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CLIMATE CHANGE-INDUCED LIVELIHOOD VULNERABILITIES IN SOUTH WESTERN COASTAL REGION OF BANGLADESH

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ABSTRACT

This study focused on the impact of climate change on the livelihood of coastal people. The study used primary and secondary data to complete the study. The climatic components are changing gradually, consequently, the impact of adversity on livelihood is severe in coastal areas. This research has found the perceptions of coastal people regarding climate change and it's devastation. Coastal people faced change-induced disasters such as cyclones, floods, tidal surges, salinity intrusion, and erosion that affected the coastal communities and their livelihoods. The study found people lost their livelihood sectors, especially agricultural activities, fish farms, fishing culture, cattle farms, business, daily working opportunities, and daily labor. However, due to the challenges during and after the disasters, they cannot easily resume their regular occupations and jobs, including agricultural activities, fishing farms, fishing and cropping businesses, daily labor, seasonal labor, and workers for fishing farms. Furthermore, the coastal people lost their property and lives, particularly settlements, agricultural land, and crops, to climate change-induced adversity. The marginal farmers and laborers are the main losers during and after disasters because they have no backup money for survival. Many of them took loans from local financial institutions and money lenders. The research will provide guidelines for the coastal community and policymakers to mitigate the impact of adversity.

Keywords: *Climate Change, Livelihood, Vulnerabilities*

Introduction

Climate change impact is a burning issue for underdeveloped and developing countries by producing different disasters. People of the countries have huge limitations like a lack of mitigation technology, poor economy, and poor social and environmental consciousness (Ahmed and Haq, 2017). Climate is changing gradually by Green House Gas (GHG) like carbon dioxide (CO2), chlorofluorocarbon (CFC), and Carbon monoxide (CO) emission from human activities. According to Special Report Emission Scenarios-SRES (Intergovernmental Panel on Climate

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Change - IPCC special project) predicts the consequences of climate change the sea level will rise in the range 0.90 to 0.80 meters approximately within 2100 (Alcamo *et al*., 2007). IWM predicts the sea level will rise 14 cm in 2030, 32 cm in 2050, and 88 cm in 2100, and that water will flood approximately 10.3% of low land will go under water within 2050, 50% will go accordingly to future as estimation (Uzzaman, 2014). According to IPCC 1-meter sea level inundated 20% percent of the land mass with saline water of the country then the agricultural production will be decreased. If the 1-meter sea level rises, agricultural production will be decreased a half of the product market that value is $ 3.5 billion (Hassan, A., & Hassaan, M. A. (2020; World Bank, 2000).

Natural catastrophes including cyclones, tornadoes, hurricanes, floods, landslides, droughts, wildfires, salinity, and ice melting for sea level rise as well as various species extension, and diseases are increasing due to global warming through human activities (IPCC, 2001). Many people in vulnerable areas have understood that the impact of climate change is gradually becoming extreme on their livelihoods and lives (Alam *et al*., 2017). The locality is at risk for climate change-induced factors like social, economic, environmental, cultural, technological innovation, and other factors (Hossen *et al*., 2019; Rakib *et al*., 2019; Islam and Nursey-Bray, 2017). The climatic components are changing gradually for example temperature annually increased 20 degrees Celsius and rainfall increased 153 millimeters during 2011-2022 in Bangladesh (Rahman and Lateh, 2017; Dastagir, 2015). The season is shifting as winter is gradually becoming cooler and drier, and the summer is getting warmer as well (Islam, 2020; Rahman, and Lateh, 2017). In 1986, the Woods Hole Oceanographic Institute listed 27 low-lying countries like Bangladesh are most vulnerable to climate change-induced disasters. The funnel shape of the Bay of Bengal is creating a cyclonic and stormy environment that makes the country vulnerable (WHOI, 1986). Bangladesh is geographically located in a monsoon climate region that is bounded by the sea in the southern portion that helps to carry humidity in the rainy season as well as may the causes of different disasters like cyclones, tidal surges, erosion, and flood (Ahmed, 2015). In the southern portion of Bangladesh, the Bay of Bengal basin is located in a semi-tropical region. The length of the coastline of Bangladesh is about 710 km and the area of the coast is 166000 km2 from the east of Teknaf Upazila, Cox's Bazar to the western part of Shyamnagar Upazila, Satkhira district are the influential economic zones for different economic sources (Hussain and Hoq, 2010). 28 % people of the total population in the country about 35.1 million people are living in coastal areas of Bangladesh. The main income sources of the people are agricultural activities, fishing, and farming in the coastal area. The unemployment rate is increasing drastically because of climate change-induced disaster cyclones, tidal surges, sea level rise flooding with salinity making the land unfertile, and loss of fishing, another estimation assessed every year 5-millimeter sea level rises in the last 30 years in Bangladesh (Uzzaman, 2014). The economy of Bangladesh is climatic vulnerable due to high dependency on agricultural activities (60%) especially rice cultivation and fishing farms are dominant in the agriculture sectors of the country. Agriculture is affected by floods and cyclones during pre and post-monsoon and rainy seasons (Rahman *et al*., 2009). Riverine flood, erosion, salinity, cyclone, and other disasters are produced by climate change that makes vulnerable the livelihood of country

people particularly coastal people (Uddin, *et al*., 2019; Ahmed, 2015). People lost their lives and property, some migrated from native to safer places due to hazardous environments (Kelman and Khan, 2013).

Agricultural production is decreasing due to the unavailability of fresh water and decreasing the fertility of the soil by saline water, and the main crop is rice the production rate is decreasing in the coastal area of the southwestern part of Bangladesh, particularly Khulna, Bagherhat, and Satkhira districts (Ali, (2000). The livelihood of the People who are living in char land and coastal areas are affected by different climatic disasters (Islam and Hossain, 2014). For example, 82% of shrimp cultivation farms were destroyed in the southwestern coastal area of Bangladesh by Cyclone Aila. The consequences of climate change-induced salinity increasing the cropping land is shifting to fishing farms because of decreasing the crop production for salinity in coastal areas, in Bangladesh (Dagupta *et al*., 2017; Dasgupta *et al*., 2015). According to MoE, 1.81 % of total GDP has been lost in the recent year, and predicted, it will be 2.5 after 2030 for the intensity of disasters driven by climate change (MoE, 2009).

The southwestern part of the coast especially the Sundarbans provides 10 million people earning sources but it is also the most vulnerable to climate change particularly erosion and salinity (Uzzaman, 2014). Loss of biodiversity and marine environment and resources happens due to climate change through salinity, sea level rise, and coastal disasters like cyclones, tidal surges, and coastal floods. Annually, 26 % of the landmass of Bangladesh goes under flood, and it creates many other deficiencies and problems (Mirza *et al*. 2000). For example, many species lost their habitat; lost agricultural land, and vegetation that provided livelihood and earnings were lost by flooding the environment with saline water in coastal areas, in Bangladesh (Hussain and Hoq, 2010). The diseases are increasing especially cholera, diarrhea, and viral diseases in coastal areas for extreme temperature and salinity (World Bank, 2000). The natural disaster particularly cyclone frequency is increasing, during 1990-2004 the 10 major cyclones occurred in coastal areas in Bangladesh, and divested the area as well. In recent years, many disasters happened in the region like Alila, Nargis, Sidr, Mohasen, and Amphan (Uzzaman, 2014). Adaptation and mitigation technology, knowledge, and skills are needed to get rid of climate change-induced disasters (Hussain and Hoq, 2010). The report of the Intergovernmental Panel for Climate Change (IPCC) showed that different scenarios for uncontrollable emission of various pollutants and gases that create disasters such as low land will be submerged for sea level rise, salinization of agricultural land, flooding the cropping land, erosion on the bank, frequent and devastating cyclone make the coastal people livelihood difficult (Roy *et al*., 2022; Jongman *et al*., 2012).

Bangladesh is a vulnerable country for climate change-induced disasters particularly sea level rise, cyclone, river bank erosion, and flood inundation associated with cyclonic tidal surge (Ahmed *et al*., 2018; Auerbach, 2015; Sarwar and Woodroffe, 2013). The country is vulnerable to climate change-induced disasters, particularly sea level rise, salinity intrusion, cyclones, and floods that impact livelihood and fatalities (Roy *et al.*, 2022). In the country, 50% of people live below 5 meters above the mean sea level while 46% of people live below 10 meters above the mean sea level (Luetz, 2018). The coastal people think they are affected by climate change-induced disasters (Ahmed *et al*., 2018). This research will try to fill the gaps and help to

understand the management policy to protect the coastal resources and livelihood in the changing climate.

The main objective of the study is to assess the perception of livelihood vulnerabilities of climate change affecting the southwestern coastal region of Bangladesh.

Materials and Methods

Methodology

The study has followed mixed method approaches while both qualitative and quantitative data have been used. Secondary data have been collected from published documents that demonstrated the research's next step. The primary data have been collected from field by using different tools and techniques such as focus group discussions, questionnaire surveys, and key informant interviews. Hence, Focus Group Discussions (FGD) have been led by various occupations that are concerned with climate change's impact on coastal communities to find out the problem and solutions before semi-structured questionnaire development. Three (3) FGDs have been conducted those are participatory methods to explore the knowledge in a particular area and help to find information regarding the research problem. This method has been used widely in climate change and climate change impacts in coastal areas. The questionnaire has focused on the factors of coastal people's livelihood vulnerability. The questionnaire followed the 5-time Likert scale for data collection and analysis. Five times Likert scale (5 = Strongly Agree, 4= Agree, 3 = Neutral (neither Agree nor Disagree), 2 = Disagree and 1 = strongly disagree) have been used (Kuvan & Akan, 2005). The main target of the questionnaire survey is to find out the livelihood vulnerable scenarios in coastal areas and their copping capacity with disastrous environments. All the people based on gender, occupation, and age group have been included in the study area. According to Yamane (1973) formula:

$$n = N/(1+N(e)2$$

7% precision about 200 semi-structured questionnaires have been surveyed based on the number of population in the study area. After completing the questionnaire survey, 5 KIIs were used for the accuracy of data. The experts, researchers, policy makers and community leaders were the respondents of KII.

Study Area

The climate change-induced disaster-prone coastal area particularly the gradually cyclone-affected southwestern coastal area makes sense the adversity for the community annually. This area has been selected as a study area due to the gradual natural calamities. Assasuni Upazila belongs to the district of Satkhira district (Fig. 1). The area of the Upazila is 402.36 sq. km. The absolute location of the Upazila is between 89°03' and 89°17' East longitudes and 22°21' and 22°40' in the North latitude. the Upazila is bounded by Shyamnagar Upazila on the South, Tala Upazila and Satkhira Sadar on the north, Debhata and Kaliganj Upazila on the West, and Paikgacha and Koira Upazila on the east (Fig. 1; BBS, 2011).

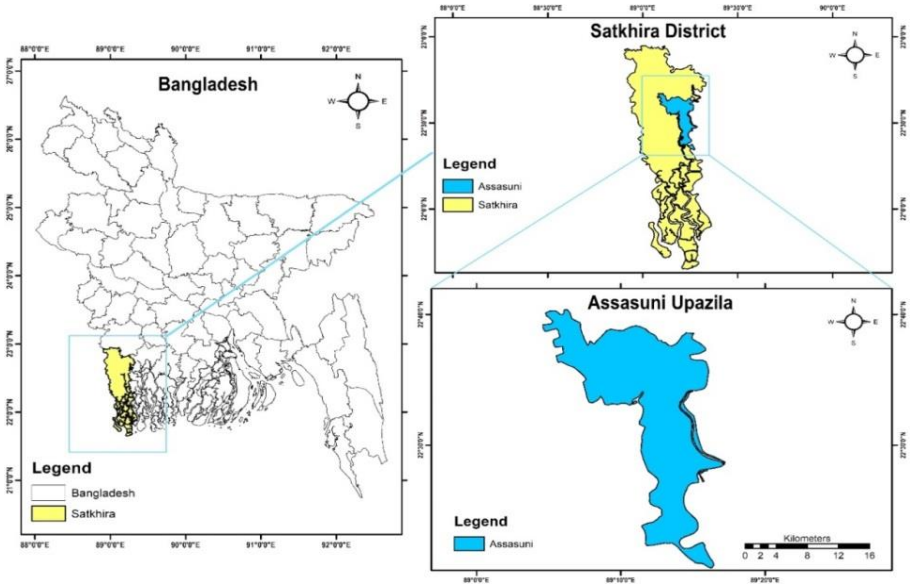

Fig. 1. Study Area (Assasuni Upazila), Source: (Author 2023).

Results and Discussion

Perception of Climate Change Impact on Coastal Area

Respondents face climate change

Most of the participants (62%) are positively responded with yes because this coastal area truly affected and experienced by climate change (Table 1). Climate change is an unavoidable threat to the coastal areas that have already been stressed by the disruption of human activity, environmental disturbance, loss of invasive species, and other disasters. The affected communities are coastal people due to they are living close to the coast.

Table 1. Climate change experience

Item	Percentage
Yes	62
No	38

Source: Field Survey, 2023

The adversity originated from climate change such as a sea level rise, frequent occurrence of natural disasters like salinity, storms, cyclones, floods and erosion, etc. Every year people face different types of disasters such as cyclones, and tidal surge-originated floods. Coastal people lost their livelihood, particularly in agricultural fields, fishing farms, and labor (Hoque *et al*., 2018).

Changing Nature of Climatic Components

The people in the study area have already been facing several climate change-induced hardships. Climate components are being changed and people opined that temperature is very high (58.5%), wind speed is being highly changed (45.5%), and wind movement is changing day to day. Almost

40% of people agreed that humidity is increasing (Table 2). The components are changing gradually, particularly temperature, humidity, wind speed, and others that influence the disastrous environment in the region. The changing components influenced to change the climate.

Table 2. Changing nature of climate components

Climate components Change	Very high	High	Moderate	Low level	Very low
Temperature is gradually high	58.5%	27.5%	5%	7%	2%
Humidity is steadily higher day by day	32%	39.5%	11%	12%	5.5%
Wind speed is higher	25.5%	45.5%	19%	7.5%	2.5%
Wind movement is changing	63%	20%	5%	9%	3%

Source: Field Survey, 2023

The global community has tried to keep the temperature at 1.5 degrees celsius at the end of the century but the components particularly temperature, humidity, and wind movement are gradually changing (Roy *et al*, 2022; Hasan and Hassaan, 2020; IPCC, 2019). Many people living in low elevated coastal lines near to sea are affected by climate change-induced disasters flooding, cyclones, and salinity in China, India, Vietnam, Indonesia, and Bangladesh (Jongman *et al*., 2012; McGranahan *et al*., 2007).

Nature of Climate Change

A large volume of people in Bangladesh who live in the coastal areas are victims of natural disasters induced by climate change with problems including salinity increases (24.0%), and flooding (33.5%) the higher-ranking climate change. Then, the temperature (54%) is the most essential and dynamic climatic component, which varies spatially and temporally. Additionally, this research area faces high salinity and high temperatures in comparison with the previous year (Table 3).

Table 3. Nature of climate change

Climate change	Yes (%)	No (%)	Not Applicable (%)
River erosion increase	60.5	7	32.5
Flooding	34.5	34.0	32.5
Increase temperature	54.0	13.5	32.5
Tidal surge	39.5	30.0	30.5
The tree is dying	8.5	59.0	32.5
Crops are less	48.5	19.0	32.5
Increase salinity	41.0	24.0	35.0

Source: Field Survey, 2023

Climate change-induced disasters are increasing bit by bit affecting agriculture, labor works, fishing farms, and other sectors in coastal areas. It is usual before or after monsoon, the devastating cyclone and flooding make the coastal livelihood scratched (Brammer, 2014; Islam & Paul, 2018).

Perception of climate change-induced natural agents

The study shows adversity of coastal disasters in table number 3.3 such as coastal flood (44%), salinity (52%), and cyclone is increasing (69%) due to climate change in coastal areas (Table 4). People in the study areas are better observers of climate change adversity. Thus, the outcomes of the study have achieved from the respondent's perception and field visit regarding the scenarios of that many disasters are associated with climatic change.

The coastal zone is vulnerable due to climate change and its geographical settings such as its flat, low-lying, and delta-exposed topography. As a result, thousands of people are forced to leave their homes because of livelihood loss due to climate-induced natural factors such as high rainfall frequency, rising temperatures, coastal salinity, or coastal erosion. The temperature is increasing with frequent cyclones associated with saline tidal surges flooding the low land of south western part of Bangladesh. This part of the country is susceptible to submerging by sea level rise (Shahana *et al*., 2021).

Table 4. Perception of climate change-induced natural agents

Perception of climate change-induced natural agents	Very high	High	Moderate	Low level	Very low
Rainfall frequency is high	15%	34%	27.5%	19%	4.5%
River stream speed is changing gradually from the previous	23.5%	35%	6.5%	25%	10%
River bank erosion is increasing from the previous	13.5%	46.5%	13%	20.5%	6.5%
Cyclone is increasing from the previous	42.5%	28%	20.5%	5%	4%
Cyclone frequency is increasing	58%	11%	12.5%	10%	8.5%
Coastal flood frequency is increasing	44%	31%	14%	7%	4%
Coastal salinity rate is increasing	22.5%	29.5%	35%	8%	5%
Coastal salinity intrusion is increasing	43.5%	21.5%	12.5%	9.5%	8%

Source: Field Survey, 2023

Perception of climate change-induced migration

The people of the study area are highly affected. Most (65%) of the respondents agreed that local people are affected by climate change-induced disasters through livelihood loss (Table 5). This study revealed that the main reasons for livelihood loss in coastal regions for climate climate-induced natural and man-made factors. Moreover, climate migration occurs when people leave their homes and livelihoods due to extreme weather events, including floods, riverbank erosion, droughts, and cyclone, as well as slower-moving climate challenges such as rising sea levels and intensifying water stress.

Table 5. Perception of climate change induced migration

Opinion	Percentage
Yes	65%
No	35%

Source: Field Survey, 2023

Livelihood status of coastal people

Occupation of the respondents

Agriculture is the most common line of work in the area beneath study, followed by farming (33%), fish farming (7.5%), and retail sales (16.5%) in that order. It was also established by the residents that they did not rely on one particular occupation due to subsistence. Many of them engaged in various kinds of employment (Fig. 2).

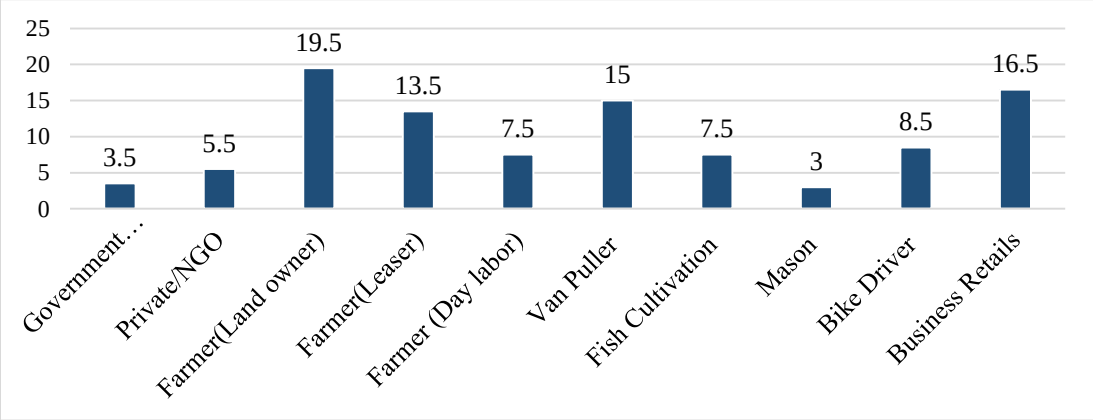

Fig. 2. Occupation of the respondent, Source: Field Survey, 2023.

In this study, people enrolled in various economic activities but many of them are involved in agricultural works including land owners, leasing farmers, agricultural labor, fishing farms, fishing, and fishing labor. Most of the coastal people are embroiled in agricultural activity particularly cropping fields and fishing (Forster *et al*., 2022).

Monthly income of the respondents

The income of the coastal people is limited. According to the fig. 3, 37% of respondents' income range is 7001-10000 BDT. while 26% is 10000-15000 BDT. The only 9% earn 20,000 BDT. and more BDT. (Fig. 3). The livelihood practice is very challenging due to nature-dependent livelihood that is often affected by climate change adversity. Many people in this region are affected by diverse climatic incidents each year that impact the regular livelihood practices particularly agriculture, fishing farms, and traditional occupations.

In this situation, their income is quite minimal and is dependent on above-ground commercial activity. Most people are poor and agricultural-dependent families but every year they lose many properties to disasters in coastal areas (BBS, 2019).

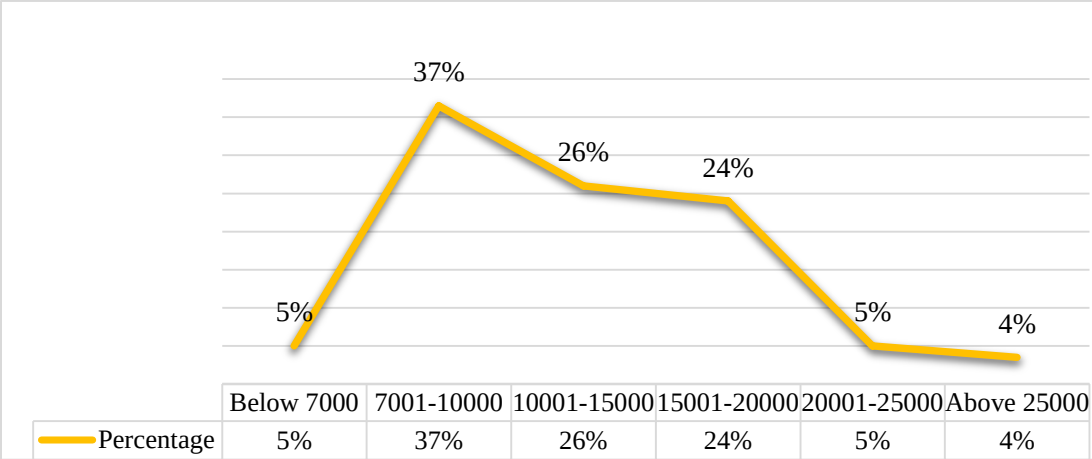

Fig. 3. Monthly income of the respondents, Source: Field Survey, 2023.

Impact of Climate Change on Livelihood in Coastal Areas

Impact of Climate change-induced natural and man-made factors on coastal livlihood. Climate change is the defining crisis of the current time, and one of the valid reasons for coastal displacement and adversity. The majority (70%) of the respondents opined that climate-induced natural and man-made disasters are responsible for livelihood loss, settlement loss, and migration (Fig. 4). The profound and far-reaching impact of climatic phenomena on human mobility is evident in the study area.

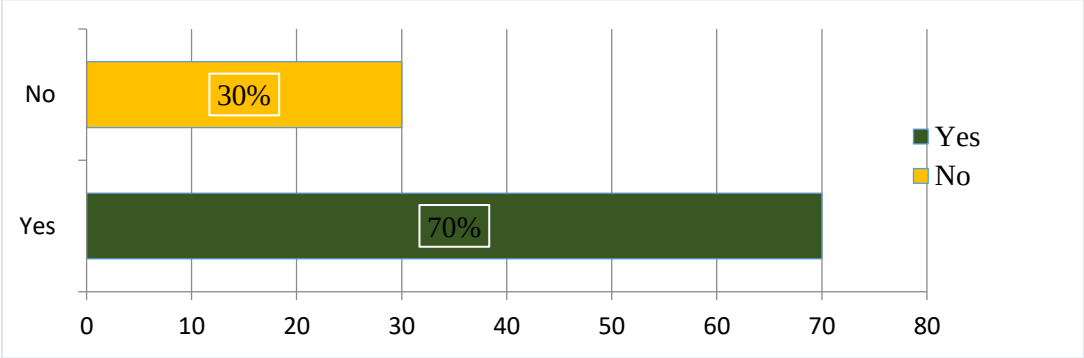

Fig. 4. Impact of climate change on livelihood in coastal areas (Source : Field Survey, 2023).

The study found that natural factors like temperature increase, high-frequency rainfall, increasing cyclone frequency, and changed the nature of socio-economic factors including income opportunity loss, levels of poverty, and dependence on agriculture were responsible for livelihood loss. Bangladesh is known as climate climate-vulnerable country due to the disadvantage of geographical settings for low-lying flat topography, poverty, high density of population, and climate-reliable livelihood. Staple food rice and fish production depended on the climatic sector, particularly rain (Didar-Ul Islam *et al.*, 2015).

The pattern of livelihood loss for climate change in coastal area

Climate change is a big challenge in the study area. Its impacts on livelihoods are severing particularly on agriculture, industry, infrastructure, disaster, health, and energy. The results of the this study show the scenario of the livelihood of coastal people. The local community opined in different sectors regarding the loss by disasters in coastal areas such as loss of cropping (51.5%), fishing farm loss (49.5%), and occupation loss (59%) were high ranking among mentioned patterns of livelihood (Table 6). Various groups in society experienced the impacts of climate change in various degrees depending upon their initial economic conditions (poor or non-poor), location (coastal or non-coastal, rural or urban), and gender. Climate change adversity is increasing gradually as well as vulnerability. Nature-dependent livelihood practices are vulnerable to disasters in coastal areas. The disasters are mostly effective such as cyclones, tidal surges, floods, river erosion, and salinity.

Table 6. Pattern of livelihood loss

The pattern of livelihood loss	Very high	High	Moderate	Low level	Very low
Loss of cropping	51.5%	29%	8%	6.5%	5%
Loss of fishing farm	49.5%	31.5%	12.5%	4.5%	3%
Loss of agricultural land	35%	42%	19.5%	5%	3.5%
Loss of fertility by salinity intrusion for flooding	38%	44.5%	12%	4%	1.5%
Loss of wages	53.5%	31%	12%	2%	1.5%
Loss of occupation	59%	26.5%	10.5%	3.5%	0.5%
Loss of investment	67.5%	22.5%	8%	1.5%	0.5%
Loss of livestock	62%	20.5%	12.5%	3%	2%
Loss of fishing business	33.5%	53%	9.5%	2.5%	1.5%
Loss of cropping business	55%	28.5%	13%	4.5%	4%

Source: Field Survey, 2023

The calamities have severely affected agriculture, fishing or fish cultivation, and livestock rearing. Whatever happens by the climate, and subsequently to various other sectors, it is important for livelihood in the coastal area. Additionally, communities remain extremely vulnerable to disasters that impede the key livelihoods in the coastal areas more than any other place. Almost 41 % of the total labor force in Bangladesh is from agriculture and 14.23% of the total GDP contribution from agriculture in the country (Shelton *et al*., 2018; BBS, 2019).

Agricultural Practice Disruption and Loss by Climate Change-Induced Natural Factors

The people of the study mentioned that the climate change impacts in different sectors especially on agriculture in the study area. In the agriculture sector, people lost their

opportunities by climate change-originated disasters through loss of jobs (69.5%), loss of agriculture production (86.5%), shifting agriculture practices (88%), and human livelihoods are high to very highly disrupted or losses by climate-induced natural factors (Table 7). There is much evidence of prominent increases in disasters by their intensity and frequency. The regular disasters are floods, land erosion, tropical cyclones, intense rainfall, storm surges, salinity intrusion, etc. in the study area. The agricultural production is lost by tropical cyclones. Many times the cropping land covered by flooding water originated from tidal surges or tropical cyclones. Agricultural farmers, agricultural businessman, and laborers are losing their opportunities because of climate change-induced disasters. Traditional agriculture cropping is decreasing in coastal areas due to variations of fresh water and salinity levels and increasing abrupt weather events, tidal inundation, and waterlogging.

Table 7. Agricultural practice disruption and loss by climate change-induced natural agents

Agricultural practice disruption	Very high	High	Moderate	Low level	Very low
Loss of farming in coastal areas by flood for high rainfall	35%	27.5%	33.5%	2.5%	3.5%
Loss of farming for river stream erosion	20.5%	51%	18.5%	7.5%	2.5%
Loss of farming by coastal cyclone	20.5%	53.5%	20%	4%	2%
Agriculture practice is shifted by coastal disaster	18%	61%	11.5%	6.5%	3%
Agricultural labor is losing wages	24%	51.5%	17%	4.5%	3%
Agricultural labor loss their jobs	27%	42.5%	25.5%	4%	1%
Agricultural businessman lose their business	32.5%	41%	19%	5.5%	2%
Frequent loss by climate change-induced disaster	39.5%	55.5%	3%	1.5%	0.5%
Loss of agricultural production	42%	44.5%	8.5%	3.5%	1.5%
Shifting agricultural practice	33.5%	54.5%	7.5%	3.5%	1%

Source: Field Survey, 2023

Therefore, climate change poses a serious and additional threat to the region's poor farmers and rural communities who live in remote, marginal areas. Such impacts pose additional risks for already vulnerable communities striving to combat poverty and achieve sustainable development. Finally, climate change is emerging as the pre-eminent development issue in Bangladesh.

Agriculture is disrupted by climate change-originated catastrophes in south western part of Bangladesh, particularly Khulna, Satkhira, and Bagherhat. The coastal livelihood is affected especially rice and vegetable production for crop damage due to cropping fields inundation and storm surge during April-September every year. It decreased the production capacity by salinity, erosion, and flooding **(**Roy, 2022). About 40 million people are living in coastal zones where most of the people are involved in agricultural activities (Lazar *et al*., 2015). Agricultural The

agricultural fields and fishing farms are affected by sea level rise in coastal areas, erosion in the char land, and flooding in the low land area **(**Roy *et al*, 2022**).**

Loss of income and working opportunity from fishing by climate change-induced agents

Most of the people of the coastal area are facing adversity such as loss of traditional fishing occupation (85%), taking loans (76.5%), and loss of working opportunities (85%) related to fish farming and fishing activities due to climate change in the coastal area (Table 8). The main impact of climate change on the coastal environment includes temperature rising in sea water, salinity increasing and sea-level rising, PH rising or reducing in seawater, and changes in upwelling water mass movement. Almost 50% of the respondents perceived that they lost their fishing activities due to climate change-induced disasters in their area (Table 8).

Table 8. Loss of income and working opportunity from fishing by climate change induced agents

Income and job opportunities lost from fishing	Very high	High	Moderate	Low level	Very low
Regular coastal occupation loss	29%	37.5%	20.5%	10%	3%
Income loss temporary or permanent from fishing	43%	16.5%	30%	7%	4.5%
Shifting their traditional occupation	36.5%	48.5%	5%	8.5%	1.5%
Fishing farm loss cyclone by erosion	34%	49.5%	8%	6%	2.5%
Taking a loan for farm loss	12.5%	64%	13.5%	2%	8%
Fishing farm loss causes of climate change	65%	15.5%	14%	4.5%	1%
Working opportunity loss from fishing	58%	27%	8.5%	4%	2.5%
Fisherman lose their lives in the deep sea because of climate change-induced cyclone	52%	24.5%	10%	3%	9.5%
Occupation is challenging due to climate change-induced disasters	27%	58.5%	6.5%	4.5%	3.5%

Source: Field Survey, 2023

The main livelihood activities are fishing, paddy cultivation and another is shrimp cultivation in the coastal area near the Sunderbans region but cyclones along with tidal surges are the main challenges to coastal livelihood (Hoque *et al*., 2019; Abdullah *et al*., 2016)**.**

Conclusion

Bangladesh is one of the most vulnerable countries to climate change in the world. It is agreed and documented that being a deltaic coastal country. The livelihood practices are disrupted by climate change-induced disasters. The coastal region of Bangladesh covers about 20% of the total

land area and over 30% of the cultivable lands of the country. The cultivable land of coastal area affected by climate change induged disasters particularly about 63% land degreed by soil salinity, predicted 20% low land will be submerged, and 20-30 million people will be displaced from coastal area (Hoque *et al*., 2019; MoA, 2013).This research found that climate components are changing especially in temperature, humidity, and radiation which have a great effect on annual climate change, nearly 60 % of the respondents perceived that climatic components are changing. About 42.5% of respondents strongly believed that cyclones are increasing in coastal areas from the previous time. Around 44% of the local people strongly agreed that coastal flooding is increasing due to climate change. Climate change-induced disasters are floods, cyclones, salinity intrusion, and erosion that affect livelihood, almost 63% of the respondents observed that climate change-induced disasters affected the livelihood of coastal communities. The livelihood practices are agriculture, fishing farms, business, labor, and services in the coastal area. Approximately 52% of the respondents strongly agreed that agricultural crop is destroyed by disasters in coastal areas thus 49.5% lost fishing farms, 53% lost wages, 59 % lost occupation, 67.5% lost investment and 55% lost business. The initiatives have been taken by the government, NGOs, personnel, and support from relatives and local donors. Climate-related change in coastal regions embodies potential additional stress on systems that are already under intense and growing pressure. The government should take the timely needed initiatives for the coastal people for their income and working opportunities, and insurance for the adversity after disasters.

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