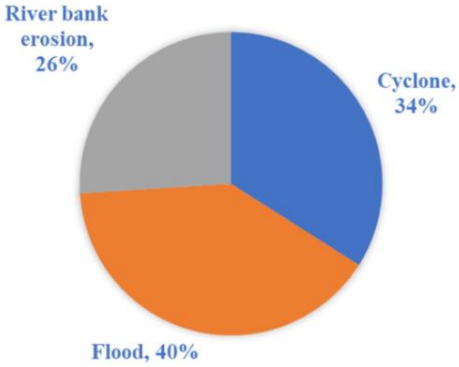

Figure 10. Reasons of severe impacts experienced percentage by the respondents in Kazirchar village.

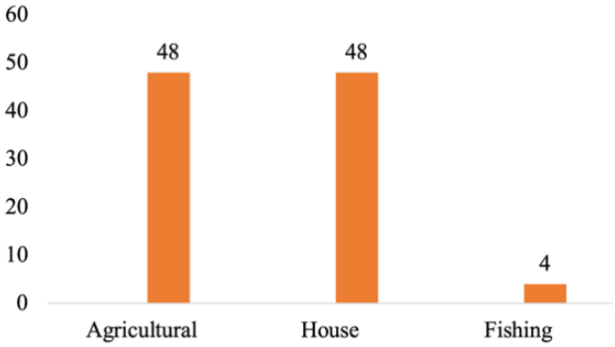

Figure 11. Losses and damages percentage from different disasters in Kazirchar village.

The overall impacts of climate change induced disaster summarized in the table 1.

Table 1: Impacts of natural disasters on local communities of Kazirchar village

Flood	Impacts
Soil erosion	Serious soil erosion (Fig. 12)
Riverbank erosion	One-third of the land area eroded between 2004 and 2014
Drinking water	Most of the tube well in char area were inundated
Loss of assets	Average Taka 20,000 per household per year
Communication	Very poor
Common diseases and conditions	Cold, fever, skin disease, diarrhea, stomach problem
Flood shelter (eg. Building for flood affected people)	No flood shelter
Cyclone impact	
Losses of life	50 people killed between 2006-2014
Losses of assets	Average Taka 40,000 per household between 2006-2014
Cyclone shelter	No cyclone center
Impact on social mobility	High rate of absenteeism from school and job
River bank erosion	
Losses of agricultural land	Average 2-3Bigha (1 Bigha = 14400 Square Feet) per household per year
Losses of homestead forest	High
Losses of houses	Approximate 100 houses between 2008-2014
Migration of household members	Very high
Damage to village road	Damage to main road to entrance of the village

Coping Techniques for Different Disasters

The villagers of Kazirchar have taken several immediate responses against adverse impacts of different natural disasters in the coastal areas of Muladi upazila of Barishal district. Some of them related to water sector and others are linked to lives and livelihoods. In the following sections the existing responses are discussed briefly.

Water supply related immediate responses for different natural disasters

Along with different shelters (safe place to live) and livelihood options, local people undertook different coping methods to have safe drinking water during and after natural disasters. The results showed that 58% people needed to travel long distances to collect water whereas 30% people use water purification tablet during disastertime. The study also found that only 10% people store potable water before the natural disasters (Fig. 13). Only few local people were unable to take any necessary action in regarding to drinking water. As the coastal area of Bangladesh is severely affected by the saline water intrusion, most of the available surface and groundwater source are contaminated with salinity. Therefore, people have to travel towards the inland areas for searching the freshwater to drink.

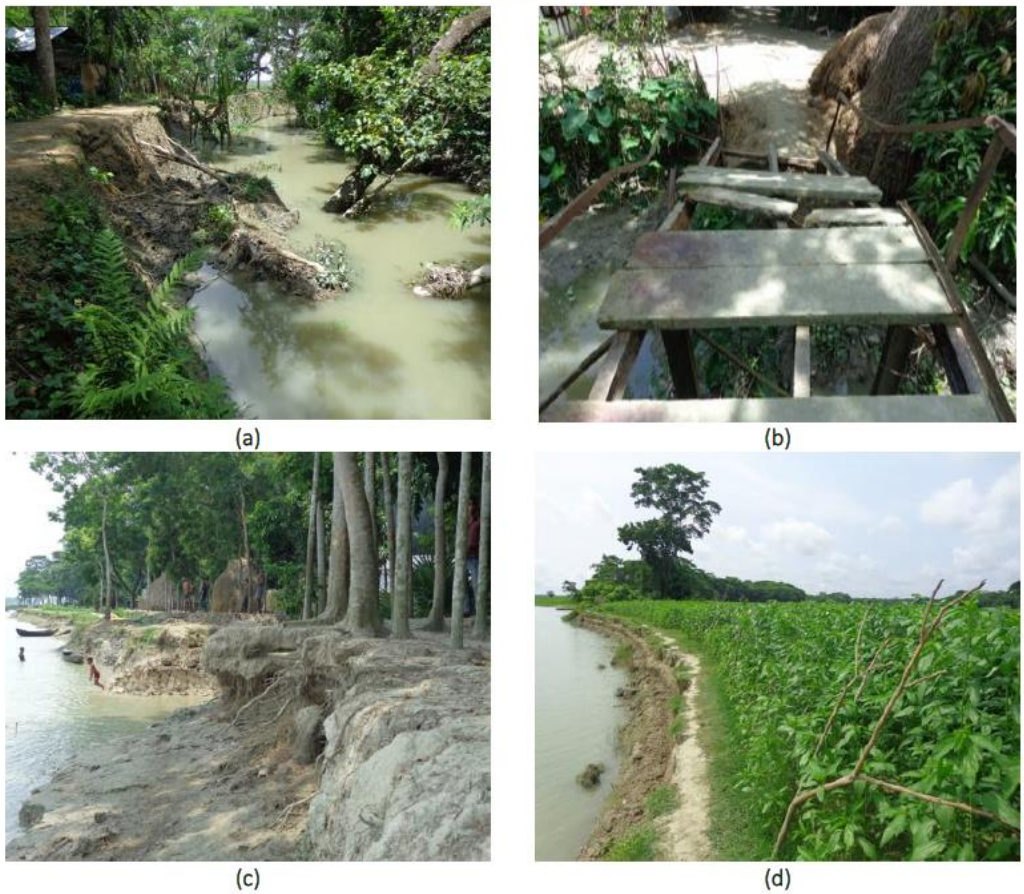

Figure 12. Impacts of natural disasters on soil, infrastructure, forest, and agricultural land in Kazirchar village, (a) soil erosion, (b) damage to main road to village entrance, (c) losses of homestead forest, and (d) losses of agricultural land.

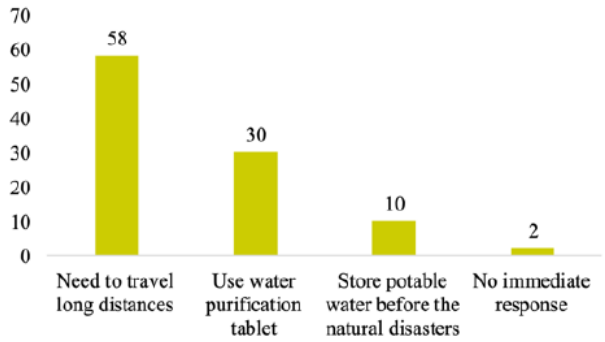

Figure 13. Water supply percentage related coping strategies of different disaster.

Shelter-related responses for different disasters

People practiced different immediate responses to protect their shelters (e.g. safe home) as well as themselves from the devastating effects of disasters. The study showed that for cyclone, 32% people take shelter at cyclone centers. For flood, 26% people take shelter land on government land and people 40% share their houses with the neighbours on high area (Fig. 14). Surprisingly, only 2% people move to their relative's house for taking emergency shelter.

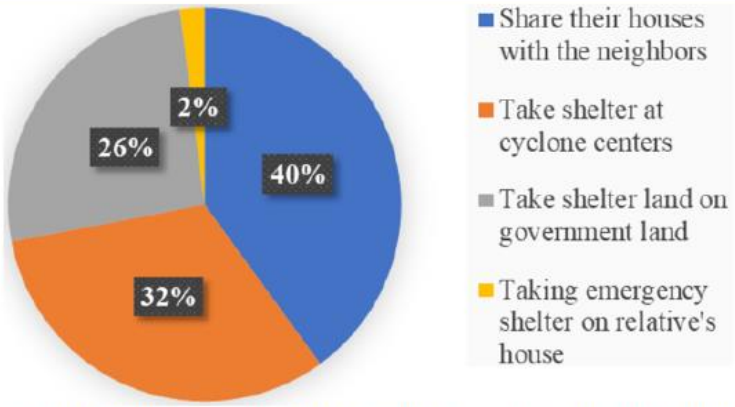

Figure 14. Shelter related immediate responses percentage in Kazirchar village.

Immediate responses to save shelter/houses

Immediate responses to save shelter depend on the risk posed by the flood erosion and cyclone. Earlier works mostly found that in flood-prone areas villagers built their dwelling units on raised land or on earthen platforms so that water cannot reach the plinth level in a normal flood (Islam, 2001). However, this study found that 60% ofrespondents in flood prone site of village built their houses on a raised land. On the other hand, 26% of respondents use bamboo, corrugated iron sheet, and wood for constructing their houses on the raised land. In addition, 12% respondents make barriers by water hyacinth (Fig. 15).

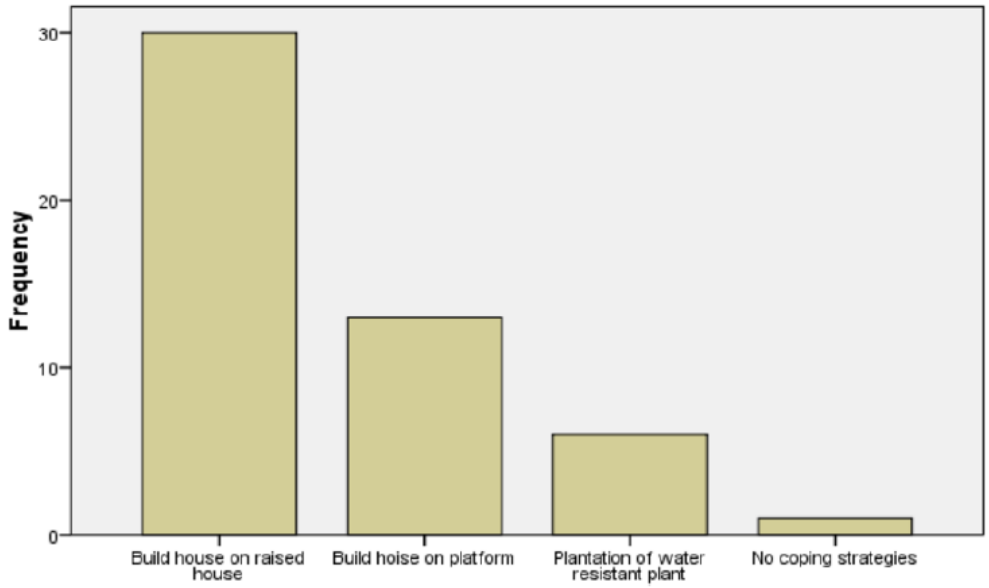

Figure 15. Coping strategies to save shelter by the communities at Kazirchar village.

People in Kazirchar village build house on raised land (e.g. higher up of the earthen floor of the house) and use platform (an additional floor above the basement of the house) to save their shelter from flood (Fig. 16). The house made by their traditional knowledge and locally available resources. Although they do not have engineeringknowledge, but the houses made is much more disaster resilient. Besides, people do tree plantation with native species around their houses for cyclone protection.

(a) (b)

Figure 16. Flood and cyclone resilient housing system in Kazirchar village, (a) house built on raised land, and (b) house built on platform above the ground and basement.

Changing Livelihood

Among the different responses related to livelihood or income sources, people primarily try to use whatever savings they have. Those who have no savings or no property such as poultry or livestock to sell into the market, then take a loan from relatives, neighbours, moneylenders, or from local NGOs. However, during the disaster, most of their relatives and neighbours also faced similar socio-economic crisis.

Occupation, loan and selling

The main occupation of the household head is an important factor that influences the adoption of immediate responses against natural disasters. The study found that 32% respondents change their occupation or working pattern whereas 30% people take aid from government and various NGOs and 26% people take aid from neighbor or relatives or others (Fig. 17).

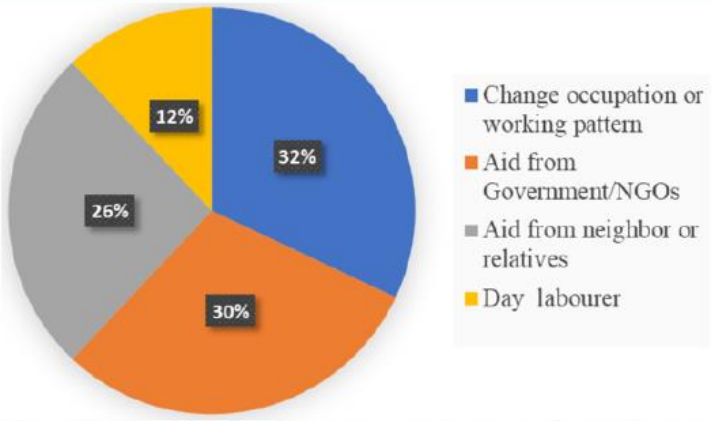

Figure 17. Diversification of livelihood percentage by the respondents of Kazirchar village.

On the other hand, people took loan after natural disaster; especially the poor people have relatively less income. During the study period, we found that 50% of the respondents took loan from different NGOs, 30% respondents took loan from money lender and only 12% respondents took loan from neighbour or relatives with interest (Fig. 18).

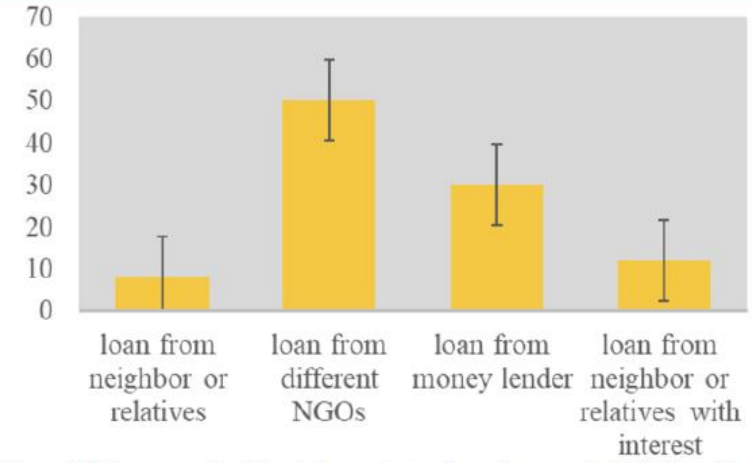

Figure 18. Loan as a livelihood dependency after disasters in Kazirchar village.

Another livelihood diversity in Kazirchar area was selling of various assets during and after a disaster. This study showed that in Kazirchar village respondents (24%) sell rice stocks, other (22%) sell livestock. About of 18% peopleof the study area sell agricultural products and trees as post-disaster immediate response (Fig. 19).

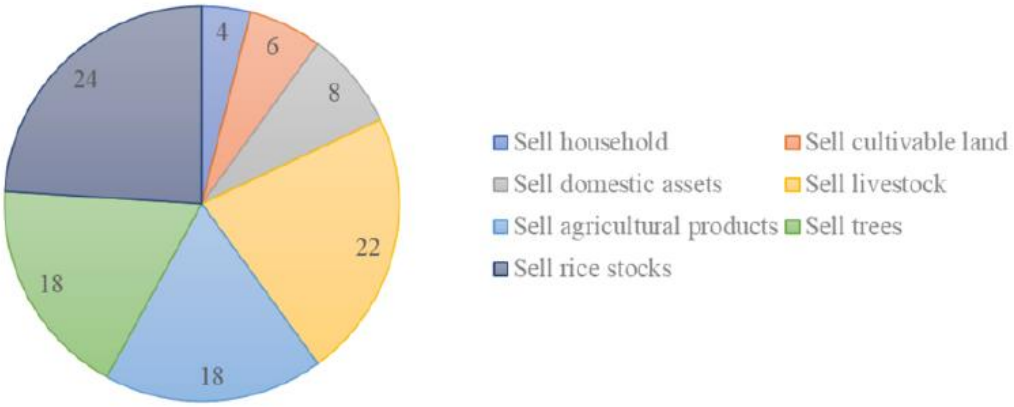

Figure 19. Selling of assets as a livelihood options after a natural disaster in Kazirchar village.

Among the different responses related to livelihood or income sources, people primarily try to use whatever savings they have. Those who have no savings or no property like poultry or livestock to sell must then take a loanfrom relatives, neighbors, moneylenders, or from local NGOs.

Immediate responses to save human lives

The study found that, 20% people of Kazirchar in char village used Muchan frequently to rise their homestead andsave their lives. Muchan is an indigenous structure made of bamboo or wood that is used as a platform. This platform can be raised using additional bamboo or wooden pillars when floodwater rises. People live on a Muchanwith all their belongings during a period of flooding. Survey also confirmed that 28% respondents use Pataton (aspecial second floor in a house made of wood) and 34% respondent do not take any action to save them from disaster anf solely rely on God. Rest of respondents (18%) relocate temporary from their houses (Fig.

20). In flood-affected areas, people build houses with either bamboo or wooden ceiling in the upper part of their home wherethey live. This ceiling is known as Pataton in which they keep food, fuel, water, and valuable assets during a flooding. By contrast, in Degree char (island village) and Shusun char (94% and 84% respectively) used Muchan to save human life (Tusher, 2012). Routry (2010) also found in Suvagacha village that villagers used Muchan and Pataton for saving human lives from flood.

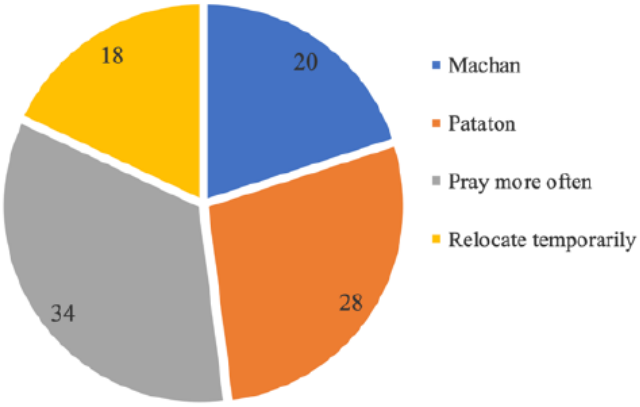

Figure 20. Coping strategies to save human life at Kazirchar village.

Coping with food habitat

Scarcity of food during and after a flood is common in flood-affected areas. Disaster affected villages generally tryto cope with food shortage by taking several immediate responses such as reduction the number of meals, dependency on less expensive food. The study exhibited that 42% of respondents changed their food habits, 36%of respondents changed frequency of meals and food items, and 22% of respondents reduced consumption of meal (Fig. 21). Tusher (2012) also found that, respondents of both Degreer and Shushua villages reduced the number of per day meal and rely on less expensive food. About 75 and 95% of inhabitants in Degreer and Shushua char had decreased their number of meals and increased their dependency on inexpensive food. However, affordability to food was less in Shushua char because of lower income level of the disaster affected people.

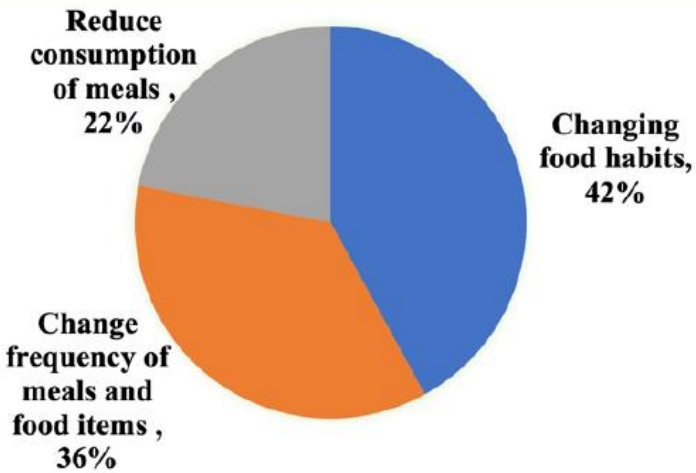

Figure 21. Coping strategies of food habitat in Kazirchar village.

Coping technique to protect crop

People in village areas have adopted different kinds of traditional practices to protect crops from floods, including the selection of appropriate crop varieties that suit the time frame of floods and the floodwater level as well as the physiographic and soil conditions of the area. The survey showed that people (48%) change land use pattern of crop, 28% people cultivate seasonal crop, and 22% people change crop pattern (Fig. 22). In Kazircahar farmers used to cultivate potatoes, pulses, spices, sweet potatoes, vegetables and wheat during the Rabi (post-flood) season. Due to flooding, many farmers prefer sugarcane and jute to paddy as they survive in high floodwater. By contrast, in Bannbari farmers cultivate Boro and other crops during the Rabi season and in the Kharif season, they prefer gathua to cultivate different vegetables. The findings of this study were very similar that of Rasid and Mallik (1995) regarding agricultural cropping patterns and related responses.

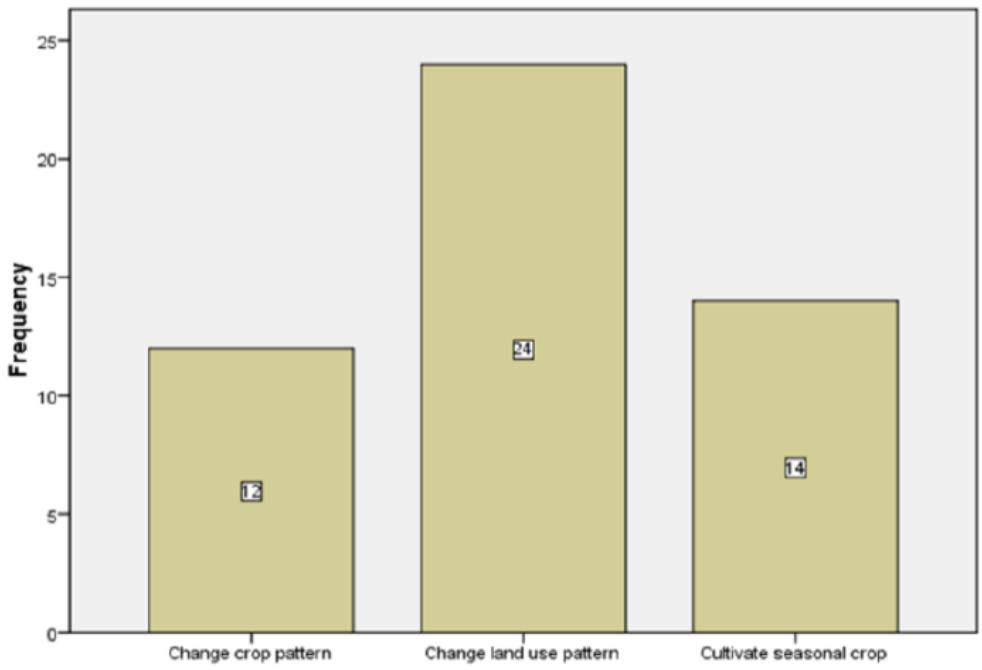

Figure 22. Coping technique to protect crop against natural disasters in Kazirchar village.

During the rainy season, flood destroy the crops and make vulnerable. People use traditionally gained knowledge to save crops from devastating impacts of natural disasters. The study found that during the flood time people raise the bank of agricultural lands to protect crops (Fig. 23).

Figure 23. Rising the land to protect crops in Kazirchar village.

Immediate response to protect poultry and livestock

Poultry and livestock are important assets for low incomes people. During the initial stage of floods and cyclones, people keep their poultry and livestock on a higher part of their homesteads. When it becomes impossible, they move them to safer places, such as higher roadsides (Fig. 24); often, they sell poultry and livestock to outsiders. Conducted survey in the study area showed that 54% of respondents kept their livestock in higher roadsides, 44% of respondents used higher part of their homestead and only 2% of respondent use Gathua whereas in Suvagacha, about 37% of respondents keep poultry and livestock on a raised part of their homesteads (Routray, 2010). People of Kazirchar village have their own coping technique to save poultry and livestock. They use roadside to protect cattle. To save poultry they use Khop made from wood. To protect their firewood, they use a small house on the roadside (Fig. 25). The summary of coping with different natural disasters in Kazirchar is presented in table 2.

Figure 24. Wooden box with long leg to protect poultry.

Figure 25. Small house to protect firewood.

Table 2: Coping with natural disasters in Kazirchar village, Muladi upazila.

Name of disaster		Coping options
Flood	Pre-disaster	Repair house, clean temporary Muchan, Pataton, Earthing up of the house, Save hard cash, store food and drinking water in high place, shift livestock in high road side, use Khop for poultry, store fire wood, and cultivate fish in Bana. High the agriculture sideline and cultivate fish.
	During disaster	Use storage food, expense low money, collect drinking water from distance tube well and use water purification tablet.
	Post disaster	Repair damaged house, collect firewood, take loan from NGOs, and use less money for daily life.
Cyclone	Pre-disaster	Repair house, took shelter in cyclone center, Pray to Allah, shift livestock near cyclone center, use Khop for poultry, Save hard cash, store food and drinking water. Plant trees around the house
	During disaster	Stay in house or cyclone center
	Post disaster	Repair damaged house, took loan from NGOs, expense less money.
River bank erosion	Pre-disaster	Relocate their household assets, livestock and poultry in safe place.
	During disaster	Do nothing
	Post disaster	Made new house in another place, take loan from NGOs.

CONCLUSIONS

Bangladesh is frequently recognized as a vulnerable country in the world. In Bangladesh, South-Western coastal districts, especially Barishal, has been experiencing the worst impacts of recurring natural disasters in the recent pasts. Consequently, this study is intended to know the coping with disasters in Kazirchar village of Muladi Upazila in Barishal, Bangladesh. Both primary and secondary data were collected to execute this study. Primary data were collected through a well-structured questionnaire survey, interviewing the key informants and focus group discussions. In addition, secondary data were collected from relevant government and non-governmental organizations. The study found that the natural disasters at Kazirchar village have devastating effects on lives, livelihood of local communities. It was also evident that, people adopt different traditional knowledge-based practices in response to various natural disasters. The study found that the most prevalent coastal hazards in Kazirchar village were

cyclones and floods. Subsequently, a large portion of the people who are living in the vicinity of this coastal village are affecting a lot both of their livelihoods and properties. It is expected that this study will be act as a reliable source of information for the taking natural disaster management initiative in this area as micro-level and formulating relevant policies to address the coping strategies against adverse effects of natural disasters in South-western coastal areas of Bangladesh in broader sense. Finally, this study recommends that fostering the socio-economic status, sound institutional set-up and strong physical arrangement can make more natural disaster resilient the local communities of Kazirchar village.

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