

Doctoral Dissertation



Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh

Submitted By

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Student's Declaration

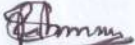
I hereby declare that this research work entitled 'Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh', has been carried out by me. Furthermore, this thesis contains no material which has been accepted for the award of any other degree in any university and to the best of my knowledge and belief, contains no materials previously published or written by another person, except where due reference has been made in the text.

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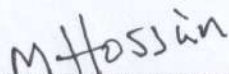
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Approval & Certification of the Supervisor

This is to certify that Registration No. 115, Session 2020-2021 is a student of Institute of Disaster Management and Vulnerability Studies at University of Dhaka has completed a Ph.D. Dissertation entitled 'Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh' submitted by Md. Sadequr Rahman under my supervision is his own original work and suitable for submission for the award of the degree of Ph.D. Furthermore, he has fulfilled all necessary requirements as mentioned by the University to get his Ph.D. degree with specialization in Disaster Management.


29.05.2024

(Professor Dr. Khondoker Mokaddem Hossain)

Supervisor

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List of Acronyms

AHP: Analytic Hierarchy Process
BBS: Bangladesh Bureau of Statistics
BDRS: Bangladesh Disaster-related Statistics
BRT: Boosted Regression Trees
CCVI: Coastal Community Vulnerability Index
CPP: Cyclone Preparedness Program
CRA: Community Risk Assessment
CRED: Centre on Research of Epidemiology and Disasters
CRI: Climate risk index
CRI: Community Resilience Index
CVI: Climate Vulnerability Index
DBMHL: Double burden of malnutrition at household level
DBP: Diastolic Blood Pressure
DER: Disaster and Emergency Response
DMA: Disaster Management Act
DMB: Disaster Management Bureau
DMC: Disaster Management Committee
DRI: Disaster Risk Index
DRM: Disaster Risk Management
DRR: Disaster Risk Reduction
EDAS: Evaluation-based on the Distance from Average Solution
EDI: Economic Development Index
EM-DAT: Emergency Events Database
EWS: Early Warning Systems
FAO: Food and Agricultural Organizations
FGD: Focus Group Discussions
GOB: Government of Bangladesh
GAR: Global Assessment Report
GIS: Geographic Information Systems
Health EDRM: Health Emergency and Disaster Risk Management

HIES: Household Income and Expenditure Survey
HVI: Health Vulnerability Index
IDMVS: Institute of Disaster Management and Vulnerability Studies
IPCC: Intergovernmental Panel on Climate Change's (IPCC)
KIIs: Key Informants Interviews
LVI: Livelihood Vulnerability Index
MoDMR: Ministry of Disaster Management and Relief
MoF: Ministry of Food
MHM: Menstrual hygiene management
mS/cm: milliSiemens per centimeter
MoFDM: Ministry of Food and Disaster Management
NDMC: National Disaster Management Council
NPDM: National Plan for Disaster Management
PAR model: Pressure and Release model
PWD: Persons with Disability
SBP: Systolic Blood Pressure
SCI: Social Capital Index
SeVI: Socio-economic vulnerability Index
SDGs: Sustainable Development Goals
SID: Statistics and Informatics Divisions
SLV: Sustainable Livelihood Framework
SOD: Standing Orders on Disasters
SSVI: socio-spatial vulnerability index
SRHR: Sexual and reproductive health and rights
TDS: Total Dissolved Solids
UNFCCC: United Nations Framework Convention on Climate Change
UNISDR: United Nations International Strategy for Disaster Reduction
WASH: Water, sanitation and hygiene
(WASH2): Water, sanitation, hygiene, and health
WRI: World Risk Index
WHO: World Health Organizations

Abstract

Due to the geo-morphological and meteorological characteristics, Bangladesh tends to be susceptible to several types of natural disasters like cyclone, tidal surge, coastal flooding, and salinity intrusion with the increasing severity and frequency of cyclonic disasters and resulting in massive losses of life, damage to property, disruptions of livelihoods, economic activities and health hazards. This study aims to analyze the severity of socio-economic and health impact of cyclonic disasters on the coastal community of south west Bangladesh, but impacts differently. To gather information for this study, a triangulation of quantitative and qualitative research approaches, including 840 questionnaire survey, 82 case studies, 68 Key Informants Interviews (KII), and 08 Focus Group Discussions (FGD) have been conducted from Satkhira and Khulna district of Khulna division, and Bhola and Barguna district of Barishal division. Multi-stages stratified sampling has been used in this study. Data has been collected from the women, pregnant women, adolescent girls, aged, elderly, physically challenged people, fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, bed community, chunery or oyster and snail collectors, riders and other vulnerable or destitute of the southern coastal community. The community people of these areas depend on mangrove forest resources and river or sea-based water resources for their livelihood. In addition, certain information came from secondary sources. Through SPSS 22, Pearson Chi-Square (χ^2) tests and some descriptive statistics have been performed in this study.

This study investigates the socio-economic and health effect of coastal cyclonic disasters on south west coastal community people in Bangladesh, particularly Shyamnagar and Ashashuni upazila in Satkhira district and Dacope and Koyra upazila in Khulna district of Khulna division, and Patharghata and Betagi upazila in Barguna district and Charfashion and Tajumuddin upazila in Bhola district of Barishal division., which are the most cyclonic disaster-prone area.

Due to the cyclonic disasters, dwellings, water, sanitation and hygiene (WASH), several roads, culverts, embankments, agricultural fields, and educational establishments have been destroyed during the cyclone disaster. This catastrophe results in salinity intrusion, fresh water crises, alternative livelihood challenges, health, and sanitation and malnutrition problems. Many people have become homeless and now lead miserable and hopeless lives.

Cyclonic disasters effect on the communities economic, social, physical, psychological, cultural, and health vulnerabilities which accounts for 100%, 89%, 13.9%, 96.9%, 6.8% and 97.5%

respectively. Cyclonic disasters destructed the infrastructure, farmland, ruining the shelter and death of cattle. Cyclonic disasters disrupted social networks and communication, hindrances to children's movement, women's income, means of livelihood disruptions, educational institutions, increased mental health issues, waterborne diseases, skin ailments, and forced migration, increasing of crime rates, vector-borne diseases, malnutrition, and gender-based vulnerabilities. It also creates the problem of WASH and potable water respectively. Cyclonic disasters disrupt the regularity of children education, children drop out from school, and tends to economic uncertainty. Physically disabled and aged people face transportation barriers, lack of water, sanitation and hygiene (WASH) facilities, sufficient toilet facilities, and lack of shelter facilities. Economic insecurity, food insecurity, lack of shelter, death risk, infrastructural losses, health risks, scarcity of safe drinking water, damage of standing crops, loss of fisheries, homestead/kitchen garden, threats to various livelihoods, and migration respectively due to cyclone and cyclone induced disasters. Workers suffer during cyclonic disasters, and also get low wages and salary, and health hazards due to cyclonic disasters. Food production and employment opportunity/income diversity, fisheries and domestic livestock sectors is threatened due to cyclonic disasters. The coastal community faced the mental depression, economic depression and social depression due to cyclonic disasters. The marginal community including adolescent girls, pregnant and breastfeeding women are not conscious and face difficulties in accessing proper and nutritious food during cyclonic disasters. Even, they do not get health rights and sexual and reproductive health and rights (SRHR). Pregnant, breastfeeding, and menstruating women are at risk of health issues during and after disasters.

Women face vulnerability and deprivation during disasters, such as limited access to healthcare due to distant health care center, and restricted roles in the informal sector due to unpaid work, patriarchal attitudes, lack of opportunities in decision-making, lack of opportunity in community decision making process, and lack of political empowerment etc. Women face the scarcity of suitable places for baby's breast feeding, for changing proper sanitary materials, do not get medical treatment, insufficient of healthcare access, inadequate of the essential medical goods and services, absent of hygienic facilities of women, lack of privacy and unavailability of separate toilets during and post disasters in cyclone shelters. About 91.3%, 89.6%, 88.4%, 87.9%, and 84.2% of the respondents mention that maternal and fetal complexity, miscarriage, changes in periodical

cycle/time, preterm/ immature birth, maternal and prenatal death/ immature death, and child growth retardation are occurred due to salinity.

About 96.7%, 95.8%, 95.6%, 95.1%, 92.7% and 65.2% of the respondents claim that they suffer various diseases like water and food borne diseases, mental, nutritional, infectious and other diseases, high rates of diseases, vector and rodent borne diseases, extreme weather events –related diseases and heat related illness and death in south west coastal Bangladesh due to cyclonic disasters. Fever, cold, bad headache, diarrhea, asthma/ breath taking problem, whooping cough and skin diseases of health risks are observed frequently.

The community have indigenous knowledge about coping mechanism of disaster risk, response and risk reduction. Respondents get to know about upcoming disaster from miking of CPP volunteers, interpersonal communication, television and Facebook. They recover from damages of properties with their capacity from their own resources, NGO support, and government support respectively due to cyclonic disasters. The respondents emphasized empowering local communities, building disaster risk reduction skills, and establishing links between local communities and governments to mitigate disaster impacts. Cyclone centers, embankment, and sluice gate should be constructed. Access of safe drinking water, medical facilities, menstrual hygiene management (MHM) corner, and reforestation is needed to reduce the disaster risks. Public health and hygiene, public awareness, meeting and training, and preparedness program should be enriched to reduce the disaster risks. Government and NGOs provided social assistance program should be extended and maintained properly.

In order to ensure efficient cyclone management and long-term physical growth, the dissertation provides some suggestions for improving the coastal communities by coordinating of ‘disaster risk reduction, adaptation, mitigation and resilient’ activities and executing future plans.

Finally, this research has proposed some implications that might be helpful for policy making and further research regarding ‘cyclonic disasters’.

Key words: Cyclone, flood, tidal surge, salinity intrusion, cyclonic disasters, social vulnerability, economic vulnerability, health care and services, health risks, adaptation, disaster risk reduction, and disaster management.

Chapter One: Introduction

1.1 Background of the Study

As a low-lying riverine, deltaic, and disaster-prone country, Bangladesh covers an area of 147,570 square kilometers and about 172.76 (January 2023) million people with a most densely populated country of 1090 per square kilometer (BBS 2023). Bangladesh faces of multitude of disasters such as cyclones, storm surges, floods, river bank erosion, earthquake, droughts, salinity intrusions, fires, and tsunamis etc. At the same time, the country faces climate change and variability related risks, which are expected to exacerbate existing natural hazards/disasters, posing significant challenges for future development. According to the Bangladesh Bureau of Statistics (BBS) report regarding Bangladesh Disaster-related Statistics (BDRS) 2021, about 54.69% household are affected by flood, 34% household are cyclone-affected households, 14.22% are affected by thunderstorm, 17.83% are affected by hailstorm, 10.04% are affected by coastal/river erosion, 5.28% are affected by tornado, 2.26% are affected by storm/tidal surge (total 83.63% households [multi-responses] are affected by storm related disasters), 10.16% are affected by water logging, 4.72% household are affected by drought and 3.27% household are affected by salinity respectively (GoB 2022). Livelihood of the community is already under tremendous risks due to disasters. A significant number of poor people forcefully reside in vulnerable areas of the southern coastal belt of Bangladesh. The vulnerability is so miserable that they forcefully go and settle in the newly accreted land in Bay of Bengal and its surrounding areas which is occasionally hit by tidal surge or devastating cyclones. The Intergovernmental Panel on Climate Change's (IPCC) 5th Assessment Report (AR5) anticipates 'increased riverine, coastal and flooding events, leading to extensive damage to infrastructure, livelihoods, and settlements for Asia. Risk of death, injury, ill-health, or disrupted livelihoods in low-lying coastal zones and small island developing states and other small islands, due to storm surges, coastal flooding, and sea-level rising' (GoB 2015).

Cyclones and tidal surges frequently inflicted the lives and property of coastal and char areas of Bangladesh. Alam and Collins (2010) explored the vulnerability to cyclone hazards using adapting strategies from pre-, during- and post- disasters. They propose that, beyond extreme cyclone forces, vulnerability is locally defined regarding responses, infrastructure, uneven exposure, residential patterns, and livelihoods. Women and children are disproportionately affected more during cyclone periods (Alam and Collins 2010). Cyclone and flood particularly caused massive

damages. Cyclone occurring in 1970, 1991, 2007 and 2009 resulted in significant casualties such as 364,000, 136,000, 3,363 and 190 respectively (Rahman 2017).

Bangladesh is at high risk of multiple climate-related hazards. According to the INFORM Risk Index 2021, Bangladesh's ranks 27th among the 191 countries regarding the risk score of 5.8 out of 10. Germanwatch create the climate risk index (CRI) and notified that Bangladesh ranks 9th on the list of 10 most affected countries and places 7th on the long term (1998-2017) risk index due to extreme climatic weather events (Eckstein et al., 2019).

Disaster risks are particularly high where extreme natural events occur tremendously and create the more vulnerable communities. World Risk Index assesses the latent disaster risks for 193 countries worldwide. Asia continent ranks the second position in terms of hazard, exposure and vulnerability. High-risk countries are as the Philippines, Myanmar, India, Indonesia, China, and Bangladesh. The 'World Risk Report 2023' identifies Bangladesh as the ninth topmost natural disaster-prone country among 193, compared to its fifth topmost position among 171 countries in the world in 2017 (UNDRR 2022; UNISDR 2017). Disasters and the climate change have an unequal impact on different people—within and between societies. The Global Assessment Report (GAR) 2011 of the UNISDR claimed that regarding the large number of people exposed to flood, cyclone, and sea surge, Bangladesh is ranked first out of 162 countries (UNISDR 2011; GAR 2011). The geographical setting, morphological and meteorological characteristics have made the country vulnerable to different geo-hazards and hydro-meteorological hazards. These hazards often lead to various disasters. The major disasters are floods, cyclones, droughts, tidal surges, tornadoes, nor'-wester, earthquakes, river erosion, fire, arsenic contamination of ground water, water logging, water and soil salinity, cold wave, building collapse, epidemic, and various forms of pollution etc.

A long-term trend of disasters in Bangladesh based on 120 years (1900-2020) data from EM-DAT data (<http://www.emdat.be/>) suggests that cyclones and floods are the two most recurrent disasters, causing significant economic losses and associated with catastrophic events in the history of Bangladesh, such as 1970 Bhola Cyclone where roughly 500,000 lives were lost (Nirapad & Start Network UK).

The population of Bangladesh has experienced steady growth, reaching about 172.76 million in January 2023, 171.74 million in July 2022 and 160.80 (July 2016) million. The annual population growth rate of Bangladesh is 1.12%, total fertility rate is 2.2 per women, contraceptives prevalence

rate is 63.3%, mortality rate is 5.8 per thousand, and life expectancy rate is 72.4 years in 2022 (BBS, 2022). Under 5 years or Child Mortality Rate per 1000 live birth is 133 in 1993 to 88 in 2004, 46 in 2014, 34 in 2016 and 31 in 2022, Infant mortality rate is 87 in 1993 to 65 in 2004, 38 in 2014, 31 in 2016 and 24 in 2022, neonatal mortality rate is 52 in 1993 to 41 in 2004, 28 in 2014 and 16 in 2022, and maternal mortality rate is 569 in 1990 to 176 in 2014 and 153 in 2022. And this mortality rate and morbidity or burden of diseases increases when the natural disasters like cyclone, flood and salinity intrusion occurs. Whatever, Bangladesh reduced child mortality faster than Sweden and many developed countries ever did.

The United Nations declares, in 2015, 17 goals to ensure sustainable development goals (SDG) by the year 2030. Among these, 'clean water and sanitation' stands in goal 6 whereas 'good health and well-being', and 'climate action' respectively stand as goal 3 and 13 target, clearly shows the importance of safe water and combating climate change induced disasters impact for ensuring sustainable development whereas health issues are directly associated with access to clean water. There are 19 districts and 148 sub-districts in coastal region of Bangladesh. This region covers an area of 47,201 km², comprises of 32% of land area and around 35 million people representing 29% of the population live in the coastal zone where the majority of the population are somehow affected (directly or indirectly) by climate change induced coastal floods, tidal surges, river bank erosion, salinity, and tropical cyclones etc. (Ahmed 2019). Fourteen of the nineteen coastal districts of Bangladesh are classified as high or moderate cyclone-risk areas (Khan et al 2010; Roy and Kovordanyi 2015). The coastal area is characterized by a wide range network of rivers and tidal channels; erosion and accretion processes continue, siltation takes place on water courses and river beds; and the area is prone to cyclone, storm surges and salinity intrusion. Coastal area is a land of natural disasters. Consequently, a series of tropical cyclones, tornadoes, tidal bore and floods attack the coast of Bangladesh year-round (Haque 2019). The number of affected areas vis-a-vis number of disasters affected people are increasing day to day. For example – due to cyclone Amphan (16 May 2020) a large portion of Koyra and Batiaghata upazila of Khulna district and Ashashuni and Shyamnagar in Satkhira district inundated for long due to the high tide. Approximately 190 million people are directly affected annually due to natural and technological hazards and emergencies, with numerous of deaths. While emergencies and disasters disproportionately affect those who are the most vulnerable, especially the poorest, as well as women, adolescent girls, children, aged, physically challenged, people with chronic diseases, fisherman, marginal farmers, day laborers,

agricultural wage laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, chunery or oyster and snail collectors, riders and other subpopulations with higher levels of risks (WHO 2019). All Health Emergency and Disaster Risk Management (Health EDRM) policies and practices should integrate gender, age, disability and cultural perspectives, in which the leadership of women, youth and other at-risk groups should be promoted. Health EDRM is derived from the good practices and achievements in humanitarian action, multi-sectoral disaster risk management, and emergency preparedness and response, health systems strengthening and community-centered primary health care (WHO 2019).

Human triumph over diseases and early death are one of the most significant improvements ever made in the condition of human life and higher standard of living. In Bangladesh, significant progress has been observed in child health care, including the provision of antibiotics, treatment of diarrhea, raise vaccine coverage, access of family planning, enhanced education, economic growth, and a reduction in family size over the last two decades. Besides, socio-economic development, improved health care, lifestyle and nutritional knowledge, access to clean water, toilets, bathing facilities, hygiene practices, proper sewerage systems, and buildings secure from rodents, vaccinations against childhood diseases, and other public health interventions contributed to preventing the spread of diseases. Despite these advancements, the infant, child and maternal mortality, morbidity and health systems are precarious or concern of alarming due to various natural disasters. Maternal mortality and woman's risk of death becomes for lack of prenatal care, lack of health care system during delivering the baby; and seeking an unsafe abortion. Similarly, child mortality and disabilities may increase for sudden onset and post- natural disasters. Due to the cyclonic disasters and the prevalence of bacterial and viral diseases disproportionately affect the poor, vulnerable, and destitute of socio-economic group such as women, adolescent girls, children, aged, physically challenged, fisherman, marginal farmers, day laborers, agricultural wage laborers, migrants, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. who are prime victims of these challenges.

Cyclone: Cyclonic disasters like cyclones, tidal surges, floods and salinity intrusions took many thousands of lives in Bangladesh directly, hinder the normal economic activities and brings the severe problems including poverty, health and quality of life. In addition, cyclonic disasters have

adversely impact on public health, livelihoods, infrastructure, the economy and socio-cultural foundations. Cyclones, floods, rising sea levels, tidal surges, and river erosion are destroying infrastructures to children's well-being, including schools, health facilities, latrines, houses, and roads. They can affect badly in access to food and drinking water and also increase the transmission risks of infectious diseases such as diarrhea, hepatitis, malaria, dengue, pneumonia, eye infections and skin diseases which contributes to the hampers of livelihoods. Surface water becomes contaminated by saline intrusion and poor sanitation systems (Haque et al. 2012; Haque and Blair 1992). Open and bamboo-wooden structured latrines and poor sanitation are common in rural and coastal areas of Bangladesh and cyclones make this situation worse (Haque and Blair 1992). Water borne diseases break out and sometimes spread out after the disaster of cyclone and tidal surge due to the lack of safe drinking water. Other causes are impacted indirectly such as damaged infrastructure, population displacement, reduced food production and the release of contamination of water (e.g. from storage and waste disposal sites). Child malnutrition happens seriously for the loss of crops and reduced access to fish in Bangladesh. Post-traumatic disorder, psychological stress and depression occurs during the disaster and post disaster of cyclone and flood period. Due to disruption of schooling for children and losses of houses and infrastructure the literacy rates are impacted badly and poor knowledge of environmental health issues creates additional problems after the cyclone.

During the period 1950-2017, about 162 cyclones formed in the Bay of Bengal, resulting massive loss of life about 567886, total negatively affected about 81769010 and destruction of property near about \$6026380 thousand (EM-DAT, CRED 2017). The massive devastating cyclone was in 1970 and 1991 around 300,000 and 138,882 were dead within very short time.

Experiences with cyclone and relevant disasters: People of all classes especially the marginal people like gender or women, girl, child, elderly, physically disable and poor including the coastal community of fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, bede community, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. are the most vulnerable group to experience the cyclonic disasters and sometimes they are socially excluded.

Women and girls suffered disproportionately in all disasters. Due to cyclone, flood and tidal surge, the mortality and morbidity rates go to a staggering disproportion and discrepancies regarding their

impacts on the gender. The vulnerability of women, children and aged to the disaster and post disaster casualties is 14 times greater than those of men (Araujo and Quesada-Aguilar 2007). During the cyclone and flood of 1991 in Bangladesh, the mortality rate of women increased fivefold than men, and out of 138,882 casualties many of whom were women and older than 40 years. Besides, many children, elderly, disabled, ethnic minorities and the poor were deceased with bitter experience (Rahman 2013; Rohr 2006). Women were killed 3 times higher compared to men in the Asian tsunami of 2004. Even, more women were died in hurricane Katrina 2005 in USA (Rahman 2013; Dasgupta et al. 2010). Additionally, the majority of women and children do not know how to swim. Also, the types of wearing clothes of women could restrict their mobility and during an emergency situation like cyclonic storm surge disastrous situation can become difficult to quick escape (Mehta 2007; Rahman 2013; Dasgupta et al. 2010). Women's health condition deteriorates alarmingly aftermath of disasters for some reasons. The community looks at the health and hygienic needs of women with differently and avoid addressing the issue of providing institutional assistance. Women faces more nutritional deficiencies especially the pregnant or breastfeeding period, and they are lower on the priority of household food intake in some cultures. In South and Southeast Asia, 45 to 60% of women are underweight in the reproductive period and 80% of pregnant women experience iron deficiencies (Rahman 2013; Davis et al. 2005). Social taboos and norms in terms of menstruation and proper behavior have contributed to health problems for young women in disaster situations. A study of WHO (2005) reported that during the 1998 flood in Bangladesh there was an increase in perinea rashes and urinary tract infections in adolescent girls because they were not able to properly wash and dry their menstrual rags (WHO 2005; Rahman 2013). Pregnant, breastfeeding and menstruating women are at risk of health during cyclone and after cyclone disaster. Scarcity of suitable places for baby's breastfeeding, proper sanitary materials such as women's underwear pose great hazards for their health condition during and post disasters. Health care access or the list of essential medical goods and services like contraceptives, birth control pills etc. are found insufficient. These increase the chance of sexually transmitted diseases (Rahman 2013; Dasgupta et al. 2010). Another problem in cyclone shelters and flood shelters or refugee camps is the common absence of hygienic facilities for women and adolescent girls. Lack of privacy at latrines, unavailability of separate toilets, showers, and tents for women, men and adolescent girls are seen and sometimes these unresolved issues are failed to solve the crisis in the society (Mehta 2007; Rahman 2013; Dasgupta et al. 2010).

Due to lack of basic necessities to sustain life, such as shelter, food, safe water, and sanitation affected communities are migrated with some level of psychological or mental health problems. These can include post-traumatic stress disorder, depressive symptoms or major depressive disorder, anxiety or generalized anxiety disorder, as well as more general mental health problems such as sleep disruption, substance abuse, and aggression (Nahar et al 2014).

Cyclonic flood is a perennial problem or recurrent event of Bangladesh. Almost every year there is flood in one or other part of the country. Floods are the most significant natural hazard in the country causing extensive damage to human life and property. It usually occurs during the monsoon season. The geographical setting and meteorological characteristics have made the country vulnerable to different geo-hazards and hydro-meteorological hazards/disasters. In the context of human exposure in flood hazard zones, nearly 19,279,960 people are present in these zones and Bangladesh ranks 1st among 162 nations (Hassan, 2016).

On the contrary, Bangladesh like other developing countries is facing socio-economic and environmental challenges and health threats due to salinity intrusion. Salt water or salinity intrudes in the coastal belt from the flow of sea water through the natural disasters like cyclone, tidal surge, flood, river flow, estuarine circulation etc. Besides, climate change, sea-level rises, and water and land management practices exacerbate the salinity. It is estimated that Bangladesh has about 2.8 million hectares of land that are affected by salinity—i.e., almost one-third of the 9 million hectares of total national cultivated area, and about one-fifth of the total area of Bangladesh.

Salinity has directly or indirectly affected negatively or adversely on human health or creature health. The main health problems of those were reported in various literature as follows: hypertension or blood pressure, heat diseases, osteoporosis, malaria, diarrhea, dehydration, skin diseases (itch, boil/blister), malnutrition, acute illness, respiratory illness such as asthma, stomach cancer and obesity, kidney diseases, chronic illness, trauma and other injuries, and infection or Communicable diseases, Non communicable diseases, pregnancy related complicacy or gynecological problems and injuries, anemia and preeclampsia etc. Due to natural disasters induced salinity intrusion it is seen that the premature birth and miscarriage rate are more severe in salinity prone coastal regions than other areas. Besides we will also know that who are more at risk comparatively among child, elderly, women, pregnant women, disable people also.

Fisheries will be greatly hampered if the salt water is present in groundwater level and open water bodies (including ponds). Diseases of fish may increase. Production of sweet water fish (like carps)

will shrink and extinct if the sea level rises. Sweet water fish or carp fishes will be died or contagious for intolerable excessive salinity and human being will be contagious or negatively affected by disease eating these contaminated fishes. It has been proved that salinity had adverse effects on fisheries, crop productivity and food grain production (Khan et al. 2008). It appears to be a threat to the wellbeing of communities who live in coastal areas of this low-lying nation.

1.2 Statement of the Problem

Bangladesh is most likely be hit by cyclone disaster because of its location, population density, low-lying riverine, weather patterns, large number of rivers and funnel-shaped coast. Cyclones, storm surges, floods, river bank erosion, earthquake, droughts, salinity intrusions, fires, and tsunamis, and rising sea level disasters are all effects of climate change. These cyclonic disasters and climate change pose significant challenges to Bangladesh, impacting socio-economic stability, public health, and the healthcare system of the coastal community people who live there. In the last few decades, people have noticed that the climate has changed dramatically and it has made terrible social and economic effects upon the community people. Almost every year, cyclones hit the coastal belt of Bangladesh and struck mostly before (April-May) and after (September-November) the monsoon season. Cyclonic disasters are the worst natural disasters those always hit in the south west coastal area of Bangladesh especially of different upazilas in the Khulna and Barishal division. The characteristics of the coastal belt, lack of education, lack of awareness, poverty, spiritual beliefs, unemployment, over population, lack of cyclone center and relief operations, an inadequate disaster management plan, lack of structural and non-structural management policies make the south west coastal district particularly Satkhira, Khulna, Bhola and Barguna district more vulnerable to cyclonic disasters. While numerous studies have documented these effects individually, there remains a critical gap in understanding the comprehensive and interconnected impacts across these domains. A systematic investigation is necessary to explore: Cyclones in Bangladesh often result in significant loss of life among coastal vulnerable populations. The destruction of homes, infrastructure, and agricultural land disrupts livelihoods, leading to long-term economic hardship. Cyclones frequently force people to temporary or permanent displacement. Crop damages and soil salinization due to storm surges can devastate the agricultural output, affecting food security, the loss of the fishing industry, the death of livestock animals, the disruption of farmland, the rapidly increasing unemployment and poverty, the diminution of investment, the decline in tourism revenue, the intrusion of salinity, the scarcity of

fresh water, women's inequality and the deterioration of the natural environment and rural incomes. In addition, cyclonic disasters cause widespread damage to infrastructure, including roads, bridges, schools, and healthcare facilities.

The biggest hazard to the health sector of the south west coastal community is posed by cyclonic disasters including injuries, loss of life, numerous infectious illnesses, vector-borne diseases, water-borne diseases, and skin diseases. The trauma of experiencing a cyclone, loss of loved ones, and displacement can lead to significant mental health issues among survivors, necessitating psychological support and counseling services. Cyclonic disasters strain already limited healthcare facilities, which struggle to cope with increased demand for medical services, emergency care, and treatment of injuries and illnesses. Besides, damage to healthcare infrastructure and transportation networks disrupts access to essential healthcare services, medicines, and medical supplies, compounding health risks for affected populations. Women, pregnant women, adolescent girls, children, elderly, physically challenged people, fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, bed community, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. are the most susceptible during cyclone disaster. Cyclonic disasters hit a lot of south west coastal community people in Khulna and Barishal division of Bangladesh every year. Each year, more or less about 12 lakh people in the community are affected by the cyclone, which causes a lot of damage in economically and socially.

In conclusion, cyclonic disasters in Bangladesh have far-reaching socio-economic, public health, and healthcare system impacts. Addressing these challenges requires comprehensive disaster preparedness and response strategies, including investments in resilient infrastructure, early warning systems, healthcare capacity building, and community resilience programs.

While numerous studies have documented these effects individually, there remains a critical gap in understanding the comprehensive and interconnected impacts across these domains. So, I have selected the timely issues entitled 'Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh'.

1.3 Rationale of the Study

Bangladesh is known as one of the most cyclonic disasters prone vulnerable countries across the globe. Cyclonic disasters not only reducing the agricultural productivity but also negatively impacted on livelihood basically the coastal people who are living near the Sundarbans area and

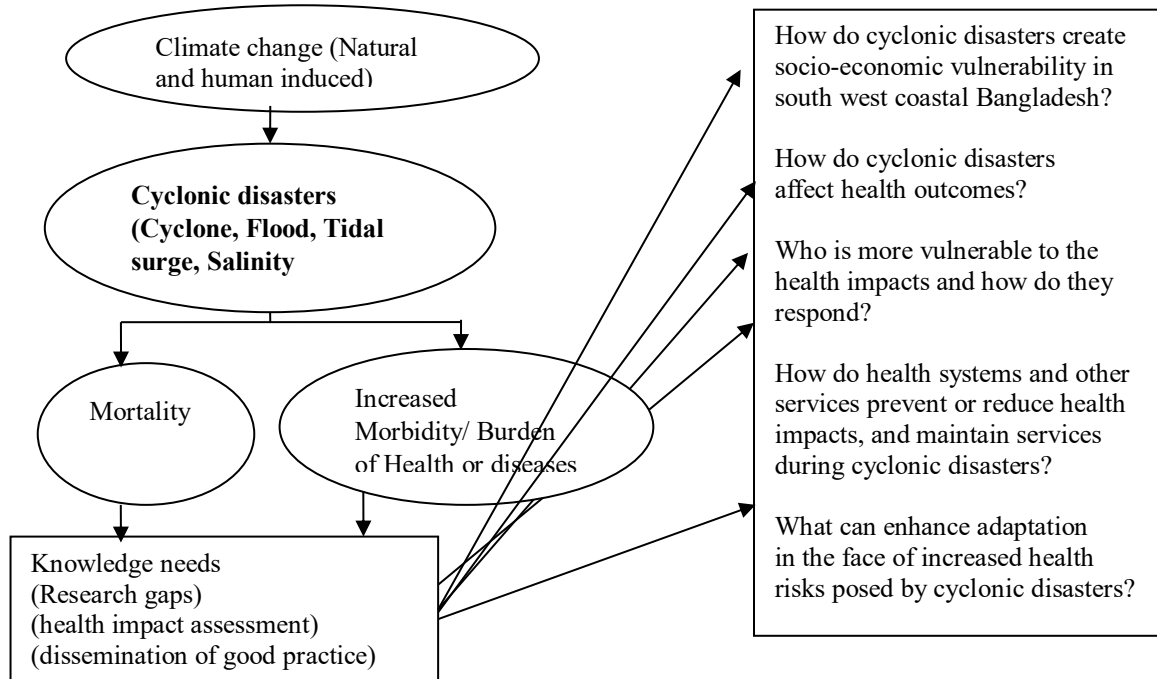
the Bay of Bengal. Most of the coastal community are primarily fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, bede community, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. The community people of these areas depend on mangrove forest resources and river or sea-based water resources for their livelihood. Climate change and cyclonic disasters have adverse effects on socio-economic and health conditions and their livelihood.

This study sought to reveal the causes, consequences and severity of cyclonic disasters in coastal community of Bangladesh and its socio-economic and health threats on the coastal community of Barishal and Khulna division in south-west Bangladesh. The researcher chooses Shyamnagar and Ashashuni upazila in Satkhira district and Dacope and Koyra upazila in Khulna district of Khulna division, and Patharghata and Betagi upazila in Barguna district and Charfashion and Tajumuddin upazila in Bhola district of Barishal division. These are very much affected by coastal cyclonic disasters at every year for near the Bay of Bengal, meteorological features and rapidly changes of weather pattern. Besides, most of the coastal people are living below the poverty line and lack of education, that exacerbates more vulnerable during and post cyclone disaster period.

The findings explore the severity and vulnerability and coping the livelihood and adaptation strategy of marginal people in coastal Sundarbans area. The research also shows that how the coastal community particularly child, adolescent girls and women, farmers, fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, chunery or oyster and snail collectors, riders and other vulnerable or destitute to cope and mitigate with cyclonic disasters during and post disastrous time. The results will be important considerations for the work of disaster politicians, disaster managers, and NGOs.

The findings of the study could be helpful for Government to build up sustainable policy using existing resources for these southern cyclonic disasters affected coastal belt people by disaster risk reduction and resilience of community. More importantly, the research outcome may guide any such projects for accelerating decision-making procedure and guiding principles for sustainable management of the project. By promoting disaster resilience, it may ensure the sustainability of a system, community or society to pursue its socio-economic and ecological development.

Fig 1.1: Rationale of the Study



(Source: Authors' regenerated framework through extracted from Roger Few et al, 2004)

1.4 Objectives of the Study

This research primarily aims to investigate the differential impacts of cyclonic disasters including cyclones, tidal surges, floods and salinity intrusions, on socio-economic vulnerability, public health and health care system, morbidity and mortality in coastal Bangladesh. For instance, cyclone hit suddenly and massive destruction with human casualties and morbidity; flood brings precarious situation on human life and brings water borne and vector borne diseases diarrhea, malaria, dengue fever and also mortality; and salinity affects directly on heart disease, heat stroke, diarrhea, dehydration, skin diseases etc. which prolongs morbidity and brings mortality.

The broad objective of the study is to explore the cyclonic disasters on people's socio-economic vulnerability, public health and health care system particularly mortality and morbidity of the people in south west coastal Bangladesh. However, the study has some specific objectives which are as follows:

1. To understand the disaster risks, causes, consequences, severity and vulnerability of cyclonic disasters like cyclones, tidal surges, floods and salinity intrusion among coastal communities in Bangladesh
2. To explore the challenges and socio-economic vulnerabilities of coastal communities and

cyclonic disaster affected people

3. To reveal how the affected communities perceive the effects of cyclonic disasters on health particularly child health, maternal health, morbidity and mortality
4. To compare and analyze the impact of different cyclonic disasters on health particularly various diseases or morbidity on community people's health
5. To examine the nature of coping mechanisms, adaptation strategies, mitigation efforts, resilience or manage disaster risk reduction

By addressing these objectives, the research aims to provide valuable insights into the complex interactions between cyclonic disasters, socio-economic vulnerabilities, public health outcomes, and disaster response measures in coastal Bangladesh.

1.5 Research Questions of the Study

In this study, the researcher has outlined several questions aimed at understanding the tripartite interaction of cyclone, tidal surge, flood and salinity intrusion on health hazard, and socio-economic vulnerabilities, and environmental vulnerability.

1. How do the cyclonic disasters like cyclones, tidal surges, floods and salinity intrusion exacerbates the socio-economic and environmental vulnerability of marginal community people differently in Bangladesh?
2. How the disasters like cyclone and tidal surge negatively triggers the health hazards (morbidity and mortality) of the community?
3. How flood negatively promotes the health hazards (morbidity and mortality) of the community?
4. How the salinity intrusion adversely triggers the health hazards (morbidity and mortality) of the community?
5. How to cope and resilient with these cyclonic disasters of the community?

1.6 Hypothesis of the Study

The study proposes several statements or propositions or hypotheses aimed at understanding the tripartite interaction between cyclones, floods, and salinity intrusion on health hazards and vulnerability. These propositions are as follows:

H1: More the climate change induced cyclonic disasters, more severe the socio-economic vulnerability

H2: More the climate change induced cyclonic disasters, more the prevalence of morbidity and mortality

H3: Morbidity or various burden of diseases are occurred in the cyclone (crippled or disability, malaria, diarrhea, dengue, skin diseases etc.) and salinity intrusion (blood pressure or hypertension, stroke, heart diseases, pregnancy complicacy, diarrhea, dehydration, itching or skin diseases) than flood (diarrhea, dengue, malaria, skin diseases etc.) which leads to mortality

H4: Disability and child growth retardation or hampered are occurred more due to cyclone and salinity intrusion than that of the flood

H5: Child, aged, disable, poor, adolescent girls and mothers are more risk and vulnerable than young, active or able bodies, rich and male people due to these disasters but differently

Chapter Two: Literature Review

2.1 Review of Literature

Meanwhile, a significant number of studies and literature have been reviewed. The researcher has reviewed and examined some studies related to climate change triggering cyclonic disasters and adverse effects on risk, challenges and vulnerability, livelihood, economy and health. Besides, the literature review will help the researcher how to cope, mitigate and resilient with the livelihood and cyclonic disasters, and manage the risk reduction of cyclonic disasters of coastal community during and post disastrous time.

Bari et al., (2024) conducted a study entitled 'Gender-based vulnerability and adaptive capacity in the disaster-prone coastal areas from an intersectionality perspective'. The main focus of the study is the susceptibility and variations in adaptive capability across families headed by men and women in two coastal subdistricts (Dacope and Paikgacha) of Khulna district in Bangladesh. The study finds that male-headed households have a better adaptive capacity index using the Boosted Regression Trees (BRT) approach and the Evaluation-based on the Distance from Average Solution (EDAS) method. The results imply that households led by women are more susceptible in terms of economics, social issues, health, housing, and land ownership. The research offers significant perspectives to coastal decision-makers, facilitating enhanced catastrophe management strategies and augmenting the region's resilience. The significant findings of the study that male is the only hope for the solution of different vulnerabilities. It can't point out that others vulnerabilities also create devastating impact on both male and female. This study only focused on the male contribution during disasters and ultimately ignored female role during and post disasters.

Murshed et al., (2023) conducted a study named 'Assessing sensitivity to climate-related disasters in the context of a developing country: Evidence from the coastal region of Bangladesh'. The paper examines the idea of sensitivity in catastrophe discourse and suggests five primary areas of focus: demographic setback, and Lack of basic resources, economic marginality, socio-cultural barriers, and fragility of policy and governance. Under these five categories, it consolidates 35 context-specific variables using the Analytic Hierarchy Process (AHP) approach. After that, the data are combined utilizing the additive method to create a composite sensitivity index that covers nineteen coastal areas. Coxsbazar (0.60), Pirojpur (0.39), Bagerhat (0.38), Shariatpur (0.37), Patuakhali (0.34), and Chandpur (0.33) are the districts that are more vulnerable. The study provides a

chance to enhance disaster risk reduction initiatives of coastal region in Bangladesh by highlighting regions that require priority activities to decrease vulnerability. Additionally, the analysis incorporates variables such as child labour, gender-based violence, early marriage at girl, corruption, and criminality behavior, which advances our conceptual knowledge of how vulnerable other developing nations are to climate- related disasters. This study highlighted on the socio-cultural vulnerabilities and ignored economic or health vulnerabilities which also creates mostly hardships during and post disasters. This paper stressed on the indigenous knowledge help people during disaster to reduce the risk but there is no specific knowledge it outlined through this paper. Joseph and Jaswal (2020) conducted the study entitled 'Elderly and Disaster Mental Health: Understanding Older Persons' Vulnerability and Psychosocial Well-Being Two Years after Tsunami'. The study documents the elderly's post-disaster lived experiences in a developing nation, with a focus on disasters, vulnerability and psycho-social wellbeing particularly on elderly and mental health, lifelong mental health, and ageing mental health during disasters. The findings demonstrate the significant shifts in older people's social standing and their experiences requesting assistance two years after the tsunami. The study's paradigm for psycho-social well-being analyses the resources, the risks, the proximal social experiences that have an impact on an individual's life, and the macro structural variables that increase the vulnerability of older people. Analysis of the elderly's lived experiences explores that the elderly's perspective of their psychosocial well-being is primarily determined by how they perceive the results that are influenced by their experiences seeking care. This study emphasized on the elder people and mental health vulnerabilities during disasters. It only focused on their mental health but it can't demonstrate that they faced more bitter experiences than any other. This paper reflects only psycho-social vulnerabilities on elder people but it can't focus on the others vulnerabilities like social and economic which also responsible for the mental health problems on elder people.

Matyas and Pelling (2012) carried out a study 'Disaster Vulnerability and Resilience: Theory, Modelling and Prospective'. The study looks, including rural development, at the significance of the uncertainty and risk associated with natural hazards, and there are still numerous obstacles and challenges to overcome before disaster risk reduction can be fully included into sustainable development strategies. This study offers a comprehensive analysis of vulnerability and resilience to highlight the theoretical arguments that underpin them. The hazard-of-place viewpoint, political ecology, and livelihoods are used to address vulnerability. The degree to which a system is

vulnerable to the negative effects of climate change, such as its extremes and unpredictability, and its inability to adapt, is known as its vulnerability. Despite this widespread usage, resilience is more of a process that results from continuing efforts than from a final product. This study aims to contribute to the overall framework that surrounds work on vulnerability and the management of disaster risk by resistance, and transformation approaches including work on resilience. This study initiates a more equitable conversation about the link between catastrophe risk reduction and sustainable development, with the ability to reflect on decisions as the primary variable. This paper examines vulnerabilities on people during cyclonic disasters but it didn't focus on health vulnerabilities which creates devastating impact during and post disasters. The significant findings of the study concentrate on adaptive resilience but which kind of resilience should be taken during disasters are not focused by the study.

Rahman and Bennish (1993) conducted a need-based study entitled 'Health related response to natural disasters: The case of the Bangladesh Cyclone of 1991'. This paper looks at the health response to the Bangladesh cyclone in 1991, concentrating on three main areas: needs assessment, coordination for health relief and rehabilitation, and efficacy of the health response. The results show that while the reaction was swift and successful in halting a rise in measles and diarrheal deaths, the needs assessment was reactive rather than the result of rigorous data collection. Along with offering suggestions for future catastrophe management and response, the report also evaluates the shortcomings and achievements of the health response. This paper stress on the health response during disaster but it can't describe the quicker process of health response implementation during and immediate post disasters. It also can't explain the actual scenario on health during different catastrophic. It should reflect on the water, sanitation and hygiene management and safe drinking water during disasters.

Saulnier et al., (2020) conducted a study named 'Disaster risk factors: hazards, exposure and vulnerability'. The article focused on disaster research involves understanding how hazards, exposure, and vulnerability interact to create risk factors for health emergencies and disaster management. Health emergency and disaster risk management (EDRM) concentrates a comprehensive grasp of risk factors coupled with relevant hazards to disasters that can lead to health problems and harms. They said that disasters are the outcome combination of hazards, exposures and vulnerability. Decision-makers must evaluate the internal and external validity of disaster research studies to assess their relevance and applicability to different settings and times.

Measuring the impact of disasters on populations is complex, with direct effects like injury and illness, and indirect effects causing long-term consequences such as chronic health conditions due to persistent stress from exposure. The study can't observe specific vulnerabilities for disaster risk and there is no specific guidelines to reduce the risk factors. This paper only identifies the existing situation during the disasters period but it can't focus pre disasters and after disasters period which is emphasized my study. However, the paper lacks a detailed discussion on the practical implications of the research findings for policymakers and practitioners involved in health emergency and disaster risk management. While it emphasizes the need for internal and external validity assessment of disaster research studies, it does not provide concrete examples or case studies to illustrate how these validity assessments can be practically implemented. The paper does not explore the role of technology or data analytics in enhancing the understanding of disaster risk factors and improving decision-making in Health EDRM.

Shameem et al., (2014) conduct their study entitled 'Vulnerability of rural livelihoods to multiple stressors: A case study from the southwest coastal region of Bangladesh'. The study focuses on the socio-ecological, environments and rural livelihoods vulnerability in the southwest coastal region of Bangladesh. It explores that how major stressors of extreme weather events like tropical cyclones, salinity intrusion, and land-use change impact ecosystem services and livelihood security. The research identifies these stresses as key drivers including land use change, salinity intrusion into soil and water, and tropical cyclones, affecting access to livelihood assets at the household level, damaging natural, social, physical and human capital and increasing financial inequality, leading to food and water insecurity and impacting adversely on social well-being. The study highlights that freshwater scarcity forces households to restrict water usage for essential needs, affecting human health and well-being. Additionally, the shift from agriculture to shrimp farming due to salinity intrusion poses risks to food security and nutrition, impacting human well-being in the communities. There is a gap in understanding the long-term implications of livelihood asset depletion due to salinity intrusion, tropical cyclones, and land-use changes on the overall resilience of households. The research does not delve deeply into the role of social networks and community support systems in enhancing the adaptive capacity of vulnerable populations in the face of multiple stressors. While the study identifies the impacts of stressors on ecosystem services and livelihood outcomes, there is a research gap in assessing the effectiveness of existing policies and interventions in mitigating these vulnerabilities and enhancing community resilience.

Virendra Proag (2014) investigated a study entitled 'The Concept of Vulnerability and Resilience'. Proag shows that the concept of vulnerability as a hazardous event, encompassing risks associated with physical, social, and economic aspects, and resilience including hard resilience focusing on the strength of structures, and soft resilience, emphasizing the ability to absorb and recover from disruptive events without fundamental changes. Resilience can be incorporated in a system to determine the vulnerability and to reduce damage from hazards. If the resilience increases, the degree of damages or intensity of hazard decreases. The paper discusses how vulnerability analysis can lead to the introduction of soft or hard resilience in a system, enhancing its ability to cope with disasters. The long-term sustainability of companies, ecosystems, and social systems can benefit from resilience enhancement features that improve the system's ability to withstand and recover from disruptive events. However, the paper does not delve into the specific methodologies or tools used for vulnerability analysis or the implementation of resilience enhancement features. There is a gap in exploring how different sectors or industries can tailor resilience enhancement features to their specific needs and challenges. Further research would be explored the effectiveness of different resilience enhancement features in real-world scenarios and their impact on reducing vulnerability and enhancing overall system resilience.

Thomalla et al., (2006) conducted a study entitled “Reducing hazard vulnerability: towards a common approach between disaster risk reduction and climate adaptation”. The paper delves into the coordination and information exchange is needed to reduce the disaster risk, climate change adaptation, environmental management, and eradicate the poverty of communities and also to reduce the socio-economic vulnerability. The study mentions various organizations and entities involved in disaster risk reduction and climate change adaptation, such as the UNFCCC, IPCC, academic research institutions, civil society organizations, and international conferences. The authors stress the importance of a common approach to reducing hazard vulnerability by bridging the gap between different communities and enhancing collaboration and learning processes. However, it does not delve deeply into the underlying causes of disasters and specific strategies or mechanisms for facilitating this collaboration effectively. While the study acknowledges the importance of engaging new researchers and sustaining dialogues with stakeholders, it does not provide detailed insights into how these efforts can be optimized or expanded to bridge the existing gaps between the different communities involved in hazard vulnerability reduction. The paper mentions the key commonalities and differences between climate change adaptation and disaster

risk reduction communities but does not extensively explore potential synergies or conflicts that may arise when integrating their approaches to reduce vulnerability effectively.

Toufique and Islam (2016) conducted a study entitled 'Assessing Risks from Climate Variability and Change for Disaster-Prone Zones in Bangladesh'. In this paper vulnerability indices were measured for four disaster-prone zones in Bangladesh, focusing on saline, flood, flash flood, and drought areas. The flash flood zone emerged as the most vulnerable, followed by saline, drought, and flood zones. The research extended the application of Livelihood Vulnerability Indices (LVI) to disaster-prone zones in Bangladesh, highlighting the significant vulnerability of these regions due to natural disasters and poverty. Factors contributing to vulnerability included poor health conditions, inadequate food security, unfavorable socio-demographic profiles, and limited livelihood opportunities, especially in the flash flood zone. The study emphasized the urgent need for increased public spending on sanitation, drinking water, health, and rural infrastructure in disaster-prone areas with high poverty rates. However, there are some research gaps including limited focus on adaptive capacity, inadequate exploration of gender dynamics, lack of livelihood diversification, and scope for longitudinal studies to track changes in vulnerability over time, especially in the context of evolving climate patterns and adaptation, that could be explored further.

Yadav and Barve (2017) conducted a study entitled 'Socioeconomic Vulnerability for Cyclone-Affected Communities in Coastal Odisha, India'. The article shed lights on vulnerability assessment in coastal regions arises from natural disasters and climate change, impacting on socioeconomic characteristics and coping capacities. This study presents on the following of IPCC highlighting the dimensions of vulnerability including adaptive capacity, sensitivity and exposure to climate change induced hazards. The article also classify vulnerability based on exposure, social conditions, and integration of exposures and societal resilience. Social vulnerability factors include resource access, political power, social capital, infrastructure, and lifelines. Studies emphasize the importance of socioeconomic factors in vulnerability assessment, with limited research focusing on primary data in India. This research attempts to address the gap by identifying potential indicators for socio-economic vulnerability assessment and developing an index based on primary data. The study also delves into the decision-making processes of households during cyclones, providing insights into adaptive capacities and resilience strategies. Future research could further investigate the interplay between socioeconomic factors and vulnerability in cyclone-prone regions to enhance disaster preparedness and mitigation strategies.

Bergstrand et al., (2015) investigated a study entitled ‘Assessing the Relationship Between Social Vulnerability and Community Resilience to Hazards in countries across the United States’ and measured and connected the two concepts social vulnerability and community resilience that are highly related with disasters, but is rarely empirically evaluated. These are two required concepts for evaluating the communities’ social risks and coping capacities for recovering and adapting when dealing with hazards. Determinants of social vulnerability is an essential step toward helping communities to accumulate the resources and strategies which is required to minimize the losses of disasters. On the other hand, community resilience is a process that links a set of adaptive capacities to a positive trajectory of functioning and adaptation following disturbances. To measure the Community Resilience Index (CRI), they follow the method provided by Sherrieb et al., (2010: 240) two components including an Economic Development Index and a Social Capital Index. In this study, there are narrow focus on disaster management where vulnerability usually incorporate the traits and condition in coping with disasters that make human vulnerable (e.g. social structures and inequalities). In sum, assessing both community resilience and social vulnerability may help to assist potentially emergency planners and in addressing weak points and improving communities' overall ability to weather hazards.

Ahsan and Warner (2014) conducted a study entitled ‘The socioeconomic vulnerability index: A pragmatic approach for assessing climate change led risks – A case study in the south-western coastal Bangladesh’ in where they explored and assessed the vulnerability status of coastal communities with the help of longitudinal analysis on coastal household response towards climate change impacts. The newly developed socio-economic vulnerability Index (SeVI) showed promising approach to capture the vulnerability scenario of coastal communities. The study mainly focuses on social and economic vulnerabilities but it can’t reflect the consequences of vulnerability on health, bitter experiences or water, sanitation and hygiene (WASH). Ahsan et al., focuses only the coping and adaptation mechanisms but how people implement these mechanisms in the disasters period are denied. There is lack of focused on the health hazards due to cyclonic disasters. Adger (2006) investigates a study entitled ‘Vulnerability’ where he presents the environmental change induced vulnerability and the challenges for resilience and adaptation. The challenges of vulnerability are to measuring vulnerability, to incorporate the diverse perceptions of risk and vulnerability, to incorporate governance research on the mechanisms and promote adaptive action and resilience. Resilient ecosystems and resilient societies can better adaptation with external

physical as well as socio political stresses via newly emerging insights of vulnerability and resilience. Converging research agendas on the problems of human-environment interactions under stressors of global environmental and social change are complemented and can be greatly enhanced by new insights into the resilience of socio-ecological systems. The significant findings of the study emphasis on the challenges and coping mechanisms and action policies but can't reflect on the particular strategies of diverse disasters.

Boruff and Cutter (2007) conducted a study on 'The Environmental Vulnerability of Caribbean Island Nations' demonstrated that some places are more vulnerable to certain extreme natural events than others and, moreover the socio-demographic components of resident populations contribute to this vulnerability. Hazard vulnerability is the nexus of physical process and human systems. Social and physical indicators increase or decrease the intensity of hazard vulnerability of Caribbean islands. At first, it is needed to identify who and what areas are most vulnerable and then try to reduce the losses and damages from disasters. It reflects only the hazards and vulnerabilities regarding the Caribbean islands but it can't reflect the humanistic mechanisms during disasters. It focuses only the spatial vulnerability of disaster risks of Caribbean islands context but ignores other geo-morphological context.

David Alexander (2012) in his studies on 'Models of Social Vulnerability to Disasters' described social vulnerability as shown to be the principal component of risk and main element of disaster impacts. Hazard acted upon vulnerability to produce disaster. World community and most countries have preferred to tackle the challenges in mitigating disasters for numerous reasons. Knowledge can be divided into three sectors: on hazard impacts, on community vulnerability, and on the coping mechanisms that produce resilience. The number of people affected by disaster which are continuously rising. Through the indigenous coping mechanism, the community develops local planning and volunteer work. Alexander only points out that increasing knowledge of disasters and the extended social processes, and the complexity of life in the early 21st century suggest that a new model ought to be formulated which will be the vulnerability of human socio-economic systems (whether natural or anthropogenic), as well as cultural and historical factors. This model is both preliminary and schematic.

Alam et al., (2017) carried out a study named on 'Vulnerability to climate change in riparian char and river-bank households in Bangladesh: Implication for policy, livelihoods and social development' presented two key vulnerability assessment approaches such as the Livelihood

Vulnerability Index (LVI) and Climate Vulnerability Index (CVI) that were customized to incorporate local and indigenous knowledge. It focuses the livelihood vulnerability and climate vulnerability of the coastal and riverine households in Bangladesh who are the most susceptible to the climate-induced hazards including riverbank erosion. They showed that char dwellers experienced more hardships than river-bank households due to their lack of financial sources, health services and education facilities, which is widespread to natural disasters and less scope to diversify crop production. It is unimaginable that how much the bitter experiences they observed during disasters period. This study adopts a holistic approach to assessing the livelihood vulnerability of riparian communities regarding socio demographic components, livelihood strategies, social networks, access to food, water and health interventions, climatic variability induced natural disasters triggers the vulnerability. New policy interventions should focus on improving access to food, health, water and sanitation for these communities to reduce the risks and vulnerability of disasters.

Hammer et al, (2019) conducted on the study entitled '(Re-) conceptualizing vulnerability as a part of risk in global health emergency response: Updating the pressure and release model for global health emergencies'. This paper revealed the neo-liberal conceptualization of vulnerability and vulnerable groups and communities. This work employs the risk concept developed in hazard research, which postulates that risk is a result of the interplay between hazard and vulnerability, in where vulnerability is the multiplications of the condition of root causes, dynamic pressures and unsafe conditions. This study primarily examines vulnerability's involvement in health emergencies regarding the pressure and release (PAR) model, which is currently an underappreciated aspect of risk in the context of disaster and emergency. The study showed that theoretical understandings of vulnerability should underpin debates about risk in global health emergencies, and that risk assessments that make implicit use of vulnerability.

Orencio and Fujii (2012) worked a study named 'An Index to Determine Vulnerability of Communities in a Coastal Zone: A Case Study of Baler, Aurora, Philippines'. This study depicts the coastal community vulnerability index (CCVI) measured by seven major factors such as: geographical, economic and livelihood, food security, environmental, policy and institutional, demographic as well as capital good. These factors increase the communities' susceptibility to hazard effects. The study explored the assumption different factors especially social and environmental conditions influencing for coastal community vulnerability. This study ignores the

health hazard, risks and vulnerabilities, and water, sanitation and hygiene (WASH) management during and after disasters.

Rakib et al, (2019) carried out a study named on 'An investigation of coastal vulnerability and internal consistency of local perceptions under climate change risk in the Southwest part of Bangladesh'. This study examines the contextual elements influencing the effects on social activities and coastal livelihoods. It also takes into account the usefulness of indigenous knowledge in reducing potential risks. This paper found that climate change severely exacerbates the livelihood becomes disruption on local community lifestyles as a result day by day by impairing social factors and also shows that by improving the fundamental components of social sustainability main hinderance disaster. The study shows that the persistent and recurring activities of climate change induced cyclones severely exacerbates the livelihood which are linked to several inevitable risks and risks for harm to their social wellbeing. Salinity intrusion damages the crops and drinking water supply which may lead the various diseases to decease among coastal communities. This paper shows that social vulnerability, social turmoil, and coastal risks are all present in the circumstance. They explore that local people rely on their indigenous knowledge to cope with different levels of crises in precarious situations, but occasionally this is not enough because of unintended changes in climate factors and knowledge gaps or uncertainties. The aim of this study is to examine the internal consistency that has not been elucidated in prior research about local views of socio- and agro-environmental vulnerability.

Toufique and Yunus (2013) investigated a study named 'Vulnerability of livelihoods in the coastal districts of Bangladesh'. This research mainly shows the livelihood vulnerability index (LVI) to assess the vulnerability of household in coastal area of Bangladesh and present that due to cyclones the rural and coastal people are more vulnerable than urban people. The LVI uses several indicators to evaluate the exposures to climate change induced natural disasters, socio-economic dynamics of household that affect their adaptive capacity, and current health status, food and water resource characteristics that determine their sensitivity to climate variability impacts. This study mentioned that coastal individuals are more vulnerable due to limited access to health services, a more fragile social network, natural catastrophes, and climatic variability fluctuation. This paper explored health issues, such as lack of access to hygienic toilets, also contribute to the heightened vulnerability of rural households. Additionally, the socioeconomic and demographic profiles of rural families are unfavorable, their social networks are weaker, and they are more susceptible to

natural disasters and climatic unpredictability.

Rafiey et al., (2016) investigated a study named ‘Are older people more vulnerable to long-term impacts of disasters?’ This research shows that older adults are more vulnerable than younger adults during disaster period. The study demonstrates and compares to the mental health by scaling 14 items and measures emotional wellbeing and psychological wellbeing between aged and young during earthquake. Due to disasters, older adult are more vulnerable groups because of decrease awareness, medication as well as lack of socio-economic resources.

McDonald and Kay (1997) conducted a study on A Geographical Introduction to Disaster. This paper primary concern is one side of this dichotomy: risks, disasters, and the extent of human susceptibility to them. They contend with constant reminders of the shortcomings and self-inflicted tragedies of modernity, yet these, or our perception of them, are not separate from the assertions of material and technical progress. (McDonald and Kay, 1997). This paper revealed the majority of catastrophe victims are not just comparatively poor, but also helpless, indicating that their lack of a political voice puts them at further danger.

Coetzee et al, (2019) conducted a study on ‘Building Disaster Resilience on the Edge of Chaos: A systems Critique on Mechanistic Global Disaster Reduction policies, Frameworks and Models’. This paper aimed at understanding and building disaster resilience as a more holistic approach and reducing disaster risks. It also aimed at critiques of the various theoretical perspectives, by which the understanding of disaster resilience can be enhanced. It explored that the existence of this kind of thinking devalues knowledge of variables that are unique to a given environment and how they affect resilience profiles, in addition to the dynamic interactions that make up catastrophe resilience. It is also argued that in order to a community become more resilient, vulnerability should be reduced in its entirety. This is because some vulnerability, or living on the brink of chaos, helps a community recognize its own risks, which ultimately makes them more resilient, agile, and adaptable.

Chang et al, (2018) conducted a study on ‘Community vulnerability to coastal hazards: Developing a typology for disaster risk reduction’. This paper constructs an approach for identifying typologies of coastal communities based on their hazard vulnerability. This study demonstrates 10 community types in Canada pacific, but focus on four like highly urbanized, wealthier, remote areas, and flat coastal lines. It investigates that the livelihood strategies of coastal community’s particular coastal hazard event may result in casualties, property damage, and economic disruption depends on a

number of factors, including wealth, socioeconomic systems, urban growth patterns, as well as coastal geomorphology.

Alam and Collins (2010) explored a study named 'Cyclone disaster vulnerability and response experiences in coastal Bangladesh'. This paper shows the underlying vulnerabilities to cyclonic disasters: hazard risk perceptions; indigenous coping mechanisms of before, during and after disastrous events; and inadequate land management policies in coastal areas that shows that women and children are more likely vulnerable during cyclone periods. This study represents that extreme cyclone force can be destroyed of infrastructure, settlement, and livelihood during disaster. It is showed that women and children are affected more during cyclone periods. This paper explored that disaster risk reduction programs by encouraging and mitigating among coastal people through indigenous practical knowledge, community behavior, as well as adaptation of affected communities.

Fatemi et al., (2016) conducted a study on 'Social Vulnerability Indicators in Disasters: Findings from a Systematic Review'. This paper examined the social vulnerability indices and underlying causes of vulnerability and susceptibility of disastrous individuals and communities. The indicators of social vulnerabilities were age, gender, education, socio-economic status, public health interventions, public infrastructures, employment, medical services, as well as migration. Social vulnerability is often associated with the degrees, frequencies and magnitudes of exposure to extreme event, and the preparedness and mitigation of individuals and social groups. The purpose of this study is to demonstrate the indications that might be used to measure of social vulnerability among communities during catastrophes.

Lesley Gray (2017) conducted a study on 'Social Determinants of Health, Disaster Vulnerability, Severe and Morbid Obesity in Adults: Triple Jeopardy?' This study explored the social determinants of health, disaster vulnerability, acute and morbid obesity. Obesity is associated with social determinants of health and these chances of increasing vulnerability is heightened during disasters. It is found that people with severe or morbid obesity have been negatively impacted in disasters and left behind because of their body size, shape or weight. This research observed that the relationship between adult (18 years of age and older) severe and morbid obesity of the socioeconomic determinants of health and catastrophe vulnerability. The elaborate causes of obesity are connected with the social determinants of health and one's effective vulnerability to disasters.

Chan et al, (2019) explored a study on 'Health Vulnerability Index for Disaster Risk Reduction: Application in Belt and Road Initiative (BRI) Region'. This paper outlines the process of creating an integrated health vulnerability index and clarifies how an all-hazard based catastrophe risk assessment may use the suggested vulnerability index. The health vulnerability index (HVI) included seven indicators, such as infectious disease, maternal mortality, under-five mortality, healthcare services, immunization, the dependency ratio, and chronic disease. It is found that health vulnerability is associated with population living with chronic diseases. This study observes that health vulnerability index that aims to enhance disaster risk assessment for disaster risk reduction.

Jacquleen Joseph (2013) conducted a study on 'Measuring vulnerability to natural hazards: a macro framework'. This paper observed that normal sensation of a disaster as a 'calamity' or 'catastrophe' to the complex notions of 'social vulnerability. The concept of "social vulnerability" is intricately linked to the material practices and ideological discourses that permeate society. This paper examined that the unequal reaction of catastrophe occurrences to hazardous events is defined in this research as vulnerability. This paper investigate that the areas are at risk so that more thorough micro-level social vulnerability assessments may be carried out there. This research measures disclosed macro vulnerability as a function of catastrophe risk and hazard probability and proposes an operationally feasible methodology for carrying out this assignment.

Mark Keim (2011) carried out a study on 'Preventing Disasters: Public Health Vulnerability Reduction as a Sustainable Adaptation to Climate Change'. This research depicts in order to prevent and mitigate the negative effects of climate change, and climate change induced disasters. Human vulnerability is influenced by social, economic, health, and cultural factors. The main goal of this study is to present the fundamental concepts of disaster risk reduction so that it may be used to preventing and mitigating the harmful consequences of climate change. By addressing the factors of social vulnerability, we can adapt to climate change and disasters. To adapt this climate change, a comprehensive disaster risk reduction particularly the role of community-focused public health in reducing human vulnerability and, consequently, the overall risk of climate-related disasters approach will be proposed.

Collins et al., (2009) carried out a study 'Vulnerability to environmental hazards in the Ciudad Juarez (Mexico)–El Paso (USA) metropolis: A model for spatial risk assessment in transnational context'. This study presents an approach for mapping risk to environmental hazards using

geographic information systems (GIS). They showed that risk is spatially characterized, using of biophysical hazard (density of multiple hazards in each neighborhood) and social vulnerability (population and structures, access to resources, and socio-economic status) of Mexico and USA. It is revealed spatial (within and between cities) disparity exacerbate the intensity of hazard vulnerability. Due to number of losses resulting from environmental hazards has increased in the recent decades, prompting emergency management to shift their attention from rapid post-disaster response to loss reduction through preparedness, mitigation, and long-term recovery. This paper only focused on the environmental vulnerabilities but other's vulnerabilities also responsible for this unwanted situation which is neglected by this paper. Also, there is no specific policy that people taken to reduce their risk which also undermine through this paper.

Bobby, A. S. (2012) conducted a study 'The vulnerability of Bangladesh and the requirement for efficient disaster risk reduction measures' and highlighted on the Disaster Risk Index (DRI) for tropical cyclone of Bangladesh. The study reveals that growing coastal exposures and insufficient funding are contributing factors to the risk of tropical cyclone disasters. Apparently, Bangladesh is susceptible to cyclones, resulting household vulnerability in Bay of Bengal of cyclone-prone areas. This study only points about the household vulnerability in Bay of Bengal but it undermines the other vulnerabilities like social, economic and health which is highlighted by my study. The nation has made progress in managing disasters, shifting from a reactive to a proactive strategy with an emphasis on policy development, community preparedness, and early warning systems but it doesn't reflect awareness building program or what kind of policy should be taken by government to reduce risk. There are also ongoing efforts to create probabilistic cyclone track estimation techniques for planning adaptation and disaster avoidance. The findings of this paper highlighted on the usefulness and the positive sign of DRI to make people safe and give them proper shelter.

Haque, M. (2019) carried out a study named 'Indigenous Knowledge and Practices in Disaster Management: Experiences of the Coastal People of Bangladesh' and elaborated that the natural disasters like floods, tidal surges, cyclones etc. are common for the coastal dwellers and to cope with these disasters they usually use several indigenous practices which are practiced over time. Indigenous practices both helps to reduce their life vulnerability and also helps to protect the biodiversity, natural resources and combating to climate change which are failed to do with technical method in number of times.

Rafa. N. et al., (2021) investigated a study named 'Impact of cyclone Amphan on the water, sanitation, hygiene, and health (WASH2) facilities of coastal Bangladesh' and highlighted cyclone *Amphan* had a significant impact on coastal Bangladesh, affecting water, sanitation, hygiene, and health (WASH2) facilities. Cyclones led to rapid synchronization of high sea surface temperatures, resulting in heavy precipitation and strong winds along the coast. It only focused on the consequences due to cyclonic disasters but there is no reflection on other's vulnerabilities like social, economic. The devastation caused by Amphan in coastal regions necessitated a study to evaluate the resilience of structures and emergency response. The study shows that this cyclone *Amphan* highly affected the water, sanitation, hygiene and health issues and created vulnerable situation on this and the people of the coastal regions, but hardly got the allowance for this.

A report published by Paul. S. (2014), on 'Determination of evacuation response to cyclone warning in coastal areas of Bangladesh: A comparative study' highlighted the evacuation initiatives during cyclone *sidr* and comparing with the past studies about the common reason for non-evacuation during disasters. He shows that the maximum of the people of coastal regions previously informed about the cyclones and about 41% people formally and informally evacuated during disasters. This is a comparative study (from 1970 the cyclone of Bhola, and 1991 Gorky to cyclone 2007 *sidr*) where he shows that the evacuation rate has been improved respectively year by year. The study also highlighted the age, gender, location, transportation, education etc. as the primary reason for non-evacuation of disaster victims. Though Bangladesh has improved more than before in the process of pre disaster information, evacuation, sheltering of the disaster victims in coastal regions. This study showed only the reason why people observed this repeatedly unwanted situation and economic hardship but it doesn't delineate how they overcome their devastating situation and how much strategies they should be taken to overcome this existing situation.

Uddin and Mazur (2014) conducted a case study named 'Understand utilization of cyclone survivors in Bangladesh'. This study provides valuable insight on the healthcare issues of the cyclone affected people. Among the systematic random sample of 384 households, 58% people are victims of some disease. An obvious drawback is that the research was done four months after the natural disaster, so there is a fear of getting the correct results. There has a significant research gap on healthcare utilization of cyclone survivors and further research could explore out their long-term effects. They avoid to reflect water, sanitation and hygiene (WASH) management and the

bitter experiences they faced during disasters which is reflected by the proposed study.

Anik et al. (2019) conducted a comparative study on 'Double burden of malnutrition at household level: A comparative study among Bangladesh, Nepal, Pakistan, and Myanmar' and provide valuable insights into same family overweight mothers and unstable infants, a phenomenon known as double burden of malnutrition at household level (DBMHL). It is a growing public health concern in South Asia. This study finds various result from (DBMHL) various regions. There are chances of bias due to where it is relies on self-reported data. They focused on the systematic framework on health hazards during cyclonic disasters in individual level but it can't reflect the community level experiences during disaster period.

Khan, S.R., and Damen, M. (1992) conducted a study 'A valuable insight on the storm-rainfall disaster due to physical environmental and socioeconomic factors'. It is found migration of the workers and high population density in the southern part of the country due to disasters. The coastal belt people migrated for socio-economic depression and economic needs. It doesn't reflect that other factors push people to migrate also. There is no reflection on health hazards due to disasters because during cyclonic disasters.

Kabir. R. and Khan, H. T. (2017) conducted a study on 'Study on Health Status of Coastal People in Bangladesh after Cyclone *Sidr* and *Aila*'. This is a useful study because a descriptive study of 1,000 households survey was conducted through cluster sampling to provide in-depth insight into the health impacts of cyclones on the population of coastal region, which is highly vulnerable to natural disasters. This study finds after cyclone the people faces diarrhea, skin disease and mental health problem. Basically, the government services were provided but it was hardly reaching these regions for provide support for the aftershock of these disaster. This paper reflects only the health hazards and household vulnerabilities but other bitter experiences are not reflected on the study. Besides they observed some specific health hazards are occurred due to disasters but other socioeconomic factors are not reflected in this study. Water, sanitation, and hygiene management are related with health sectors but it is not reflected in this research.

Alam and Collins (2010) explored a comprehensive study named 'The vulnerability of coastal and island of Bangladesh to cyclonic hazards' and provide a valuable insight on the path of salvation and the coping mechanism of the pre-disaster, during, and post-disaster periods where people are affected by the disaster. The author used qualitative data for this research. This study finds that the women and children are more affected despite the modifications of the traditional hierarchies in

cyclone period. This paper reflects the coping mechanism and policy but it doesn't outline the specific mechanism for specific vulnerabilities. Also, the author can not explain the major vulnerabilities caused by cyclonic disasters.

Bernard et al. (2022) offers a comprehensive study 'The disaster management policy and aspect of socio-spatial vulnerability' and also guiding a valuable insight on in policy making. They introduced a new metric socio-spatial vulnerability index (SSVI) which is function of the sensitivity of delta inhabitants. They identifying SSVI by four domains including socioeconomic status, household composition and disability, housing and infrastructures, and cyclone protection and exposure. They trace out the most vulnerable places that are understudied, leading us to differently consider the coastal area for the state, NGOs and IOs (international organizations) in their prioritization of preparedness and recovery programs. This study found most vulnerable flooding area of delta regions. The significant finding of this study is social vulnerability and policy making during disasters but it ignores the process of coping mechanism or what kind of coping mechanism they implement during or after cyclonic disasters. They also undermine other vulnerabilities due to different cyclonic disasters.

While numerous studies have documented these effects individually, there remains a critical gap in understanding the comprehensive and interconnected impacts across these domains. In conclusion, cyclonic disasters in Bangladesh have far-reaching socio-economic, public health, and healthcare system impacts. Addressing these challenges requires comprehensive disaster preparedness and response strategies, including investments in resilient infrastructure, early warning systems, healthcare capacity building, and community resilience programs. So, I have selected the timely issues entitled 'Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh'.

2.2 Definitional Terms

Cyclone

Cyclone, comes from the Greek word 'kyklos' which is meant by coil of snakes, refers to an area of low pressure characterized by strong winds blowing around a center in an anticlockwise direction in the northern hemisphere and a clockwise direction in the southern hemisphere. When these winds reach of 74 mph or 119 kmph and more, they are known by different names depending on the region: Hurricanes in the American continent; Typhoons in the Far East; and Tropical cyclones in the South Asian sub-continent (Coppola, 2011).

Storm/Tidal Surge

A storm surge is primarily happened for the pressure differences within a cyclonic storm and the direct impact of high winds on the water.

Salinity Intrusion

Salinity refers to the concentration of dissolved salts in water such as chloride anions, usually expressed in parts per thousand (1 ppt = 1,000 mg/l = 1,000 ppm). Salt water or salinity intrudes in the coastal belt from the flow of sea water through the natural disasters: cyclone, tidal surge, flood, river flow, estuarine circulation, extensive shrimp cultivation. Besides, climate change, sea-level rises, précipitation, and water and land management practices exacerbâtes the salinity (Rahman et al. 2023, Rahman et al. 2000; Nahian et al. 2018).

Flood

Coastal flooding is a phenomenon where dry and low-lying land is submerged (flooded) by seawater (Kurian et al. 2009).

Cyclonic Disasters

Cyclonic disasters refers to cyclones and cyclone affiliâtes disasters those who create massive damages of property, loss of life and disruptions of livelihood.

Coastal Area

A coast is an area where tidal surge water determines the agricultural practices, movement of river transport, estuarine commercial and daily activities; water enters the salinity intrusion; and the area is severe risk of cyclones and storm surges (Haque 2019).

Household

A household is typically defined as s a group of individuals who live together and share common arrangements for meals, including cooking facilities with their dependents, relatives, servants, and other members.

Hazard

Hazard refers to an extreme event or circumstances or situation triggered by natural, human, or an economic situation that can potentially cause harm. For example, a blizzard, a landslide, or a terrorist attack (The Commonwealth of Learning 2004).

Hazards can be divided into several subgroups: **natural hazards, technological hazards, and intentional hazards**. These categories of hazards can be subdivided.

Natural hazards can be sub-categorized into tectonic hazards, mass movement hazards, hydrologic hazards, meteorological hazards, and biological/health-related hazards.

Technological, or ‘man-made’ hazards are the product of technological innovation arise from various components of transportation, infrastructure, industry, and buildings/structures which can occur after the failure of existing technology.

Intentional hazards are those that create to act in an antisocial or anti-establishment manner from the conscious decision of individuals. These are new and emerging, for instance modern biological, chemical, radiological weapons, and war (Coppola 2011).

Hazard Analysis

Disaster managers must carefully identify and determine exactly how the hazard exists within the specific community or country to analyze a hazard. Due to climate, geography, settlement patterns, and regional and local political stability, among many other factors each hazard occurs differently. Disaster managers create a risk statement into accurately address each hazard in specific context of the community or country. Several methods are used to create these risk statements. If it is done properly then the disaster managers can adequately assess the community’s risk and determine mitigation and preparedness priorities. To begin profiling hazards, it is a prime need to create a base map. A base map contains important geographical, political, population, and other information upon which hazard information may be overlaid (Coppola 2011).

Risk

Risks are the chances of an occurring hazard and its impact on the exposed communities or assets. For example, a community is living in the foothills of landslides prone area. Thus, risk depends on likelihood of occurrence of hazard, likelihood of injury, loss, or destruction of the exposed communities and coping capacity.

Risk Evaluation

Risk evaluation is carried out to calculate the hazard risks of the country or community being evaluated by the disaster manager. Regarding the risk evaluation, each hazard must be identified, described, mapped, and analyzed according to its chances of occurrence and its consequences

(Coppola 2011). During the processing of risk evaluation step, hazards are thoroughly examined and risks are compared to each other to prioritize them.

Capacity

Capacities encompass a wide range of attributes, including knowledge, skills, technology and resources. However, the capacity is needed for effective disaster risk reduction and mitigation that could be represented through comprising a society with organizations that particularly deal with disaster issues, well developed disaster plans and preparedness, coping mechanisms, adaptive strategies, memory of past disasters, good governance, ethical standards, local leadership, physical capital, resilient buildings and infrastructure that cope with and resist extreme hazard forces, etc. (SOD 2010).

Disaster

The concept 'disaster' comes from the French word 'disastre', implies 'des' (bad or evil sense) and aster (star). Additionally, it is derived from the Latin roots dis- and astro, meaning 'away from the stars' or, in other words, an event to be blamed on an unfortunate astrological configuration. Ian Burton et al. (1978) identified that disaster is a 'collective stress situation', while Quarantelli and Dynes (1977) compare it with 'social crisis period'. A disaster is present when need exceeds resources. Disaster = Need > Resources. CRED defines a disaster as 'a situation or event which overwhelms local capacity, necessitating a request to a national or international level for assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering' (EM-DAT 2017b). According to UN (1994), 'a disaster is usually defined as a serious disruption of the functioning of society, causing widespread human, material or environmental losses, which exceed the ability of the affected society to cope using only its own resources. Disaster is a severe, relatively sudden and unexpected disruption of normal structural arrangements within a social system over which the system has no firm control'. So, it can be said that disaster is based on the number of deaths, the destroyed property or the decreased in per capita income. The symbolic component requires knowledge of the sense of vulnerability, and the adequate death and destruction (Rahman 2013, Rahman et al. 2017; Barkun 1977).

Vulnerability

Vulnerability refers to 'the exposure of populations and sets susceptible to hazards such as weak buildings or individuals like the aged, children, disable, or women, who cannot offer any resilience

to the potential hazards' (The Commonwealth of Learning 2004). Vulnerability is a measure of the propensity of an object, area, individual, group, community, country, or other entity to incur the consequences of a hazard (Coppola 2011).

Generally, there are four different types of vulnerabilities: physical, social, economic, and environmental (Coppola 2011).

Women, disable, older people and children and poor including fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. may be much more vulnerable than active adults. Poor people have fewer capital resources and are likely to suffer more from the effects of hazards such as flood invasion of their homes.

Disaster Risk Management

Disaster Risk Management (DRM) is the systematic process of using administrative decisions, organization, operational skill and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters (GoB 2010).

Disaster Risk Reduction (DRR)

Disaster Risk Reduction (DRR) refers to the formulation and implementation of policies and practices that minimizes risks to vulnerabilities and disasters, applies to managing and responding to current disaster risks (GoB 2010).

Resilience

Resilience is the capability of a system and its components parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner, including through ensuring the preservation, restoration, or improvement of its essential basic structures, identity and functions, while also maintaining the capacity for adaptation, learning and transformation (Siddiqul et al. 2015).

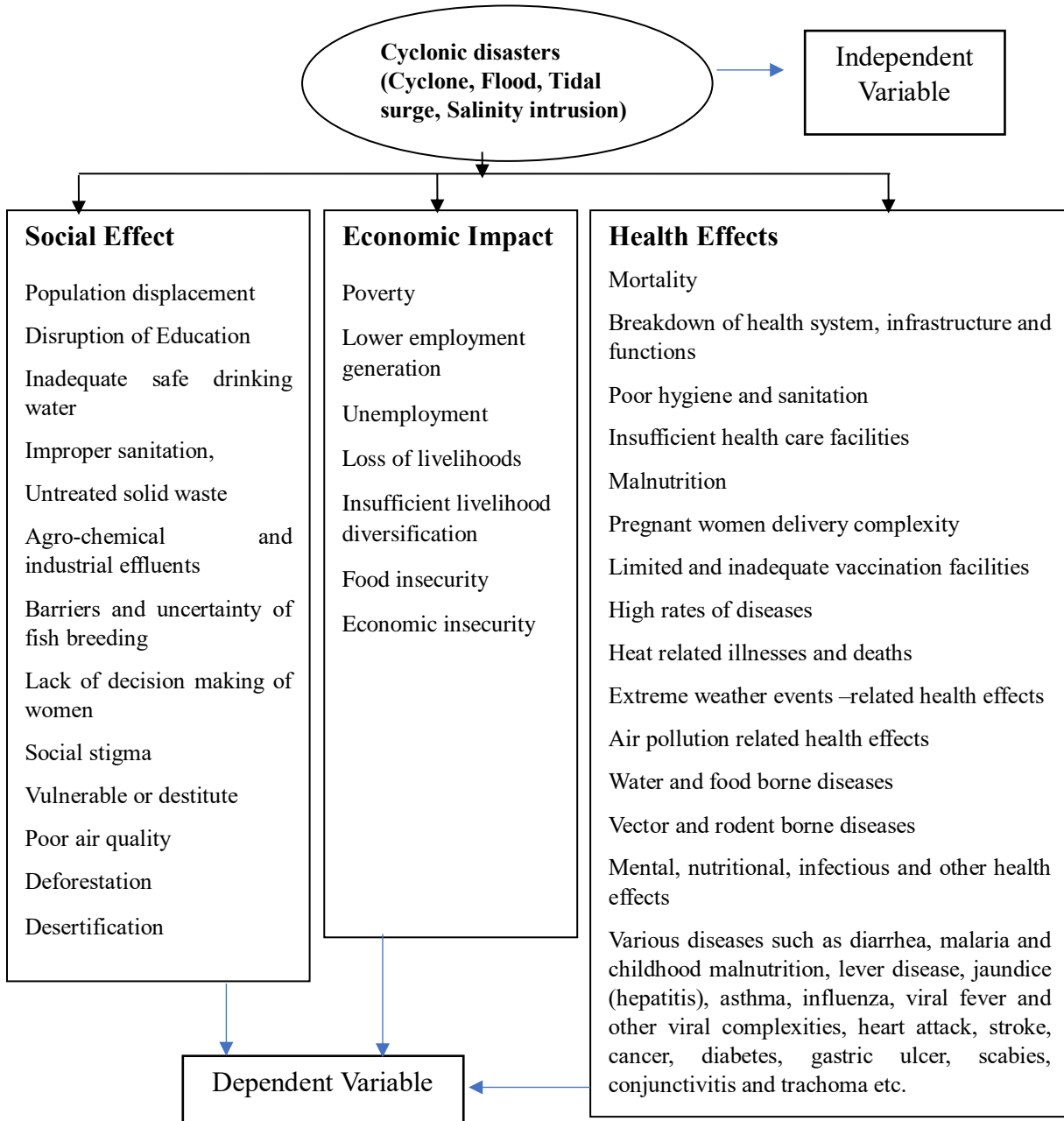
Adaptation

Adaptation means the adjustment or cope up with natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm and exploits beneficial opportunities (GoB 2010).

Chapter Three: Conceptual and Theoretical Framework

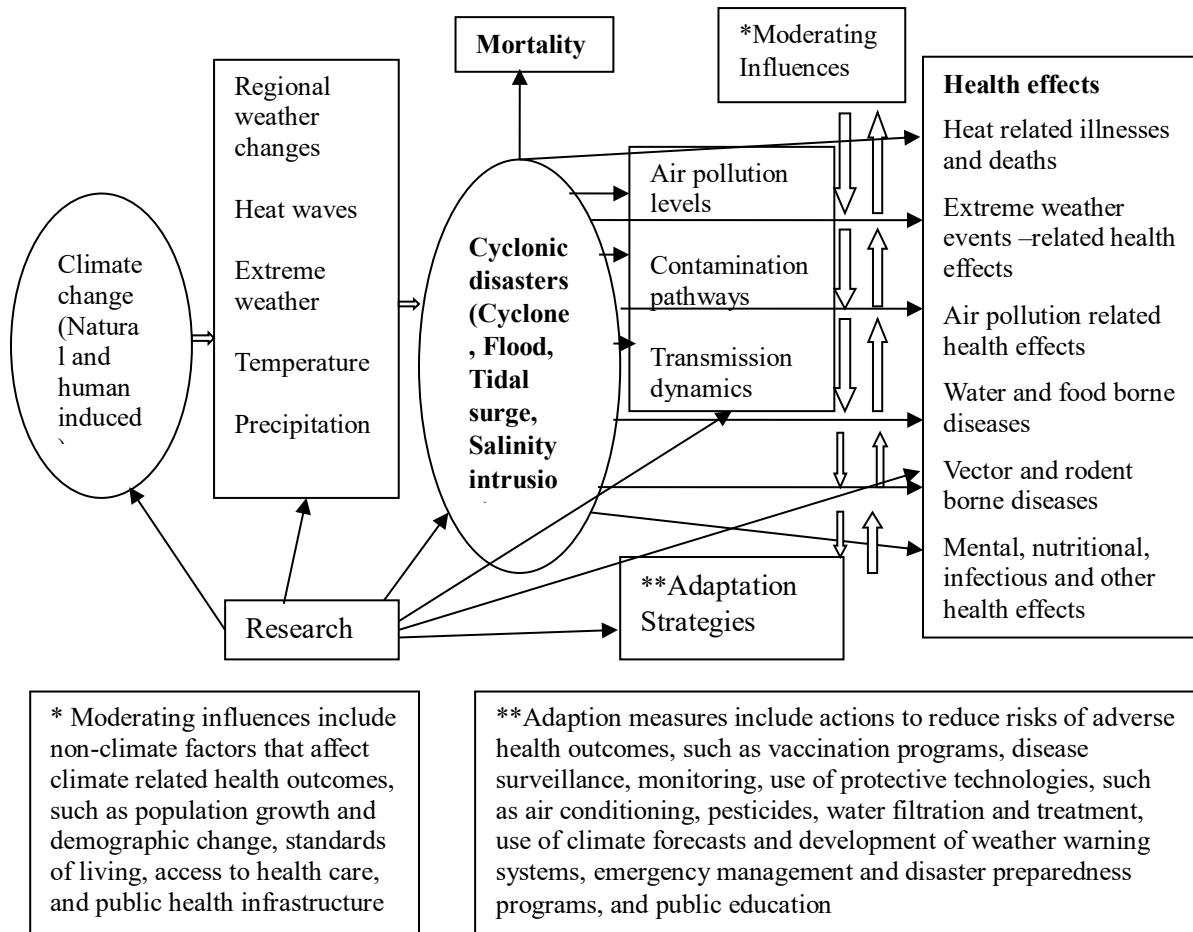
3.1 Conceptual Framework

Fig 3.1.1: Potential socio-economic and health effects of cyclonic disasters



(Source: Authors generated Framework)

Fig 3.1.2: Potential health effects of climate variability and change induced cyclonic disasters



(Source: Patz & Kovats 2002, WHO 2003 and Authors generated)

3.2 Theoretical Framework

3.2.1 Sustainable Livelihood Theory

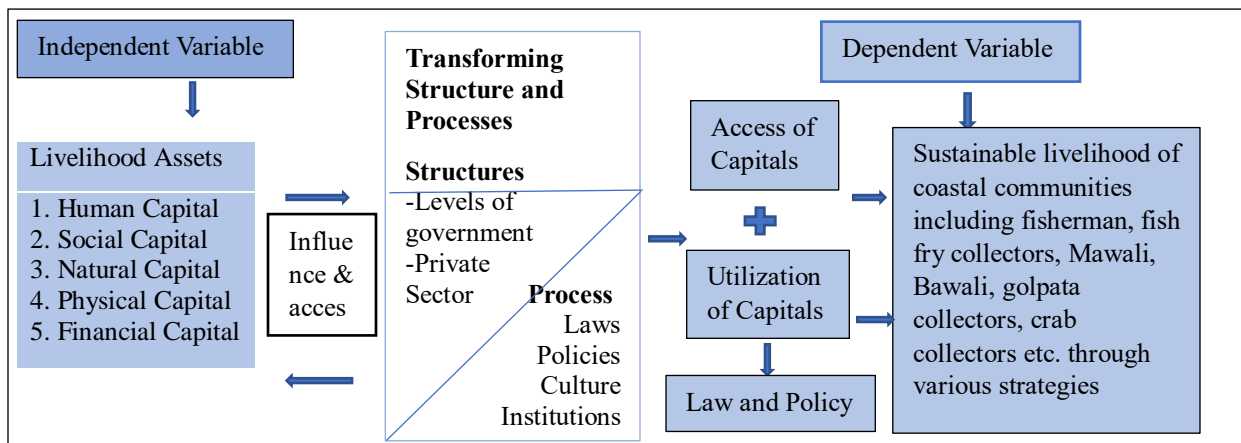


Fig 3.2.1: Sustainable livelihood Framework (SLF) by DFID, 2002 and author's compilation, 2023

The framework shows that how, in different contexts, sustainable livelihoods are acquired through access to a range of livelihood resources and of different livelihood strategies (Scoones, 1998). In order to create sustainable livelihoods, people must combine the ‘capital’ endowments that they have access to and control over. These may be encompassed by personal capabilities, tangible assets and intangible assets (Chambers & Conway 1992; DFID 2002). The coastal community’s livelihood also entailed assets (their bodies), capabilities (skills required), and activities (fishing, honey collecting, golpata collecting, crab collecting,) and it deals with shocks and stresses from within and without the community due to cyclonic disasters. But in coastal disaster-prone area where the community (fisherman, fish fry collectors, golpata collectors, bawali, mawali, crab collectors, riders, snail and oyster collectors etc.) lived, it is hard to access and utilization all the elements of capital. However, it is possible to achieve sustainable livelihood with access and utilization of these livelihood assets. According to SLF, the community can achieve sustainable livelihood by their various strategies eg., more income, better health, access to education, reduced risk and reduced vulnerability. These can be achieved through accessing various capital assets eg., human capital, social capital, natural capital, physical capital and financial capital.

Sustainable Livelihood: ‘A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in the future’ (Chambers and Conway, 1992).

Livelihood Assets: Livelihood assets encompasses with five basic capitals following to DFID (DFID 2002). These are as follows:

Human Capital: Human capital refers to the abilities, experience, work skills, knowledge, education or training sectors, and the excellent health that combinedly allow populations to engage with different livelihood strategies and reach their own objectives (UNDP, 2017). The marginal community including fisherman, mawali, bawali, fish fry collectors, golpata collectos, crab collectors, chunery and sanil collectors, riders, day labors have little bit knowledge and education to develop their lives, even they have to struggle to maintenance or subsistence of their families.

Social Capital: Social capital refers to the social resources that one relies on their livelihoods, including network and connections, membership of different groups, participation in more formal groups, relationships of trust, reciprocity and exchanges to achieve their specific goals relating to their livelihoods (UNDP, 2017). Their mutual understanding is almost good, trusted based on

interpersonal communications and relationship, even it is found for early awareness building and preparedness and recovery of disaster period. But this reciprocal relationship also breakdown due to frequent and recurrent of cyclonic disasters which exacerbate them vulnerability.

Natural Capital: Natural capital engages with natural resources such as land, soil, drinking water, marine and forest resources, tree, crop or animal farming, livestock, fisheries, air and water quality, mineral extraction, and so on by which people accumulates their capital or maintain their livelihoods whole or partly (UNDP, 2017). The community have access to water and forest (Mangrove forest *Sundarbans*) resources, but entering in forests hampers for unavailability of pass systems, or even sometimes want to bribery. The community has minimal land and face the challenges of safe drinking water due to excessive salinity.

Physical Capital: Physical capital refers to the basic infrastructures and production goods required to support livelihoods. This capital requires access to road and transport, housing and safe buildings, water and sanitation, clean and affordable energy, and access to information (UNDP, 2017). Regarding the physical capacities, the community have only able to their physical bodies to work, but housing, roads, and transports are fragile or breakdown due to recurrent cyclonic disasters, access to water, sanitation and hygiene, and energy system are unavailable.

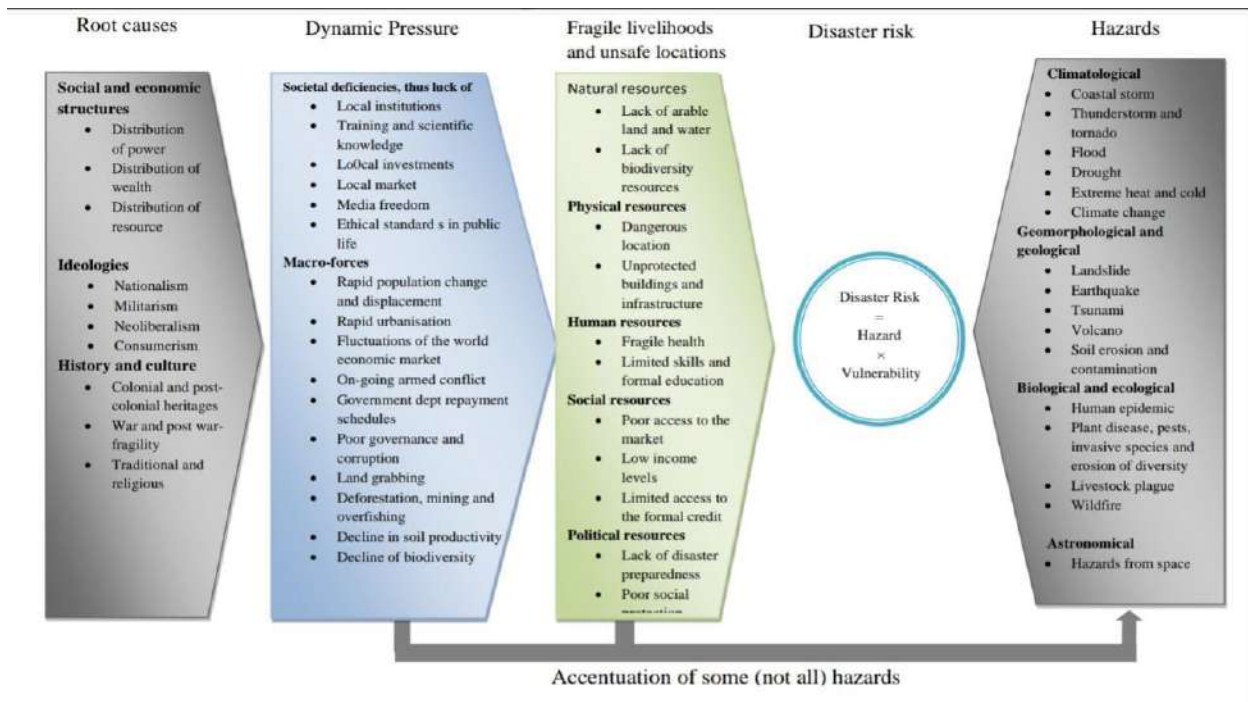
Financial Capital: Financial Capital means financial resources, including savings, credit, earned income, employment, remittances, aid and trade by which people consider to achieve their livelihood objectives through the sources of flows of money and available stocks (UNDP, 2017). The community have limited access to financial capital or even cyclonic disasters exacerbate the losses of houses, infrastructures, agricultural crops, food and foodgrains, fisheries, trees and forest sectors which lead to financial hardship or vulnerability.

The community have limited access to various capitals and they still lead their inhuman lives and livelihood practices by doing their traditional works (occupation) which are not sufficient and not even sustainable. To make their lives and livelihood as sustainable and sufficient for them, it is needed to improve their access of knowledge, skills, education, health care, communication with mainstream society, accessibility in infrastructure, utilization natural resources, employment opportunity and bank loan facilities. It is required to accept their hard work, diversity with respect, dignity and honor.

3.2.2 The Progression of Vulnerability Theory

Wisner et al. (2011) introduced a conceptual tool ‘pressure and release (PAR) model of the progression of vulnerability’ which is applicable for both descriptive and explanatory analyses of vulnerability to disasters. The basic idea of the ‘PAR’ model arises from the concept of intersection of two factors of disaster: vulnerability is generated in the society, and hazards or disasters are occurred in nature which is not entirely free of human influence. Hazards are influenced by a range of human activities, for instances, economic and political decisions, land use policy, etc. (Wisner et. al., 2011). The concept ‘Release’ is connected to conceptualizing how to relieve pressure. When a disaster strikes vulnerability has to be reduced (Wisner et al., 2011). The model is illustrated below.

Fig 3.2.2: The Progression of Vulnerability



(Source: Reprinted from Wisner et al., 2011)

Though cyclonic disasters are natural or extremely weather event, the community is largely affected by how they prepare and manage them. Therefore, the community have a greater degree of control over the creation of vulnerability to cyclonic disasters. Recent studies show that people’s daily activities create their vulnerability consciously and/or unconsciously. In the framework, government policies and the authority of local government and political party’s ideology determine the community’s ability to make decisions on disaster planning and mitigation strategies

(Wisner et al., 2011). Regarding this process, some people fail to attraction or less attraction of NGOs and local government in the event of natural hazards (Rahman et al., 2018). Some people's habitats and livelihoods strategies are controlled by ideology and policy. The community have unequal access to opportunities and resources. Some segments of community do not have equitable access to safe drinking water, food, land or farms, or even minimal access to basic health services and cyclonic disasters led to these crises.

Regarding the fragile livelihoods and unsafe conditions, certain people live and work in uncertainty risk zones having no alternative choice (Wisner et al., 2011; Blaikie et. al., 2003). Due to the lack of sufficient economic resources, some people have to live in less protective coastal areas or even resides on the edge of embankments. It also includes the primary level of well-being of the people which involves access to tangible (e.g. cash, shelter, food supplies, etc.) and intangible resources like networks of support, knowledge regarding survival and sources of assistance, ability to function in a crisis (Wisner et al., 2011 and 2004).

The idea of vulnerability is important from a theoretical and practical standpoint in many different fields and occupations. Every stage of a crisis, and danger might be considered vulnerable.

This theory demonstrates that in different the elements that are assumed to influence susceptibility across areas are used to create livelihood vulnerability indexes. Adger defines 'vulnerability' as the exposure of a person or community to stress brought on by environmental and social change that interferes with way of life. Adger further defines social vulnerability as the state in which a person or community is exposed to stress from external threats, particularly from climatic shocks. Wisner (2003) proposed a progression of vulnerability that is context-specific. For assessing vulnerability, a sustainable livelihood framework using 'capital asset' theory is also recommended. In this study, most of the respondents face different kinds of vulnerability like economic vulnerability, physical vulnerability, social vulnerability, psychological vulnerability, and health vulnerability during and aftermath of disaster that effect on their livelihood.

During disasters, the community face two types of impacts of economic vulnerability such as short-term impacts and long- term impacts. Dur to cyclonic disasters, majority of the respondents fall short term impacts such as immediate losses of their life, various kinds of properties as well as infrastructure resulting financial hardship or insolvency. They also face disruption of economic activities and services as well as increased of spending on emergency response and inadequate of relief efforts at that time of disaster. Pregnant women, aged people and physically disabled people

face different kind of vulnerability during disaster like lack of security, transportation barriers, lack of shelters, lack of toilet facilities as well as lack of water sanitation and properly hygiene facilities. After disaster they also face long term impacts on mental depression as well as economic depression. Due to increased poverty and inequality, vulnerable communities struggle to recover and accelerating their life through adjustment with migration and displacement leading to demographic shifts as well as social oppression after disaster in their regions. The community also face specific impacts on agricultural, manufacturing and services. Cyclonic disasters exacerbate their loss of crops, livestock, and social degradation, damage to various kinds of facilities, machinery, and supply chain, disruption of other service-oriented sectors.

Social vulnerability during disasters refers to inability of certain populations to prepare for, respond to, and recover from disasters due to various socio-economic and demographic factors. The elderly, physically challenged people, women, pregnant women and children are more susceptible at risks due to physical as well as psychological factors during disaster in their regions. They often require medical emergencies during disaster.

Health vulnerability individuals with disabilities face increase risk during disasters. They can not properly access to medical care facilities as well as life sustaining equipment because during disaster those service can be disrupted. Women, especially those who are pregnant or single mothers, may face unique challenges with feminine issues and gender-based vulnerability during and after disaster.

Psychological vulnerability requires that during disasters refers to the increased risk of mental health issues and emotional distress that individuals may experience in the face of disastrous events. individuals may experience shock, confusion, and difficulty concentrating. They can not get properly access emergency mental health services, lack of community support programs, lack of formal education and awareness, and lack of access to resources, resulting psychological vulnerability during and post disaster.

3.2.3 Risk Communication Theory

The conception of risk communication provided by Sheppard et al., (2012), which is derived from multiple fields of inquiry and notably overlaps with definitions of and research on crises and disasters. The theory of risk communication deals with methods for informing the public about risks in advance, during, and after disasters. It highlights how crucial timely, precise, and clear information is in assisting people in making decisions and acting appropriately.

Covello (1992) describes the ‘process of exchanging information among interested parties about the nature, magnitude, significance, or control of a risk’. According to some definitions, risk management is crucial (McComas, 2006), communication with stakeholders is important (Palenchar, 2005), and continuous risk monitoring is required (Coombs, 2012).

This section will cover both theories and models, with the goal of demonstrating how they might be combined to give a more comprehensive, wide-ranging picture of the elements required for effective risk communication. Two sections make up this section. Given their general features, cross-cutting theories and models that apply to the three risk phases (recovery, reaction, and readiness) are first discussed. Second, the theories and models most useful for a specific risk phase are discussed (Covello, 1992).

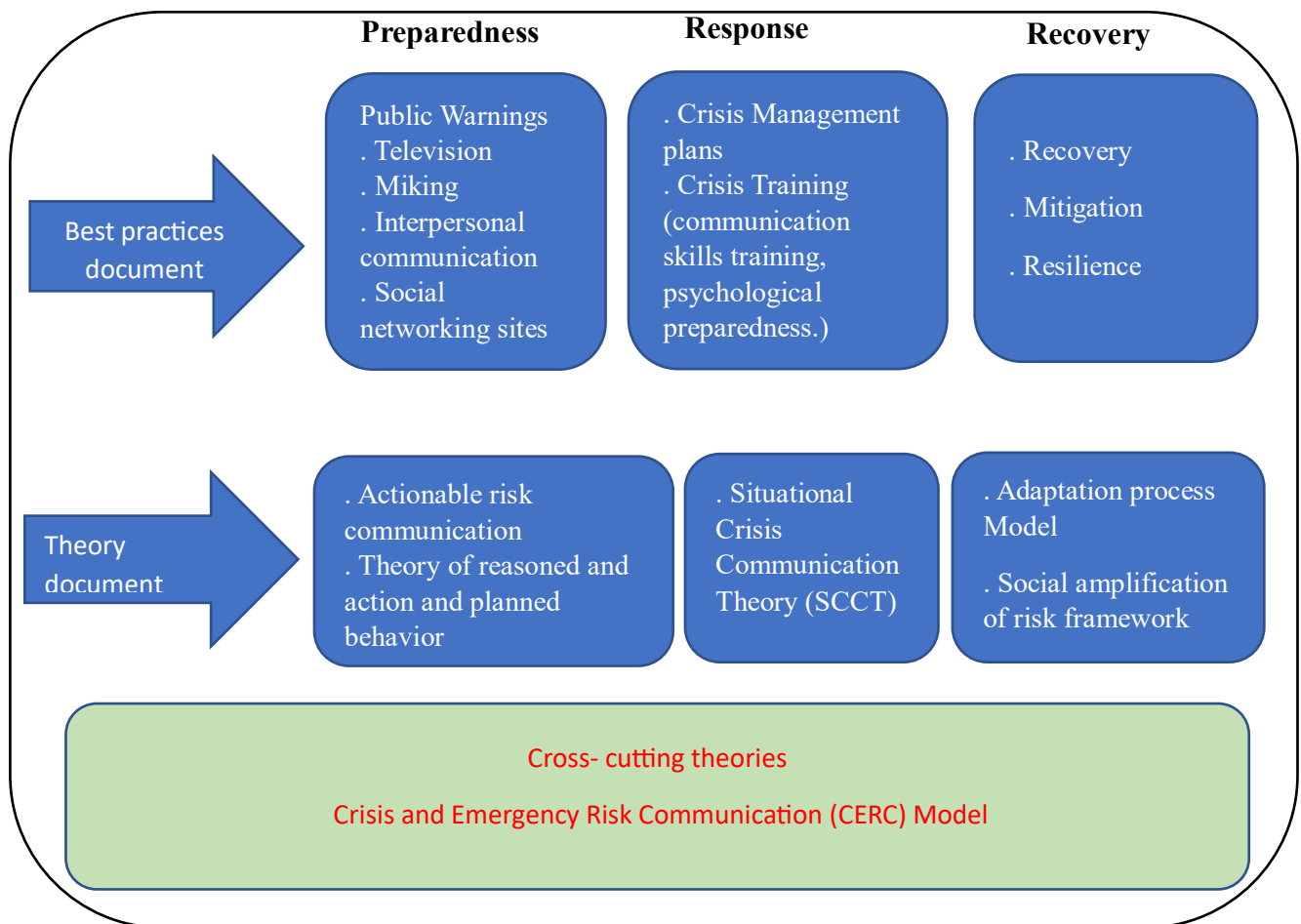


Fig 3.2.3: Crisis and Emergency Risk Communication (CERC) Model

In this study, most of the participants face vulnerability preparedness, response, and recovery before, during, and after disasters. Disaster prone areas people do not get proper opportunities their

livelihood through three indicators of risk communication theory by (Coombs, 2012) in this area. Preparedness including (Public warning system) available in this region during disaster periods. Majority of the people having positive response about this indicator warning system is there. They know about upcoming disasters via television, miking, interpersonal communication as well as social networking sites (Facebook). They have maximum interpersonal communication with each other during disaster. Response including (crisis management plans, and crisis training). Crisis training like communication skills, psychological preparedness, technical skills training. Government and other stakeholders can give training how to effectively communicate with each other in this area during disaster. Training for providing psychological first aid and support to disaster victims as well as responders before and after disaster in their areas. Recovery including (Recovery, mitigation and resilience). Most of the respondents said they recover their damaged properties capacities from their own resources with Government, NGOs and also Stakeholders support in these regions. The community need to recover the damage properties and setback in regular life activities maximum 7 to 12 month and longer aftermath of cyclonic disasters in these areas.

3.2.4 Behavioral Theories to Disaster and Emergency Health Preparedness

Ejeta et al., (2015) provides a 'behavioral health theory to disaster and emergency health preparedness' which focuses on the health belief model (HBM), and psychological and emotional behavioral effects of human by catastrophes. It entails being aware of the short- and long-term impacts on mental health, such as stress and anxiety, as well as creating treatments to promote mental health and wellbeing. Individual, societal, and organizational preparedness for crises and disasters may be more useful instruments for reducing the livelihood of disasters and lessening their effects as they occur (Ardalan et al., 2013).

It is important to identify the cognitive, affective, emotional and other social relationship and interaction factors that influence how individuals interpret environmental risk information and how this relates to behavioral preparedness for disaster and emergency. The main goal of preparation initiatives is to alter human behavior to lower risk and improve people's capacity to deal with the effects of hazards (Paton, 2003).

Preparations for emergencies and disasters mostly center on human behavior. Human behavior is influenced by a wide range of circumstances, including perceptions of danger, lessons learned from

direct and indirect encounters with emergencies and disasters in the past, and interactions between people and their surroundings. The type and degree of people's emergency and disaster health preparation are influenced by the interaction of these elements (Ejeta et al., 2015).

In this study, most of the respondents face psychological and emotional distress impacted by disasters that are the central focus of behavior health theory during disaster. Majority of the respondents have lost their own properties as well as relatives during disaster. Due to loss of their properties, they face financial insolvency after disaster. People face the economic vulnerability with social as well as mental depression due to cyclonic disasters. Cyclonic disasters are harmful for economic activities in this area. They face occupational hazards and challenges such as low wages salary, health hazards due to cyclonic disaster, feel physical irritation and hazards due to saline water in the paddy fields. After disaster the community face economic hardship because of saline water like food production, cattle, and lack of employment opportunities. People face long term impacts of mental health during and after disaster and creating treatment to mental health and wellbeing. Majority of the respondents can not get proper access to treatment facilities in this region during disaster because lack of sufficient health complex, family planning center as well as government health services institution with logistic supports. They can not get free medical services and goods during and after disaster resulting sickness day after day after disaster, sometimes they had been died lack of proper treatment. During cyclonic disasters, they are more health vulnerable because at that time they can not get proper nutritious food, sanitation facilities, pure drinking water facilities. These factors lead to precarious of their health profoundly. The condition of residence including filthy, unhygienic, nasty, dusty and polluted environment leads to numerous health risks including fever, cold, diarrhea observed in the community. Due to saline water they can not get pure drinking water that is harmful for health during and aftermath of cyclonic disasters.

Chapter Four: Disasters in Bangladesh: An Overview

4.1 Major Disasters in Bangladesh: An Overview

Bangladesh suffers from different types of disasters such as floods, cyclones, storm surge, river bank erosion, earthquake, drought, salinity intrusion, fire and tsunami. It experienced 326 natural disasters in between 1950 and 2017, exacerbating over 633614 death toll, 446231103 affected households and US\$19.536780 billion in total damage (EM-DAT 2017a). Due to climate variability, the geographical location, land characteristics and multiplicity of rivers, the country is exposed to various disasters which leads the people to go highly vulnerable. Cyclones and floods particularly caused massive damages. Cyclones occurred catastrophically and severely in 1970, 1991, 2007 and 2009 and killed 300,000, 138,882, 3,363 and 190 respectively.

Table 4.1: Synthesize top 10 disasters by total damage, total affected and total death from 1950 to 2017

| Disaster No | Type | Date | Total damage ('000 US\$) with rank | Total Affected with rank | Total Death with rank |
|-------------|------------|-----------|------------------------------------|--------------------------|-----------------------|
| 1998-203 | Flood | 05-07-98 | 4300000 (1) | 15000050 (10) | |
| 2007-556 | Storm | 15-11-07 | 2300000 (2) | | |
| 2004-298 | Flood | 20-06-04 | 2200000 (3) | 36000000 (3) | |
| 1988-242 | Flood | 00-6-1988 | 2137000 (4) | 45000000 (1) | |
| 1991-120 | Storm | 29-04-91 | 1780000 (5) | 15438849 (9) | 138866 (2) |
| 1995-82 | Storm | 15-05-95 | 800000 (6) | | |
| 1987-319 | Flood | 00-8-1987 | 727500 (7) | | |
| 2016-175 | Storm | 21-05-16 | 600000 (8) | | |
| 1974-34 | Flood | 00-7-1974 | 579200 (9) | 38000000 (2) | 28700 (4) |
| 2004-659 | Earthquake | 26-12-04 | 500000 (10) | | |
| 1984-41 | Flood | 00-5-1984 | | 30000000 (4) | |
| 1987-132 | Flood | 22-07-87 | | 29700000 (5) | |
| 1982-9350 | Drought | 00-7-1983 | | 20000000 (6) | |
| 1968-54 | Flood | 00-7-1968 | | 15889616 (7) | |
| 1965-28 | Storm | 11-05-65 | | 15600000 (8) | 36000 (3) |
| 1970-63 | Storm | 12-11-70 | | | 300000 (1) |
| 1963-13 | Storm | 28-05-63 | | | 22000 (5) |
| 1985-63 | Storm | 24-05-85 | | | 15000 (6) |
| 1965-34 | Storm | 00-6-1965 | | | 12047 (7) |
| 1961-4 | Storm | 09-05-61 | | | 11000 (8) |
| 1960-1 | Flood | 00—1960 | | | 10000 (9) |
| 1960-31 | Storm | 30-10-60 | | | 5149 (10) |

Source: (EM-DAT 2017a)

4.1.1 Cyclone

Cyclone and storm-surges are regular or recurrent events during the pre-monsoon and retreating monsoon periods along the coastal belt of Bangladesh. Cyclones originate when warm and moist air forms a low pressure over the oceans (Haque 2019). In Bangladesh, nearly 46,41,060 people are at risks and threats of cyclones with ranking at 6th among the 89 countries analyzed in 2014 (Hassan 2016). The term cyclone originates from the Greek word ‘*kyklos*’ meaning coil of snakes. Technically, a cyclone is an area of low pressure where strong winds blow around a center in anticlockwise direction in the northern hemisphere and rotates clockwise direction in the southern hemisphere. Cyclones occurring in the tropical regions are called tropical cyclones those are usually destructive and these are the ones which affect Bangladesh. Tropical storms are known as Hurricanes in the American continent, Typhoons in the Far East and cyclones in the South Asian sub-continent (Choudhury 2009). The people of the southern coastal belt use the word *tufan*, to describe a cyclone, which apparently seems close to “hurricane” in Atlantic Ocean; “typhoon” in Pacific Ocean; “baggio” in Philippines Sea; and “willie willie” in the Pacific (Haque 2019).

Tropical cyclones are spinning marine storms that primarily affect the coastal areas, but they may also penetrate far inland under certain conditions. They are characterized by high winds, heavy rainfall, and coastal storm surges. People sustained maximum surface winds of less than 39 mph or 62 kmh with tropical cyclones that are called tropical depressions. Once winds reach at least 39 mph they are typically called tropical storms and assigned a name. If winds reach 74 mph or 119 kmh, they are classified as hurricanes in the American continent, typhoons in the Far East and cyclones in the South Asian sub-continent (Coppola 2011).

Cyclone has a distinctive characteristic with ‘eye’ shape which is usually found in severe cyclones. The eye is small and almost circular area are coinciding with the region of lowest pressure having a diameter from 8 to 50 kms. The eye is warmer than the rest of the storm. The more violent is the storm, the warmer is the eye.

The wind speed gradually decreases as one moves away from the region of strongest wind. The main cyclone is often accompanied by a long tail, consisting of multiple bands, forming a spiral structure, and look like an inverted comma. The tail may extend up to a few hundred kilometers. Cyclones can extend up to a height of 15 kilometers. The frequency and intensity of the cyclone are on the increase as a result of global warming.

The Saffir-Simpson Hurricane Scale identifies cyclonic storms into the ratings of 1–5 based upon a measurement of the storm’s current intensity. The measurement scale is designed for hurricanes but can be used for any cyclonic storm and is used to give an estimation of the potential property damage and tidal surge expected along the affected coastal and inland regions. Wind speed is the determinant in the scale.

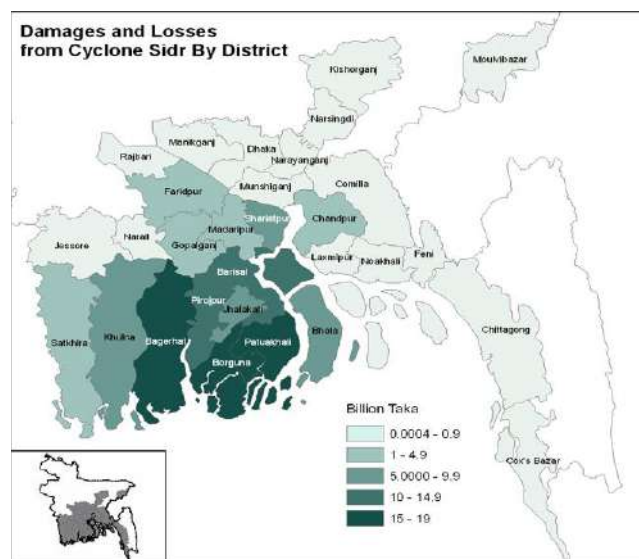
- Tropical storm. Wind speed ranges from 39 to 73 mph.
- Category 1. Wind speed ranges between 74 to 95 mph, resulting minimal damage to buildings and mobile homes, along with coastal flood and minor pier damage.
- Category 2. Wind speed ranges from 96 to 110 mph, resulting in moderate damage to building roofs, doors, and windows, considerable damage to floating homes and flood of coastal areas.
- Category 3. Wind speed ranges from 111 to 130 mph, causing structural damage to small residences and utility buildings, large trees blown down. Poorly built floating homes destroyed.
- Category 4. Wind speed ranges from 131 to 155 mph, resulting in extensive structural damage, erosion of beach areas, and flooding well inland.
- Category 5. Wind speed: 156 mph and above. It causes severe damages of all structures near the coast including many residences and industrial buildings (Coppola 2011).

Cyclones, often associated with storm surges, are a major concern for Bangladesh. During the period 1950–2017, approximately 162 severe cyclones are found in the Bay of Bengal, resulting in massive loss of life around 567886, total affected about 81769010 households, and destructed property near about 6026380 thousand US dollars (EM-DAT 2017a). The severe cyclone of 12 November 1970 took a toll of 300,000 human lives and put property damages to more than one billion US dollars. Almost 90% of the coral fisheries suffered extensive losses. It was estimated that about 46000 inland fishermen operating in the cyclone affected region lost their lives (Choudhury 2009). The April 1991 cyclone inflicted a material damage was about USD 2.4 billion and human casualties numbered around 140,000. Considering the fact that this cyclone was more dreadful than the 1970 cyclone. Moreover, storm surge is an unusual rise in sea water associated with a tropical cyclone originating in the Bay of Bengal and also brings severe devastation in coastal belt. The cyclone of 1876, 1919, 1961, 1963, 1965, 1970, 1991, 2007, 2009 and 2020 were severe in nature.

Cyclones and floods in Bangladesh periodically result in significant loss of lives, disrupt normal economic activities and exacerbate issues related to poverty, health and quality of life. Moreover,

cyclones have direct and indirect impacts on general public health, livelihoods, infrastructure, the economy and socio-cultural foundations. They can affect adversely in access to food and drinking water and increasing the risks of infectious diseases such as diarrhea, hepatitis, malaria, dengue, pneumonia, eye infections and skin diseases which contributes to the hampers of livelihoods (Sommer 1972; Haque et al. 2012). Surface water becomes contaminated due to salinity intrusion and poor sanitation systems (Haque et al. 2012; Unicef 1993; Haque and Blair 1992). Open space and bamboo-wooden structured latrines and poor sanitation are common in rural and coastal areas of Bangladesh and cyclones make this situation worse (Haque and Blair 1992). Water borne diseases break out and sometimes spread out after the disaster of cyclone and tidal surge due to the lack of safe drinking water. Other reasons are impacted indirectly such as damaged infrastructure, population displacement, reduced food production and the release of contamination of water (e.g. from storage and waste disposal sites). Child malnutrition occurs severely for the loss of crops and reduced access to fish in Bangladesh. Indirect health-related impacts such as increased suicide, theft, burglary and crime rates, and adverse pregnancy complications are related with cyclones (Paul et al. 2008). These events increase after the cyclone. As a result, post-traumatic disorder, psychological stress and depression are observed during the disaster and post disaster period. Due to disruption of schooling for children and losses of houses and infrastructure, the literacy rates are impacted adversely and scant knowledge of environmental health issues creates other challenges after the cyclone.

Map 4.1: Most Affected Districts in Damage and Loss Terms by cyclone Sidr



(Source: GoB, 2008)

Cyclone *Sidr* made landfall in the coastal areas on 15 November 2007 with tremendous winds of 250 km/h and a five-meter tidal surge. More than 3,300 people were affected, injured 55,282, about one million tons of rice crop were lost, and by January 2008 nearly 500,000 people were living in temporary shelters (Hassan 2016).

Cyclone *Rashmi* hit the southern coasts of Bangladesh on 27 October 2008 with wind speeds of up to 80 km/h. At least 15 people were deceased and some 300 were injured. More than 10 fishing boats with 50 aboard were missing in the Bay of Bengal after the storm *Rashmi* lashed. Thousands of homes and areas of crops were damaged. At least 1,000 of cattle were died as offshore islands (Ahmed and Fox 2008). The storm brought down electrical and telephone poles, cutting power and disrupting communities and uprooted trees; more than 40,000 people on 20 chars (river and char land areas) in coastal Barguna district were marooned due to flooding. Winter vegetables in the areas were heavily damaged in low-lying char land areas. At that time, there were no standing paddy crops in the agricultural fields (IRIN 2008).

Cyclone *Aila* strikes in Bangladesh on 25 May 2009 and heavily damaged southern coastal areas of Bangladesh. It brings 190 immediate deaths, injuries to 7,103 people and more than 500,000 people become homeless. The amount of damage was USD 270 million (Choudhury 2009).

Cyclone *Mahasen* made landfall on 16th May 2013 in the cyclone affected 8 coastal districts including Chittagong, Bhola, Barguna, Pirojpur, Noakhali, Patuakhali, Satkhira and Laxmipur; 17 people were dead, 102 were injured, 14,828 houses were fully and 44,182 were partly damaged and 386,221 people were affected due to this cyclone (Disaster Report 2013). Large amounts of standing crops were damaged and numerous fish ponds and cultured fish washed away. According to the government's information of 26 May, 26,577 houses are completely damaged and 124,428 houses are partially damaged in the above affected districts. Women, children, elderly and the disabled were the most affected and at risks to maintain their regular activities and remain secure in new accommodations (IFRIC 2013).

Cyclone *Komen* struck with high winds and heavy rainfall on 29 July 2015 in coastal areas of Bangladesh including Cox's Bazar, Chittagong, Bandarban, Noakhali, Feni and Bhola districts. At least seven people were died, 38 were missing and numerous of people injured due to the cyclone. Thousands of houses were flattened and trees uprooted. About 346389 households and 1584942 people were affected. 32544 houses were fully damaged and 95464 houses were partially damaged.

Many houses went under 5 to 6 feet of water, electricity supply was cut and the communication system collapsed in some areas for heavy rain (IFRIC 2015).

Cyclone *Roanu* strikes on 21 May 2016, resulting floods, landslides and submerging homes. Initial reports indicate at least 24 are deceased and up to half a million people have been affected. The emergency services were far reach more remote areas (Reliefweb 2016).

Severe Cyclonic Storm *Mora* hit struck in Bangladesh on 30 May 2017. The wind speeds were hit maximum 130 km/h or mor. At least six people are died, and 136 people are injured. Government official information assumed that about 52,000 houses were destroyed, leaving 260,000 people in possible demand of shelters (ECHO 2017). Cox’s Bazaar was heavily attacked with about 17,000 residences damaged (UNRC 201742). Bangladesh Red Crescent Society (BDRCS) distributed relief assistance for 80,000 people for eight months in their utmost demanded like health, water, sanitation and hygiene (WASH); shelter, food security and livelihoods; disaster risk reduction (DRR) and National Society capacity building (IFRIC 2017). About 3.3 million people have been affected and 540,000 people are estimated to need humanitarian assistance. 70% of shelters and latrines, clinics and other infrastructure were damaged (OCHA 2017).

Table 4.2: Yearly impact by major types of disasters (2014-2024)

| Year | Affected Population | Displaced Population | Fully Damaged Houses | Partially Damaged Houses | Death | Economic Loss ('000 US\$) |
|-------|---------------------|----------------------|----------------------|--------------------------|-------|---------------------------|
| 2014 | 3,033,546 | 357,225 | 23,314 | 130,023 | 59 | 160,000 |
| 2015 | 5,593,422 | 696,130 | 70,523 | 377,037 | 84 | 114,586 |
| 2016 | 5,705,854 | 529,508 | 60,920 | 1,024,372 | 134 | 750,000 |
| 2017 | 12,035,016 | 657,869 | 140,498 | 644,478 | 322 | 951,000 |
| 2019 | 8,144,460 | 3,989,081 | 41,882 | 568,371 | 171 | 144,385 |
| 2020 | 7,509,289 | 3,192,658 | 146,740 | 1,387,506 | 283 | 2,000,000 |
| Total | 42,021,587 | 9,422,471 | 483,877 | 4,131,787 | 1,053 | 4,119,971 |
| 2024 | 3,758,096 | | 35,483 | 114,992 | 21 | 596,923 |

(Source: Emergency Events Database (EM-DAT), National Disaster Coordination Centre (NDRCC), Health Crises Management Centre, Director General Health Services (DGHS), International Displacement Management Centre (IDMC), NIRAPAD Hazard Incidence reports)

It is revealed that from 42 million affected people the largest number of 12 million were in 2017 where four devastating disasters were occurred across the country including floods, cyclones, and landslides. People were displaced largely in 2019 (3.9 million) and 2020 (3.1 million) due to occurring three cyclones and two flood events (Table 2.1), it reveals that the high frequency of cyclones and flood impact leads to huge displacement as well. Overall, the disasters for the studied period resulted in 1,053 deaths, 4.6 million houses damaged (where almost 0.5 million houses were fully damaged and 4.1 million were partly damaged), and \$4.1 billion were economic loss due to various types of disasters during 2014 to 2020.

Table 4.3: Some Major Cyclones that hit the Bangladesh Coast

| Date | Maximum Wind speed (kmh) | Storm Surge height (meters) | Death Toll | Affected people | Displaced | Houses | Economic loss |
|--------------------------|--------------------------|-----------------------------|------------|-----------------|-----------|--------|---------------|
| 30 October 1960 | 210 | 4.6- 6.1 | 5149 | | | | |
| 28 May 1963 | 203 | 4.2-5.2 | 11520 | | | | |
| 11 May 1965 | 161 | 3.7-7.6 | 19,279 | | | | |
| 15 December 1965 | 217 | 2.4-3.6 | 873 | | | | |
| 01 October 1966 | 139 | 6.0-6.7 | 850 | | | | |
| 12 November 1970 | 224 | 6.0-10.0 /20-30 ft | 300,000 | | | | |
| 25 May 1985 | 154 | 3.0-4.6 | 11,069 | | | | |
| 29 April 1991 | 225 | 6.0-7.6 | 138,882 | | | | |
| 19 May 1997 | 232 | 3.1-4.6 | 155 | | | | |
| 15 November 2007 (Sidr) | 223 | 6.1-7.6 | 3363 | | | | |
| 27 October 2008 (Rashmi) | 85 | 5-7 feet (ft) | 15 | | | | |
| April 2009 (Bijli) | 95 | 2.1-3 m / 7-10 ft | 7 | | | | |
| 25 May 2009 (Aila) | 92 | 4.0-4.6 | 190 | | | | |
| 16 May 2013 (Mahasen) | 95 | 1 m/3.3ft | 17 | | | | |

| | | | | | | | |
|-----------------------------|-----------|---------------------|----------|--------------------|-----------------|----------------|-------------------|
| 29 July 2015 (Komen) | 100 | 1-2/3.3- 6.6ft | 45 | 2.6 M | 0.331M | | |
| 21 May 2016 (Roanu) | - | 0.9-1.2m /3-4 ft | 21 | 1.676M | 0.513M | | |
| 30 May 2017 (Mora) | 135 | 1.2-1.5/ 4-5 ft | 6 | 0.297M 32452559 | 0.456M | 300000 | |
| 2019 (Fani & Bulbul) | 80 148 | | 14 52 | 100000 722674 | 1.1M 3.681 M | 13000 18000 | \$5.5M \$14.8M |
| 20 May 2020 Amphan | 210 | | 26 | 1.644M | 1.364M | | \$1.5B |
| 26 May 2021 YAAS | 150 | 6-8/ft | 9 | 1.3 M | | 26000 | |
| 24 October, 2022 Sitrang | 88 | 10 feet | 09 | | 1.0 M | 10000 | |
| 14 May 2023 Mocha | 220 | | - | 429337 | | 12748 | |
| 26 May 2024 (Remal) | 130 | 8-10 ft | 21 | 3758096 | | 150000 | \$0.597 B |

Source: (EM-DAT 2017b and Bangladesh Meteorological Department 2023, Reliefweb 2024)

Within the considered (from 2014 to 2020) period, 15 major disasters strike on 42 million people, displaced 9.4 million people, damaged 4.6 million houses either fully or partially, caused 1,053 deceased, and resulting in an extensive economic loss of \$4.1 billion. Among the four major disasters, flood affected the highest 34.9 million people accounts for 83% of the total affected 42 million, the next larger impact was caused by cyclone and storm surge that affected 7.05 million people and accounts 16.78% of the affected population (Asikunnaby, 2021).

4.1.2 Storm/Tidal Surge

Storms are caused by atmospheric disturbance, influenced by variations in pressure and wind patterns, spanning from small-scale tornadoes (1 km across) to large extra-tropical cyclones (2000-3000 km across). These disturbances lead to a rise in sea levels, causing flooding along coastlines. Ocean currents, winds, and major storms contribute to these events (GoB 2009). Mostly, deaths in cyclones are caused by the associated storm surge, not by the heavy winds. For instance, the 1991 cyclone turned to a surge estimated at 6 meters above normal tide levels and wind speeds exceeding 200 km/hr. This event resulted in significant human and livestock losses, as well as damage to infrastructure, including houses, trees, crops, and fishing boats and shrimp farms. Coastal

embankments were also heavily destroyed, leaving croplands exposed to saltwater flooding until repairs could be made (Choudhury 2009). Storm surges, characterized by oscillations in water levels over periods ranging from minutes to days, are caused by atmospheric forces within weather systems, with pressure differences and high winds playing significant roles. It results in a mass of water, a high wave with moving high speed as the cyclone. The northern bay of Bengal experiences particularly severe impacts due to a combination of factors such as high tides, funneling coastal configuration, low flat terrain, and high dense population, leading to high mortality rates associated with storm surges (Flierl and Robinson 1972; Khalil 1992; Khan).

Storm surges are primarily caused by two principal factors: drops in atmospheric pressure and wind stress. When atmospheric pressure decreases, water levels rise due to the 'inverted barometer effect', typically by about 1 cm per 1 millibar drop in pressure. However, wind is the main driver behind storm surge generation, with the wave's magnitude directly related to wind strength, which increases with the square of wind speed (Khan).

Bangladesh's coastline faces disproportionately severe impacts from storm surges due to several factors including recurvate of tropical cyclones in the Bay of Bengal, shallow continental shape particularly in the eastern part of Bangladesh, high tide, triangular shape at the head of the Bay of Bengal, almost coastal terrain of Bangladesh nearly at sea level, and high density of population and coastal defense system (Khan).

Storm-surge waves belong to the class of long gravity waves. While they propagate faster than weather systems in deep water, the slower propagation on the continental shelf allows for significant energy transfer from the weather system to the water wave via resonance. This amplifies the surge, leading to flooding as it approaches the coast (Khan 48). Storm surges in Bangladesh are mostly occur in shallow waters. The amplitude/height of surges depends inversely on the depth of water. Numerical models have been developed for simulating storm surges in the Bay of Bengal especially along the Bangladesh coast by many scientists. Numerical models developed by Das (1972), Jones and Ali (1980), Ghosh et al., (1983), Qayyum (1983), Dube et al., (1985), Flather and Khandaker (1987), Abrol (1987), and Katsura et al., (1992) are noteworthy (Khan). All of the above-mentioned models taken into account various parameters like time, sea surface elevation, depth-mean currents, wind stress on the sea surface, bottom stress, atmospheric pressure, water depth, density, gravity, and Coriolis forces (Khan).

In a country where the majority of the people live in bamboo and timber-framed huts, walled with matting and thatched with straw leaves are flattened by even a moderate cyclone. However, the massive destructive force of cyclones in Bangladesh comes from the storm surge generated by strong winds (Khalil 1992).

The Surge Decay Coefficient (SDC) is calculated as follows:

$$SDC = \frac{\text{Surge height} - \text{Avg. elevation of the land at the end of the surge}}{\text{Width total inundated area} - \text{Width area with constant surge}} \text{ (Damen and van Western)}$$

Due to storm surges, about 60% of all deaths are occurred in the low-lying southern coastal areas of Bangladesh bordering the bay of Bengal and another 40% storm surge struck the adjoining the Andaman sea (Murty et al. 1986).

4.1.3 Flood

Flooding is a recurrent and widespread issue in Bangladesh, affecting the country nearly every year during the monsoon season. These floods cause significant and extensive damage to both human life and property. The geographical setting and meteorological characteristics have made the country frequently flooded and more vulnerable. There are two main types of floods in Bangladesh: annual floods, known as "barsha," which inundate approximately 20% of the land area, and low-frequency floods of high magnitude, known as "bonna," which inundate more than 35% of the area. The most catastrophic floods in Bangladesh occurred in 1954, 1955, 1974, 1984, 1987, 1988, 1993, 1998, 1999, 2000, 2007, 2008, 2020, and 2022 causing destruction and caused serious threat to lives and economy with most flooding area (Choudhury 2009). The 1988 flood set a historical record for the flooded area, while 1998 flood was unprecedented with its prolonged duration. In terms of human exposure of flood hazard zones, nearly 19,279,960 people reside in these vulnerable zones and Bangladesh ranks top position among 162 nations (Rahman et al. 2017; Hassan 2016). There are some record breaking deceased of floods in Bangladesh such as 1657 in the year of 1987, 1708 in 1988, 918 in 1998, 747 in 2004, 800 in 2007, 102 in 2008, 54 in 2020, 52 in 2022 respectively (Source: Disaster Management Bureau & Relief web, 2022).

Table 4.4: Yearly Impact by Flash Flood (2015-2023)

| Year | Affected Population | Displaced Population | Fully Damaged Houses | Partially Damaged Houses | Death | Economic Loss ('000 US\$) |
|------|---------------------|----------------------|----------------------|--------------------------|-------|---------------------------|
| 2015 | 1,807,335 | 202,459 | 27,269 | 78,090 | 19 | 34,586 |
| 2017 | 4,667,623 | 0 | 0 | 28,037 | 0 | 128,000 |
| 2019 | 7.6M | 307646 | 10000 | 583402 | 114 | 27000 |
| 2020 | 5,451,586 | 2.4M | 55767 | 205368 | 54 | 200000 |
| 2021 | 21M | 2.4M | | 700000 | 41 | |
| 2022 | >7.2 M | 481,827 | | 135770 | 59 | 584000 |
| 2023 | 2.4M | 40000 | 10591 | 24058 | 51 | 173838 |

(Source: Emergency Events Database (EM-DAT), National Disaster Coordination Centre (NDRCC), Health Crises Management Centre, Director General Health Services (DGHS), International Displacement Management Centre (IDMC), NIRAPAD Hazard Incidence reports)

Table 4.5: Area affected by flood in Bangladesh

| Year | Area (thousand Sq. Km.) | % area flooded | Year | Area (thousand Sq. Km.) | % area flooded | Year | Area (thousand Sq. Km.) | % area flooded |
|------|-------------------------|----------------|------|-------------------------|----------------|------|-------------------------|----------------|
| 1954 | 36.4 | 24.66 | 1973 | 29.4 | 19.92 | 1991 | 28.6 | 19.38 |
| 1955 | 49.9 | 33.81 | 1974 | 52.0 | 35.23 | 1992 | 2.0 | 1.35 |
| 1956 | 35.1 | 23.78 | 1975 | 16.4 | 11.11 | 1993 | 28.7 | 19.44 |
| 1960 | 28.2 | 19.10 | 1976 | 27.9 | 18.91 | 1994 | 0.42 | 0.28 |
| 1961 | 28.4 | 19.24 | 1977 | 12.3 | 8.34 | 1998 | 85.0 | 57.60 |
| 1962 | 36.9 | 25.01 | 1978 | 10.8 | 7.32 | 2007 | 62.3 | 42.22 |
| 1963 | 42.5 | 28.79 | 1980 | 32.5 | 22.02 | 2008 | 34.6 | 23.45 |
| 1964 | 30.7 | 20.81 | 1982 | 3.1 | 2.11 | 2009 | 27.8 | 18.83 |
| 1965 | 28.2 | 19.11 | 1983 | 11.0 | 7.45 | 2010 | 25.8 | 17.48 |
| 1966 | 33.0 | 22.36 | 1984 | 27.9 | 18.91 | 2011 | 29.7 | 20.12 |
| 1967 | 25.3 | 17.14 | 1985 | 11.3 | 7.65 | 2014 | 37.4 | 25.34 |

| | | | | | | | | |
|------|------|-------|------|------|-------|------|------|-------|
| 1968 | 36.9 | 25.06 | 1986 | 3.1 | 2.11 | 2015 | 46.5 | 31.51 |
| 1969 | 41.0 | 27.78 | 1987 | 56.6 | 38.35 | 2016 | 47.6 | 32.25 |
| 1970 | 42.0 | 28.46 | 1988 | 81.8 | 55.43 | 2017 | 62.3 | 42.21 |
| 1971 | 35.8 | 24.25 | 1989 | 6.1 | 4.13 | 2019 | 79.1 | 53.61 |
| 1972 | 20.5 | 13.89 | 1990 | 3.5 | 2.37 | 2020 | 55.1 | 37.33 |
| | | | | | | 2021 | 44.1 | 29.88 |

(Source: Choudhury 2009 & Disaster Management Bureau, 2022)

4.1.4 Salinity Intrusion

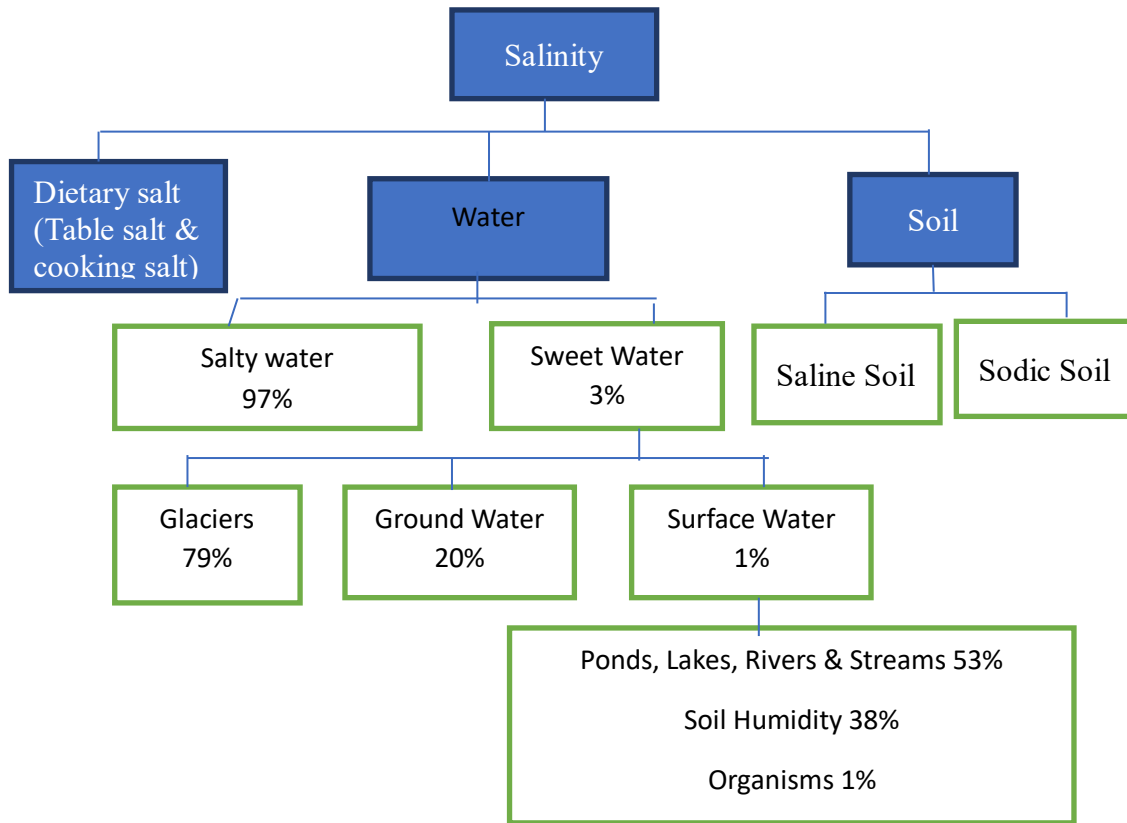
It is estimated that about 2.8 million hectares of land of Bangladesh are affected by salinity, which accounts for nearly one-third of the 9 million hectares of total cultivated area, and about one-fifth of the total area of Bangladesh (Salim et al. 2007; Khan et al. 2008). Salt water or salinity intrusion occurs in the coastal belt from the flow of seawater through natural disasters like cyclones, tidal surges, floods, river flows, estuarine circulation, extensive shrimp cultivation. Besides, climate change, sea-level rises, precipitation, and water and land management practices exacerbates the salinity (Rahman et al. 2023, Rahman et al. 2000; Nahian et al. 2018). The adverse effects of salinity on crop productivity and food grain production are well-documented, posing a threat to the wellbeing of coastal communities of this country (Khan et al. 2008). It also severe threats to the agriculture, coastal biodiversity and human health. Salinity intrusion is extending into the non-coastal areas, reaching over 100 kilometers inland in Bangladesh (Talukder et al. 2016a).

In the southwest coastal regions of Bangladesh, salinity in both surface water and groundwater poses health risks to the 35 million inhabitants, directly or indirectly affecting their agricultural production (Clarke et al. 2015; Ayers et al. 2017; Khan et al. 2011). Long-term consumption of saline water can lead to hypertension, and in severe cases, it has been associated with higher rates of conditions like pre-eclampsia and gestational hypertension, particularly during the dry season compared to the rainy season (Khan et al. 2011b).

Scientific studies show that salinity levels have increased in domestic ponds, groundwater supplies, and agricultural land in Bangladesh through the various estuaries and water inlets intertwined with major rivers (Colligan 2011). According to Ministry of Environment and Forest (MOEF) 2006, about 20 million of the 37 million of coastal Bangladeshi people are susceptible to the challenges of excessive salinity (Khan et al. 2011b). Dasgupta et al. (2015) carried out a study

regarding soil salinity of southern Bangladesh and showed that the soil salinity in Barisal are relatively more than their riverine areas (Dasgupta et al. 2015). Salinity is found in mostly water, soil and diet as table salt or cooking salt which are shown in a flowchart:

Flowchart 4.1: Sources of salinity



(Source: Khanom & Salehin 2012; Ayers et al. 2016, 2017; Khan et al. 2011; Stenhouse & Kijne 2006; Rasheed et al. 2016; Naser et al. 2017; Lecture of Joos van den Noortgate [WASH & MSF, CRED]).

The salinity of coastal groundwater typically consists of soluble salts such as sodium (Na), magnesium (Mg), strontium (Sr), and chlorine (Cl), which are all highly correlated (Ayers et al, 2016). Salinity is commonly measured as milligram of total dissolved solids (TDS) per liter. It is expressed using the Electrical Conductivity (in reference to 25° Celcius) often expressed either in milliSiemens per centimeter (mS/cm) or microSiemens per centimeter (µS/cm) (Duncan et al. 2000). In southwest coastal area of Bangladesh, groundwater specific conductivity (SpC) exists as in 1 to 10 (mS/cm), equivalent to salinities of 0.5–5.2 parts per thousand (ppt, seawater is 35 ppt). High salinity water intrudes through tidal channels. Tidal channel water brings seawater from the Bay of Bengal to the freshwater with salinities up to ~15 ppt during the dry season (Ayers et al.

2016; George 2013). The average salinity of groundwater in the southwest area is ~10 ppt, roughly one-third of seawater in the dry season (Ayers et al, 2016).

Salinity is the concentration of dissolved salts in water, typically chloride anions, usually known in parts per thousand (1 ppt = 1000 mg/L = 1000 ppm). According to the Environment Conservation Rules of 1997 in Bangladesh, the suggested range of chloride in drinking water is 150 to 600 ppm (mg/l). A higher value of salinity up to 1000 ppm for problematic areas including the coastal belt is considered (DPHE 2006) for drinking.

4.1.4.1 Effects of Salinity

The impacts of higher salinity on health have been observed in low-income countries (Rahaman et al, 2019). Bangladesh government and Caritas Development Institute (CDI) have highlighted various health risks among coastal people due to increased salinity exposure through drinking, cooking and bathing, including hypertension and miscarriage of pregnant women, skin diseases, acute respiratory infection and diarrheal diseases (Vineis et al, 2011).

Salinity has directly or indirectly affected negatively or adversely on human health or animal health. The main health problems of coastal belt people in Bangladesh were reported in various literature as follows: hypertension or high blood pressure, stroke, heart diseases, osteoporosis, malaria, diarrhea, dehydration, skin diseases (itch, boil/blister), malnutrition, acute illness, respiratory illness such as asthma, stomach cancer and obesity, kidney diseases, chronic illness, trauma and other injuries, and infection or communicable diseases, non-communicable diseases, pregnancy related complicacy or gynecological problems and injuries, anemia and pre-eclampsia (Colligan 2011).

Studies indicate that high salt intake in children can lead to increased blood pressure and predispose an individual to various diseases, including high blood pressure, osteoporosis, asthma, stomach cancer and obesity. Coastal communities experience higher rates of premature birth and miscarriage compared to other areas due to natural disasters induced to salinity intrusion. Children, elderly, women, pregnant women, disable people are more at risk comparatively. Women are the most vulnerable and worst sufferers regarding socio-economic or physical status (Downie 2007). Salinity not only affects human health but also impacts the environment and plant growth directly and indirectly where agricultural production is almost impossible due to severe salinity (Stenhouse and Kijne 2006). It also affects the loss of biodiversity, negative impacts on wildlife and disruption of ecosystems leading to loss of ecosystem function (Barrett Lennard et al., 2005). Homestead

production like kitchen vegetables and domestic livestock is reduced for increasing the salinity of domestic water. Besides, salinity causes the losses of agricultural production and other economic loss through its direct effects on infrastructure and drinking water. Salt is highly active chemically, and also causes the destruction of infrastructures like roads and buildings (Abdel-Dayem 2005).

The presence of saltwater in groundwater and open water bodies, including ponds, poses a significant threat to fisheries, leading to potential increases in fish diseases. Sweet water fish production (like carps) may decline and verge of extinct if the sea level rises, as these species cannot tolerate excessive salinity. Consumption of contaminated fish from salt-affected areas can also pose health risks to humans (Abdullah et al. 2021).

In salinity-prone coastal areas, drinking water sodium or salinity is a risk factor for hypertension or blood pressure related diseases which leads to cardiovascular morbidity and mortality. Several studies have investigated the relationship between drinking water salinity and conditions of women's health. Women are associated with high blood pressure or hypertension due to high drinking saltwater, salt, or sodium intake (Khan et al. 2008, 2011, 2014; Nahian et al. 2018, Clarke et al. 2015; Rasheed et al. 2016; Naser et al. 2017; Vineis et al. 2011; Scheelbeek et al. 2016b; Adhikary 2016). Some studies like Khan et al. (2008, 2011), Khan (2014), and Rasheed et al. (2016) assessed the relations between drinking water salinity and the pre-eclampsia, eclampsia rates and gestational hypertension in pregnant women. They also mentioned that pregnant women were identified as having 'hypertension in pregnancy' (SBP > 140 mmHg or DBP > 90 mmHg after the 20th week of pregnancy and not before pregnancy), pre-eclampsia (high BP in pregnancy), and eclampsia due to drinking water salinity. During pregnancy hypertension is related with increased rates of adverse maternal and fetal outcomes including impaired liver function, low platelet count, intrauterine growth retardation, premature birth, and maternal and perinatal deaths in both acute and long term.

Vineis et al. (2011) evaluated the potential damage of economic and infrastructural, livelihoods and raises health risks via saline contamination of drinking water regarding the parameters of independent variable (IV) - climate change, salinity intrusion, and dependent variable (DV) - shrimp culture, soil salinity, low productivity, hypertension or high BP, miscarriage, skin diseases, respiratory diseases, mosquito borne diseases, diarrheas, stroke. They found that water salinity creates and develop pre-hypertension (SBP=120-139 mmHg or DBP=80-89 mmHg) and hypertension (SBP > 140 mmHg or DBP > 90 mmHg) significantly. Hypertension and miscarriage

among pregnant women, skin diseases, acute respiratory diseases, and diarrheal diseases were prevalent because of increased salinity in drinking, cooking, and bathing water.

Scheelbeek et al. (2017) evaluated the relations between drinking water salinity (sodium concentration) and blood pressure in coastal population in Bangladesh regarding the confounders drinking water salinity, dietary salt intake, age, sex (model 1), physical activity, BMI, and smoking (model 2), temperature, disease; marital status; religion; HH members; education; use of *paan*, *hukka*, and *gul*; insecticides and chemical; and life styles. This is the first cohort study on drinking water sodium and blood pressure in (non- pregnant) adults in a salinity affected coastal area. Khan and her team found that drinking water salinity is associated with higher risk of pre-eclampsia and gestational hypertension in this population and the number of hypertensions was almost 8 times higher than in non-coastal areas of Bangladesh. It is noticed that the higher prevalence of hypertension or raised blood pressure in pregnant women in the dry season than in the rainy season (Clarke et al 2015; Khan et al. 2011; Naser et al. 2017). Nath et al. (2012) conducted case control study from 290 respondents of salinity prone area (Bagerhat district) and non-salinity area (Tangail) to assess the blood pressure status regarding salinity and non-salinity area in Bangladesh. About 20% of the non-saline respondents' SBP was 110-120 mm of Hg and 26% of saline area had SBP >135-140 mm of Hg. About 19% of the non-saline respondents' DBP was \leq 85 mm of Hg. About one third had \geq 90 mm of Hg, among them 31% were from saline area. They observed that mean of SBP and DBP among the people of salinity area (Bagerhat) was more than that of non-salinity (Tangail) area. Khan et al. (2008) conducted a survey of 561 pregnant women in 2008 of Gynecology department in Chalna Upazilla Health Complex in the southwestern coastal areas and examined the relations between drinking water salinity and the rates of pre-eclampsia, eclampsia and gestational hypertension in pregnant women. They noted that 21% of the respondents and between the ages of 16 and 40 years were diagnosed regarding hypertensive disorder due to drinking water salinity. Khan et al. (2011) further showed that women who drank shallow tube-well water were more likely to have urine sodium > 100 mmol/day than women who drank rainwater [OR 2.05; 95% CI, 1.11–3.80].

Talukder et al. (2016a) carried out a cross-sectional study of 253 participants aged 19-25 years from four villages during May-June 2014 in Koyra of Khulna in Bangladesh to examine the association between high salinity drinking water and blood pressure among young adults in coastal Bangladesh. They reported that 65% of the population of Koyra were exposed to highly saline

drinking water (Bangladesh standard 600 mg/L and above), with a mean salinity in drinking water of 817 mg/L. This study represents the first population-based investigation to measure the blood pressure among young adults in low-lying coastal communities regarding climate change-induced sea-level rise and salinity affected exposure.

Rasheed et al. (2014) discovered that more than three-fourths of the study population consumed excess drinking water of salinity more than biological requirements, with half consuming more than 5 g of salt daily. This excessive salt consumption poses a risk factor for hypertension.

Talukder et al. (2016a) and Sheelbeek et al. (2016) demonstrated that salinity (sodium) was higher in tube wells (ground) water users [2 times more] than pond (surface) water users.

In contrast, Talukder et al. (2017) conducted a systematic analysis to measure the association between sodium in drinking water and the prevalence of hypertension. They found that higher sodium exposure was linked to increased blood pressure, particularly for diastolic blood pressure (DBP), and other chronic diseases (e.g. cardiovascular and kidney diseases) in low-lying coastal areas.

Nahian et al. (2018) investigated the correlation among socio-ecological systems (SESs), drinking saline water and health crises, particularly hypertension or blood pressure, through cross sectional household survey from over 1,500 household in coastal Bangladesh. They observed a higher prevalence of hypertension among females, individuals aged 35-59 years, and those consuming higher concentrations of saline water ($\geq 3,000$ mg/l). Drinking water salinity poses the high blood pressure or (prehypertension and hypertension) which leads to cardiovascular diseases (CVD). Due to slightly saline (1000-2000 mg/l) and moderately saline (≥ 2000 mg/l) concentration potable water, people exposed to higher risk of hypertension 17% ($p < 0.1$) and 42% ($p < 0.05$) respectively than who drank fresh water (< 1000 mg/l). Women were hypertensed 31% more risk than men. Besides, (35-59 years) of respondents were about 2.4 times higher hypertensive than the below of 35 years age. The people who are the above age group of 35 years, both prehypertension and hypertension were found higher than national rural statistics (50.1%) for drinking saline water (53.8% for slightly and 62.5% for moderate saline).

Scheelbeek et al. (2016a) reported that drinking tube well water, pond water, and combined sources were significantly associated with higher systolic pressure (+3.62 mm Hg [CI: 1.20, 6.04] and +4.85 mm Hg [2.55, 7.25] for pond and tube well users, respectively) compared with drinking rain water after adjustment of confounders. The people who consumed drinking water with a high

sodium concentration is associated with higher blood pressures in normotensive pregnant women in coastal areas of Bangladesh.

Khan et al. (2008, 2014) and Talukder et al. (2016) conducted studies the pregnant women and young adults in coastal Bangladesh and found the relations between drinking water salinity and hypertension. Additionally, Talukder et al. (2017) established a positive association between consuming saline drinking water and elevated blood pressure. Due to climate change induced saline intrusion in water and high salt consumption heightened risk of hypertension were observed about 20 million people in Bangladesh (Rasheed et al. 2016). The country has witnessed over 16,600 hypertensive deaths, accounting for 2.28% of total deaths, with an age-adjusted death rate of 17.92 per 100,000 population, ranking Bangladesh 77th globally (Nahian et al. 2018; WLE 2014).

Research indicates a clear association between increased salt intake from drinking water or dietary sources and elevated blood pressure or hypertension. This increasing blood pressure leads to other chronic diseases like cardiovascular diseases, stroke or heart attack, pre-eclampsia and eclampsia of pregnant women, impaired liver function or kidney disease, low platelet count, intrauterine growth retardation, premature birth, maternal and perinatal deaths. Furthermore, high salinity areas are prone to cholera outbreaks due to warm temperatures and increased plankton presence, exacerbating the health risks associated with salinity intrusion.

Chapter Five: Methodology

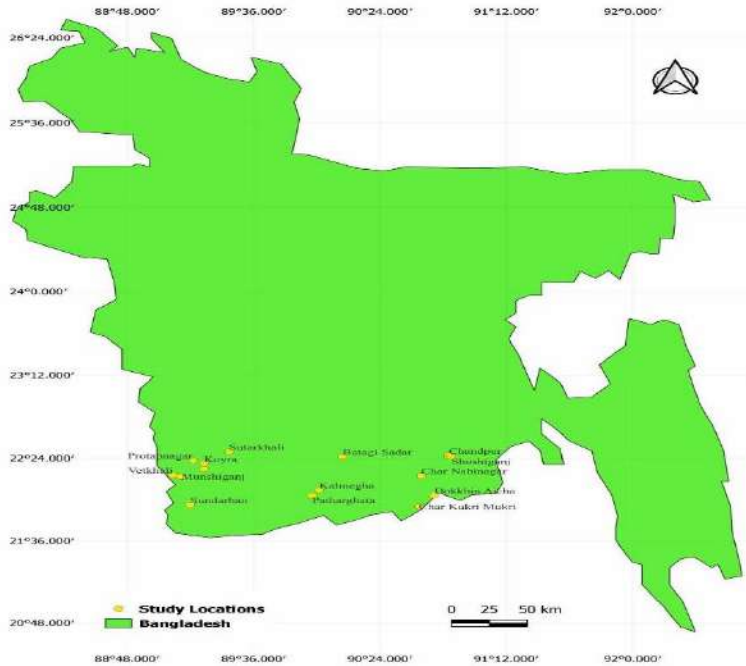
5.1 Materials and Method of the Study

This study employed an exploratory research approach to examine the interplay between cyclones, tidal surges, floods, and salinity intrusion on health hazards, socio-economic vulnerabilities, and environmental vulnerabilities.

The research was conducted in triangulation research like juxtaposition of quantitative and qualitative research. Comprehensive structured and semi-structured interview were taken by means of well reformed questionnaire. The study aimed at analyzing and comparing differently the current situation of socio-economic vulnerability, mortality and morbidity and their trends regarding cyclonic disasters including cyclone, tidal surge, flood and salinity intrusion disaster settings. For this purpose, the data were collected through field surveys. A total of 840 household sample were chosen by following various formula and guidelines; 420 (210+210) of household samples were selected from the two major cyclonic disasters affected districts like Barguna and Bhola district of Barisal division. Another 420 (210+210) of household samples were selected from the cyclonic disasters prone area like Khulna and Satkhira district of Khulna division in Bangladesh. Data were collected from different respondents through face-to-face interview following purposive sampling in 2022-2023. Some reasonable like 08 Focus Group Discussion (FGD) with 57 participants, 68 Key Informant Interview (KII) and 82 Case Study method were also employed and the respondents were taken from different stake holders.

| Division | District | Sub-District | Union | Village |
|----------|----------|--------------|---|--|
| Barishal | Bhola | Charfasson | Char Kukri Mukri, Char Nabinagar, Dokkhin Aicha | Char Kukrimukri, Char Nabinagar, Babuganj, Aminpur, Hajipur, Char Faruki, Char Mainka, Char Kassopia |
| | | Tajumuddin | Chandpur, Shoshiganj | Kajikandi, Hajikandi, Vasarpara, Keyamullah |
| | Barguna | Patharghata | Patharghata, Kalmegha | Haringhata, Gohorpur, Charlathimara, Kharakanda, Soto Patharghata |
| | | Betagi | Betagi Sadar | Keurabunia, Jhopkhali (Soto), Betagi (Uttar & dokkhin), Gabua |
| Khulna | Khulna | Koyra | Uttar Bedkashi, Koyra | Uttar Bedkashi, Patharkhali, Gajibari, Borobari, 2, 4 no union Koyra |
| | | Dacope | Sutarkhali | Gunari, Nalian, Kalabagi |

| | | | | |
|--|----------|------------|---------------------------------------|--|
| | Satkhira | Shyamnagar | Vetkhali, Munshiganj, Sundarban | Tengrakhali, Vetkhali (Baro & Soto), Mirgao (Moragang), Harinagar |
| | | Ashashuni | Protapnagar | Protapnagar, Kurikawnia, Sripur |



Map 5.1: Area of the Study

The above-mentioned regions sample respondents were selected for data collection considering following grounds: ➤ Degree of devastating cyclonic disasters related severe storms, tidal surge, flood and salinity threat due to climate change impacts; ➤ Challenges of health care access to flood and cyclone shelters, and functioning of health system during and aftermath of cyclonic disasters; ➤ Convenient access to data and significance of information.

Data Collection:

First of all, a sample survey questionnaire was developed. The pilot survey was conducted in two prospective cyclonic disaster-prone areas which have similar socio-economic and environmental background. On the basis of pilot survey result, necessary corrections, modification, incorporation and dropping of unnecessary questions has been done to the questionnaire. After finalizing the sample survey questionnaire, the main study has been conducted. In this research both structured and semi-structured questionnaire has been used to collect necessary data. As the respondent are heterogeneous in nature, the sample population cover different categories of people of two

different coastal divisions. All communities are at risk of emergencies and disasters including those associated with infectious disease outbreaks, conflicts, and natural, technological and other hazards. The health, economic, political and societal consequences of these events can be devastating. To meet the minimum sample size criteria this study has been drawn about 840 sample respondents on the basis of stratified sampling techniques. The basis of this standard number is sample formula which is given by Uma Sekaran (Known as mother of statistics) in her famous book 'Research Methods for Business'. Apart from the following criteria in drawing the sample respondents, some more specific target respondents were selected from the following categories: Women (40); Pregnant women of aged between 15 and 49 years (40); Adolescent girls of aged between 12 and 17 years (40); young adult women of aged between 19 and 25 years (40); aged people greater than 60 years old (40); child aged between 7 and 14 years old (40); IDPs or internally displaced people (40); physically disable people or handicap (40); health attendant or health service providers' perception (40); health care seeker or patient in hospital (40); marginal farmers (40), landless poor (40); daylaborer (40), Cyclone preparedness program (CPP) volunteers/workers (40); fisher man or *Jele* (40); boat man or *majhi* (40); *Bede* community (40); Doctors perception (20), *Bawali* or wood cutter (20), *Nypa* (golpata used as roof materials) collector (20), *Mawali* or honey and bee wax collector (20), medicinal plant collector (20), Fish fry collectors (20); crab collector (20), *Chunery* or oyster and snail collector or other vulnerable and destitute (20). In this study, multi-stages stratified sampling was used by purposively. At first, we created strata by using division like Barishal and Khulna; secondly, made strata by using district; thirdly, created strata by using sub-district or Upazila; fourthly, created strata by using Union; then created strata by using village or community and finally then created strata by using different segment of required people. The expected sample size will be determined (after pilot survey) by using following sampling technique or the given formula and rules of thumb:

$$SS = \frac{Z^2 \times (P) \times (1-P)}{d^2} \quad \text{Where:}$$

Z = Z value, the standard normal deviate (e.g. 1.96 for 95% confidence level)

P = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)

d= margin of error (precision), (usually set at 5%, but we set as 4% e.g., 0.04)

$$\begin{aligned} \text{So, the required sample size is } SS &= \frac{Z^2 \times (P) \times (1-P)}{d^2} = \frac{1.96^2 \times (0.5) \times (1-0.5)}{0.04^2} \\ &= \frac{3.841 \times (0.5) \times (0.5)}{0.0016} = \frac{3.841 \times 0.25}{0.0016} = \frac{0.96025}{0.0016} = 600.15625 \cong 600 \end{aligned}$$

So, 600 is the entire sample size. But with utmost need and involvement in marginal people of various livelihoods and different segments people, 840 sample size is required in the study.

Rules of thumb for determining sample size

Sample sizes greater than 30 and less than 500 are fitting for utmost research. In case of subsamples the minimum sample size for each category has to be 40 (Sekaran and Bougie 2016).

On the other hand, the respondents for qualitative study comprised the representatives of different stakeholders. Effective coordination among many disciplines in the health community is also required, such as emergency medicine, disease surveillance, mental health, nutrition, water and sanitation, health information management and many more. KII was conducted with DRRO (4), PIO (8), UNO (8), medical doctors/health service providers of UHC or health attendants (8), CPP volunteers/leaders (8), Union disaster council members (8), civil society members/ professionals (8), Upazila Social Service Officers (8), political leaders (8) who are playing role in combating climate change effect by introducing relevant policies in addressing disasters and hazards.

Researchers conducted some case study or in-depth interview (IDI) with the following stakeholders: Mawali/Honey collector (8), Bawali (4), Golpata collectors (8), Crab collectors (8), Bede community (4), fish fry collectors (8), Medicinal plant collectors (4), fisherman (8), Boatman (8), daylabor/marginal farmer/landless poor (8), women (8), pregnant women (8), adolescent girls (8), young adult women (8), elderly (8), children (8), and person with disabled (8). In addition, to ensure validity of the research required qualitative data were collected through participant observation (PO), focus group discussions (FGD) with an average participation of 6-8 respondents, case study and in-depth studies of different stake holders and community representatives.

Inclusion and Exclusion criteria

Inclusion criteria: Only receptive respondents will be interviewed.

Exclusion Criteria: Mentally retarded or critically sick people or those who will not consent to provide the information.

Secondary Data Collection – Such information has taken from available web sources, especially online sources such as scholarly journal articles, e-books, government and non-government reports, e-newspapers etc. which has open access and if necessary, access through permission or minimum payment.

Instruments of the study – To avail necessary data for both qualitative and quantitative data following research techniques will apply.

| Quantitative data collection techniques | Qualitative data collection techniques |
|--|--|
| <ul style="list-style-type: none"> ▪ Sample Survey Questionnaire ▪ Participant observation | <ul style="list-style-type: none"> ▪ Participant observation ▪ Key informant interview ▪ Case study or in-depth interview (IDI) ▪ Focus group discussion (FGD) |

Researcher compared the measuring mortality by counting or providing information of Ministry of Disaster Management in Bangladesh and Bangladesh Meteorological Department and standard thresholds of mortality according to various international agencies which are as followed:

| Agencies | Assumed baseline | Emergency standards |
|--|---|--|
| Centres for Disease control (CDC), Medicins Sans Frontiers Epicentre (MSF) and Academia | Fixed at: CMR: 0.5 per 10000 per day U5MR: 1 per 10000 per day | Emergency if: CMR: ≥ 1 per 10,000 per day U5MR: ≥ 2 per 10,000 per day |
| UNHCR | Fixed at: CMR: 0.5 per 10000 per day U5MR: 1 per 10000 per day | CMR > 1 per 10,000 per day: 'very serious' CMR > 2 per 10,000 per day: 'out of control' CMR > 5 per 10,000 per day: 'major catastrophe' (double for U5MR thresholds) |
| Sphere Project Note: if baseline is not known, sphere goal is CMR <1 per 10,000 per day | Context-specific CMR (U5MR): South Asia: 0.25 (0.59) Sub-saharan Africa: 0.44 (1.14) Latin America: 0.16 (0.19) Eastern Europe, Former Soviet Union 0.30 (0.20) | Emergency if CMR (U5MR): South Asia: 0.5 (1.2) Sub-saharan Africa: 0.9 (2.3) Latin America: 0.3 (0.4) Eastern Europe, former soviet Russia 0.60 (0.40) |

After collecting required data, entry, processing, analyzing were administered by using SPSS software with descriptive statistical analysis like percentage distribution and chi square (χ^2) test analysis. Moreover, some secondary sources like books, publications, journals, articles, reports, workshop, newspapers, internet websites etc. and other documents were also used as support.

5.2 Ethical Considerations

An ethical consideration is a very crucial aspect in a research study. The codes of ethics focus on the following issues: physical and mental harm of the respondents, covert or hidden research, invasion of privacy, violation of anonymity and confidentiality, deception, coercion, plagiarism,

fabrication or concealment of findings (Sarandakos, 2005). In regarding these ethical issues, only the unbiased research work is the only way to gain the ethical consideration.

Before conducting the survey through face-to-face interview and in-depth interview, the researcher took oral consents from the interviewee and assured that their responses will be held with strict confidence and shall remain anonymous in this research. Furthermore, the respondents were assured that all kinds of their information would be used only for academic research and their identity will be protected, when necessary, as the research work might be considered as sensitive and related to the respected respondents. Data collectors repeated the questions whenever required and examples were added for clarification. Researcher administered 'ID/ Member checking', which is known as good technique by many researchers, as it enhances the credibility of results. Data collectors used mobile phone or tape recorder to take the photograph and data transcriptions and interpretations for research, which helped us to establish research credibility, reliability, validity and accuracy, and conformity.

5.3 Limitations of the Study

Any social research dealing with the dynamics of societal living is confronted with a variety of obstacles. Regarding methodological and empirical considerations, this study has several limitations. The disaster related problem particularly cyclonic disasters (cyclone, tidal surge, flood and salinity intrusion) related problems in the coastal regions of Bangladesh is highly varied, as contexts vary from district to districts, upazila to upazila and union (a sub-division of a sub-district) to union. During the study, the researcher and data collectors encountered many limitations those are: some potential respondents flatly refused to cooperate and faced a lot of problems to elicit real information. Sometimes, the aforementioned segments of respondents' data eg., the golpata collectors, crab collectors, bawali and mawali community those who depends on mangrove Sundarbans forest is almost found insufficient in Bhola district. Besides, the children aged 7-14 years old respondents from whom the data was collected, but considering the suggestions of one of expert members of an academic committee during the second seminar, the survey data from children is excluded. But the data which is collected from children is used/ included only for case study respondents. Furthermore, some of the aforementioned (some are more and some are less) data of the research proposal is not maintained properly. The study is very much context specific. The study is only limited to some selected areas. So, generalization about the situation of coastal community people can't be made based on the findings for this study alone.

Chapter Six: Nexus between Cyclonic Disasters and Social Vulnerability

6.1 Social Vulnerability during Disasters

Due to geographical location, Bangladesh face regularly experienced of cyclonic disasters at every year. During disaster, Bangladesh faces different kinds of vulnerability. Social vulnerability is one of them. Coastal people of Bangladesh are more severely disaster affected every year. The housing condition becomes very bad during and after disaster. Majority of these coastal belt people of Bangladesh do not get proper educational facilities during and after disaster. Cyclonic disasters including cyclones, tidal surge, coastal flooding and salinity destroy the educational institution as well as destruction of infrastructure, ruining shelter, school closure, loss of books and other accessories. Besides, cyclonic disaster exacerbates the migration, increasing illiteracy rate and deplete the morality in the coastal community of Bangladesh. People force to change their livelihood and occupation resulting in economic hardship due to cyclonic disasters. Bangladesh is subjected to recurrent climatic risks of tropical cyclones and storm surges throughout the pre- and post-monsoon seasons. Due to its physical location, Bangladesh's southwest coastline area regularly experiences natural catastrophes such cyclones, floods, and tidal surges. Local communities in this area, however, have a long history of managing the negative consequences of these calamities. Bangladesh is now considered the world's most climate-vulnerable nation (Tanir et al., 2023; Kabir and Hossain, 2021), with over two-fifths of the global effect from various natural catastrophes occurring there (Dasgupta, et al., 2009). Climate change and cyclonic disasters effect exacerbate the vulnerabilities of coastal areas. Social vulnerability is a system that is inextricably linked to the internal social features of the society and is caused by personal circumstances that influence access restrictions, hence increasing the likelihood and intensity of susceptibility to the effects of hazards and catastrophic occurrences (Dunning & Durden 2013). Social vulnerability to natural disasters and considered social vulnerability to be a byproduct of social inequality. These factors had an impact on how sensitively different groups were affected by disasters to some degree, which further affected their resilience and ability to cope (Cutter et al., 2003). When societies are exposed to natural catastrophes and suffer negative effects or damage due to their sensitivity and inability to deal with and recover from natural disasters, this is known as social vulnerability to natural disasters. The major drivers of social vulnerability are a society's basic structural traits, and social vulnerability is conditioned by natural catastrophes (Zhang et al., 2023). There is notable regional variation in social vulnerability to natural disasters; the

southwest Bangladesh is most of the places with the highest vulnerability index. The main variables influencing societal susceptibility to natural catastrophes are economic density, population density, GDP, and the proportion of the population with higher education in cities (Wang & Sun 2023; Kabir & Hossain 2021).

Table 6.1: Household, population and household size by division in disaster prone area

| Division | Household | Population | | | Percentage | | | Household Size |
|-------------------|-----------|------------|----------|---------|------------|-------|--------|----------------|
| | | Total | Male | Female | Total | Male | Female | |
| Bangladesh | 4361261 | 20204367 | 10497444 | 9706923 | 100.00 | 51.96 | 48.04 | 4.63 |
| Barisal | 818137 | 3728172 | 1948496 | 1779676 | 18.45 | 9.64 | 8.81 | 4.56 |
| Chittagong | 430540 | 2203878 | 1168609 | 1035269 | 10.91 | 5.78 | 5.12 | 5.12 |
| Dhaka | 931668 | 4435469 | 2309931 | 2125538 | 21.95 | 11.43 | 10.52 | 4.76 |
| Khulna | 668873 | 2843763 | 1463319 | 1380445 | 14.07 | 7.24 | 6.83 | 4.25 |
| Rajshahi | 613704 | 2593770 | 1346316 | 1247453 | 12.84 | 6.66 | 6.17 | 4.23 |
| Rangpur | 488564 | 2146425 | 1111909 | 1034516 | 10.62 | 5.50 | 5.12 | 4.39 |
| Sylhet | 409776 | 2252890 | 1148864 | 1104026 | 11.15 | 5.69 | 5.46 | 5.50 |

(Source: GoB 2016)

Table 6.1 presents the number of households and population by male and female in the household and household size who lived in disaster-prone area in 2009 to 2014. It is seen that Dhaka division were the highest risk of population (21.95%) and Rangpur was the lowest (10.62%) among the divisions regarding disaster prone area. It is mentioned that the highest 51.96% population belonged to the male population and 48.04% contained the female population in disaster prone areas. The scenario was same across the divisions where male population surpassed the female population. The table indicates that the average household size in Bangladesh was 4.63 and out of seven divisions, the highest average household size (5.50) was found in Sylhet whereas the lowest average household size was found in Rajshahi which is only 4.23, Chittagong represented second highest (5.212) and Khulna was the second lowest (4.25) household size among the divisions those who lived in disaster prone areas during the period of 2009-2014 (GoB 2016).

Table 6.2: Distribution of disaster affected household by division and disaster, 2015-2020

| Division | Household affected by division and disaster | | | | | | | | | | | | | |
|------------|---|---------------|-------------|-----------|-------------------|-------------|-------------|-------------------------|------------------|-------------------|----------------|--------------|---------------|--------------------------------|
| | Household | Household (%) | Drought (%) | Flood (%) | Water logging (%) | Cyclone (%) | Tornado (%) | Storm / Tidal surge (%) | Thunderstorm (%) | River erosion (%) | Landslides (%) | Salinity (%) | Hailstorm (%) | Others (Fog, Insecticide etc.) |
| Bangladesh | 7515977 | 12.40 | 4.72 | 54.69 | 13.88 | 21.31 | 4.14 | 8.65 | 14.94 | 4.95 | 0.08 | 4.09 | 11.88 | 7.90 |
| Barisal | 932266 | | 0.27 | 4.09 | 26.04 | 30.39 | 5.21 | 85.42 | 3.21 | 5.98 | 0.00 | 41.10 | 0.38 | 0.00 |
| Chittagong | 771853 | 10.27 | 9.62 | 8.52 | 20.55 | 13.26 | 1.98 | 3.84 | 7.85 | 7.91 | 93.26 | 12.05 | 4.16 | 7.69 |
| Dhaka | 1190889 | 15.84 | 25.83 | 21.41 | 11.86 | 12.17 | 7.10 | 0.00 | 9.52 | 20.61 | 0.00 | 0.16 | 11.76 | 54.44 |
| Khulna | 1009247 | 13.43 | 8.96 | 0.95 | 23.55 | 36.72 | 5.49 | 10.74 | 12.42 | 14.43 | 0.00 | 46.69 | 12.88 | 15.15 |
| Mymensingh | 722557 | 9.61 | 9.96 | 14.20 | 4.30 | 1.29 | 7.91 | 0.00 | 8.19 | 7.54 | 0.00 | 0.00 | 12.26 | 1.08 |
| Rajshahi | 1145212 | 15.24 | 15.37 | 14.51 | 10.06 | 5.21 | 38.90 | 0.00 | 29.11 | 19.73 | 0.00 | 0.00 | 12.26 | 1.08 |
| Rangpur | 1056350 | 14.05 | 8.32 | 21.76 | 2.68 | 0.72 | 21.44 | 0.00 | 15.03 | 20.94 | 0.00 | 0.00 | 26.43 | 10.64 |
| Sylhet | 687603 | 9.15 | 21.66 | 14.56 | 0.94 | 0.25 | 11.97 | 0.00 | 14.66 | 2.87 | 6.74 | 0.00 | 10.64 | 0.00 |

(Source: GoB 2020)

Table 6.2 shows the number of disaster-affected households varied across divisions in Bangladesh. Dhaka Division is the highest number of affected households at 18204659 (15.43%), followed by Rajshahi with 764,376 (14.96%), and Rangpur at 1,721,251 (14.59%). Conversely, Mymensingh has the lowest number of affected households, with 1,025,014 (8.96 %) affected households. Analysis of the data by division shows that Barisal has the highest percentage of affected households due to waterlogging (26.04%) and storm/tidal surge (85.42%). Chattogram has the highest percentage of affected households by landslides (93.26%), while Sylhet experiences landslides affecting 6.74% of households. River and coastal erosion and salinity, respectively, affects the highest percentage of households in Dhaka (20.60%) and Khulna Division (46.69%). Rajshahi Division is severely affected by tornadoes (38.90%) and hailstorms (21.50%). Rangpur and Dhaka Divisions are the most affected by flooding (21.76%) and drought (25.83%), respectively. It's important to note that the data presented covers a six-year period from 2015 to 2020 (GoB 2020).

A study of Bangladesh disaster related Statistics (GoB 2016) represents the percentage distribution of affected households by division and disaster categories from the year of 2009 to 2014. The highest number of disasters affected households (931668) was located in Dhaka division and the lowest disaster affected households (409776) were found in Sylhet division. At the divisional level, cyclone and storm/tidal surge were recorded only in Barisal, Chittagong and Khulna division. In the case of flood affected households, Sylhet division possessed the highest position (69.97%) while Barisal division hold only 5.24% households. Regarding the water logging affected households, (34.88%) were found in Khulna division and only 0.65% households were found in Rajshahi division. With regard to the number of households affected by cyclone Barisal division was topmost (78.31%), Chittagong division stood second (30.96%) in comparison to lowest in Khulna (23.23%). It is noted that in case of thunderstorm Sylhet division represented the highest (31.84%) number of households followed by Rangpur (23.53%) and Rajshahi (20.40%) divisions. Khulna division was the highest households affected by salinity (22.24%) and Chittagong was some sort of the problem (5.30%). While it is compared, almost all divisions were some form of disaster problems and higher number of households affected while Sylhet division was lower number of households as affected by various disasters (GoB 2016).

6.2 Data Analysis, Interpretation and Findings of the Quantitative Study

6.2.1 Socio-Demographic Profile

Table 6.2.1: Percentage distribution of geographical area of the respondents

| Geographical area of the respondents | Frequency | Percent |
|--------------------------------------|-----------|---------|
| Shyamnagar | 105 | 12.5 |
| Ashashuni | 105 | 12.5 |
| Koyra | 105 | 12.5 |
| Dacope | 105 | 12.5 |
| Patharghata | 105 | 12.5 |
| Betagi | 105 | 12.5 |
| Charfassion | 105 | 12.5 |
| Tajumuddin | 105 | 12.5 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The study area is divided by eight upazila from the four districts under the two division Barishal and Khulna of Bangladesh. Table 6.2.1 shows the respondent number from each sub-district. Every district has equal number of respondents, which is 210 and each upazila has also equal number of respondents, which is 105. And the total number of respondents is 840.

Table 6.2.2: Percentage distribution of age of the respondents

| Age (in year) | Frequency | Percent |
|---------------|-----------|---------|
| 11-20 | 97 | 11.5 |
| 21-30 | 153 | 18.2 |
| 31-40 | 203 | 24.2 |
| 41-50 | 161 | 19.2 |
| 51-60 | 104 | 12.4 |
| 61-70 | 93 | 11.1 |
| 71-80 | 24 | 2.9 |
| 81-90 | 5 | .6 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.2 shows the percentage distribution of the age categories of the respondents. Majority of the respondents exists between 31 – 40 age group which is 24.2%. There are about 19.2% respondents belong to 41 – 50 age group, and 18.2% of the respondents belong to 21-30 age group. In total, almost one-third (26.9%) of the respondents belongs to more than 50 age group. Only 14.6% respondents belong to more than 60 years old and 11.5% are very young who are between 11-20 age group.

Table 6.2.3: Percentage distribution of gender of the respondents

| Gender | Frequency | Percent |
|--------|-----------|---------|
| 11-20 | 97 | 11.5 |
| 21-30 | 153 | 18.2 |
| 31-40 | 203 | 24.2 |
| 41-50 | 161 | 19.2 |
| 51-60 | 104 | 12.4 |
| 61-70 | 93 | 11.1 |
| 71-80 | 24 | 2.9 |
| 81-90 | 5 | .6 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The above table exhibits that there exists almost two-third of total respondents or 60.7% of male respondents. Female respondents are almost two-fifth of total respondents, 39.3% which is comparatively lower than men.

Table 6.2.4: Percentage distribution of the respondents' marital status

| Marital Status | Frequency | Percent |
|----------------|-----------|---------|
| Married | 746 | 88.8 |
| Single | 85 | 10.1 |
| Separation | 1 | .1 |
| Widow | 4 | .5 |
| Divorced | 4 | .5 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.4 exhibits the marital status of the respondents. Among the 840 respondents, 88.8% of the respondents are married and 10.1% of the respondents are single. Only 0.1% of the respondents are separated. Only 0.5% of the respondents are widowed and divorced respectively.

Table 6.2.5: Percentage distribution of educational background of the respondents

| Educational Background | Frequency | Percent |
|------------------------|-----------|---------|
| Illiterate | 336 | 40.0 |
| Primary | 307 | 36.6 |
| Secondary | 140 | 16.7 |
| Higher Secondary | 24 | 2.8 |
| Graduate | 22 | 2.6 |
| Post Graduate | 11 | 1.3 |
| Total | 836 | 100.0 |

(Source: Field Survey, 2023)

The level of education in those coastal belt areas is comparatively below standard. Majority of the respondents 40.0% of respondents are illiterate. Following this, about 36.6% of the respondents have completed their primary level. So, more than three-fourths or 76.6% of the total respondents exist under primary level education. Moreover, about 16.7% of the respondents completed secondary level education, 2.8% of the respondents attained higher secondary level education, 2.6% of the participants have completed graduation and only 1.3% of the participants have completed post-graduate degree.

Table 6.2.6: Percentage distribution of current occupational status or main livelihood practice of the respondents

| Occupational Status | Frequency | Percent |
|--------------------------------------|-----------|---------|
| Agriculture | 117 | 13.9 |
| Fishing | 243 | 28.9 |
| Shrimp cultivation | 2 | 0.2 |
| Homestead/ kitchen garden plantation | 140 | 16.7 |
| Employed | 34 | 4.0 |
| Crab collector | 26 | 3.1 |
| Wood cutter | 9 | 1.1 |
| Honey collector | 22 | 2.6 |
| Golpata collector | 22 | 2.6 |
| Medicinal plant collector | 5 | 0.6 |
| Day labor | 65 | 7.7 |
| Marginal farmer | 36 | 4.3 |
| Landless poor | 32 | 3.8 |
| CPP volunteer | 17 | 2.0 |
| Business | 30 | 3.6 |
| Housewife | 3 | 0.4 |
| Boatman | 28 | 3.3 |
| Bede community | 3 | 0.4 |
| Don't know | 6 | 0.7 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.6 exhibits the percentage distribution of current occupational status or main livelihood practice of the respondents in south west coastal Bangladesh. Among the 840 respondents, 117 participants or 13.9% of the respondents engaged in agriculture, almost one-third or 28.9% of the respondents engaged in fishing activities, and 16.7% of the respondents are involved in homestead or kitchen garden activities. The rest of others 0.2%, 4.0%, 3.1% 1.1%, 2.6%, 2.6%, 0.6%, 7.7%,

4.3%, 3.8%, 2.0%, 3.6%, 0.4%, 3.3%, and 0.4% of the respondents engaged in shrimp cultivation, job, crab collector, wood collector, honey collector, medicinal plant collector, day labor, marginal farmer, landless poor, CPP volunteer, business, housewife, boatman, bede community respectively.

Table 6.2.7: Percentage distribution of the respondents' current occupational status

| Current Occupational Status | Frequency | Percent |
|------------------------------------|-----------|---------|
| Day Labourer | 78 | 9.3 |
| Marginal Farmer | 56 | 6.7 |
| Landless Poor | 48 | 5.7 |
| CPP volunteer | 31 | 3.7 |
| Fisherman | 79 | 9.4 |
| Boatman/ Majhi | 43 | 5.1 |
| Bede community | 4 | .5 |
| Bawali/wood cutter | 16 | 1.9 |
| Mawali/honey and bee wax collector | 27 | 3.2 |
| Nypa/golpata collector | 25 | 3.0 |
| Medicinal plant collector | 8 | 1.0 |
| Fish fry collector | 14 | 1.7 |
| Crab collector | 36 | 4.3 |
| Chunery/oyster and snail collector | 2 | .2 |
| Business | 17 | 2.0 |
| Shopkeeper / Grocery | 13 | 1.5 |
| Other destitute | 4 | .5 |
| Total | 501 | 59.6 |
| Missing System | 339 | 40.4 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The presentation of data collection by category and the current occupational status of the respondents are included in the above (6.2.6) table of the current occupational status and main livelihood practices of the respondents. As the data has been collected by occupation and the category of vivid segments.

Table 6.2.8: Percentage distribution of respondents' data collection by category

| Data collection by category | Frequency | Percent |
|--|-----------|---------|
| Women | 61 | 7.3 |
| Pregnant women (15-49 years) | 57 | 6.8 |
| Adolescent girls (12-17 years) | 43 | 5.1 |
| Young Adult Women (19-25 years) | 45 | 5.4 |
| Aged people (more than 60 years) | 57 | 6.8 |
| Internally displaced people (IDP) | 46 | 5.5 |
| Physically disable people | 39 | 4.6 |
| Health attendant/service providers | 21 | 2.5 |
| Health care seeker/patient in hospital | 16 | 1.9 |
| Total | 385 | 45.8 |
| Missing System | 455 | 54.2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The presentation of data collection by category and the current occupational status of the respondents are included in the above (6.2.6) table of the current occupational status and main livelihood practices of the respondents. As the data has been collected by occupation and the category of vivid segments.

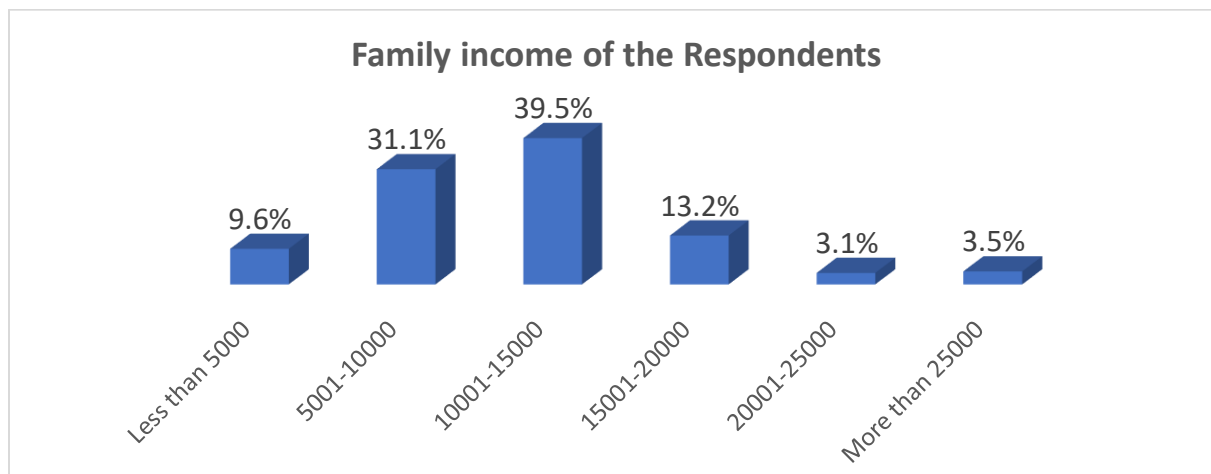
Table 6.2.9: Percentage distribution of size of the family member

| Size of the family member | Frequency | Percent |
|---------------------------|-----------|---------|
| Less than 3 | 43 | 5.1 |
| 3-6 | 656 | 78.1 |
| 7-10 | 134 | 16.0 |
| More than 10 | 7 | .8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The table indicates that the number of family member of the respondent. More than three-fourth of the total respondents or 78.1% of the respondents opine that they have three to six family members, 16% of the respondents point out that they have seven to ten members, 7.5% of the respondents consist of less than three members in their family and only 2.2% of the respondents have more than ten members in their family. It is revealed that joint or extended seems to be less found and also observed that single or nuclear family are becoming grow day by day.

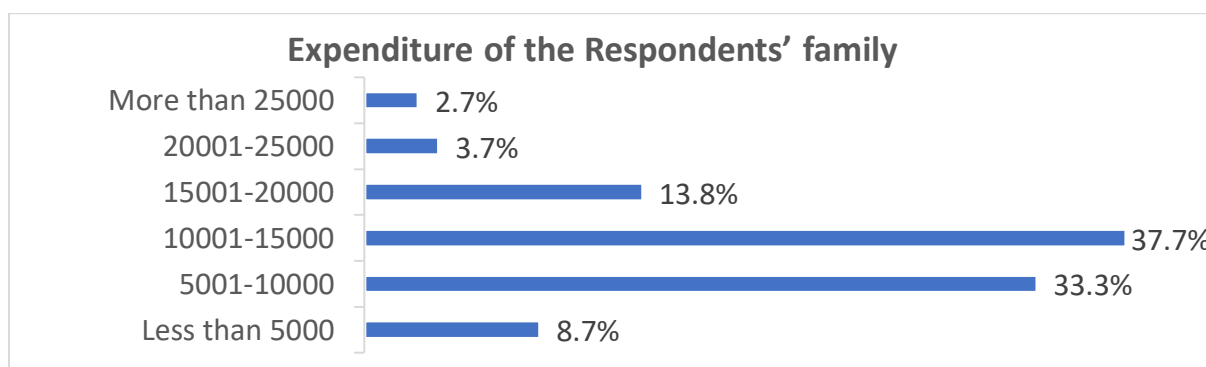
Graph 6.2.1: Percentage distribution of family income of the respondents



Source: Field Survey, 2023)

Graph 6.2.1 exhibits the percentage distribution of family income of the respondents. It is revealed from the table that 9.6% of the respondents opine that their family income is less than 5000 taka. Almost one-third or 31.1% of the respondents point out that their family income is 5001 to 10000 taka whereas 39.5% of the respondents show that their family income is 10001 to 15000 taka. Almost one-sixth or 13.2% of the respondents shows that their family income is fifteen thousand to twenty thousand taka, About 3.1% of the respondents point out that their family income is twenty thousand to twenty five thousand taka and the rest of 3.5 % income is more than twenty five thousand taka.

Graph 6.2.2: Percentage distribution of expenditure of the respondents' family



Source: Field Survey, 2023)

Graph 6.2.2 indicates the percentage distribution of expenditure of the respondent's family. About 8.7% of the respondents expense less than 5000 taka for their family maintenance, one-third or 33.3% of the respondents family expenditure is 5001-10000 taka, 37.7% of the respondents' family

expenditure is 10001 to 15000 taka, 13.8% of the respondents' family expenditure is 15001 to 20000 taka, 3.7% of the respondents' family expenditure is 20001 to 25000 taka, and rest of the 2.7% of the respondents expense more than 25000 taka for their family expenditure.

6.2.2 Risk, Challenges and Social Vulnerabilities

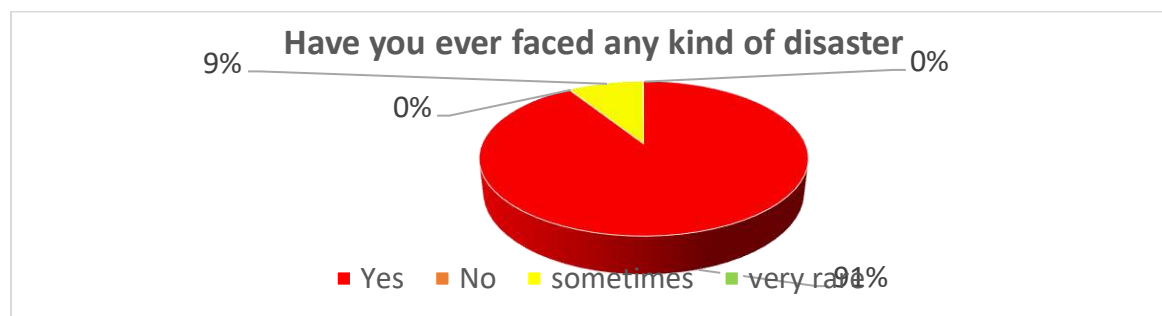
Table 6.2.10: Types of natural disasters are occurred /arose in coastal belt

| Natural disasters are occurred in household | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Cyclone | 840 | 25.2% | 100.0% |
| Salinity Intrusion | 828 | 24.9% | 98.6% |
| Tidal Surge | 825 | 24.8% | 98.2% |
| Flood | 837 | 25.1% | 99.6% |
| Total | 3330 | 100.0% | 396.4% |

(Source: Field Survey, 2023) Multiple Responses*

The above table indicates the different types of natural disasters like cyclone, salinity intrusion, tidal surge and flood those are occurred in the south west coastal area. All of the respondents or 100% of the respondents' response that they observed cyclone. A significant portion 98.6%, 98.2% and 99.6% of the respondents' face salinity intrusion, tidal surge and flood respectively in their lifetime.

Graph 6.2.3: Percentage distribution of respondents ever faced of any kind of disaster



(Source: Field Survey, 2023)

Graph 6.2.3 shows that the percentage distribution of the coastal community frequently face different types of disaster. A significant portion or about 91% of the south west coastal respondents opine that they faced or struggled various kinds of disasters frequently and 0.1% of the respondents opine that they didn't face or struggle various kinds of disasters and if they face that is very rarely faced respectively regarding this question. About 8.8% of the respondents have claimed that they sometimes or often faced or struggled various kinds of disasters.

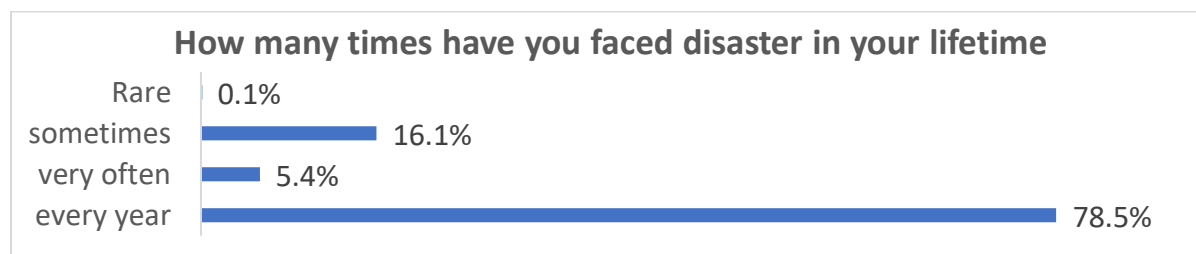
Table 6.2.11: Percentage distribution of respondents facing kinds of disasters

| Facing kinds of disasters in household | Response | | Percent of Cases |
|--|----------|---------|------------------|
| | N | Percent | |
| Flood | 836 | 21.9% | 99.5% |
| Cyclone | 838 | 21.9% | 99.8% |
| Storm surge | 822 | 21.5% | 97.9% |
| River bank erosion | 502 | 13.1% | 59.8% |
| Salinity intrusion | 819 | 21.5% | 97.5% |
| Earthquake | 1 | 0.0% | 0.1% |
| Total | 3818 | 100.0% | 454.5% |

(Source: Field Survey, 2023) Multiple Responses*

Table 6.2.11 portrays the percentage distribution of the respondents' facing kinds of disasters in household. There are several kinds of disaster or hazard which are very common to the south west coastal community. Multiple responses are presented by the south west coastal belt areas respondents. A lion sheer (99.8%) of the respondents opine that they are facing cyclone, 99.5% of the respondents are facing flood, 97.9% of the respondents are facing storm surge and 97.5% of the respondents are facing salinity intrusion. Besides, 59.8% of the respondents admit that they are facing river bank erosion disasters for living in south west coastal areas in Bangladesh. On the other hand, only 0.1% of the respondents are facing earthquake disasters. This means that there is continuing happening various kinds of natural disasters.

Graph 6.2.4: How many times have you faced disaster in your lifetime



(Source: Field Survey, 2023)

Graph 6.2.4 exhibits that how many times have they faced various kinds of disasters in household in their lifetime. Regarding facing times of disaster in lifetime, almost four-fifth or 78.5% of the respondents express their opinion that every year they face disasters in their lifetime, 5.4% of the respondents opine that they face disasters very often, one-sixth or 16.1% of the respondents note that sometimes they face disasters and only 0.1% of the respondent response that rarely they face disasters.

Table 6.2.12: Percentage distribution of respondents' perception regarding Meaning of cyclonic disasters

| Meaning of cyclonic disasters | Responses | | Percent of Cases |
|-------------------------------|-----------|---------|------------------|
| | N | Percent | |
| Cyclone | 840 | 23.4% | 100.0% |
| Tidal surge | 832 | 23.2% | 99.0% |
| Salinity Intrusion | 830 | 23.1% | 98.8% |
| Flood | 834 | 23.3% | 99.3% |
| Water logging | 246 | 6.9% | 29.3% |
| Drought | 2 | 0.1% | 0.2% |
| Earthquake | 1 | 0.0% | 0.1% |
| Don't know | 1 | 0.0% | 0.1% |
| Total | 3586 | 100.0% | 426.9% |

(Source: Field Survey, 2023) Multiple Responses*

Table 6.2.12 portrays the perception of the respondents regarding the meaning of cyclonic disasters which shows the different types of natural disasters. All (100%) of the respondents respond that cyclone, 99.0% of the respondents respond about tidal surge, 98.8% of them respond about salinity intrusion, 99.3% of them responses about flood, 29.3% of the respondents respond about water logging, 0.2% of the respondents respond about drought, only 0.1% of the respondents respond about earthquake regarding the meaning of cyclonic disasters. And the rest of 0.1% respondent do not know regarding the meaning of cyclonic disasters.

Table 6.2.13: Percentage distribution of the respondents faced types of cyclonic disasters

| Facing types of Cyclonic Disasters | Frequency | Percent |
|------------------------------------|-----------|---------|
| 1.00 | 2 | .2 |
| 2.00 | 4 | .5 |
| 3.00 | 31 | 3.7 |
| 4.00 | 803 | 95.6 |
| Total | 840 | 100.0 |

(Sources: Filed survey, 2023)

There are four types of cyclonic disasters which are facing in southern coastal community in Bangladesh. Here, 1 means facing one type of disaster, 2 means facing two types of cyclonic disaster, 3 means facing three types of cyclonic disasters, and 4 means facing four types of cyclonic disasters. Almost all (95.6%) of the respondents mention that they faced four types of cyclonic

disasters including cyclones, tidal surges, floods and salinity intrusion. About 3.7% of the participants note that they face any three kinds of disasters among them. Only 0.5% and 0.2% respondents mention that they faced two types of cyclonic disasters and only one type of cyclonic disasters. so, it can be said that the study area is very much cyclonic disasters prone area.

Table 6.2.14: Have you faced any bitter experiences caused by cyclonic disasters

| Faced any bitter experiences by cyclonic disasters | Frequency | Percent |
|--|-----------|---------|
| Yes | 839 | 99.9 |
| No | 1 | .1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.14 exhibits about the bitter experiences faced by the respondents due to cyclonic disasters. From the 840 number of respondents 839 (99.9%) of them expressed bitter experiences they faced at the period of or post cyclonic disasters and the rest of 1 respondent who expressed that s/he didn't get bitter experiences caused by cyclonic disasters.

Table 6.2.15: Percentage distribution of respondents affected by cyclonic disasters

| Affected negatively by cyclonic disasters | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Economically | 840 | 24.7% | 100.0% |
| Socially | 748 | 22.0% | 89.0% |
| Physically | 117 | 3.4% | 13.9% |
| Psychology | 814 | 24.0% | 96.9% |
| Culturally | 57 | 1.7% | 6.8% |
| Health | 819 | 24.1% | 97.5% |
| Total | 3395 | 100.0% | 404.2% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 6.2.15 shows the negative effect or vulnerability like their economic, social, physical, psychological, cultural, and health by cyclonic disasters. All of the respondents (100%) opine that cyclonic disasters affect negatively on economically during and aftermath of disasters. Table also shows that cyclonic disasters also impact negatively on the socio-cultural and health sector of the south west coastal marginal community. A significant portion 96.9% of the respondents opine that cyclonic disasters create and continue with increasing pressure on mental health or psychological well-being. A lion sheer of the respondents or 97.5% of them respond about their health effect negatively during or post cyclonic disasters period. Followed by 89.0% of the respondents respond

that cyclonic disasters affect negatively on social sectors during and aftermath of disasters. About 13.9% of them respond about physical effect adversely during and post cyclonic disasters period. Only 6.8% of the respondent faced negatively culturally during cyclonic disasters.

Table 6.2.16: Percentage distribution of how much types of vulnerability they faced

| Facing types of Vulnerability | Frequency | Percent |
|-------------------------------|-----------|---------|
| 1.00 | 3 | 0.4 |
| 2.00 | 5 | 0.6 |
| 3.00 | 84 | 10.0 |
| 4.00 | 622 | 74.0 |
| 5.00 | 114 | 13.6 |
| 6.00 | 12 | 1.4 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The above table shows the percentage distribution of how much types of vulnerability the community faced. There are six types of vulnerability which are observed due to cyclonic disasters in south west coastal belt in Bangladesh. Here, 1 means facing one type of vulnerability, 2 means facing two types of vulnerabilities, 3 means facing three types of vulnerabilities, and 4 means facing four types of vulnerabilities, 5 means facing five types of vulnerabilities, and 6 means facing six types of vulnerabilities. Almost all (74.0%) of the respondents mention that they faced four types of vulnerabilities due to cyclonic disasters including cyclones, tidal surges, floods and salinity intrusion. About 13.6% of the participants note that they face any five kinds of vulnerabilities among them due to disasters. About 10.0% of the participants note that they face any three kinds of vulnerabilities among them due to disasters. Only 1.4%, 0.6% and 0.4% respondents mention that they faced any six or all kinds of vulnerabilities, two types of vulnerabilities and only one type of vulnerability respectively due to cyclonic disasters. so, it can be said that the study area is highly susceptible to vulnerability due to cyclonic disasters.

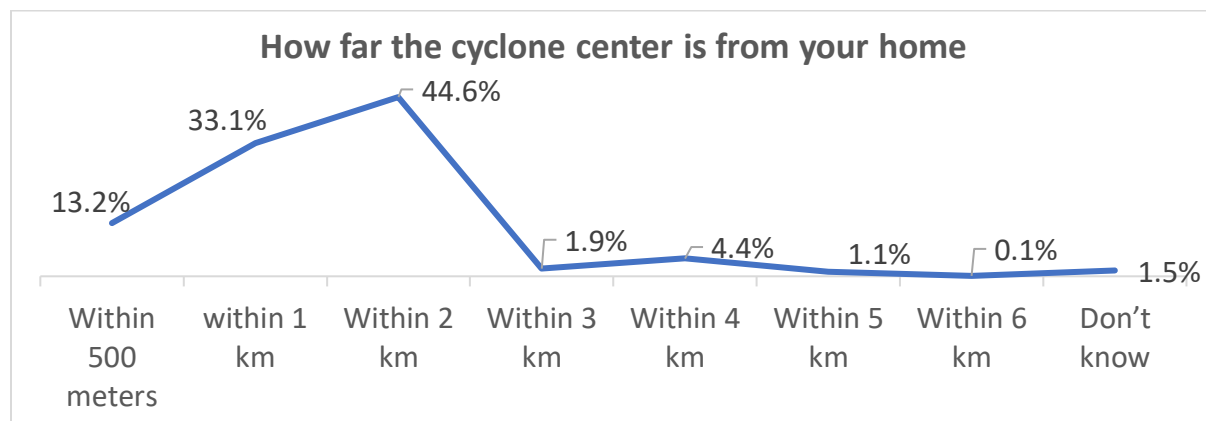
Table 6.2.17: Percentage distribution of existence of any shelter in your regions

| Existence of any shelter nearby | Frequency | Percent |
|---------------------------------|-----------|---------|
| Yes | 829 | 98.7 |
| No | 10 | 1.2 |
| Don't know | 1 | .1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.17 portrays that a lion sheer (98.7%) of the respondents opine that there exists enough cyclone center in their region. These are used as school cum cyclone center. The schools are structured as a cyclone center. On the contrary, only 1.2% of the respondents say that they do not have cyclone center in this region. Besides, 0.1% of the respondent respond that they do not know the existing cyclone center in these south west coastal areas in Bangladesh.

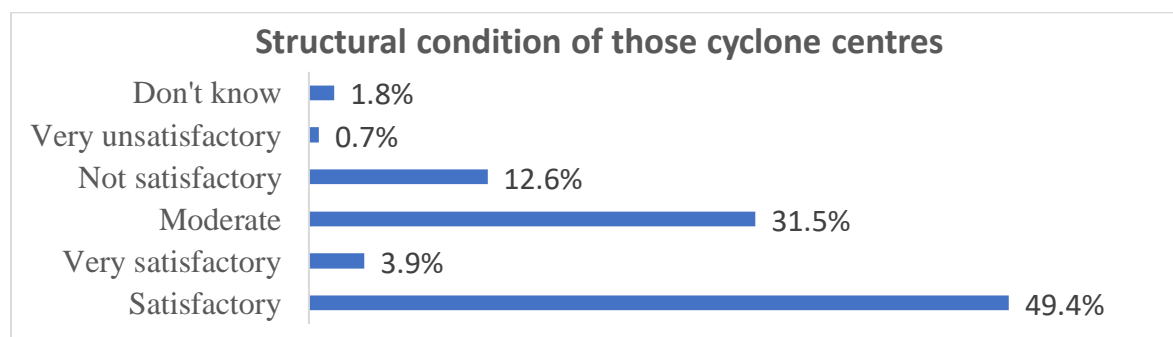
Graph 6.2.5: How far the cyclone center is from your home



(Source: Field Survey, 2023)

Majority of the respondents (44.6%) point out that the cyclone center is situated within 2 km far from their houses. Almost one-third (33.1%) of the respondents express that the cyclone center exists within 1 km far from their houses. Almost one-sixth (13.2%) of the respondents express that the cyclone center exists within 500 meters far from their houses. Only 1.9%, 4.4%, 1.1% and 0.1% of the respondents opine that the cyclone center is quite far away from their houses like within 3 km far, within 4 km far, within 5 km far, within 6 km far respectively. On the contrary, only 1.5% of the respondents admit that they don't know where the cyclone center is existed in their territory or locality.

Graph 6.2.6: Perception of the respondents regarding structural condition of cyclone center



(Source: Field Survey, 2023)

Graph 6.2.6 shows the perception of the respondents about the structural conditions of the cyclone center. Majority or almost half of the total respondents (49.4% of the respondents) opine that the structural condition of the cyclone center is quite better or satisfactory, only 3.9% of the respondents opine that the structural condition of cyclone center is very satisfactory, and almost one-third (31.5%) of the respondent mention that the structural condition of the center is moderate satisfactory. But 12.6% of the respondents noted that the structural condition of the cyclone center is not satisfactory and a few (0.7%) of the respondents opine that the structural condition of cyclone center is very unsatisfactory. Some cyclone center is very old, and its infrastructure is not good enough to well decorated. But the new centers are in good structural conditions with required facilities.

Table 6.2.18: Percentage Distribution of kind of economic damages caused by cyclonic disasters

| Kind of economic damages caused by cyclonic disasters | Response | | Percent of Cases |
|---|----------|---------|------------------|
| | N | Percent | |
| Destruction of infrastructures | 831 | 29.5% | 98.9% |
| Ruining the shelter | 807 | 28.7% | 96.1% |
| Death of cattle | 395 | 14.0% | 47.0% |
| Destruction of farmland | 775 | 27.5% | 92.3% |
| Don't know | 6 | 0.2% | 0.7% |
| Total | 2814 | 100.0% | 335.0% |

(Source: Field Survey, 2023) Multiple Responses*

Cyclonic disaster creates economic hazards or vulnerability. A significant portion (98.9%) of the respondents opine that the most effect of cyclonic disasters is destruction of infrastructure that creates economic vulnerability. Followed that, ruining the shelter, destruction of farmland, and death of cattle are caused by cyclonic disasters and those are 96.1%, 92.3% and 47% respectively. Cyclonic disasters trigger all of these loss and damages at that time. On the contrary, only 0.7% of the respondents opine that they do not know regarding the facing various kinds of economic hazards due to cyclonic disasters that creates economic vulnerability.

Table 6.2.19: Percentage distribution of cyclonic disasters effect on livelihood activities

| Cyclonic disasters affect negatively on livelihood activities | Frequency | Percent |
|---|-----------|---------|
| Yes | 838 | 99.8 |
| No | 2 | .2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.19 shows the percentage distribution of the respondents' negative effect on livelihood activities during and aftermath of cyclonic disasters. 99.8% of the participants confess the negative effect of cyclonic disasters on their livelihood. Other 0.2% respondents opine that cyclonic disasters do not negative effects on their livelihood.

Table 6.2.20: Percentage distribution of cyclonic disasters negatively effect on social life

| Cyclonic disasters affect negatively on social life | Frequency | Percent |
|---|-----------|---------|
| Yes | 838 | 99.8 |
| No | 2 | .2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The above table exhibits the percentage distribution of negative effect on social life due to cyclonic disasters. 99.6% of the respondents note that cyclonic disasters affect negatively on social life during and aftermath of disasters and the rest of 3 (0.4%) respondents opine that cyclonic disasters do not negative effects on their social life during and post cyclonic disaster period.

Table 6.2.21: Percentage distribution of respondents' perception regarding facing community people negatively by cyclonic disasters

| Community face negatively by cyclonic disasters | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Interruptions of daily activities | 835 | 20.5% | 99.4% |
| Hindrance of cultural activities like wedding ceremony, rituals | 635 | 15.6% | 75.6% |
| Food scarcity | 802 | 19.7% | 95.5% |
| Disruption of prayers | 205 | 5.0% | 24.4% |
| Disruption of transport communication | 804 | 19.8% | 95.7% |
| Spread of communicable diseases | 781 | 19.2% | 93.0% |
| Don't know | 3 | 0.1% | 0.4% |
| Total | 4065 | 100.0% | 483.9% |

(Source: Field Survey, 2023) Multiple Responses*

Table 6.2.21 portrays the community people are facing negative effects by cyclonic disasters. Almost all (99.4%) of the respondents respond about interruptions of daily activities of the respondent observed. Three-fourth (75.6%) of the respondents observed hindrance of cultural activities like wedding ceremony, rituals etc. during disaster period. A lion sheer (95.5%) of the respondents mention that they feel food scarcity during and aftermath of cyclonic/ natural disasters. Almost one-fourth (24.4%) of the respondents observed the disruption of prayers during disaster period. A significant portion (95.7%) of them observed that communication system is

disrupted at the time of disaster period and post disaster period due to cyclonic disasters. Majority of the respondents (93.0%) opine that the numerous of diseases spread during and immediate after of disaster period due to cyclonic disasters. The rest of 0.4% of the respondents do not know the negative effects facing the community people due to cyclonic disasters.

Table 6.2.22: Percentage distribution of respondents’ perception disrupted by cyclonic disasters

| Social disruption by cyclonic disasters | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Disruption of social network | 827 | 8.8% | 98.5% |
| Hindrance to movement of children | 725 | 7.7% | 86.3% |
| Disruption of communication and transportation | 827 | 8.8% | 98.5% |
| Impediment to women’s income and employment | 770 | 8.2% | 91.7% |
| damage of educational institutions | 769 | 8.2% | 91.5% |
| Increasing rate of crime | 145 | 1.5% | 17.3% |
| Increasing rate of mental health issues | 778 | 8.3% | 92.6% |
| Prevalence of diarrhea | 774 | 8.2% | 92.1% |
| Spread of different vector borne diseases like dengue, malaria | 543 | 5.8% | 64.6% |
| Spread of water borne diseases like dysentery, jaundice etc. | 767 | 8.1% | 91.3% |
| Hyponatraemia due to dehydration | 24 | 0.3% | 2.9% |
| Malnutrition leading kwashiorkor and marasmus | 18 | 0.2% | 2.1% |
| Prevalence of skin diseases | 803 | 8.5% | 95.6% |
| Forced migration | 795 | 8.4% | 94.6% |
| Disruption of the means of livelihood | 784 | 8.3% | 93.3% |
| Gender based vulnerability due to lack of security | 61 | 0.6% | 7.3% |
| Other (specify) | 6 | 0.0% | 0.8% |
| Total | 9416 | 100.0% | 1121.0% |

(Source: Field Survey, 2023) Multiple Responses*

Table 6.2.22 shows that the percentage distribution of respondents’ perception regarding cyclonic disaster impacts negatively on the socio-cultural, economic and health sectors of the south west coastal marginal community. Almost all (98.5%) of the respondents opine that cyclonic disasters create the disruption of social network and disruption of communication and transportation respectively. Cyclonic disasters disrupt the employment opportunity of women that is 91.7%, hinder to movement of children responded by 86.3%, damage the educational institution which is

91.5%. About 92.6% of the respondents opine that cyclonic disasters create and continue with increasing pressure on mental health, and more than one-sixth or 17.3% of respondents opine that cyclonic disasters also cause for increasing crime rate.

During disaster and aftermath of disaster, the people of these area face several health hazards. Among these, significant portion of the respondents (92.1%) of the respondents suffer prevalence of diarrhea, almost two-third (64.6%) said that there exists spread of different vector borne diseases like dengue, malaria etc., 91.3% of the respondents claim that disasters effect on the spread of water borne diseases like dysentery, jaundice etc., and 95.6% of the respondents claim that disaster effect on the prevalence of skin diseases. A significant portion (94.6% and 93.3%) of the respondents claim that disasters heighten forced migration and disrupt the means of livelihood respectively. Only 7.3% of the respondents claim that disasters create gender-based vulnerability due to lack of security respectively.

Table 6.2.23: Respondents’ perception regarding effect of cyclonic disasters on water, sanitation and hygiene (WASH)

| Effect of cyclonic disasters on water, sanitation and hygiene (WASH) | Frequency | Percent |
|--|-----------|---------|
| Yes | 838 | 99.8 |
| No | 2 | .2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Regarding the cyclonic disasters create the problem of water, sanitation and hygiene (WASH), almost all (99.8%) of the respondents respond that cyclonic disasters create the problem of water, sanitation and hygiene (WASH). On the converse, only 0.2% of the respondents point out that cyclonic disasters do not create the problem of water, sanitation and hygiene (WASH).

Table 6.2.24: How do the cyclonic disasters create the problem of safe drinking water

| Cyclonic disasters create the problem of safe drinking water | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Pure drinking water | 823 | 43.4% | 98.0% |
| Level of groundwater lower | 444 | 23.4% | 52.9% |
| Water polluted by waste disposal | 627 | 33.1% | 74.6% |
| Don’t know | 2 | 0.1% | 0.2% |
| Total | 1896 | 100.0% | 225.7% |

(Source: Field Survey, 2023)

Multiple Responses*

Regarding the cyclonic disasters create the problem of safe drinking water, 98% of the respondents mention that cyclonic disasters create the problem of safe drinking water by pure drinking water, almost three-fourth (74.6%) of the respondents mention that cyclonic disasters create the problem of safe drinking water by water polluted through waste disposal and 52.9% of the respondents note that cyclonic disasters create the problem of safe drinking water through lower ground water level. On the other hand, 0.2% of the mention that they do not know the cyclonic disasters create the problem of safe drinking water.

Table 6.2.25: Percentage distribution of female respondents faced various challenges

| Women faced different kinds of challenges | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Hardly get preferential treatment in health care services | 776 | 17.8% | 92.4% |
| Health care center is far from the home | 748 | 17.2% | 89.0% |
| Women face patriarchal attitude in the context | 317 | 7.3% | 37.7% |
| Women face social restriction and barriers in getting access to health care services | 786 | 18.0% | 93.6% |
| Women faces lack of opportunity in community decision making process due to domination of males | 376 | 8.6% | 44.8% |
| Lack of political empowerment | 72 | 1.7% | 8.6% |
| Social exclusion due to lack of empowerment | 185 | 4.2% | 22.0% |
| Roles in domestic chores, child care and rearing like informal sector (unpaid) | 773 | 17.7% | 92.0% |
| Women are unable to play role in voluntary services due to restriction of social movement | 326 | 7.5% | 38.8% |
| Total | 4359 | 100.0% | 518.9% |

(Source: Field Survey, 2023) Multiple Responses*

Table 6.2.25 presents the facing various challenges of women due to cyclonic disasters. Regarding the facing vulnerability/ deprived situation of women, 93.6% of the respondents express that women face social restriction and barriers in getting access to health care services, 92.4% of the respondents point out that they hardly get preferential treatment in health care services, 92% of the respondents mention that their roles in domestic chores, child care and rearing include in informal sectors or sometimes even unpaid, 89% of the respondents note that health care center is far from their home. About 44.8% of the respondents claim that women face lack of opportunity in community decision making process caused by domination of males and due to cyclonic disasters. Almost two-fifth (38.8% and 37.7%) of the respondents claim that women are unable to play role

in voluntary services due to restriction of social movement and women face patriarchal attitude in the context respectively. Only 8.6% of the respondents express that women face vulnerability/deprived situation because of lack of political empowerment and due to cyclonic disasters.

Table 6.2.26: Percentage distribution of who suffered most during cyclonic disasters

| Suffered most during cyclonic disasters | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Children | 783 | 17.9% | 93.2% |
| Adolescent girls | 774 | 17.7% | 92.1% |
| Young Adult women | 334 | 7.6% | 39.8% |
| Pregnant women | 834 | 19.1% | 99.3% |
| Disabled person | 829 | 19.0% | 98.7% |
| Old people | 809 | 18.5% | 96.3% |
| Others | 4 | 0.1% | 0.5% |
| Don't know | 2 | 0.0% | 0.2% |
| Total | 4369 | 100.0% | 520.1% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 6.2.26 exhibits the multiple responses of the people regarding the more vulnerability context due to cyclonic disasters. Regarding the more vulnerable group, about 99.3%, 98.7%, 96.3%, 93.2%, and 92.1% of the total respondents opine that the more vulnerable group is pregnant women, disable person, old/aged people, children and adolescent girls respectively. The percentage of pregnant women, disable person, old/aged people, children and adolescent girls and women are close to each other which is above ninety percent of the respondents. Furthermore, two-fifth (39.8%) of the total respondents opine that the more vulnerable group is young adult women.

Table 6.2.27: Percentage distribution of respondents' perception regarding children affected by disasters

| Respondents' perception regarding children affected by disasters | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Increasing of children death | 771 | 30.5% | 91.8% |
| Lack of food security | 836 | 33.0% | 99.5% |
| Juvenile delinquency | 97 | 3.8% | 11.5% |
| Risk of infectious disease | 827 | 32.7% | 98.5% |
| Don't know | 1 | 0.0% | 0.1% |
| Total | 2532 | 100.0% | 301.4% |

(Source: Field Survey, 2023)

Multiple Responses*

During cyclonic disasters and aftermath of disaster, children are considered as more vulnerable group. About 98.5% respondents express that cyclonic disasters create and increase the risk of infectious diseases among children, about 99.5% of the respondents point out that there is also lack of food security among the children because of their economic vulnerability. Cyclonic disasters also increase the rate of child mortality particularly infant mortality and neonatal mortality or under 5 years mortality rate and 91.8% of the total respondents claimed so. Due to unrest situation of during and aftermath of cyclonic disasters period, only 11.5% of the respondents express that disaster aggravates the juvenile delinquency.

Table 6.2.28: Percentage distribution of respondents’ perception regarding cyclonic disasters effect on children’s education

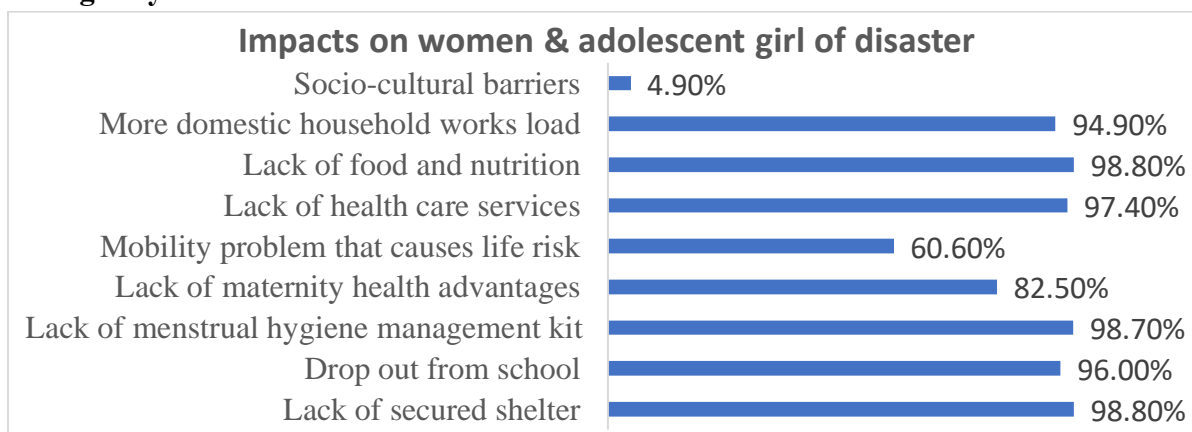
| Effect on child education | Responses | | Percent of Cases |
|------------------------------------|-----------|---------|------------------|
| | N | Percent | |
| School was closed | 836 | 29.9% | 99.5% |
| Damages of infrastructures | 835 | 29.9% | 99.4% |
| Economic uncertainty | 828 | 29.6% | 98.6% |
| Loss of books or other accessories | 295 | 10.6% | 35.1% |
| Others | 2 | 0.1% | 0.2% |
| Total | 2796 | 100.0% | 332.9% |

(Source: Field Survey, 2023)

Multiple Responses*

Cyclonic disasters have negative impact on child education for south west coastal belt people. A significant portion (99.4%) of the respondents express that aftermath of disaster there are infrastructural damages which includes road, bridge, academic buildings etc. Almost all (98.6%) of the respondents admit that children drop out from school and started to engage by helping their parents in earning money for their livelihood because of their family face economic uncertainty. As schools are used as cyclone center the school remain closed during that period, 99.5% opine that cyclone or cyclonic disasters disrupts the regularity of children’s education. And 35.1% of the participants express that during flood, tidal surge and cyclone the books and other accessories are destroyed. As a result, disasters effect negatively on children’s education.

Graph 6.2.7: Percentage distribution of women & adolescent girls faced different kind of challenges by disaster incidents



(Source: Field Survey, 2023)

Multiple Responses*

Graph 6.2.7 shows the adverse impact of cyclonic disasters on south west coastal belt women and adolescent girls as more vulnerable group. About 98.8% respondents express their opinion that they feel lack of security in shelter and lack of food and proper nutrition of women and adolescent girls respectively. As many kinds of people stay together in cyclone center, especially adolescent girls feel uncomfortable and unsafe in shelter. Almost all (98.7%) of the respondents opine that there is lack of menstrual hygiene management kit during cyclonic disasters period, about 97.4% said that there is lack of health care services, 96% mention that drop out from school, and 82.5% of the women face lack of maternity health advantages and for these reason pregnant women are the worst sufferer. Along with this, 94.9% of the participants response that disaster creates more havoc of domestic household work load and 60.6% of the respondents confess that they face problem in mobility for wet clothes that causes life risk among the women and adolescent girls.

Table 6.2.29: Percentage distribution of respondents' perception regarding facing kinds of vulnerability old or aged people

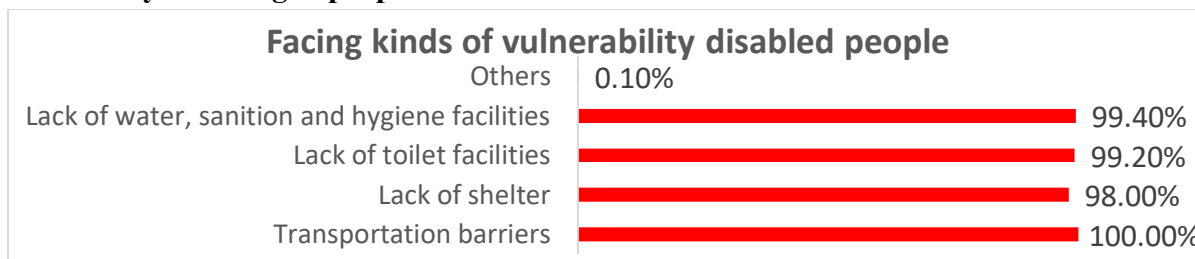
| Facing kinds of vulnerability old or aged people | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Transportation barriers | 840 | 25.2% | 100.0% |
| Lack of shelter | 823 | 24.7% | 98.0% |
| Lack of toilet facilities | 837 | 25.1% | 99.6% |
| Lack of water, sanitation and hygiene facilities | 836 | 25.1% | 99.5% |
| Others | 1 | 0.0% | 0.1% |
| Total | 3337 | 100.0% | 397.3% |

(Source: Field Survey, 2023)

Multiple Responses*

The data derives that all (100%) of the respondents express that the old people face transportation barriers due to their aged related chronic illness and cyclonic disasters, 99.5% of the respondents admit that they also experience lack of water, sanitation and hygiene facilities for old people, 99.6% of the elderly faces lack of toilet facilities and almost all (98.0%) of the respondents face lack of shelter facilities due to elderly and cyclonic disasters also.

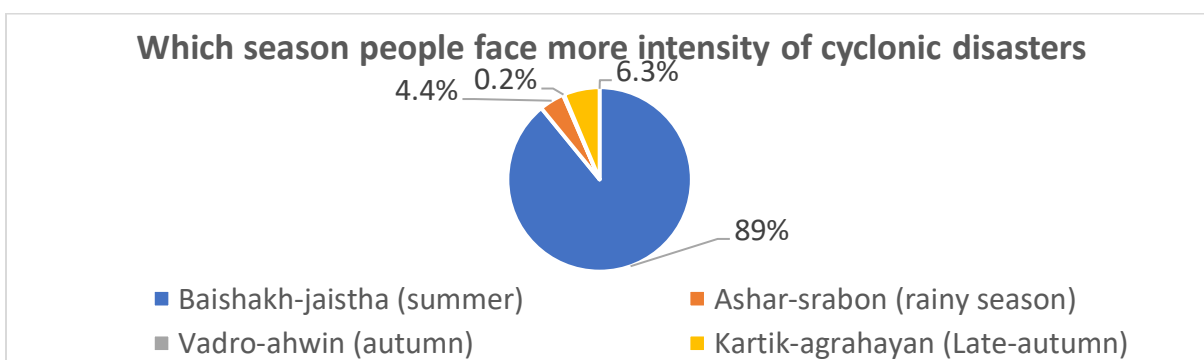
Graph 6.2.8: Percentage distribution of respondents’ perception regarding facing kinds of vulnerability old or aged people



(Source: Field Survey, 2023) Multiple Responses*

During cyclonic disasters and aftermath of disaster, people with disability are also considered as more vulnerable group. Due to cyclonic disasters, the main problem of vulnerability among the disable people is transportation barriers, all (100%) of the participants note so. About 99.4% of the respondent said that there is lack of water, sanitation and hygiene (WASH) facilities, 99.2% of the respondent said there is lack of sufficient toilet facilities mainly in cyclone center. About 98.0% of the respondent said that disable people also face problem regarding the shelter facilities.

Graph 6.2.9: Which season people face more intensity of cyclonic disasters



(Source: Field Survey, 2023)

Graph 6.2.9 depicts the season in which people face more intensity of cyclonic disasters. Almost all (89%) of the respondents express that Baishakh-jaistha (summer) is that season in which people face more intensity of cyclonic disasters. On the contrary, only 4.4%, 0.2% and 6.3% of the

participants mention that Ashar-srabon (rainy season), Vadro-ashwin (autumn) and Kartik-agrahasayan (Late-autumn) is the season in which people face more intensity of cyclonic disasters.

Table 6.2.30: Which season is found in least cyclonic disasters

| Least cyclonic disasters period | Frequency | Percent |
|----------------------------------|-----------|---------|
| Ashar-srabon (rainy season) | 31 | 3.7 |
| Vadro-ashwin (autumn) | 1 | .1 |
| Kartik-agrahasayan (Late-autumn) | 1 | .1 |
| Poush-Magh (winter) | 804 | 95.7 |
| Falgun-chaitra (spring) | 3 | .4 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The table 6.2.30 depicts the season in which people face less intensity of cyclonic disasters. Almost all (95.7%) of the respondents express that cyclonic disasters are found least of Poush-Magh (winter). On the contrary, only 3.7%, 0.1%, 0.1%, and 0.4% of the participants mention that Ashar-srabon (rainy season), Vadro-ashwin (autumn), Kartik-agrahasayan (Late-autumn) and Falgun-chaitra (spring) is the season in which cyclonic disasters are found in least respectively.

Table 6.2.31: Percentage distribution of respondents' perception regarding social disruptions of cyclonic disasters

| Social disruptions of cyclonic disasters | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Disruption of social network | 833 | 14.2% | 99.2% |
| Disruption of communication and transportation | 834 | 14.2% | 99.3% |
| Impediment to women's income and employment | 780 | 13.3% | 92.9% |
| Irritated mind/short temper | 270 | 4.6% | 32.1% |
| Abnormality of norms, attitude, practices | 91 | 1.6% | 10.8% |
| Social exclusion | 345 | 5.9% | 41.1% |
| Lack of Social cohesion/ bondage | 171 | 2.9% | 20.4% |
| Increase of domestic violence | 170 | 2.9% | 20.2% |
| Lack of enrollment in formal education | 751 | 12.8% | 89.4% |
| Forced migration | 797 | 13.6% | 94.9% |
| Disruption of the means of livelihood | 793 | 13.5% | 94.4% |
| Gender based vulnerability due to lack of security | 28 | 0.5% | 3.3% |
| Total | 5863 | 100.0% | 698.0% |

(Source: Field Survey, 2023) Multiple Responses*

About 99.2% of the respondents mentioned that disruption of social network is seen. About 99.3% respondents are found regarding the disruption of communication and transportation. About 92.9% said impediment to women's income and employment are the causes of social disruptions in

cyclone center. About 41.1% and 32.1% of the respondents are socially excluded and experienced with irritated mind/ short temper regarding the social disruption in cyclonic centers. A significant portion (89.4%) of the participants opined that their children have lack of enrollment in school. Almost all of the respondents or 94.9% said they are migrated forcefully regarding the issue of social disruptions in cyclonic disaster. About 94.4% identified disruption of the means of livelihood, 20.4% notified lack of social bondage, and 20.2% identified domestic violence have increased for the social disruptions in cyclone center. On the other hand, only 10.8% and 2.7% of the respondents noted that they are experienced with abnormality of norms, attitude, practices etc., and gender-based vulnerability due to lack of security and cyclonic disasters in cyclone centers.

Table 6.2.32: Percentage distribution of respondents’ perception regarding the adverse /negative effects of cyclonic disasters in your households

| Adverse effects of cyclonic disasters in your households | Responses | | Percent of Cases |
|--|-------------|---------------|------------------|
| | N | Percent | |
| Economic insecurity | 835 | 9.0% | 99.4% |
| Food insecurity | 835 | 9.0% | 99.4% |
| Lack of shelter | 832 | 9.0% | 99.0% |
| Life/Death risk | 804 | 8.7% | 95.7% |
| Loss of infrastructure | 824 | 8.9% | 98.1% |
| Health risk/problem/hazard | 821 | 8.8% | 97.7% |
| Lack of pure drinking water | 818 | 8.8% | 97.4% |
| Damage of standing crops/crop productivity | 305 | 3.3% | 36.3% |
| Damage of fisheries | 650 | 7.0% | 77.4% |
| Damage of homestead/kitchen garden | 779 | 8.4% | 92.7% |
| Reduce of domestic livestock/cattle | 204 | 2.2% | 24.3% |
| Threat to various livelihoods | 805 | 8.7% | 95.8% |
| Soil degradation/infertility | 64 | 0.7% | 7.6% |
| Migration | 712 | 7.7% | 84.8% |
| Others | 3 | 0.0% | 0.4% |
| Don't know | 1 | 0.0% | 0.1% |
| Total | 9292 | 100.0% | 1106.2% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 6.2.32 indicates the respondents’ perception regarding the adverse consequences of disasters. Almost all of the respondents or 99.4%, 99.4%, 99%, 95.7%, 98.1%, 97.7%, 97.4%, 92.7%, and 95.8% of the respondents faced numerous challenges eg, economic insecurity, food insecurity, lack

of shelter, death risk, infrastructural losses, health risks, scarcity of safe drinking water, homestead/ kitchen garden, and threats to various livelihoods respectively due to cyclonic disasters. On the contrary, 77.4%, and 84.8% respondents claimed that cyclonic disasters exacerbate the damages of fisheries and migration respectively. About 36.3% and 24.3% respondents claim that they have damaged their standing crops and domestic livestock are reduced due to cyclonic disasters.

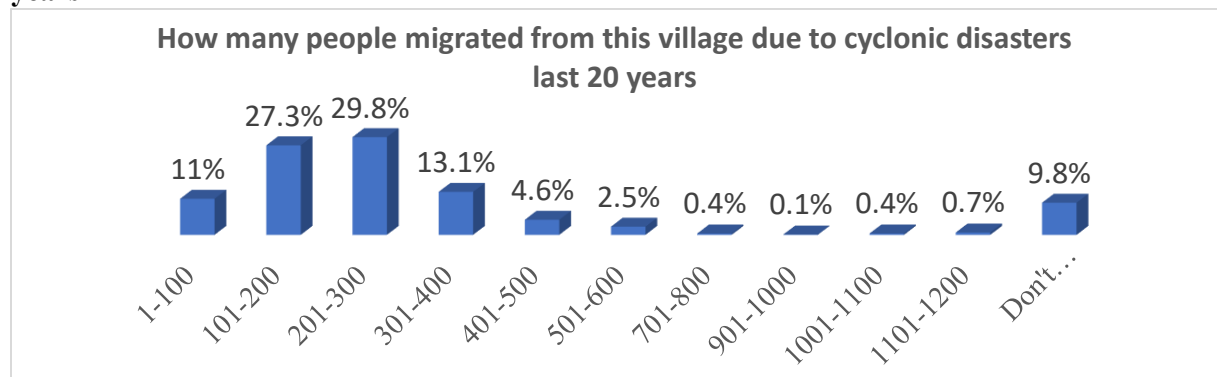
Table 6.2.33: Percentage distribution of respondents’ perception regarding people migrated because of cyclonic disasters or water salinity

| Migration occurred due to salinity | Frequency | Percent |
|------------------------------------|-----------|---------|
| Yes | 770 | 91.7 |
| No | 20 | 2.4 |
| Don't Know | 50 | 6.0 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.33 shows that south west coastal people migrated because of cyclonic disasters/water salinity. Almost all (91.7%) of the participants point out that south west coastal belt people migrated because of cyclonic disasters/water salinity. On the contrary, only 2.4% of the participants note that south west coastal belt people did not migrate because of cyclonic disasters/water salinity. On the other hand, 6% of the participants claim that they do not know that the south west coastal belt people whether migrate or not due to cyclonic disasters/water salinity.

Graph 6.2.10: How many people migrated from this village due to cyclonic disasters last 20 years

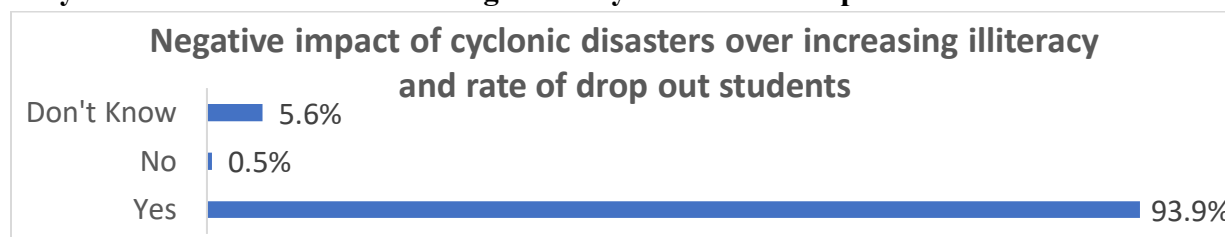


(Source: Field Survey, 2023)

Graph 6.2.10 shows the trends of south west coastal people migration because of cyclonic disasters or water salinity last 20 years. Almost one-third (29.8%) of the participants point out that 201 to 300 south west coastal belt people migrated because of cyclonic disasters/water salinity last 20 years. More than one-fourth (27.3%) of the participants point out that 101 to 200 south west coastal

belt people migrated because of cyclonic disasters/water salinity last 20 years. About 13.1% and 11% of the participants point out that 301 to 400 and 1 to 100 south west coastal belt people migrated due to cyclonic disasters/ water salinity last 20 years respectively. On the other hand, only 4.7%, 2.5%, 0.4%, 0.1%, 0.4% and 0.7% of the participants point out that 401 to 500, 501 to 600, 701 to 800, 901 to 1000, 1001 to 1100, and 1101 to 1200 south west coastal belt people migrated respectively because of cyclonic disasters/ water salinity last 20 years. On the contrary, only 9.8% of the participants claim that they do not know whether the south west coastal belt people migrate or not due to cyclonic disasters/ water salinity last 20 years.

Graph 6.2.11: Percentage distribution of respondents’ perception regarding negative impact of cyclonic disasters over increasing illiteracy and rate of drop out students



(Source: Field Survey, 2023)

Regarding the issues of cyclonic disasters have negative impact over increasing illiteracy and rate of drop out students, a significant portion (93.9%) of the respondent mention that cyclonic disasters have negative impact over increasing illiteracy and rate of drop out students in southern coastal Bangladesh. On the contrary, 0.5% of the respondents note that cyclonic disasters do not have negative impact over increasing illiteracy and rate of drop out students in coastal area. On contrary, 5.6% of the respondents respond that they do not know whether the cyclonic disasters have negative impact on increasing illiteracy and rate of drop out students or not in coastal Bangladesh.

Table 6.2.34: Percentage distribution of respondents’ perception regarding depression due to cyclonic disasters

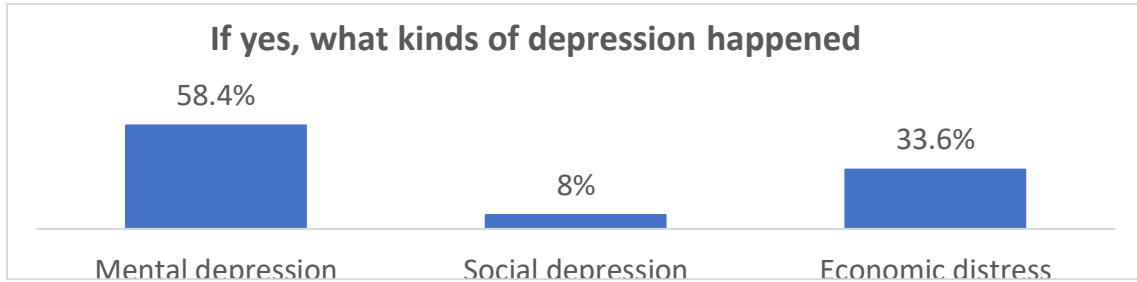
| Facing depression due to cyclonic disasters | Frequency | Percent |
|---|-----------|---------|
| Yes | 801 | 95.4 |
| No | 6 | .7 |
| Don't Know | 33 | 3.9 |
| Total | 839 | 100.0 |

(Source: Field Survey, 2023)

Table 6.2.34 exhibits the percentage distribution of the respondents’ perception regarding the coastal people are facing the vulnerability with social/mental depression or not due to cyclonic

disasters. Almost all (95.4%) of the respondents admit that the southwest coastal people are facing the vulnerability with social/mental depression due to cyclonic disasters. Regarding the coastal people are facing the vulnerability with social/mental depression due to cyclonic disasters, only 0.7% and 3.9% of the respondents respond ‘no’ and ‘don’t know’ respectively.

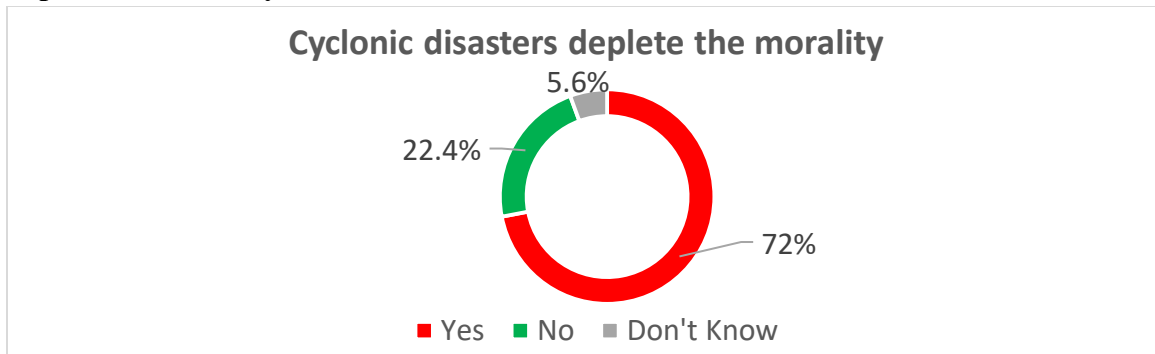
Graph 6.2.12: If yes, what kinds of depression happened



(Source: Field Survey, 2023)

Graph 6.2.12 exhibits that the coastal people are facing the various depression due to cyclonic disasters. A significant portion (58.4%) of the respondents admit that the southwest coastal people faced the mental depression due to cyclonic disasters. Almost one-third (33.6%) of the total respondents admit that the southwest coastal people faced the economic depression due to cyclonic disasters. On the contrary, only 8% of the total respondents note that the southwest coastal community faced the social depression due to cyclonic disasters.

Graph 6.2.13: Percentage distribution of people’s perception regarding cyclonic disasters deplete the morality



(Source: Field Survey, 2023)

Graph 6.2.13 exhibits that the coastal people are depleting the morality due to cyclonic disasters. Almost three-fourth (71.9%) of the respondents admit that the cyclonic disasters deplete the morality in southwest coastal people. Regarding the cyclonic disasters deplete the morality, almost one-fourth or 22.4% and 5.6% of the respondents respond ‘no’ and ‘don’t know’ respectively.

Table 6.2.35: Association between cyclonic disasters and various social vulnerability indicators through Pearson Chi-Square (χ^2) Tests

| Pearson Chi-Square (χ^2) Tests | | | | | | |
|---|---|--------------------|--------------------|-------------|-------|--------------------------------------|
| | | Cyclonic Disasters | | | | P-value |
| | | Cyclone | Salinity Intrusion | Tidal Surge | Flood | |
| | | Count | Count | Count | Count | |
| Geographic area | Shyamnagar | 105 | 105 | 100 | 105 | .024* $\chi^2 = 44.72$ Df = 28 |
| | Ashashuni | 105 | 102 | 101 | 105 | |
| | Koyra | 105 | 105 | 102 | 105 | |
| | Dacope | 105 | 104 | 102 | 105 | |
| | Patharghata | 105 | 105 | 105 | 103 | |
| | Betagi | 105 | 102 | 105 | 105 | |
| | Charfassion | 105 | 100 | 105 | 104 | |
| | Tajumuddin | 105 | 105 | 105 | 105 | |
| Division-based Geographic area | Khulna | 420 | 416 | 405 | 420 | .001* $\chi^2 = 19.63$ Df = 4 |
| | Barishal | 420 | 412 | 420 | 417 | |
| Vulnerability | Economically | 840 | 828 | 825 | 837 | 0.066 $\chi^2 = 35.13$ Df = |
| | Socially | 748 | 740 | 736 | 745 | |
| | Physically | 117 | 113 | 112 | 117 | |
| | Psychology | 814 | 803 | 799 | 811 | |
| | Culturally | 57 | 55 | 56 | 56 | |
| | Health | 819 | 809 | 805 | 816 | |
| Destruction | Destruction of infrastructures | 831 | 819 | 816 | 828 | 0.23 $\chi^2 = 19.65$ Df = 16 |
| | Ruining the shelter | 807 | 797 | 793 | 805 | |
| | Death of cattle | 395 | 392 | 385 | 393 | |
| | Destruction of framland | 776 | 766 | 762 | 773 | |
| Community faced negatively | Hindrance of daily activities | 835 | 823 | 820 | 832 | .000* $\chi^2 = 68.40$ Df = 24 |
| | Hindrance of cultural activities like wedding ceremony, rituals | 635 | 628 | 622 | 632 | |
| | Food insecurity | 802 | 792 | 789 | 799 | |
| | Disruption of prayers | 205 | 204 | 201 | 205 | |
| | Disruption of communication | 804 | 795 | 792 | 801 | |
| | Break out of diseases | 782 | 773 | 773 | 779 | |
| Challenge of water, sanitation & hygiene (WASH) | No | 2 | 2 | 1 | 2 | .000* $\chi^2 = 26.60$ Df = 4 |
| | Yes | 838 | 826 | 824 | 835 | |
| Challenge of safe drinking water | No | 4 | 4 | 3 | 4 | .014* $\chi^2 = 12.42$ Df = 4 |
| | Yes | 836 | 824 | 822 | 833 | |
| | Pure drinking water | 823 | 812 | 809 | 820 | .043* |

| | | | | | | |
|---|--|-----|-----|-----|-----|---------------------------------------|
| Creating problem of safe drinking water | Level of groundwater lower | 444 | 441 | 434 | 443 | $\chi^2=12.08$ Df = 12 |
| | Water polluted by waste disposal | 627 | 620 | 615 | 625 | |
| Negative social implications | Disruption of social network | 827 | 815 | 813 | 824 | .000* $\chi^2=297.68$ Df = 72 |
| | Hindrance to movement of children | 725 | 719 | 712 | 722 | |
| | Disruption of communication and transportation | 827 | 816 | 812 | 824 | |
| | Impediment to women's income and employment | 770 | 760 | 758 | 768 | |
| | Damage of educational institutions | 769 | 761 | 757 | 767 | |
| | Increasing rate of crime | 145 | 143 | 144 | 144 | |
| | Increasing rate of mental health issues | 778 | 772 | 764 | 776 | |
| | Prevalence of diarrhea | 774 | 769 | 762 | 771 | |
| | Spread of different vector borne diseases like dengue, malaria | 543 | 538 | 536 | 540 | |
| | Spread of water borne diseases like dysentery, jaundice, | 767 | 758 | 754 | 765 | |
| | Hyponatraemia due to dehydration | 24 | 24 | 23 | 24 | |
| | Malnutrition leading kwashiorkor and marasmus | 18 | 18 | 15 | 18 | |
| | Prevalence of skin diseases | 803 | 794 | 794 | 800 | |
| | Forced migration | 795 | 785 | 785 | 793 | |
| | Disruption of the means of livelihood | 784 | 777 | 773 | 782 | |
| | Gender based vulnerability due to lack of security | 61 | 58 | 61 | 61 | |
| Other (specify) | 3 | 3 | 3 | 3 | | |
| Don't know | 3 | 3 | 3 | 3 | | |
| More vulnerable | Children | 784 | 772 | 769 | 781 | 0.62 $\chi^2 = 21.24$ Df = 24 |
| | Adolescent girls | 774 | 764 | 759 | 772 | |
| | Young Adult women | 334 | 326 | 329 | 332 | |
| | Pregnant women | 834 | 822 | 819 | 831 | |
| | Disabled person | 829 | 817 | 814 | 826 | |
| | Old people | 809 | 797 | 795 | 807 | |
| Impact of children education | Increasing rate of children death | 771 | 762 | 756 | 769 | 0.54 $\chi^2 = 30.39$ Df = 32 |
| | Lack of food security | 836 | 824 | 821 | 833 | |
| | Juvenile delinquency | 97 | 96 | 95 | 97 | |
| | Risk of infectious disease | 827 | 816 | 814 | 824 | |
| | School was closed | 836 | 824 | 821 | 833 | |
| | Damages of infrastructures | 835 | 823 | 820 | 832 | |
| | Economic uncertainty | 828 | 816 | 813 | 825 | |
| | Loss of books or other accessories | 295 | 289 | 290 | 295 | |
| Impact of women adolescent girl | Lack of secured shelter | 830 | 821 | 817 | 827 | .000* $\chi^2 = 103.68$ Df = 36 |
| | Drop out from school | 806 | 795 | 792 | 803 | |
| | Lack of menstrual hygiene management kit | 829 | 817 | 814 | 826 | |
| | Lack of maternity health advantages | 693 | 684 | 679 | 692 | |

| | | | | | | |
|--------------------------|---|-----|-----|-----|-----|---------------------------------------|
| | Mobility problem that causes life risk | 509 | 503 | 496 | 508 | |
| | Lack of health care services | 818 | 807 | 804 | 815 | |
| | Lack of food and nutrition | 830 | 818 | 816 | 827 | |
| | More domestic household works load | 797 | 787 | 783 | 794 | |
| | Socio-cultural barriers | 41 | 41 | 41 | 41 | |
| Disabled vulnerability | Transportation barriers | 840 | 828 | 825 | 837 | .025* $\chi^2 = 28.80$ Df = 16 |
| | Lack of shelter | 823 | 813 | 808 | 821 | |
| | Lack of toilet facilities | 833 | 821 | 818 | 830 | |
| | Lack of water, sanitation and hygiene facilities | 835 | 823 | 820 | 832 | |
| Aged vulnerability | Transportation barriers | 840 | 828 | 825 | 837 | .000* $\chi^2 = 46.99$ Df = 16 |
| | Lack of shelter | 823 | 813 | 809 | 821 | |
| | Lack of toilet facilities | 837 | 825 | 823 | 834 | |
| | Lack of water, sanitation and hygiene facilities | 836 | 824 | 821 | 833 | |
| Women face vulnerability | Hardly get preferential treatment in health care services | 778 | 767 | 767 | 775 | .032* $\chi^2 = 53.27$ Df = 36 |
| | Health care center is far from the home | 748 | 740 | 734 | 745 | |
| | Women face patriarchal attitude in the context | 317 | 314 | 313 | 317 | |
| | Women face social restriction and barriers in getting access to health care services | 786 | 776 | 772 | 784 | |
| | Women faces lack of opportunity in community decision making process due to domination of males | 378 | 376 | 375 | 376 | |
| | Lack of political empowerment | 72 | 71 | 71 | 71 | |
| | Social exclusion due to lack of empowerment | 185 | 183 | 184 | 185 | |
| | Roles in domestic chores, child care and rearing like informal sector (unpaid) | 773 | 762 | 759 | 770 | |
| | Women are unable to play role in voluntary services due to restriction of social movement | 326 | 325 | 315 | 326 | |
| Adverse effect household | Economic insecurity | 835 | 823 | 820 | 832 | .000* $\chi^2 = 138.82$ Df = 56 |
| | Food insecurity | 835 | 823 | 820 | 832 | |
| | Lack of shelter | 832 | 821 | 817 | 829 | |
| | Death risk | 804 | 795 | 792 | 801 | |
| | Loss of infrastructure | 824 | 815 | 809 | 821 | |
| | Health risk/problem/hazard | 821 | 812 | 807 | 818 | |
| | Lack of pure drinking water | 818 | 807 | 803 | 815 | |
| | Damage of standing crops/crop productivity | 305 | 301 | 302 | 304 | |
| | Damage of fisheries | 650 | 642 | 638 | 647 | |
| | Damage of homestead/kitchen garden | 779 | 770 | 768 | 776 | |
| | Reduce of domestic livestock/cattle | 204 | 201 | 202 | 203 | |
| | Threat to various livelihoods | 805 | 795 | 793 | 802 | |
| | Soil degradation/infertility | 64 | 63 | 63 | 64 | |
| | Migration | 712 | 701 | 703 | 709 | |

| | | | | | | |
|--|--|-----|-----|-----|-----|---------------------------------------|
| People migrated from this village due to cyclonic disasters including salinity last 20 years | 1-100 | 92 | 88 | 91 | 91 | .000* $\chi^2 = 103.23$ Df = 40 |
| | 101-200 | 229 | 227 | 229 | 228 | |
| | 201-300 | 250 | 250 | 246 | 249 | |
| | 301-400 | 110 | 106 | 107 | 110 | |
| | 401-500 | 39 | 38 | 37 | 39 | |
| | 501-600 | 21 | 21 | 21 | 21 | |
| | 601-700 | 0 | 0 | 0 | 0 | |
| | 701-800 | 3 | 3 | 3 | 3 | |
| | 801-900 | 0 | 0 | 0 | 0 | |
| | 901-1000 | 1 | 0 | 1 | 1 | |
| | 1001-1100 | 3 | 3 | 3 | 3 | |
| | 1101-1200 | 6 | 6 | 6 | 6 | |
| | Don't Know | 82 | 82 | 77 | 82 | |
| Increasing illiteracy and drop-out rate | No | 4 | 4 | 4 | 4 | .002* $\chi^2 = 23.894$ Df = 8 |
| | Yes | 790 | 778 | 780 | 787 | |
| | Don't Know | 46 | 46 | 41 | 46 | |
| Kinds of depression | Mental depression | 467 | 459 | 462 | 464 | .05* $\chi^2 = 7.035$ Df = 8 |
| | Social depression | 64 | 64 | 64 | 64 | |
| | Economic distress | 269 | 265 | 262 | 269 | |
| Deplete the morality | No | 188 | 185 | 183 | 188 | .030* $\chi^2 = 16.98$ Df = 8 |
| | Yes | 604 | 595 | 598 | 601 | |
| | Don't Know | 47 | 47 | 43 | 47 | |
| Social disruption by cyclonic disasters | Disruption of social network | 833 | 821 | 818 | 830 | .000* $\chi^2 = 119.57$ Df = 48 |
| | Disruption of communication and transportation | 834 | 822 | 821 | 831 | |
| | Impediment to women's income and employment | 780 | 769 | 767 | 777 | |
| | Irritated mind/short temper | 271 | 268 | 268 | 268 | |
| | Abnormality of norms, attitude, practices | 91 | 89 | 87 | 91 | |
| | Social exclusion | 345 | 340 | 341 | 343 | |
| | Lack of Social cohesion/ bondage | 171 | 169 | 168 | 171 | |
| | Increase of domestic violence | 171 | 171 | 169 | 169 | |
| | Lack of enrollment in formal education | 751 | 744 | 741 | 748 | |
| | Forced migration | 797 | 787 | 786 | 794 | |
| | Disruption of the means of livelihood | 793 | 785 | 780 | 790 | |
| | Gender based vulnerability due to lack of security | 23 | 22 | 23 | 23 | |
| | Disruption of social network | 833 | 821 | 818 | 830 | |

(Source: Field Survey, 2023)

Multiple Response*

6.4 Presenting result in APA 6th Style of chi-square tests (χ^2)

Pearson chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=28, N=840) =44.72, $p<0.05$ (0.024*) indicating that there is a relationship between occurring

cyclonic disasters and geographical area. Another chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to division based geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =19.63, $p<0.05$ (0.001*) indicating that there is a relationship between occurring cyclonic disasters and division categorized geographical area.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to various hardships like economic, social, psychological, cultural and health vulnerabilities. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) =35.13, $p>0.05$ (0.066) indicating that there is no association between cyclonic disasters and vulnerabilities. But it is apparently said from the response of participants, cyclonic disasters exacerbate the various vulnerabilities of southwest coastal communities including economic, social, psychological, cultural and health vulnerabilities.

To test the association of economic hazards facing by the cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) =19.65, $p>0.05$ (0.23) indicating that there is no association between cyclonic disasters and vulnerabilities. But from the response of fieldwork participants, cyclonic disasters exacerbate the economic hazards of southwest coastal communities.

Regarding the people of the community faced negatively by cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically significant, χ^2 (df=24, N=840) =68.4, $p<0.05$ (0.000*) indicates that there is a relationship between occurring cyclonic disasters and community faced negatively.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters create the problem of water, sanitation and hygiene (WASH). The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =26.6, $p<0.05$ (0.000*) indicating that there is a relationship between occurring cyclonic disasters and those create the problem of water, sanitation and hygiene (WASH).

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to challenges of safe drinking water. The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =12.42, $p<0.05$ (0.014*) indicating that there exists a positive relationship between occurring cyclonic disasters and creating challenges of safe drinking water.

To test the association of cyclonic disasters and those create the problem of safe drinking water, a chi-square test (χ^2) for independence with $\alpha=0.05$ has been used. The chi-square test (χ^2) is statistically significant, χ^2 (df=12, N=840) =12.08, $p<0.05$ (0.043*) indicates that cyclonic disasters and creating the problem of safe drinking water are associated.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters trigger the negative social implications. The chi-square test (χ^2) was statistically significant, χ^2 (df=72, N=840) =297.68, $p<0.05$ (0.000*) indicating that there exists a positive relationship between occurring cyclonic disasters and adverse social implications of various indicators.

To test the association of more vulnerability facing by the cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) =21.24, $p>0.05$ (0.62) indicating that there is no association between cyclonic disasters and vulnerabilities. But from the response of fieldwork participants, cyclonic disasters exacerbate the vulnerabilities including women, pregnant women, young adult women, child, adolescent girls, disabled, and aged of southern coastal communities.

Regarding the association between cyclonic disasters and impacts of children, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=32, N=840) =30.39, $p>0.05$ (0.54) indicates that there is no association between cyclonic disasters and negative impacts of children. But from the descriptive statistics of percentage distribution, it can be said that cyclonic disasters exacerbate the negative impacts of children.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters trigger the negative impacts of women and adolescent girls. The chi-square test (χ^2) was statistically significant, χ^2 (df=36, N=840) =103.68, $p<0.05$ (0.000*) indicating that there exists an association between occurring cyclonic disasters and the negative impacts of women and girls.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters trigger the vulnerability of physically disabled people. The chi-square test (χ^2) was statistically significant, χ^2 (df=16, N=840) =28.80, $p<0.05$ (0.025*) indicating that there exists an association between occurring cyclonic disasters and the vulnerability of disabled people.

In terms of the association between cyclonic disasters and vulnerability of aged people, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically

significant, χ^2 (df=16, N=840) =46.99, $p<0.05$ (0.000*) indicating that there exists an association between occurring cyclonic disasters and the vulnerability of aged people.

Whether the association between cyclonic disasters and women facing vulnerability, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=36, N=840) =53.27, $p<0.05$ (0.032*) indicating that there exists an association between occurring cyclonic disasters and women facing vulnerability.

Whether the association between cyclonic disasters and the adverse /negative effects on community households, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=56, N=840) =138.82, $p<0.05$ (0.000*) indicates that cyclonic disasters pose the adverse /negative effects on community households.

Whether people migrated from this village due to cyclonic disasters including salinity last 20 years, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=40, N=840) =103.23, $p<0.05$ (0.000*) indicates that cyclonic disasters pose the migration or aggravates the internally displacement.

Regarding the increasing illiteracy and drop-out rate of child due to disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =23.894, $p<0.05$ (0.002*) indicates that cyclonic disasters pose the increasing illiteracy and drop-out rate of child.

Whether the kinds of depression of community due to disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =7.035, $p<0.05$ (0.05*) indicates that cyclonic disasters heightened the depression of community.

Regarding the depletion of morality due to disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. Chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =16.98, $p<0.05$ (0.030*) indicates that cyclonic disasters pose the increasing illiteracy and drop-out child rate.

Whether the people socially disrupted or not, due to facing cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=48, N=840) =119.57, $p<0.05$ (0.000*) indicates that cyclonic disasters aggravate the social disruptions of the community.

So, finally it can be said that cyclonic disasters exacerbate the social vulnerabilities of south west coastal community.

Chapter Seven: Nexus between Cyclonic Disasters and Economic Vulnerability

7.1 Economic Vulnerability during Cyclonic Disasters

Bangladesh has encountered severe economic challenges and facing numerous cyclonic disasters including cyclones, storm surges, floods, and salinity intrusions etc. Cyclonic disasters severely effect on different kinds of sectors including economic, health, social as well as psychological wellbeing which lead the community vulnerability. Cyclonic disasters are harmful to their economic activities. During disasters, the coastal people of Bangladesh have lost different kinds of properties. By creating significant delays, damage to other infrastructures, such as roads, bridges, and culverts, may also have an effect on economic disruption. Cyclonic disasters can be more harmful of coastal people for lacking of economic activities. Coastal people face occupational hazard and challenges especially low wages salary and less demand for human labour. Majority of the economic sector can be threats to economic insecurity such as: lack of employment opportunities and increasing non-arable land. Bangladesh is among the world's poorest and most vulnerable country to natural disasters. Bangladesh is the sixth most disaster-prone country in the world. At present the terms of cyclonic disaster is most prominent important factors for Bangladesh. Every year Bangladesh faces bitter experiences caused by cyclonic disaster. During cyclonic disasters, Bangladesh faces different kinds of vulnerability, economic vulnerability is one of them. These vulnerabilities result from persistent, underlying, chronic underdevelopment and poverty. Other cyclone-related losses and damages continue to be expensive, particularly in the financial and economic domains. The most clearly quantifiable direct losses—the financial expenses of obvious physical damage have traditionally been the focus of estimates of the economic effects of disasters, including cyclones, while other effects, which are frequently indirect but have a protracted duration, are generally outside the scope of government action (Sultana 2022). In Bangladesh, women's limited access to public spaces and financial resources significantly adverse impacts on their economic vulnerability, while government initiatives mostly focus on providing assistance for immediate survival (Sultana 2022). Rice growers, fishermen, and shrimp farmers are among the workforce groups most susceptible due to cyclones and their association with coastal economic growth. Particularly threatening agricultural and fishing sectors, cyclones frequently result in acute poverty for those who are unable to continue in their line of work (Mallick & Vogt 2017). Due to the fact that shrimp farmers had greater losses than agriculture producers during Cyclone Aila in 2009 (Akter & Mallick 2013), they are

particularly worried about this issue. Due to cyclonic disasters, local economy suffers to significant economic losses and disruption of housing, infrastructures, and threats to agricultural and fishing sectors which emphasizes their vulnerability. This vulnerability is mostly influenced by different kinds of factors like: agricultural factors, infrastructure as well as diversification of economy. Cyclonic disasters impact on economic vulnerability by two ways: short terms impact and long-term impact. Short term impact includes in coastal areas of Bangladesh, immediate loss of life and properties, disruption of local economic markets and also most prominent important factors increased unemployment rate as well as loss of income during and after cyclonic disaster. Long term impact includes outmigration from severely affected areas and leading to population in further economic deplorable situation in coastal belt of Bangladesh (Noy & Yonson 2018; Rahman et al., 2023).

According to Bangladesh Disaster-related Statistics 2021 report which is conducted by Government of the People's Republic of Bangladesh, from the total BDT 1791988 million damage and loss in 2015-2020, Dhaka division is found the most damage and loss with TK. 380345 million (21.22%), followed by Rangpur with TK. 280593 million (15.66%) and Barishal with TK. 235444 million (13.14%), Rajshahi with TK. 197683 million (11.03%), and Khulna with TK. 181155 million (10.11%) respectively. On the other hand, damage and loss were the least with TK. 161559 million (9.02%) for Sylhet division. Due to the cyclone, total damage and loss amounted to TK. 255382 million (14.25%) of which Khulna is accounted for 43.74% and Barishal is accounted for 33.62%. Cyclone had negligible effect on the rest of the divisions. Only Barishal consisted 82.71% of the total damage and loss of TK. 15475 million caused by the storm/tidal surge, while Khulna accounted for 15.59%. Barishal, Chattogram and Khulna suffered the damage and losses caused by salinity with 37.84%, 31.71% and 30.42% respectively. The report also indicates that out of 1791988 million taka, the highest 56.41% of damage and losses are caused by flood, followed by 14.99% due to river/coastal erosion, 14.25% cyclone, 5.23% water logging, 2.73% hailstorm, 1.63% thunderstorm, 1.52% drought, 1.16% salinity, 0.86% tidal surge, 0.85% tornado, 0.34% landslides and other categories have 2.34% in 2015-2020 (GoB 2022).

On the contrary, according to Bangladesh Disaster-related Statistics 2015 report, out of the total BDT 184247.34 million damage and loss in 2009-2014, Dhaka division is found to lead with 25.00% damage and loss followed closely by Barisal division (20.07%), Khulna division (15.86%), Rajshahi division (11.77%), Chittagong division (10.33%), Sylhet division (8.50%) and

Rangpur division (8.47%) respectively. The report also indicates that out of 184247.34 million taka, the most 23.23% damage and losses are caused by flood, followed by 19.76% due to river/coastal erosion, 15.41% cyclone, 8.72% water logging, 6.88% tidal surge, 6.23% hailstorm, 5.94% thunderstorm, 5.74% drought, 3.30% salinity, 0.14% landslides and other categories have 2.34% in 2009-2014 (GoB 2016).

Table 7.1: Distribution of damage and loss by sector and by disaster categories, 2015-2020

| Disaster | Damage and Loss by sector (in million taka) | | | | | | | |
|------------------------------|---|--------|-----------|---------|---------|--------|--------|--------------------|
| | Total | crops | Livestock | Poultry | Fishery | Land | Houses | Homestead forestry |
| All | 1791988 | 517961 | 71373 | 26976 | 66460 | 941843 | 132315 | 35061 |
| Drought | 27344 | 12311 | 1077 | 609 | 262 | 12728 | 146 | 210 |
| Flood | 1010882 | 241842 | 42956 | 13495 | 40927 | 632163 | 33024 | 6474 |
| Water logging | 93860 | 26632 | 2492 | 1729 | 6281 | 53763 | 2379 | 585 |
| Cyclone | 255382 | 153921 | 13367 | 5196 | 11542 | 0 | 52348 | 52348 |
| Tornado | 15226 | 4418 | 336 | 626 | 165 | 0 | 8046 | 1637 |
| Storm surge | 15475 | 2731 | 783 | 693 | 2117 | 7854 | 990 | 307 |
| Thunderstorm | 29195 | 8821 | 2184 | 704 | 232 | 0 | 13079 | 4175 |
| River/coastal erosion | 268703 | 26765 | 6597 | 3044 | 2498 | 219744 | 8264 | 1790 |
| Landslides | 6082 | 381 | 173 | 8 | 1 | 4897 | 292 | 331 |
| Salinity | 20756 | 5934 | 677 | 522 | 2216 | 10694 | 435 | 280 |
| Hailstorm | 48945 | 34155 | 731 | 348 | 214 | 0 | 13258 | 240 |
| Others | 136 | 51 | 1 | 2 | 5 | 0 | 53 | 24 |
| Percentage (%) | | | | | | | | |
| All | 100.00 | 28.90 | 3.98 | 1.51 | 3.71 | 52.56 | 7.38 | 1.96 |
| Drought | 100.00 | 45.02 | 3.94 | 1.51 | 3.71 | 52.56 | 7.38 | 1.96 |
| Flood | 100.00 | 23.92 | 4.25 | 1.33 | 4.05 | 62.54 | 3.27 | 0.64 |
| Water logging | 100.00 | | | | | | | |
| Cyclone | 100.00 | 60.27 | 5.23 | 2.03 | 4.52 | 0.00 | 20.50 | 7.44 |
| Tornado | 100.00 | | | | | | | |
| Tidal surge | 100.00 | 17.65 | 5.06 | 4.48 | 13.68 | 50.75 | 6.40 | 1.98 |
| Thunderstorm | 100.00 | 30.21 | 7.48 | 2.41 | 0.79 | 0.00 | 44.80 | 14.30 |
| River/coastal erosion | 100.00 | 9.96 | 2.46 | 1.13 | 0.93 | 81.78 | 3.08 | 0.67 |
| Landslides | 100.00 | 6.26 | 2.84 | 0.13 | 0.02 | 80.52 | 4.80 | 5.44 |
| Salinity | 100.00 | 28.59 | 3.26 | 2.51 | 10.68 | 51.52 | 2.10 | 1.35 |
| Hailstorm | 100.00 | 69.78 | 1.49 | 0.71 | 0.44 | 0.00 | 27.09 | 0.49 |
| Others | 100.00 | 37.50 | 0.74 | 1.47 | 3.68 | 0.00 | 38.97 | 17.65 |

(Source: GoB, 2020)

Table 7.1 illustrates the distribution of economic damage and loss due to disasters from 2015 to 2020). The data reveals substantial economic losses experienced by households due to various disasters during this period. According to survey data, households in disaster-affected areas of the country lost wealth and property equivalent to TK. 1791988 million over a six-year period (2015–20). This information discloses the fact that the average annual economic loss of 1.32% of the GDP at current prices.

Survey data indicates that out of damage and loss of TK. 1791988 million, only flood was responsible for 56.41% (TK. 1010882 million) of the total damage and loss, while river/coastal erosion and cyclones were responsible for 14.99% (TK. 268703 million) and 14.25% (TK.255382 million), respectively. Flood, river/coastal erosion, and cyclones together contributed to 85.66 % of total damage and losses. Land suffered the most significant damage (52.66%) out of total damages. The loss and damage of land includes degradation of land due to various type of disaster as well loss of land due to river/coastal erosion. On the contrary, crops and houses experienced 22.89% and 7.38% of the total damage, respectively, with houses encompassing residential structures, kitchens, cowsheds, and similar properties.

Table 7.2: Distribution of damage and loss by sector and by disaster categories, 2009-2014

| Disaster | Damage and Loss by sector (in million taka) | | | | | | | |
|------------------------------|---|----------|-----------|---------|----------|----------|----------|--------------------|
| | Total | crops | Livestock | Poultry | Fishery | Land | houses | Homestead forestry |
| All | 184247.34 | 66703.42 | 8772.16 | 2224.88 | 10713.99 | 49229.73 | 31676.89 | 14926.27 |
| Drought | 10569.20 | 9144.99 | 191.14 | 81.93 | 189.65 | 698.15 | 0.00 | 263.34 |
| Flood | 42807.19 | 22163.26 | 2373.29 | 593.81 | 1986.77 | 8966.45 | 5040.03 | 1683.58 |
| Water logging | 16062.24 | 8660.70 | 702.99 | 204.59 | 2466.43 | 1541.53 | 1769.64 | 716.36 |
| Cyclone | 28384.81 | 4194.25 | 3137.51 | 750.92 | 2109.46 | 0.00 | 10833.38 | 7359.29 |
| Tornado | 4299.03 | 984.46 | 145.80 | 28.02 | 0.00 | 0.00 | 2484.62 | 656.13 |
| Storm/tidal surge | 12676.02 | 2343.78 | 769.93 | 321.96 | 33271.24 | 3318.00 | 1847.69 | 803.42 |
| Thunderstorm | 10940.12 | 2493.63 | 432.28 | 103.39 | 0.00 | 0.00 | 6212.35 | 1698.47 |
| River/coastal erosion | 36408.92 | 1076.20 | 729.30 | 33.90 | 338.72 | 31742.12 | 2034.28 | 454.40 |
| Landslides | 249.01 | 7.78 | 0.16 | 0.11 | 0.00 | 200.23 | 21.44 | 19.29 |

| | | | | | | | | |
|------------------------------|----------|---------|--------|-------|--------|---------|---------|--------|
| Salinity | 6072.94 | 2162.73 | 142.23 | 11.01 | 0.00 | 2763.21 | 46.92 | 946.84 |
| Hailstorm | 11471.69 | 9679.63 | 53.38 | 27.01 | 0.00 | 0.00 | 1386.53 | 325.14 |
| Others | 4306.11 | 3792.00 | 94.14 | 68.24 | 351.73 | 0.00 | 0.00 | 0.00 |
| Percentage (%) | | | | | | | | |
| All | | 36.20 | 4.76 | 1.21 | 5.82 | 26.72 | 17.19 | 8.10 |
| 100.00 | | | | | | | | |
| Drought | 5.74 | 4.96 | 0.10 | 0.04 | 0.10 | 0.38 | 0.00 | 0.14 |
| Flood | 23.23 | 12.03 | 1.29 | 0.32 | 1.08 | 4.87 | 2.74 | 0.91 |
| Water logging | 8.72 | 4.70 | 0.38 | 0.11 | 1.34 | 0.84 | 0.96 | 0.39 |
| Cyclone | 15.41 | 2.28 | 1.70 | 0.41 | 1.14 | 0.00 | 5.88 | 3.99 |
| Tornado | 2.33 | 0.53 | 0.08 | 0.02 | 0.00 | 0.00 | 1.35 | 0.36 |
| Storm/tidal surge | 6.88 | 1.27 | 0.42 | 0.17 | 1.78 | 1.80 | 1.00 | 0.44 |
| Thunderstorm | 5.94 | 1.35 | 0.23 | 0.06 | 0.00 | 0.00 | 3.37 | 0.92 |
| River/coastal erosion | 19.76 | 0.58 | 0.40 | 0.02 | 0.18 | 17.23 | 1.10 | 0.25 |
| Landslides | 0.14 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 | 0.01 | 0.01 |
| Salinity | 3.30 | 1.17 | 0.08 | 0.01 | 0.00 | 1.50 | 0.03 | 0.51 |
| Hailstorm | 6.23 | 5.25 | 0.03 | 0.01 | 0.00 | 0.00 | 0.75 | 0.18 |
| Others | 2.34 | 2.06 | 0.05 | 0.04 | 0.19 | 0.00 | 0.00 | 0.00 |

(Source: GoB, 2016)

Table 7.2 indicates that out of 184247.34 million taka, the largest 23.23% damage and losses were caused by flood followed by 19.76% due to river/coastal erosion, 15.41% cyclone, 8.72% water logging and rest 8 categories together had 32.90%. The table further shows that the highest 36.20% of damage and losses were found in crops, followed by 26.72% loss and damage of land, 17.19% in houses (residence, kitchen, cowshed etc.) and the rest livestock, poultry, fisheries and homestead forestry together had 19.89% damage and loss. It is noted that a total of taka 36408.92 million loss and damages were in river/coastal erosion whereas damage and loss of land due to river/coastal was taka 31742.12 million in period of 2009-2014 (GoB 2016).

Table 7.3: Number and percentage distribution of damage houses (dwelling, kitchen and cowshed) and Loss by division and disaster (in million taka), 2015-2020

| Disaster | Damage of dwelling houses Loss by division and disaster (in million taka) | | | | | | | | |
|------------|---|---------|------------|-------|--------|------------|----------|---------|--------|
| | Total | Barisal | Chittagong | Dhaka | Khulna | Mymensingh | Rajshahi | Rangpur | Sylhet |
| All | 132315 | 21129 | 15258 | 18397 | 23481 | 7659 | 19301 | 17147 | 9943 |

| | | | | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Drought | 146 | 13 | 11 | 78 | 9 | 5 | 7 | 15 | 9 |
| Flood | 33024 | 2769 | 4541 | 5597 | 119 | 3095 | 4429 | 7529 | 4946 |
| Water logging | 2379 | 1033 | 677 | 314 | 172 | 17 | 105 | 44 | 17 |
| Cyclone | 52348 | 15698 | 7654 | 7005 | 19008 | 729 | 1863 | 277 | 113 |
| Tornado | 8046 | 28 | 91 | 669 | 66 | 936 | 3913 | 1480 | 863 |
| Storm/tidal surge | 990 | 518 | 31 | 0 | 441 | 0 | 0 | 0 | 0 |
| Thunderstorm | 13079 | 41 | 1082 | 994 | 558 | 1757 | 3800 | 2129 | 2716 |
| River/coastal erosion | 8264 | 804 | 577 | 3019 | 1353 | 144 | 1173 | 615 | 577 |
| Landslides | 292 | 0 | 156 | 0 | 0 | 0 | 0 | 0 | 136 |
| Salinity | 435 | 212 | 124 | 0 | 98 | 0 | 0 | 0 | 0 |
| Hailstorm | | 12 | 314 | 681 | 1657 | 975 | 3996 | 5060 | 565 |
| Others | 53 | 0 | 0 | 39 | 0 | 1 | 14 | 0 | 0 |
| Percentage (%) | | | | | | | | | |
| All | 100.0 | 15.97 | 11.53 | 13.90 | 17.75 | 5.79 | 14.59 | 12.96 | 7.51 |
| Drought | 100.0 | 8.90 | 7.53 | 53.42 | 6.16 | 3.42 | 4.79 | 10.27 | 6.10 |
| Flood | 100.0 | 8.38 | 13.75 | 16.95 | 0.36 | 9.37 | 13.41 | 22.80 | 14.98 |
| Water logging | 100.0 | 43.42 | 28.46 | 13.20 | 7.23 | 0.71 | 4.41 | 1.85 | 0.71 |
| Cyclone | 100.0 | 29.99 | 14.62 | 13.38 | 36.31 | 1.39 | 3.56 | 0.53 | 0.22 |
| Tornado | 100.0 | 0.35 | 1.13 | 8.31 | 0.82 | 11.63 | 48.63 | 18.39 | 10.73 |
| Storm/tidal surge | 100.0 | 52.32 | 3.13 | 0.00 | 44.56 | 0.00 | 0.00 | 0.00 | 0.00 |
| Thunderstorm | 100.0 | 0.31 | 8.27 | 7.60 | 4.27 | 13.43 | 29.05 | 16.28 | 20.78 |
| River/coastal erosion | 100.0 | 9.73 | 6.98 | 36.53 | 16.37 | 1/74 | 14.19 | 7.44 | 6.98 |
| Landslides | 100.0 | 0.00 | 53.42 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 46.58 |
| Salinity | 100.0 | 48.74 | 28.51 | 0.00 | 22.53 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hailstorm | 100.0 | 0.09 | 2.37 | 5.14 | 12.50 | 7.35 | 3014 | 38.17 | 4.26 |
| Others | 100.0 | 0.00 | 0.00 | 73.58 | 0.00 | 1.89 | 26.42 | 0.00 | 0.00 |

(Source: GoB, 2020)

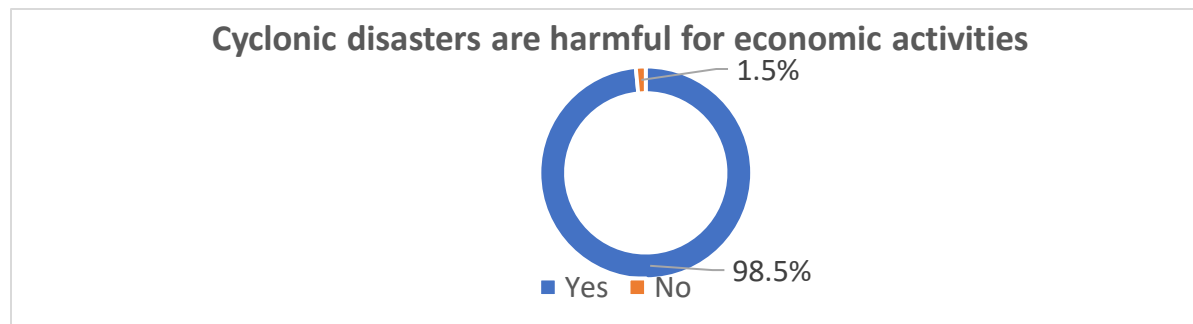
Table 7.3 shows the extensive loss and damage of dwelling houses, including connected structures (kitchen, storage for crops, cow shed, etc.) within the same premises, over the period from 2015 to 2020. The total estimated damage and loss of dwelling houses and related structures due to

different types of disasters during this period was TK. 132315 million. Khulna recorded the highest loss of TK. 23,481 million (17.75%), followed by TK. 21129 million (15.97%) in Barisal and TK. 19301 million (14.59%) in Rajshahi. On the contrary, Mymensingh experienced the least damage and losses, totaling TK. 7659 million (5.79%). Cyclones alone were responsible for TK. 52,348 million (39.56 %) of total losses by disaster. Floods and hailstorms contributed TK. 33024 million (24.96%) and TK. 13258 million (10.02%) respectively. Further analysis indicates that Barisal was most affected by cyclones (29.99%), Rangpur by floods (22.80%), and Rajshahi by hailstorms (36.17%).

The report of Government of Bangladesh (2016) following to Bangladesh Disaster related Statistics, 2016 shows that in total damage worth taka 31676.89 million due to the damage of houses was highest 29.14% in Barisal division followed by 16.46% in Khulna division, 14.54% in Dhaka division, 14.17% in Chittagong division, 9.45% in Rajshahi division, 9.42% in Sylhet division and 6.82% in Rangpur division. The table also shows that as a disaster category more than one third (34.20%) of the total damages caused by cyclone followed by thunderstorm (19.61%), flood (15.91%), tornado (7.84%), river/coastal erosion (6.42%), storm or tidal surge (5.83%), water logging (5.59%) and the rest (5.23%) respectively. It is seen that categories of disaster damages varied from division to division. In Barisal division 23.07% damage was reported for cyclone whereas 4.27% and 4.37% damage were reported due to flood and thunderstorm in Sylhet division (GoB 2016).

7.2 Data Analysis, Interpretation and Findings of the Quantitative Study

Graph 7.2.1: Cyclonic disasters are harmful for economic activities



(Source: Field Survey, 2023)

Graph 7.2.1 exhibits the cyclonic disasters are harmful for economic activities of south west coastal people. Almost all (98.5%) of the respondents express that cyclonic disasters are harmful for economic activities of south west coastal community. Only 1.5% of the respondents claim that cyclonic disasters are not harmful for economic activities of south west coastal people.

Table 7.2.1: Percentage distribution of Respondents' occupational hazards and challenges

| Occupational hazards and challenges they faced | Responses | | Percent of Cases |
|---|-------------|---------------|------------------|
| | N | Percent | |
| Workers suffer due to cyclonic disasters and less demand for human labor | 814 | 26.3% | 96.9% |
| Feel physical irritation and hazards due to saline water in the paddy fields | 276 | 8.9% | 32.9% |
| Low wage and salary | 810 | 26.2% | 96.4% |
| Women are discriminated in terms of wage and work environment | 378 | 12.2% | 45.0% |
| Health hazards due to cyclonic disasters and saline water while fishing and other agricultural work | 814 | 26.3% | 96.9% |
| Don't know | 3 | 0.1% | 0.4% |
| Total | 3095 | 100.0% | 368.5% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 7.2.1 presents facing the occupational hazards and challenges due to cyclonic disasters. Almost all (96.9%) of the respondents claim that workers suffer due to cyclonic disasters and less demand for human labor and health hazards due to cyclonic disasters and saline water while fishing and other agricultural work respectively. Due to cyclonic disasters, all (96.4%) of the respondents claim that they faced lower wage and salary related challenges, and 45% of the respondents claim

that women are discriminated in terms of wage and work environment. Almost one-third (32.9%) of the respondents claim that they feel physical irritation and hazards due to saline water in the paddy fields. On the other hand, only 0.4% of the respondents point out that they don't know anything regarding the occupational hazards and challenges due to cyclonic disasters.

Table 7.2.2: How many days in a month you remain unemployed due to cyclonic disasters

| Unemployed days in a month | Frequency | Percent |
|----------------------------|-----------|---------|
| 1-5 days in a month | 214 | 25.5 |
| 6-10 | 386 | 45.8 |
| 11-15 | 202 | 25.2 |
| 16-20 | 29 | 3.5 |
| Total | 830 | 100.0 |

(Source: Field Survey, 2023)

Due to cyclonic disasters, almost half of the total (45.2%) respondents remain unemployed 6 to 10 days in a month. One-fourth (25.2%) of the respondents remain unemployed 1 to 5 days in a month. Almost one-fourth (24.9%) of the respondents remain unemployed 11 to 15 days in a month. On the other hand, only 3.5% of the respondents remain unemployed 16 to 20 days in a month.

Table 7.2.3: Percentage distribution of respondents' perception regarding threatening sectors to economic insecurity for cyclonic disasters

| Threatening sectors to economic insecurity for cyclonic disasters | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Food production | 832 | 30.0% | 99.0% |
| Fisheries/shrimp cultivation | 573 | 20.7% | 68.2% |
| Domestic livestock/ cattle | 280 | 10.1% | 33.3% |
| Damage of forestry | 129 | 4.7% | 15.4% |
| Increasing non-arable land | 170 | 6.1% | 20.2% |
| Lack of employment opportunity/ income diversity | 784 | 28.3% | 93.3% |
| Don't know | 1 | 0.0% | 0.1% |
| Total | 2769 | 100.0% | 329.6% |

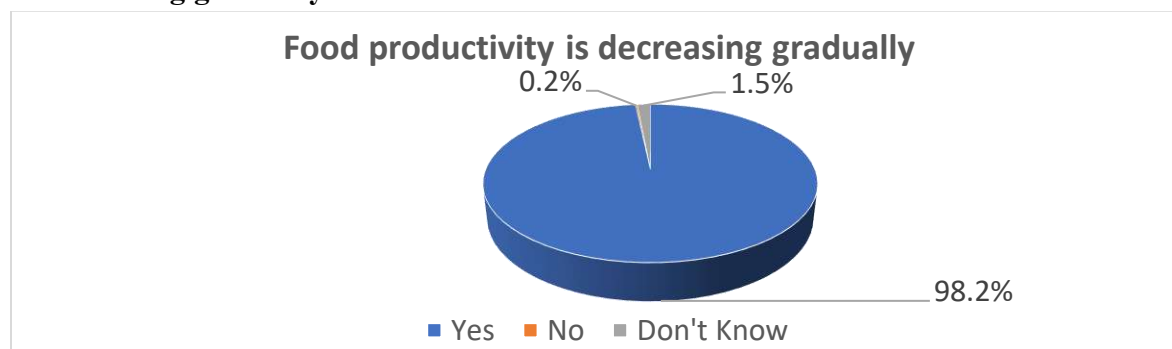
(Source: Field Survey, 2023)

Multiple Responses*

Regarding the threatening sectors to economic insecurity for cyclonic disasters, almost all (99%) and 93.3% of the respondents respond that the food production and employment opportunity/ income diversity is threatened respectively due to cyclonic disasters. Besides, 68.2% of the respondents claim that the fisheries/ shrimp cultivation sector is threatened due to cyclonic

disasters. Furthermore, one-third (33.3%) of the respondents respond that the domestic livestock/cattle is threatened due to cyclonic disasters. On the other hand, 20.2% and 15.4% of the respondents respond that the non-arable land is increasing and forestry sector is damaged and threatened respectively due to cyclonic disasters.

Graph 7.2.2: Percentage distribution of respondents' perception regarding food productivity is decreasing gradually



(Source: Field Survey, 2023)

Graph 7.2.2 exhibits the percentage distribution of respondents' perception regarding cyclonic disaster decreased food productivity gradually. Almost all (98.2%) of respondents express that food productivity is decreasing gradually due to cyclonic disasters. Only 0.2% of the respondents claim that cyclonic disasters do not create the decreasing food productivity gradually. On the contrary, only 1.5% of the respondents claim that they do not know the food productivity is decreasing gradually or not due to cyclonic disasters.

Table 7.2.4: Percentage distribution of respondents' perception regarding kinds of food grains are seriously affected

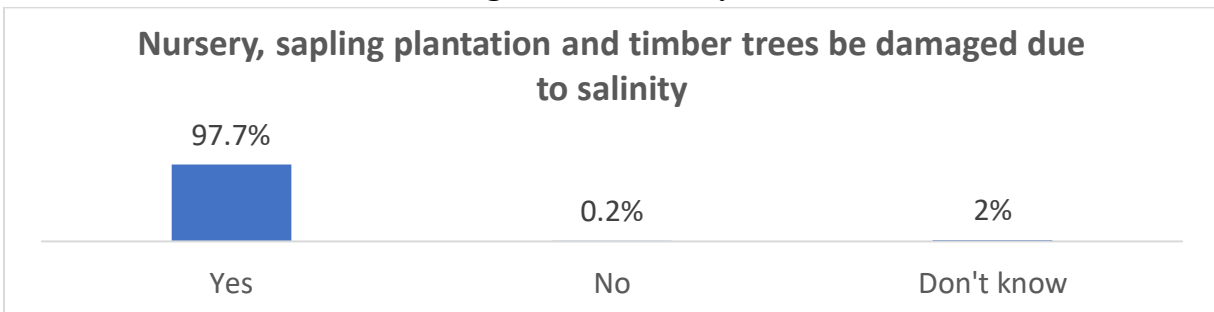
| Affected food grains due to salinity | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Seasonal crops (paddy/wheat/pulse/onion/brinjal/garlic/ginger/coriander/cucumber/jute/chilly) cannot be cultivated due to salinity in land (how many seasonal crops.....) | 836 | 40.9% | 99.5% |
| Vegetables cannot be grown due to saline water (Amount of vegetable land and types of vegetables) | 569 | 27.8% | 67.7% |
| Fruit trees (Mango, guava, jackfruit, blackberry etc.) cannot be grown due to saline water | 638 | 31.2% | 76.0% |
| Don't know | 2 | 0.1% | 0.2% |
| Total | 2045 | 100.0% | 243.5% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 7.2.4 portrays the modes of food grains are seriously affected or not. Almost all (99.5%) of the respondents claim that seasonal crops (paddy, wheat, pulse, onion, brinjal, garlic, ginger, coriander, cucumber, jute, chilly etc.) cannot be cultivated due to salinity in land. More than three-fourth (76%) of respondents respond that fruit trees (Mango, guava, jackfruit, blackberry etc.) cannot be grown due to saline water. On the other hand, two-third (67.7%) of the respondents claim that vegetables cannot be grown due to saline water.

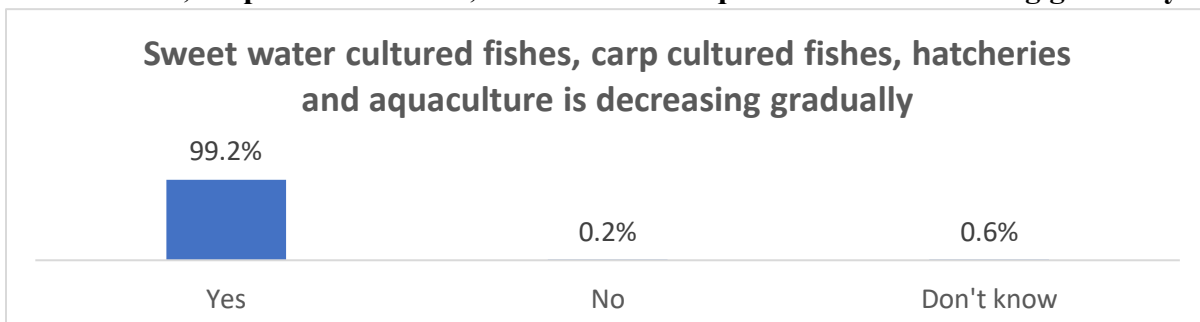
Graph 7.2.3: Percentage distribution of respondents’ perception regarding nursery, sapling plantation and timber trees be damaged due to salinity



(Source: Field Survey, 2023)

Graph 7.2.3 shows the percentage distribution of respondents’ perception regarding nursery, sapling plantation and timber trees can be damaged due to salinity. Almost all (97.7%) respondents admit that nursery, sapling plantation and timber trees can be damaged due to salinity. Only 0.2% respondents claim that salinity does not create the damage of nursery, sapling plantation and timber trees. On the contrary, only 2% of the respondents claim that they do not know that nursery, sapling plantation and timber trees can be damaged or not due to cyclonic disasters or salinity.

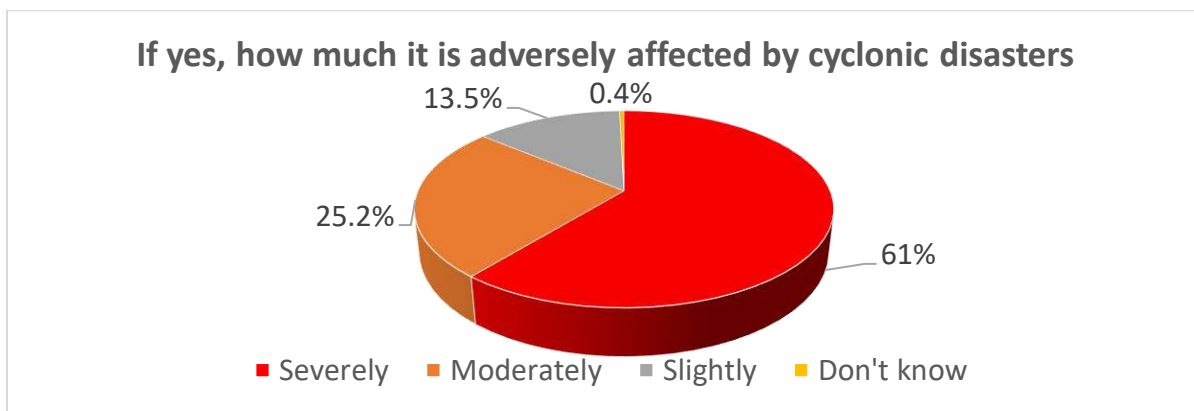
Graph 7.2.4: Percentage distribution of respondents’ perception regarding sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture is decreasing gradually



(Source: Field Survey, 2023)

Graph 7.2.4 displays that cyclonic disaster decreased fisheries sector or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity gradually. Almost all (99.2%) of respondents express that sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture is decreasing gradually due to cyclonic disasters. Only 0.2% of the respondents claim that cyclonic disasters do not create the decreasing fisheries sectors eg., sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity gradually. On the contrary, only 0.6% of the respondents claim that they do not know the fisheries sector eg., Sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity is decreasing gradually or not due to cyclonic disasters.

Graph 7.2.5: If yes, how much it is adversely affected



(Source: Field Survey, 2023)

Graph 7.2.5 represents that how much the fisheries sectors or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity is adversely affected due to cyclonic disasters. About 61% of the respondents respond that their fisheries sectors or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity are severely adverse affected due to cyclonic disasters. One-fourth (25.2%) of the respondents respond that their fisheries sectors or sweet water cultured fishes, carp cultured fishes, affected hatcheries and aquaculture productivity is moderately adverse affected. About 13.5% of the respondents respond that their fisheries sectors or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity are slightly adverse affected due to cyclonic disasters. On the converse, 0.4% of the respondents claim that they don't know how much the fisheries sectors or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity are adversely affected.

7.3 Livelihood challenges related information

Table 7.3.1: Main Livelihood Practice of the Respondents

| Occupational status of the respondents | Frequency | Percent |
|--|-----------|---------|
| Agriculture | 117 | 13.9 |
| Fishing | 243 | 28.9 |
| Shrimp cultivation | 2 | 0.2 |
| Homestead/ kitchen garden plantation | 140 | 16.7 |
| Employed | 34 | 4.0 |
| Crab collector | 26 | 3.1 |
| Wood cutter | 9 | 1.1 |
| Honey collector | 22 | 2.6 |
| Golpata collector | 22 | 2.6 |
| Medicinal plant collector | 5 | 0.6 |
| Day labor | 65 | 7.7 |
| Marginal farmer | 36 | 4.3 |
| Landless poor | 32 | 3.8 |
| CPP volunteer | 17 | 2.0 |
| Business | 30 | 3.6 |
| Housewife | 3 | 0.4 |
| Boatman | 28 | 3.3 |
| Bede community | 3 | 0.4 |
| Don't know | 6 | 0.7 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 7.3.1 presents the current occupational status or main livelihood practice of the respondents in south west coastal Bangladesh. Among the 840 respondents, 117 participants or 13.9% of the respondents engaged in agriculture, almost one-third or 28.9% of the respondents engaged in fishing activities, and 16.7% of the respondents are involved in homestead or kitchen garden activities. The rest of others 0.2%, 4.0%, 3.1% 1.1%, 2.6%, 2.6%, 0.6%, 7.7%, 4.3%, 3.8%, 2.0%, 3.6%, 0.4%, 3.3%, 0.4% of the respondents engaged in shrimp cultivation, job sector, crab collector, wood collector, honey collector, medicinal plant collector, day labor, marginal farmer, landless poor, CPP volunteer, business, housewife, boatman, and Bede community respectively.

Table 7.3.2: How many days in a month are you working

| Working days in a month | Frequency | Percent |
|-------------------------|-----------|---------|
| 10-15 | 59 | 7.0 |
| 15-20 | 308 | 36.7 |
| 20-25 | 401 | 47.7 |
| 25-30 | 72 | 8.6 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 7.3.2 shows that 7% of the respondents work only 10 to 15 days only. Almost two-fifth or 36.7% of the participants work 15 to 20 days. Almost half or 47.7% of the participants work 20 to 25 days, while 8.6% of the respondents work 25 to 30 days.

Table 7.3.3: Percentage distribution of respondents' family's daily income

| Respondents' family's daily income | Frequency | Percent |
|------------------------------------|-----------|---------|
| 50- 100 tk | 11 | 1.3 |
| 100- 150 tk | 41 | 4.9 |
| 150- 200 tk | 132 | 15.7 |
| 200-250 tk | 226 | 26.9 |
| 250-300 tk | 147 | 17.5 |
| More than 300 tk | 283 | 33.7 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 7.3.3 exhibits the daily family income of the respondents. Almost one-third or 33.7% of the respondents point out that their daily family income is more than 300 taka whereas 26.9% of the respondents show that their daily family income is 200 to 250 taka. Almost one-sixth or 15.7% and 17.5% of the respondents shows that their daily family income is 150 to 200 taka and 250 to 300 taka respectively. About 4.9% of the respondents point out that their daily family income is 100 to 150 taka and the rest of 1.3% income is 50 to 100 taka.

Table 7.3.4: In which season people earn more money

| Which season people earn more money | Frequency | Percent |
|-------------------------------------|-----------|---------|
| Baishakh-jaistha (summer) | 217 | 25.8 |
| Ashar-srabon (rainy season) | 171 | 20.4 |
| Vadro-ahwin (autumn) | 54 | 6.4 |
| Kartik-agrahasyan (Late-autumn) | 97 | 11.5 |
| Poush-Magh (winter) | 291 | 34.6 |
| Falgun-chaitra (spring) | 10 | 1.2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 7.3.4 presents the more income season in the community. About 25.8% and 20.4% of the community people respond that they earned more money in the summer and rainy season respectively. One-third or 34.6% of the respondent's response that they earn more money during winter season. On the other hand, 6.4%, 11.5%, and 1.2% of the respondents claim that they earn more money during autumn, late-autumn and spring season respectively.

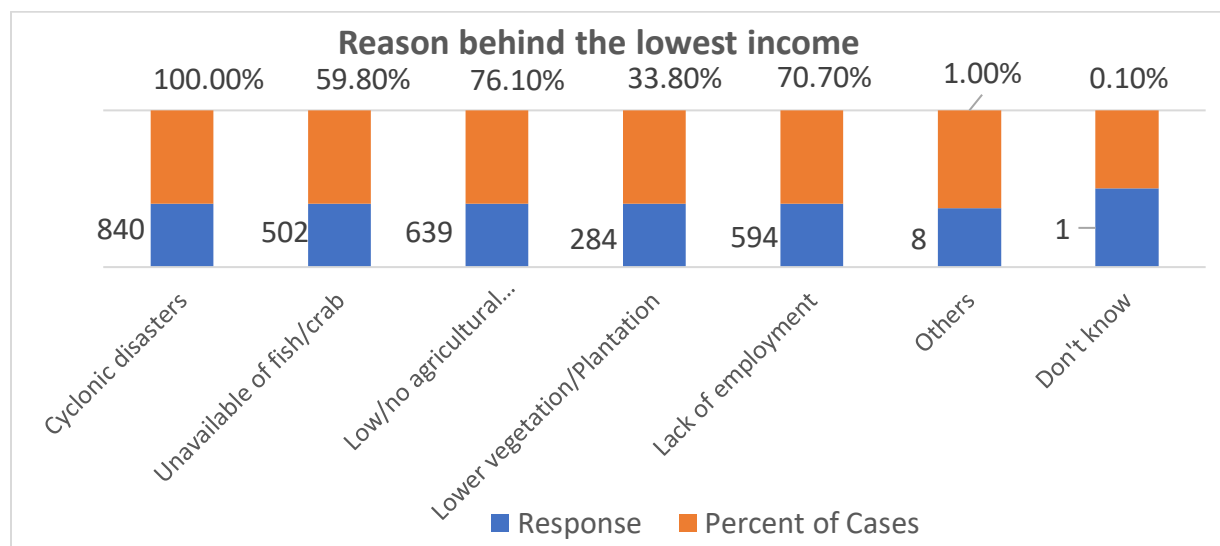
Table 7.3.5: In which season your income is found in the lowest

| Which season people earn least money | Frequency | Percent |
|--------------------------------------|-----------|---------|
| Baishakh-jaistha (summer) | 51 | 6.1 |
| Ashar-srabon (rainy season) | 338 | 40.2 |
| Vadro-ahwin (autumn) | 32 | 3.8 |
| Kartik-agrahasyan (Late-autumn) | 45 | 5.4 |
| Poush-Magh (winter) | 346 | 41.2 |
| Falgun-chaitra (spring) | 28 | 3.3 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 7.3.5 presents the lowest income season in the coastal community. Two-fifth or about 40.2% and 6.1% of the respondents respond that they earned least money in the rainy season and summer season respectively. Another two-fifth or 41.2% of the respondent’s response that they earn least money during winter season. On the other hand, 3.8%, 5.4%, and 3.3% of the respondents claim that they earn least money during autumn, late-autumn and spring season respectively.

Graph 7.3.1: Percentage distribution of respondents’ perception regarding reason behind the lowest income

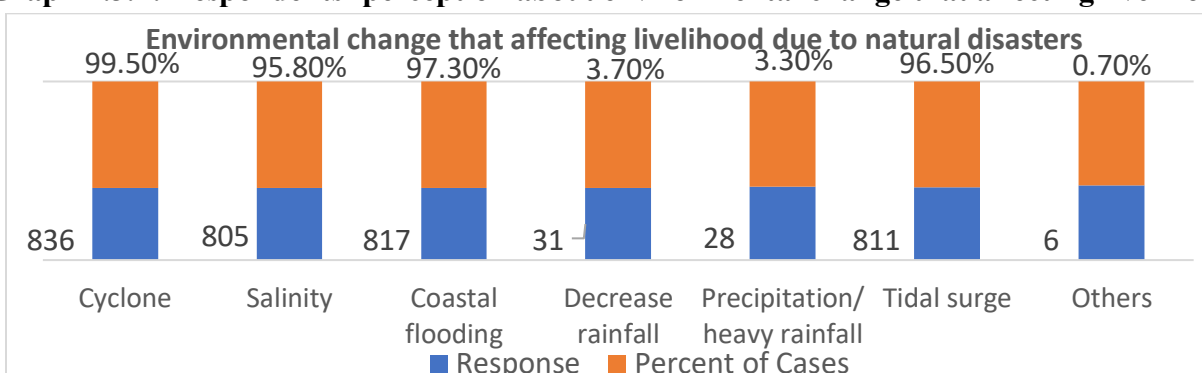


(Source: Field Survey, 2023)

Multiple Responses*

Graph 7.3.1 represents the reason behind the lowest income. All respondents admit that they have low income due to cyclonic disasters. A significant portion (76.1%) respondents admit that they have low/ no agricultural productivity and 70.7% of the respondents claim that they have lack of employment opportunity, and 33.8% respondents note that they have lower vegetation/ plantation. About 59.8% of the respondents note that they have low income due to unavailable of fish/ crab. On the contrary, only 1% of the respondents claim other factors for their lower income.

Graph 7.3.2: Respondents’ perception about environmental change that affecting livelihood



(Source: Field Survey, 2023) Multiple Responses*

Graph 7.3.2 shows the environmental change induced cyclonic disasters that affecting livelihood. Regarding the environmental change induced cyclonic disasters that affecting livelihood, almost all (99.5%) of the respondents claim that cyclone affect their livelihood, almost all (95.8%) of the respondents mention that salinity affect their livelihood, almost all (97.3%) of the respondents admit that coastal flooding affects their livelihood, almost all (96.5%) of the respondents mention that tidal surge affects their livelihood. On the contrary, only (3.7% and 3.3%) of the respondents admit that decreased rainfall and precipitation/ heavy rainfall affect their livelihood respectively.

Table 7.3.6: Percentage distribution of respondents’ perception regarding cyclonic disasters hamper the environmental /ecological balance

| Cyclonic disasters hamper the environmental /ecological balance | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Creating heat wave/hot weather | 788 | 11.4% | 93.8% |
| Damage of zooplankton and phytoplankton cycle | 121 | 1.7% | 14.4% |
| Hindrance of vegetation and plant species | 666 | 9.6% | 79.3% |
| Lack of homestead and kitchen garden | 577 | 8.3% | 68.7% |
| Soil fertility degradation | 331 | 4.8% | 39.4% |
| Deforestation | 794 | 11.5% | 94.5% |
| Intensifying global warming | 780 | 11.3% | 92.9% |
| Increasing CFC gas | 21 | 0.3% | 2.5% |
| Changes in vegetation | 794 | 11.5% | 94.5% |
| Loss of biodiversity | 795 | 11.5% | 94.6% |
| Disruption of ecosystems | 807 | 11.6% | 96.1% |
| Disease of fish may increase | 114 | 1.6% | 13.6% |
| Production of carp and sweet water fish will extinct | 338 | 4.9% | 40.2% |
| Total | 6929 | 100.0% | 824.9% |

(Source: Field Survey, 2023) Multiple Responses*

Table 7.3.6 shows that the cyclonic disasters hamper the environmental /ecological balance. Almost all (93.8%) of the respondents claim that cyclonic disasters create heat wave/hot weather, almost all (94.5%) of the respondents claim that cyclonic disasters create deforestation, 92.9% of the respondents claim that cyclonic disasters create the intensifying global warming, 94.5% of the respondents claim that cyclonic disasters changes in vegetation, 94.6% of the respondents claim that cyclonic disasters create loss of biodiversity, 96.1% of the respondents claim that cyclonic disasters disrupt the ecosystem. More than two-third (68.7%) of the respondents note that cyclonic disasters create lack of homestead and kitchen garden, 40.2% of the respondents mention that production of carp and sweet water fish will extinct due to cyclonic disasters and 39.4% of the respondents claim that cyclonic disasters degrade the soil fertility. On the other hand, 14.4%, 13.6%, 2.5% and 0.2% of the respondents claim that cyclonic disasters damage the zooplankton and phytoplankton cycle, may increase the diseases of fish, promote CFC gas increases and others respectively.

Table 7.3.7: Association between cyclonic disasters and various economic vulnerability indicators through Pearson Chi-Square (χ^2) Tests

| Pearson Chi-Square (χ^2) Tests | | | | | | |
|---------------------------------------|--------------|--------------------|--------------------|-------------|-------|--|
| | | Cyclonic Disasters | | | | P-value |
| | | Cyclone | Salinity Intrusion | Tidal Surge | Flood | |
| | | Count | Count | Count | Count | |
| Geographical area | Shyamnagar | 105 | 105 | 100 | 105 | .024* X ² = 44.72 Df = 28 |
| | Ashashuni | 105 | 102 | 101 | 105 | |
| | Koyra | 105 | 105 | 102 | 105 | |
| | Dacope | 105 | 104 | 102 | 105 | |
| | Patharghata | 105 | 105 | 105 | 103 | |
| | Betagi | 105 | 102 | 105 | 105 | |
| | Charfassion | 105 | 100 | 105 | 104 | |
| | Tajumuddin | 105 | 105 | 105 | 105 | |
| Division-based Geographical area | Khulna | 420 | 416 | 405 | 420 | .001* X ² = 19.63 Df = 4 |
| | Barishal | 420 | 412 | 420 | 417 | |
| Vulnerability | Economically | 840 | 828 | 825 | 837 | 0.066 X ² =35.13 Df = |
| | Socially | 748 | 740 | 736 | 745 | |
| | Physically | 117 | 113 | 112 | 117 | |
| | Psychology | 814 | 803 | 799 | 811 | |
| | Culturally | 57 | 55 | 56 | 56 | |
| | Health | 819 | 809 | 805 | 816 | |

| | | | | | | |
|---|--|-----|-----|-----|-----|--|
| Harmful for economic activities | Yes | 827 | 815 | 813 | 824 | .05* X ² =2.86 Df = 4 |
| | No | 0 | 0 | 0 | 0 | |
| | Don't know | 13 | 13 | 12 | 13 | |
| Occupational challenges | Workers suffer due to cyclonic disasters and less demand for human labor: | 814 | 802 | 800 | 811 | .000* X ² =50.07 Df = 20 |
| | Feel physical irritation and hazards due to saline water in the paddy fields | 278 | 274 | 274 | 275 | |
| | Low wage and salary | 810 | 800 | 797 | 807 | |
| | Women are discriminated in terms of wage and work environment | 378 | 373 | 368 | 378 | |
| | Health hazards due to cyclonic disasters and saline water while fishing and other agricultural work | 814 | 805 | 801 | 811 | |
| | Workers suffer due to cyclonic disasters and less demand for human labor | 814 | 802 | 800 | 811 | |
| Threatening sector | Food production | 832 | 820 | 817 | 829 | 0.44 X ² = 24.32 Df = 24 |
| | Fisheries/shrimp cultivation | 573 | 566 | 562 | 570 | |
| | Domestic livestock/ cattle | 280 | 274 | 275 | 279 | |
| | Damage of forestry | 131 | 131 | 130 | 129 | |
| | Increasing non-arable land | 170 | 166 | 169 | 169 | |
| | Lack of employment opportunity/ income diversity | 784 | 775 | 771 | 781 | |
| Foodgrains affected | Seasonal crops (paddy/wheat/pulse/onion/brinjal/garlic/ginger/coriander/cucumber/jute/chilly) cannot be cultivated due to salinity in land | 836 | 824 | 822 | 833 | 0.06 X ² = 19.93 Df = 12 |
| | Vegetables cannot be grown due to salinity | 569 | 560 | 557 | 566 | |
| | Fruit trees (Mango, guava, jackfruit, blackberry etc.) Cannot be grown due to saline water | 638 | 631 | 624 | 636 | |
| Decreasing fish, hatchery & aquaculture | Severely | 514 | 510 | 509 | 511 | .004* X ² = 29.28 Df = 12 |
| | Moderately | 212 | 208 | 205 | 212 | |
| | Slightly | 111 | 107 | 109 | 111 | |
| | Don't know | 3 | 3 | 2 | 3 | |
| Environmental balance | Creating heat wave/hot weather | 788 | 778 | 776 | 785 | .002* X ² = 86.23 Df = 52 |
| | Damage of zooplankton and phytoplankton cycle | 121 | 121 | 118 | 121 | |
| | Hindrance of vegetation and plant species | 666 | 659 | 653 | 665 | |
| | Lack of homestead and kitchen garden | 577 | 568 | 568 | 575 | |
| | Soil fertility degradation | 331 | 325 | 323 | 330 | |
| | Deforestation | 794 | 784 | 781 | 791 | |
| | Intensifying global warming | 780 | 771 | 768 | 777 | |
| | Increasing CFC gas | 21 | 21 | 20 | 21 | |
| | Changes in vegetation | 794 | 784 | 780 | 791 | |
| | Loss of biodiversity | 795 | 787 | 783 | 792 | |
| | Disruption of ecosystems | 807 | 796 | 795 | 804 | |
| | Disease of fish may increase | 115 | 114 | 115 | 114 | |

| | | | | | | |
|--|--|-----|-----|-----|-----|--|
| | Production of carp and sweet water fish will extinct | 339 | 333 | 329 | 337 | |
|--|--|-----|-----|-----|-----|--|

(Source: Field Survey, 2023)

Multiple Responses*

7.4 Presenting result in APA 6th Style of chi-square tests (χ^2)

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=28, N=840) =44.72, $p<0.05$ (0.024*) indicating that there is a relationship between occurring cyclonic disasters and geographical area. Another chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to division based geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =19.63, $p<0.05$ (0.001*) indicating that there is a relationship between occurring cyclonic disasters and division categorized geographical area.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to various hardships like economic, social, psychological, cultural and health vulnerabilities. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) =35.13, $p>0.05$ (0.066) indicating that there is no association between cyclonic disasters and vulnerabilities. But it is apparently said from the response of participants, cyclonic disasters exacerbate the various vulnerabilities of southwest coastal communities including economic, social, psychological, cultural and health vulnerabilities.

To test the association of harmfulness for economic activities and the cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =2.86, $p<0.05$ (0.05) indicates that there is an association between cyclonic disasters and harmfulness for economic activities of southwest coastal communities.

Regarding the occupational challenges faced the community by cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically significant, χ^2 (df=20, N=840) =50.07, $p<0.05$ (0.000*) indicates that there is a relationship between occurring cyclonic disasters and the occupational challenges of the community.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters threat the various sectors of their livelihoods. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) = 24.32, $p<0.05$ (0.44) indicating that there is no relationship

between occurring cyclonic disasters and threatening various sectors of their livelihood. On the contrary, descriptive statistics with percentage distribution show threatening the various sectors of their livelihood because of cyclonic disasters.

Whether foodgrains of the community are affected or not, due to cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=12, N=840) = 19.93, $p<0.05$ (0.06) indicating that there is no relationship between occurring cyclonic disasters and negatively affected of foodgrains. On the contrary, descriptive statistics with percentage distribution display that cyclonic disasters affected adversely for producing of their foodgrains.

To test the association of cyclonic disasters and decreasing the sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture, a chi-square test (χ^2) for independence with $\alpha=0.05$ has been used. The chi-square test (χ^2) is statistically significant, χ^2 (df=12, N=840) =29.28, $p<0.05$ (0.004*) indicates that cyclonic disasters decreased the sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture.

Regarding the association between cyclonic disasters and hampering the environmental/ecological balance, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=52, N=840) =86.23, $p<0.05$ (0.002*) indicates that there is an association between cyclonic disasters and hampering the environmental /ecological balance of the coastal community.

It can be sum up that cyclonic disasters exacerbate the economic hardship or vulnerability of southern coastal community.

Chapter Eight: Nexus between Cyclonic Disasters and Health Vulnerability

8.1 Health Vulnerability during Cyclonic Disasters

During cyclonic disasters the southern coastal region of Bangladesh are more severely affected especially health affected. Coastal areas people can not get properly medical facilities as well as properly nutritious food. Most of the people of coastal areas in Bangladesh are more vulnerable in health facilities because the upazila health complex and union health complex are not properly there. During disaster the coastal belt people of Bangladesh are more vulnerable especially pregnant women, old people, disable people and children. Due to cyclonic disasters, coastal people of Bangladesh face different kinds of vector borne diseases like diarrhea, malaria, cold and also skin diseases. The most susceptible portion of the country is its coastline region, with natural catastrophes causing environmental impairment in the southwest of the region. In Bangladesh, natural catastrophes threaten the survival of people's lives and means of subsistence. Numerous vector-borne and aquatic illnesses have direct health impacts, but there are also perhaps more significant indirect effects (Sarkar 2022). The general and mental health of the people living in the afflicted areas is being negatively impacted by natural catastrophes. Following the cyclones, the prevalence of skin conditions, infectious illnesses, and diarrhea has increased. Cyclones direct effect on health including fatalities and injuries. Significant epidemics of infectious, water-related, and other ailments, such as diarrhea, hepatitis, malaria, fever, pneumonia, eye infections, and skin conditions, are among the major indirect health effects. The majority of disaster survivors reside in small, unclean, and wet dwellings and temporary shelters. These circumstances make it easier for a variety of harmful health impacts to pass from person to person inside the home (Tapsell et al. 2002). By creating significant damages to other infrastructures, such as roads, bridges, and culverts, may also have an effect on health outcomes. It is an obstacle to get emergency medical professionals and supplies to treat recent injuries or contain disease outbreaks (Kuni et al., 2002). Malnutrition and decreased nutrition is common significant risk factor in underdeveloped nations (Sarkar 2022). Following a disaster, these nations' nutritional conditions deteriorate even more as a result of decreased food intake (IFRC 2011). Natural catastrophes cause interruptions to income-earning activities, damage to current food stores, disruptions to regular food production, and price increases for food (O'Donnell et al. 2002). Mental health is linked to the effects of catastrophes, such as cyclones, on human health. Natural disaster-related stress often poses a direct and indirect danger to the well-being of the populace in the coastal areas. Lifelong disability is an example of

direct effect. Individual breakdowns that result in stress-related illnesses are one way that indirect effects observed in society. Furthermore, catastrophes may increase pre-existing stress or cause acute stress, which can result in chronic disease and mortality (Curtis and Mills, 2009).

The population of Bangladesh has experienced steady growth, reaching about 172.76 million in January 2023, 171.74 million in July 2022 and 160.80 (July 2016) million. The annual population growth rate of Bangladesh is 1.12%, total fertility rate is 2.2 per women, contraceptives prevalence rate is 63.3%, mortality rate is 5.8 per thousand, and life expectancy rate is 72.4 years in 2022 (BBS, 2022). Under 5 years or Child Mortality Rate per 1000 live birth is 133 in 1993 to 88 in 2004, 46 in 2014, 34 in 2016 and 31 in 2022, Infant mortality rate is 87 in 1993 to 65 in 2004, 38 in 2014, 31 in 2016 and 24 in 2022, neonatal mortality rate is 52 in 1993 to 41 in 2004, 28 in 2014 and 16 in 2022, and maternal mortality rate is 569 in 1990 to 176 in 2014 and 153 in 2022. And this mortality rate and morbidity or burden of diseases increases when the natural disasters like cyclone, flood and salinity intrusion occurs. Whatever, Bangladesh reduced child mortality faster than Sweden and many developed countries ever did.

Human triumph over diseases and early death are one of the most significant improvements ever made in the condition of human life and higher standard of living. In Bangladesh, significant progress has been observed in child health care, including the provision of antibiotics, treatment of diarrhea, raise vaccine coverage, access of family planning, enhanced education, economic growth, and a reduction in family size over the last two decades. Besides, socio-economic development, improved health care, lifestyle and nutritional knowledge, access to clean water, toilets, bathing facilities, hygiene practices, proper sewerage systems, and buildings secure from rodents, vaccinations against childhood diseases, and other public health interventions contributed to preventing the spread of diseases. Despite these advancements, the infant, child and maternal mortality, morbidity and health systems are precarious or concern of alarming due to various natural disasters. Maternal mortality and woman's risk of death becomes for lack of prenatal care, lack of health care system during delivering the baby; and seeking an unsafe abortion. Similarly, child mortality and disabilities may increase for sudden onset and post- natural disasters. Due to the cyclonic disasters and the prevalence of bacterial and viral diseases disproportionately affect the poor, vulnerable, and destitute of socio-economic group such as women, children, farmer, agricultural wage laborers, shrimp cultivators, fish fry collectors, wood cutter and honey collectors who are prime victims of these challenges.

Table 8.1: Number and percentage distribution of household members suffering disease to the pre, during and post disaster period by division, 2009-2014

| Division | Total household | Before disaster | | During disaster | | Post disaster | |
|-----------------------|-----------------|-----------------|--------------|-----------------|--------------|---------------|--------------|
| | | Water borne | Vector borne | Water borne | Vector borne | Water borne | Vector borne |
| All | 4361261 | 3833975 | 527286 | 4108468 | 252793 | 3996923 | 364338 |
| Barisal | 818137 | 692577 | 125559 | 735765 | 82370 | 740455 | 77681 |
| Chittagong | 430540 | 384572 | 45969 | 386374 | 44165 | 367183 | 63358 |
| Dhaka | 931668 | 819430 | 112238 | 879393 | 52275 | 857786 | 73883 |
| Khulna | 668873 | 574658 | 94215 | 653549 | 15325 | 623157 | 45717 |
| Rajshahi | 613704 | 548409 | 65295 | 585658 | 28046 | 575590 | 38113 |
| Rangpur | 488564 | 445108 | 43455 | 466320 | 22243 | 446589 | 41975 |
| Sylhet | 409776 | 369221 | 40555 | 401406 | 8369 | 386164 | 23612 |
| Percentage (%) | | | | | | | |
| All | 100.00 | 87.91 | 12.09 | 94.20 | 5.80 | 91.65 | 8.35 |
| Barisal | 100.00 | 84.65 | 15.35 | 89.93 | 10.07 | 90.51 | 9.49 |
| Chittagong | 100.00 | 89.32 | 10.68 | 89.74 | 10.26 | 85.28 | 14.72 |
| Dhaka | 100.00 | 87.95 | 12.05 | 94.39 | 5.61 | 92.07 | 7.93 |
| Khulna | 100.00 | 85.91 | 14.09 | 97.71 | 2.29 | 93.17 | 6.83 |
| Rajshahi | 100.00 | 89.36 | 10.64 | 95.43 | 4.57 | 93.79 | 6.21 |
| Rangpur | 100.00 | 91.11 | 8.89 | 95.45 | 4.55 | 91.41 | 8.59 |
| Sylhet | 100.00 | 90.10 | 9.90 | 97.96 | 2.04 | 94.24 | 5.76 |

(Source: GoB, 2016)

Table 8.1 indicates that out of 4361261 household members 87.91% household members were infected by water borne diseases in comparison to 12.09% household members infected by vector borne diseases before disaster. During disaster 94.20% household members were affected by water borne diseases in comparison to 5.80% by vector borne diseases. Similarly, after disaster 91.65% household members affected by water borne and 8.35% household members were infected by vector borne disease respectively. During disaster, the percentage of water borne disease affected household member increased up to 94.20% and after the disasters the percentage of household members affected by water borne diseases are 91.65%. During disasters and after disasters the percentage of household members affected by vector borne diseases were 5.80% and 8.35% respectively. About 97.96% of household members were affected by water borne diseases in Sylhet during disasters, which was the highest, and vector borne diseases infected 14.72% of household members in Chittagong division after disasters, which were also the very high (GoB 2016).

Table 8.2: Number and percentage distribution of people reported illness by division and disaster category, 2015-2020

| Disaster | Number of populations reported illness (overlapping total across the types of disasters) | | | | | | | | |
|------------------------|--|---------|------------|-------|--------|------------|----------|---------|--------|
| | Total | Barisal | Chittagong | Dhaka | Khulna | Mymensingh | Rajshahi | Rangpur | Sylhet |
| Diarrhea | 52866 | 6269 | 8801 | 5067 | 3133 | 9803 | 2063 | 6433 | 11296 |
| Dysentery | 29517 | 5135 | 3375 | 3681 | 1090 | 2994 | 726 | 3291 | 9225 |
| Malaria | 5315 | 286 | 2525 | 141 | 0 | 117 | 22 | 534 | 1690 |
| Skin Disease | 37764 | 6437 | 2963 | 6290 | 1489 | 1727 | 3398 | 4160 | 11300 |
| Cold/Cough | 107378 | 22689 | 9949 | 19147 | 6335 | 5575 | 9799 | 12008 | 21877 |
| Fever | 124389 | 24294 | 12640 | 20393 | 7227 | 8050 | 8719 | 14672 | 28395 |
| Typhoid | 30102 | 9547 | 1787 | 4296 | 1448 | 1733 | 791 | 1430 | 9069 |
| Asthma | 21929 | 7194 | 1515 | 3308 | 2045 | 1145 | 2533 | 2695 | 1494 |
| Jaundice | 19505 | 10916 | 1299 | 3033 | 99 | 1505 | 904 | 946 | 804 |
| Malnutrition | 24754 | 11523 | 2134 | 2376 | 1199 | 3292 | 1055 | 1808 | 1368 |
| Dengue | 1820 | 1029 | 463 | 213 | 0 | 50 | 64 | 0 | 0 |
| Chikungunia | 1023 | 259 | 225 | 16 | 150 | 215 | 0 | 97 | 61 |
| Mental Disorder | 20285 | 2655 | 2753 | 2477 | 1601 | 2311 | 3194 | 3258 | 2036 |
| Chicken Pox | 1881 | 190 | 441 | 350 | 32 | 378 | 170 | 179 | 140 |
| Cholera | 2011 | 74 | 1145 | 102 | 0 | 378 | 0 | 255 | 56 |
| Others | 94484 | 16516 | 12153 | 13733 | 15546 | 6164 | 7915 | 9096 | 13362 |
| Percentage (%) | | | | | | | | | |
| Diarrhea | 100.00 | 11.86 | 16.65 | 9.58 | 5.93 | 18.54 | 3.90 | 12.17 | 21.37 |
| Dysentery | 100.00 | 17.40 | 11.43 | 12.47 | 3.69 | 10.14 | 2.46 | 11.15 | 31.25 |
| Malaria | 100.00 | 5.38 | 47.51 | 2.65 | 0.00 | 2.20 | 0.41 | 10.05 | 31.80 |
| Skin Disease | 100.00 | 17.05 | 7.85 | 16.66 | 3.94 | 4.57 | 9.00 | 11.02 | 29.92 |
| Cold/Cough | 100.00 | 21.13 | 9.27 | 17.83 | 5.90 | 5.19 | 9.13 | 11.18 | 20.37 |
| Fever | 100.00 | 19.53 | 10.16 | 16.39 | 5.81 | 6.47 | 7.01 | 11.80 | 22.83 |
| Typhoid | 100.00 | 31.72 | 5.94 | 14.27 | 4.81 | 5.76 | 2.63 | 4.75 | 30.13 |
| Asthma | 100.00 | 32.81 | 6.91 | 15.09 | 9.33 | 5.22 | 11.55 | 12.29 | 6.81 |
| Jaundice | 100.00 | 55.97 | 6.66 | 15.55 | 0.51 | 7.72 | 4.63 | 4.85 | 4.12 |
| Malnutritio | 100.00 | 46.55 | 8.62 | 9.60 | 4.84 | 13.30 | 4.26 | 7.30 | 5.52 |
| Dengue | 100.00 | 56.54 | 25.44 | 11.76 | 0.00 | 2.75 | 3.52 | 0.00 | 0.00 |
| Chikungunia | 100.00 | 25.32 | 21.99 | 1.56 | 14.66 | 21.02 | 0.00 | 9.48 | 5.96 |
| Mental Disorder | 100.00 | 13.09 | 13.57 | 12.21 | 7.89 | 11.39 | 15.75 | 16.06 | 10.04 |
| Chicken Pox | 100.00 | 10.10 | 23.44 | 18.61 | 1.70 | 20.10 | 9.04 | 9.52 | 7.44 |
| Cholera | 100.00 | 3.68 | 56.94 | 5.07 | 0.00 | 18.80 | 0.00 | 12.68 | 2.78 |
| Others | 100.00 | 17.48 | 12.86 | 14.53 | 16.45 | 6.52 | 8.38 | 9.63 | 14.14 |

(Source: GoB 2020)

Table 8.2 reveals that among the total of 298,378 reported cases of illness, the highest proportion, comprising 124,389 individuals (41.69%), experienced some form of fever. Cold or cough affected 107,378 individuals (35.99%), while diarrhea impacted 52,866 individuals (17.22%). Conversely, the lowest number of cases, totaling 1023 (0.34%), attributed to chikungunya. On the other hand, 1881 participants (0.63%) were affected by chicken pox, though small pox was eradicated from our country, but still exists an endemic form in the country. When the prevalence of different types of diseases is divided by division, it becomes evident that Sylhet had the highest prevalence of diarrhea (21.37%) and fever (22.83%), while Barisal had the highest prevalence of colds and coughs (21.13%). On the other hand, Barisal also reported the highest prevalence rates of malnutrition (46.55%) and dengue fever (56.54%).

Table 8.3: Number and percentage of death as a result of disaster by division and disaster category 2015-2020

| Disaster | Number of death as a result of disaster by division and disaster category | | | | | | | | |
|------------------------------|---|---------|------------|-------|--------|------------|----------|---------|--------|
| | Total | Barisal | Chittagong | Dhaka | Khulna | Mymensingh | Rajshahi | Rangpur | Sylhet |
| All | 8108 | 1263 | 1337 | 891 | 711 | 638 | 1336 | 1264 | 669 |
| Drought | 22 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 |
| Flood | 3425 | 277 | 237 | 426 | 0 | 531 | 717 | 849 | 388 |
| Water logging | 710 | 195 | 352 | 90 | 72 | 0 | 0 | 0 | 0 |
| Cyclone | 539 | 66 | 128 | 16 | 329 | 0 | 0 | 0 | 0 |
| Tornado | 540 | 0 | 0 | 0 | 0 | 0 | 324 | 216 | 0 |
| Storm surge | 191 | 191 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Thunderstorm | 2207 | 321 | 556 | 326 | 284 | 107 | 272 | 60 | 281 |
| River/coastal erosion | 246 | 213 | 0 | 33 | 0 | 0 | 0 | 0 | 0 |
| Landslides | 64 | 0 | 64 | 0 | 0 | 0 | 0 | 0 | 0 |
| Salinity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Hailstorm | 165 | 0 | 0 | 0 | 26 | 0 | 0 | 139 | 0 |
| Others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Percentage (%) | | | | | | | | | |
| All | 100.0 | 15.58 | 16.49 | 10.99 | 8.77 | 7.87 | 16.47 | 15.59 | 8.25 |
| Drought | 100.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 100.00 | 0.00 | 0.00 |
| Flood | 100.0 | 8.09 | 5.92 | 12.44 | 0.00 | 15.50 | 20.93 | 24.79 | 11.33 |
| Water logging | 100.0 | 27.46 | 49.58 | 12.68 | 10.14 | 0.00 | 0.00 | 0.00 | 0.00 |
| Cyclone | 100.0 | 12.24 | 23.75 | 2.97 | 61.04 | 0.00 | 0.00 | 0.00 | 0.00 |
| Tornado | 100.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 60.00 | 40.00 | 0.00 |
| Storm surge | 100.0 | 100.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Thunderstorm | 100.0 | 14.54 | 25.19 | 14.77 | 12.87 | 4.85 | 12.32 | 2.72 | 12.73 |

| | | | | | | | | | |
|------------------------------|-------|-------|-------|-------|-------|------|------|-------|------|
| River/coastal erosion | 100.0 | 86.59 | 0.00 | 13.41 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Landslides | 100.0 | 0.00 | 100.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Salinity | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Hailstorm | 100.0 | 0.00 | 0.00 | 0.00 | 15.76 | 0.00 | 0.00 | 84.24 | 0.00 |
| Others | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

(Source: GoB, 2020)

Over the past six years (2015–20), a total of 8,108 deaths were attributed to various calamities. Chattogram division recorded the highest number of fatalities caused by natural disasters, accounting for 1,337 deaths, or 16.49% of the total death. Similarly, Rajshahi and Rangpur reported the death tolls of 1,335 (16.47%) and 1,264 (15.59%) respectively, while Mymensingh had 638 deaths (7.87%) of the total death. Flooding was expected to claim a maximum of 3425 lives (42.24%). Thunderstorms and lightning were responsible for 2207 deaths (27.22%), and waterlogging at 710 deaths (8.76%). In addition, river erosion accounted for 246 deaths (3.03%), while landslides resulted the fewest deaths at 64 people (0.79%).

The mortality originates from the cyclonic disasters that have been triggered such as small tornadoes, flash flooding, and storm surges. In a cyclone, many additional trauma incidents are caused by large objects which can become airborne in the severe winds. Although it is not possible to predict with accuracy which diseases will occur following certain types of disasters, diseases can be distinguished as either water-borne, air-borne/droplet or vector-borne diseases, and contamination from wounded injuries (Uddin 2017).

8.2 Data Analysis, Interpretation and Findings of the Quantitative Study

8.2.1 Health risk/hazard related information

Table 8.2.1: Percentage distribution of respondents' consciousness of health

| Consciousness about health | Frequency | Percent |
|----------------------------|-----------|---------|
| Yes | 266 | 31.7 |
| No | 574 | 68.3 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.1 shows the percentage distribution of the respondents' conscious or awareness about health in southwest coastal people during and aftermath of cyclonic disaster period. A significant portion 68.3% of the respondents are not conscious about their health. One-third of the participants or 31.7% of the respondents claim that they are conscious about their sound health.

Table 8.2.2: Percentage distribution of respondents' getting proper food

| Getting proper food | Frequency | Percent |
|---------------------|-----------|---------|
| Yes | 170 | 20.2 |
| No | 670 | 79.8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.2 shows that the southwest coastal people getting proper food in their meal during and post cyclonic disaster period. A significant portion (79.8%) of the respondents do not get proper food in their meal. Only 20.2% of the respondents claim that they get proper food in their meal.

Table 8.2.3: Percentage distribution of respondents' perceptions taking meal in a day

| Taking meal in a day | Frequency | Percent |
|----------------------|-----------|---------|
| 2 | 71 | 8.5 |
| 3 | 769 | 91.5 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

The above table indicates that south west coastal belt people how much taking meal in a day during or post cyclonic disasters. Regarding the question of taking meal in a day, 91.5% of the respondents take 03 meals in a day during or post cyclonic disasters. On the other hand, 8.5% of the respondents take 02 meals in a day during or post cyclonic disasters. This is happened due to cyclonic disasters trigger poverty.

Table 8.2.4: Percentage distribution of respondents' getting nutritional food in meal

| Getting nutritional food in meal | Frequency | Percent |
|----------------------------------|-----------|---------|
| Yes | 126 | 15.0 |
| No | 702 | 83.6 |
| Don't Know | 12 | 1.4 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.4 portrays the percentage distribution of respondents' perceptions regarding getting nutritional food in their meal during and post cyclonic disaster period. A significant portion 702 out of 840 respondents or 83.6% of the respondents do not get nutritional food in their meal. Only 15% of the respondents claim that they get nutritional food in their meal. On the contrary, only 1.4% of the respondents don't know about nutritional food.

Table 8.2.5: Percentage distribution of respondents' perceptions regarding pregnant women get sufficient nutritional food during or post-cyclonic disaster period

| Pregnant women get sufficient nutritional food | Frequency | Percent |
|--|-----------|---------|
| Yes | 15 | 1.8 |
| No | 799 | 95.1 |
| Don't Know | 26 | 3.1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.5 portrays that the percentage distribution of respondents' perceptions regarding pregnant women get sufficient nutritional food in their meal during and post cyclonic disaster period. Almost all (95.1%) of the respondents claim that the pregnant women do not get sufficient nutritional food in their meal during and post cyclonic disaster period. Only 3.1% of the respondents claim that they don't know regarding the pregnant women get sufficient nutritional food in their meal during and post cyclonic disaster period. Only 1.8% respondents admit that the pregnant women get sufficient nutritional food in the meal during and post cyclonic disaster period.

Table 8.2.6: Percentage distribution of respondents' perceptions regarding Breast feeding women get sufficient nutritional food during or post-cyclonic disaster period

| Breastfeeding women get sufficient nutritional food | Frequency | Percent |
|---|-----------|---------|
| Yes | 13 | 1.5 |
| No | 801 | 95.4 |
| Don't Know | 26 | 3.1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.6 portrays that the breast-feeding women get sufficient nutritional food in their meal during and post cyclonic disaster period. Almost all (95.4%) of the respondents claim that the breast-feeding women do not get sufficient nutritional food in their meal during and post cyclonic disaster period. Only 3.1% of the respondents claim that they don't know regarding the breast-feeding women get sufficient nutritional food in their meal during and post cyclonic disaster period. In contrast, only 1.5% of the respondents admit that the breast-feeding women get sufficient nutritional food in their meal during and post cyclonic disaster period.

Table 8.2.7: Percentage distribution of respondents' perceptions regarding adolescent girl gets sufficient nutritious food during or post-cyclonic disaster period

| Adolescent girls get sufficient nutritional food | Frequency | Percent |
|--|-----------|---------|
| Yes | 21 | 2.5 |
| No | 795 | 94.6 |
| Don't Know | 24 | 2.9 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.7 portrays that the adolescent girl gets sufficient nutritious food in their meal during and post cyclonic disaster period. Almost all (94.6%) of the respondents claim that the adolescent girl does not get sufficient nutritional food in their meal during and post cyclonic disaster period. Only 2.9% of the respondents claim that they don't know regarding the adolescent girl get sufficient nutritional food in their meal during and post cyclonic disaster period. On the contrary, only 2.5% of the respondents admit that the adolescent girl gets sufficient nutritional food in their meal during and post cyclonic disaster period.

Table 8.2.8: Percentage distribution of respondents' perceptions regarding pregnant/breast feeding women face iron deficiency during reproductive period

| Pregnant/breast feeding women face iron deficiency | Frequency | Percent |
|--|-----------|---------|
| Yes | 799 | 95.1 |
| No | 18 | 2.1 |
| Don't Know | 23 | 2.7 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.8 portrays that the pregnant or breast-feeding women face iron deficiency during reproductive period in the time of cyclonic disaster period. Almost all (95.1%) of the respondents claim that the pregnant or breast-feeding women face iron deficiency during reproductive period of onset and post cyclonic disaster period. On the contrary, only 2.1% of the respondents claim

that the pregnant or breast-feeding women do not face iron deficiency during reproductive period in the time of cyclonic disaster period. Besides, only 2.7% of the respondents admit that they do not know whether the pregnant or breast-feeding women face iron deficiency or not during reproductive period in the time of cyclonic disaster period.

Table 8.2.9: Percentage distribution of respondents’ perceptions regarding pregnant/breast feeding women carry underweight for getting in-sufficient nutritious food during reproductive period

| Pregnant/breast feeding women carry underweight for getting in-sufficient nutritious food | Frequency | Percent |
|---|-----------|---------|
| Yes | 774 | 92.1 |
| No | 38 | 4.5 |
| Don't Know | 28 | 3.3 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.9 displays that the pregnant or breast-feeding women carry underweight for getting in-sufficient nutritional food during reproductive period in the time of cyclonic disaster period. Almost all (92.1%) of the respondents claim that the pregnant or breast-feeding women carry underweight for getting in-sufficient nutritional food during reproductive period in the time of cyclonic disaster period. On the contrary, only 4.5% of the respondents claim that the pregnant or breast-feeding women do not carry underweight for getting in-sufficient nutritional food during reproductive period in the time of cyclonic disaster period. Besides, only 3.3% of the respondents admit that they do not know whether the pregnant or breast-feeding women face iron deficiency or not during reproductive period in the time of cyclonic disaster period.

Table 8.2.10: Have you known about getting your health rights

| Have you known about getting your health rights | Frequency | Percent |
|---|-----------|---------|
| Yes | 77 | 9.2 |
| No | 719 | 85.6 |
| Don't Know | 44 | 5.2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.10 portrays that the respondents get health rights during and post cyclonic disaster period. Almost 85.6% of the respondents claim that the respondents do not get health rights during and post cyclonic disaster period. Only 5.2% of the respondents claim that they don’t know

regarding the respondents get health rights during and post cyclonic disaster period. On the contrary, only 9.2% of the respondents admit that the respondents get health rights during and post cyclonic disaster period.

Table 8.2.11: Percentage distribution of respondents’ perceptions regarding women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR)

| Women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR) | Frequency | Percent |
|---|-----------|---------|
| Yes | 69 | 8.2 |
| No | 673 | 80.1 |
| Don't Know | 98 | 11.7 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.11 portrays that the women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR) during and post cyclonic disaster period. Almost 80.1% of the respondents claim that the women, adolescent girl, and pregnant women do not get sexual and reproductive health and rights (SRHR) during and post cyclonic disaster period. Only 11.7% of the respondents claim that they don’t know regarding the women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR) during and post cyclonic disaster period. On the contrary, only 8.2% of the respondents admit that women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR) during and post cyclonic disaster period.

Table 8.2.12: Percentage distribution of respondents’ perceptions regarding having water, sanitation and hygiene (WASH) facilities

| Having water, sanitation and hygiene (WASH) facilities | Frequency | Percent |
|--|-----------|---------|
| Yes | 137 | 16.3 |
| No | 660 | 78.6 |
| Don't Know | 43 | 5.1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.12 presents that the respondents have water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period. Majority (78.6%) of the respondents mention that the respondents do not have water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period. Only 5.1% of the respondents claim that they don’t know having water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period. On the contrary, only 16.3% of the respondents admit that the respondents have water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period.

Table 8.2.13: Percentage distribution of respondents' perceptions regarding pregnant, breastfeeding & menstruating women are at risk of health during and after disasters

| Pregnant, breastfeeding & menstruating women are at risk of health | Frequency | Percent |
|--|-----------|---------|
| Yes | 776 | 92.4 |
| No | 15 | 1.8 |
| Don't Know | 49 | 5.8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.13 portrays that the pregnant, breastfeeding and menstruation women are at risk of health during and post cyclonic disaster period. Almost all (92.4%) of the respondents claim that the pregnant, breastfeeding and menstruation women are at risk of health during and post cyclonic disaster period. On the contrary, only 1.8% of the respondents admit that the pregnant, breastfeeding and menstruation women are not at risk of health during and after disasters period. On the other hand, only 5.8% of the respondents claim that they don't know the pregnant, breastfeeding and menstruation women are at risk of health during and aftermath of disasters.

Table 8.2.14: Percentage distribution of respondents' perceptions regarding facing kinds of problem of women during cyclonic disasters

| Women facing problems in cyclone center | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Scarcity of suitable places for baby's breastfeeding | 754 | 11.9% | 89.8% |
| Scarcity of suitable places for changing proper sanitary materials | 796 | 12.5% | 94.8% |
| Do not get medical treatment | 814 | 12.8% | 96.9% |
| Health care access are found insufficient | 819 | 12.9% | 97.5% |
| The essential medical goods and services like contraceptives, birth control pills etc. are found insufficient | 802 | 12.6% | 95.5% |
| Increase the chance of sexually transmitted diseases | 50 | 0.8% | 6.0% |
| Absence of hygienic facilities for women | 802 | 12.6% | 95.5% |
| Lack of privacy at latrines are seen | 799 | 12.6% | 95.1% |
| Unavailability of separate toilets, showers, and tents for women, men and adolescent girls | 726 | 11.4% | 86.4% |
| Total | 6362 | 100.0% | 757.4% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 8.2.14 displays that the facing kinds of problem of women during and post disasters. About 89.8% and 94.8% of the respondents claim that women face the scarcity of suitable places for baby's breast feeding, and face the scarcity of suitable places for changing proper sanitary materials

respectively during and post disasters in cyclone shelters. In contrast, 96.9%, 97.5%, and 95.5% respondents admit that they do not get medical treatment, lack of healthcare access, and inadequate of the essential medical goods and services are found respectively during the onset and post disaster period. Moreover, 95.5%, 95.1%, and 86.4% of the respondents point out that hygienic facilities of women are absent, the lack of privacy at latrines, and unavailability of separate toilets, showers, tents for women, men and adolescent girls respectively during and post disasters in cyclone shelters. On the contrary, only 6% of the respondents mention that increase the chance of sexually transmitted disease are occurred during and post disasters in cyclone shelters.

Table 8.2.15: Percentage distribution of respondents’ perceptions regarding having drinking water during or post cyclonic disasters

| Having drinking water during or post cyclonic disasters | Frequency | Percent |
|---|-----------|---------|
| Yes | 249 | 29.6 |
| No | 587 | 69.9 |
| Don't Know | 4 | .5 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.15 presents that the respondents have drinking water facilities during and post cyclonic disaster period. More than two-third (69.9%) of the respondents claim that they do not have potable water facilities during and post cyclonic disaster period. Only 0.5% respondents claim that they don’t know having water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period. On the contrary, almost one-third 29.6% of the respondents admit that the respondents have drinking/potable water facilities during and post cyclonic disaster period.

Table 8.2.16: Percentage distribution of respondents’ perceptions regarding having proper sanitation facilities during or post cyclonic disasters

| Having proper sanitation facilities during or post cyclonic disasters | Frequency | Percent |
|---|-----------|---------|
| Yes | 153 | 18.2 |
| No | 686 | 81.7 |
| Don't Know | 1 | .1 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.16 presents that the respondents have proper sanitation facilities during and post cyclonic disaster period. About 81.7% of the respondents mention that they do not have proper sanitation facilities during and post cyclonic disaster period. Only 0.1% respondents claim that they don’t know having proper sanitation facilities while, only 18.2% of the respondents confess that the respondents have proper sanitation facilities during and post cyclonic disaster period.

Graph 8.2.1: Percentage distribution of respondents' perceptions regarding health or health care related information during or post cyclonic disasters

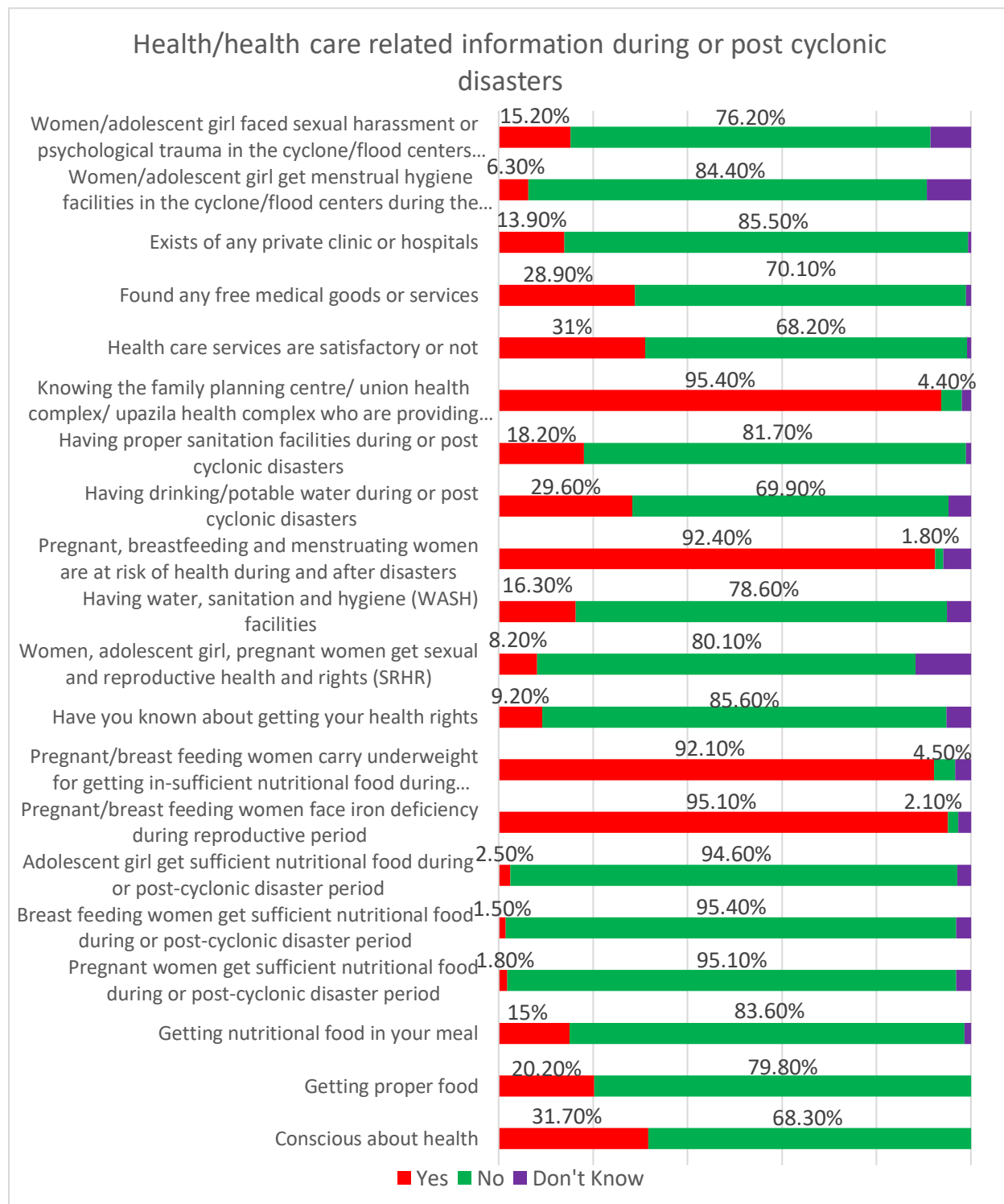


Table 8.2.17: Percentage distribution of respondents’ perceptions regarding condition of Residence/ Habitat

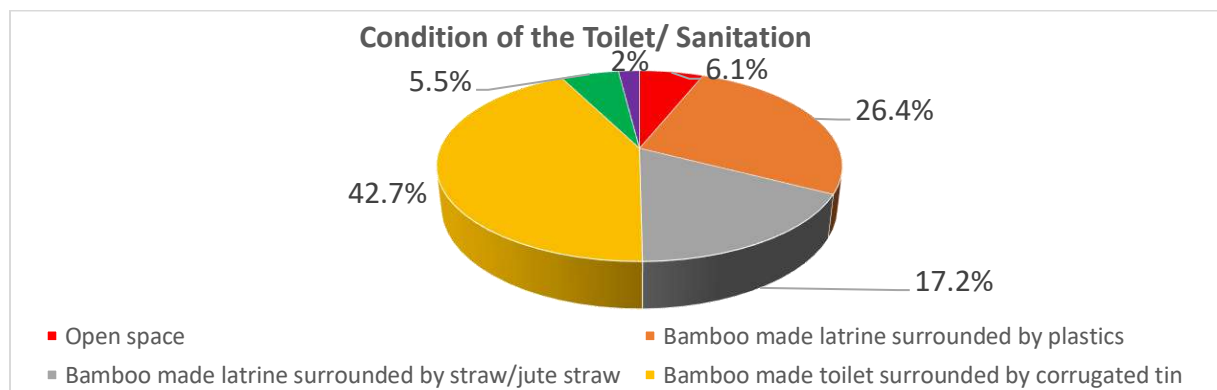
| Modes of Residence | Responses | | Percent of Cases |
|--------------------------------|-----------|---------|------------------|
| | N | Percent | |
| Filthy | 127 | 5.0% | 15.1% |
| Dusty and nasty | 337 | 13.4% | 40.1% |
| Extremely heated | 153 | 6.1% | 18.2% |
| Risky and unhygienic | 654 | 25.9% | 77.9% |
| Dirty and polluted environment | 452 | 17.9% | 53.8% |
| Toxic environment | 150 | 5.9% | 17.9% |
| Suffocating environment | 585 | 23.2% | 69.6% |
| Low height | 39 | 1.5% | 4.6% |
| Good | 27 | 1.1% | 3.2% |
| Total | 2524 | 100.0% | 300.5% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 8.2.17 shows the percentage distribution of respondents’ perceptions regarding conditions of the respondents’ residence/ habitat. More than three-fourth (77.9%) of the respondents mention that the condition of the residence is risky and unhygienic. Almost three-fourth (69.6%) of the respondents mention that their condition of the residence is suffocating environment. More than half (53.8%) of the total respondents note that their condition of the residence is dirty and polluted environment. Almost two-fifth (40.1%) of the respondents’ residence is dusty and nasty, and very few (15.1%, 18.2%, 17.9%, and 4.6%) of the respondents opine that the condition of their habitat is filthy, extremely heated, toxic environment, and low height houses respectively. On the contrary, only 3.2% of the respondents mention that their structural condition of residence/ habitat is good.

Graph 8.2.2: Percentage distribution of respondents’ condition of the sanitation



(Source: Field Survey, 2023)

Graph 8.2.2 shows the percentage distribution of respondents' perceptions regarding conditions of the toilet of respondents' house. Nearly half of the respondents (42.6%) opine that the condition of the toilet is bamboo made toilet surrounded by corrugated tin, and more than one-fourth (26.4%) of the respondent mention that the condition of the toilet is bamboo made latrine surrounded by plastics. But one-sixth (17.1%) of the respondents note that the structural condition of the toilet is latrine surrounded by straw/jute straw and a very few (6.1% and 2%) of the respondents opine that the structural condition of toilet is open space and hanging latrine respectively. Only 5.5% of the respondents opine that the structural condition of toilet is pucca latrine.

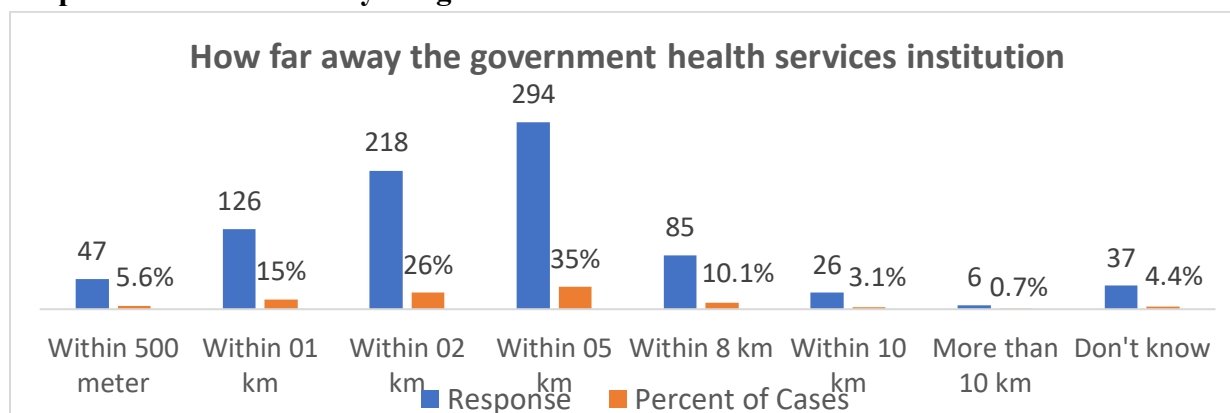
Table 8.2.18: Percentage distribution of respondents' perceptions regarding knowing the family planning center/ union health complex/ upazila health complex who are providing the health services

| Knowing the family planning center/ union/ upazila health complex | Frequency | Percent |
|---|-----------|---------|
| Yes | 801 | 95.4 |
| No | 37 | 4.4 |
| Don't Know | 2 | 0.2 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Regarding the question of knowing the family planning center/ union health complex/ upazila health complex who are providing the health services, almost all (95.2%) of the respondents said so. On the contrary, only 4.4% of the respondents said no regarding the question of knowing the family planning center/ union health complex/ upazila health complex who are providing the health services. Only 0.2% of the respondents claim that they do not know regarding the question of knowing the family planning center/ union health complex/ upazila health complex who are providing the health services.

Graph 8.2.3: How far away the government health services institution



(Source: Field Survey, 2023)

Majority (35%) of the respondents point out that the government health services institution is situated within 05 kilometers far from their houses. About 5.6% of the respondents express that the government health services institution exists within 500 meters far from their houses. Almost one-sixth (15%) of the respondents express that the government health services institution exists within 01 kilometer far from their houses. More than one-fourth (26%) of the respondents express that the government health services institution exists within 02 kilometers far from their houses. Only 10.1%, 3.1% and 0.7% of the respondents opine that the government health services institution is quite far away from their houses like within 08 km far, within 10 km far, and more than 10 km far respectively. On the contrary, only 4.4% of the respondents admit that they don't know where the government health services institution is existed in their territory or locality.

Table 8.2.19: Percentage distribution of respondents' perception regarding health care services are satisfactory or not

| Health care services are satisfactory or not | Frequency | Percent |
|--|-----------|---------|
| Yes | 260 | 31.0 |
| No | 573 | 68.2 |
| Don't Know | 7 | .8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.19 shows the perception of the respondents about the health care services are satisfactory or not. Almost one-third (31%) of the respondent mention that their health care services are quite satisfactory. On the contrary, 68.2% of the respondents noted that their health care services are not satisfactory. Some government health institution is very old, and its infrastructure is not good enough to well decorated. Sometimes, medical doctor and health care attendant or service providers are found insufficient. But the new centers are in good structural conditions with required facilities. On the other hand, only 0.8% of the respondents do not know whether the health care services exist or not in their territory.

Table 8.2.20: Percentage distribution of respondents' perception regarding found any free medical goods or services

| Getting free medical goods or services | Frequency | Percent |
|--|-----------|---------|
| Yes | 243 | 28.9 |
| No | 589 | 70.1 |
| Don't Know | 8 | 1.0 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.20 shows the perception of the respondents about the medical goods and services are found free or not. Almost one-third (28.9%) of the respondent mention that their medical goods and services are found free. On the contrary, 70.1% of the respondents noted that their required medical goods and services are not found free. On the other hand, only 1% of the respondents do not know whether the medical goods and services are found free or not in their territory.

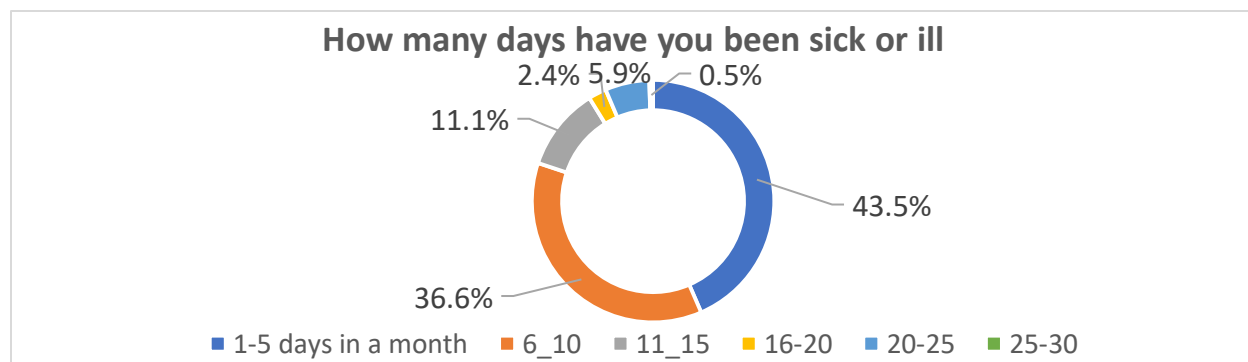
Table 8.2.21: Percentage distribution of respondents’ perception regarding exists of any private clinic or hospitals

| Exists of any private clinic or hospitals | Frequency | Percent |
|---|-----------|---------|
| Yes | 117 | 13.9 |
| No | 718 | 85.5 |
| Don't Know | 5 | .6 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.21 shows the existence of any private clinic or hospitals. Only 13.9% of the respondent mention that private clinic or hospitals exist in their territory. On the contrary, 85.5% of the respondents noted that private clinic or hospitals do not exist in their territory. On the other hand, only 0.6% of the respondents do not know whether the private clinic or hospitals exist or not in their territory.

Graph 8.2.4: Percentage distribution of respondents’ opinion about how many days have been sick



(Source: Field Survey, 2023)

Graph 8.2.4 shows the duration of sick and illness due to cyclonic disasters. Due to cyclonic disasters, 43.5% of the respondents claim that they suffer illness 1-5 days in a month, 36.6% of the respondents suffer illness 6-10 days in a month. On the other hand, 11% of the respondents claim that they suffer illness 11-15 days in a month. Furthermore, only (2.4%, 5.9 and 0.5%) of

the south west coastal respondents claim that they suffer illness 16-20 days in a month, 21-25 days in a month, and 26-30 days in a month respectively due to cyclonic disasters.

Table 8.2.22: Percentage distribution of respondents’ perception regarding women or adolescent girl get menstrual hygiene facilities in cyclone centers during disasters period

| Women or adolescent girl get menstrual hygiene facilities | Frequency | Percent |
|---|-----------|---------|
| Yes | 53 | 6.3 |
| No | 709 | 84.4 |
| Don't Know | 78 | 9.3 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.22 portrays that the women or adolescent girl get menstrual hygiene facilities in the cyclone/flood centers during and post cyclonic disaster period. A significant portion (84.4%) of the respondents claim that the women or adolescent girl do not get menstrual hygiene facilities in the cyclone/flood centers during and post cyclonic disaster period. Only 9.3% of the respondents claim that they don’t know regarding the women or adolescent girl get menstrual hygiene facilities in the cyclone/flood centers during and post cyclonic disaster period. On the contrary, only 6.3% of the respondents admit that women or adolescent girl get menstrual hygiene facilities in the cyclone/flood centers during and post cyclonic disaster period.

Table 8.2.23: Percentage distribution of respondents’ perception regarding women or adolescent girl faced sexual harassment or psychological trauma in the cyclone centers

| Women or adolescent girl faced sexual harassment or psychological trauma | Frequency | Percent |
|--|-----------|---------|
| Yes | 128 | 15.2 |
| No | 640 | 76.2 |
| Don't Know | 72 | 8.6 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.23 exhibits that the women or adolescent girl faced sexual harassment or psychological trauma or not in the cyclone/flood centers during and post cyclonic disaster period. A significant portion (76.2%) of the respondents claim that the women or adolescent girl do not face sexual harassment or psychological trauma in the cyclone/flood centers during and post cyclonic disaster period. Only 8.6% of the respondents claim that they don’t know regarding the women or adolescent girl faced sexual harassment or psychological trauma or not in the cyclone/flood centers during and post cyclonic disaster period. On the contrary, one-sixth (15.2%) of the respondents

admit that women or adolescent girl faced sexual harassment or psychological trauma in the cyclone/flood centers during and post cyclonic disaster period.

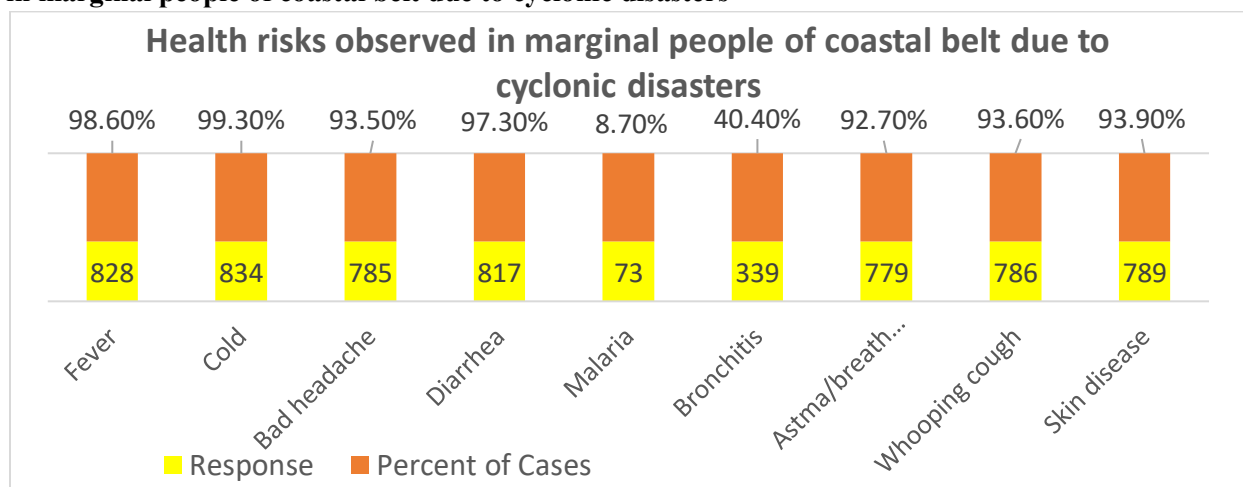
Table 8.2.24: Percentage distribution of respondents’ perception about adverse health implications of marginal people due to cyclonic disasters

| Adverse health implications of marginal people due to cyclonic disasters | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| High rates of diseases | 803 | 17.1% | 95.6% |
| Heat related illnesses and deaths | 548 | 11.7% | 65.2% |
| Extreme weather events –related health effects | 779 | 16.6% | 92.7% |
| Air pollution related health effects | 150 | 3.2% | 17.9% |
| Water and food borne diseases | 812 | 17.3% | 96.7% |
| Vector and rodent borne diseases | 799 | 17.0% | 95.1% |
| Mental, nutritional, infectious and other health effects | 805 | 17.1% | 95.8% |
| Other | 2 | 0.0% | 0.2% |
| Total | 4698 | 100.0% | 559.3% |

(Source: Field Survey, 2023) Multiple Responses*

Table 8.2.24 presents the adverse health implications of marginal people due to cyclonic disasters. Almost all (96.7%, 95.8%, 95.6%, 95.1% and 92.7% respectively) of the respondents claim that they suffer from various diseases like water and food borne diseases, mental, nutritional, infectious and other diseases, high rates of diseases, vector and rodent borne diseases and extreme weather events –related diseases in south west coastal Bangladesh due to cyclonic disasters. Almost two-third (65.2%) of the respondents suffer heat related illness and death due to cyclonic disasters. On the other hand, one-sixth (17.9%) of the respondents suffer air pollution related diseases.

Graph 8.2.5: Percentage distribution of respondents’ perception regarding health risks observed in marginal people of coastal belt due to cyclonic disasters



(Source: Field Survey, 2023) Multiple Responses*

Graph 8.2.5 presents the health risks observed in marginal people of coastal belt due to cyclonic disasters. Regarding the health risks observed in marginal people of coastal belt due to cyclonic disasters, almost all (98.6%, 99.3%, 93.5% 97.3%, 92.7%, 93.6% and 93.9%) of the total 840 respondents note that they suffer from fever, cold, bad headache, diarrhea, asthma/ breath taking problem, whooping cough and skin diseases health risks respectively. On the other hand, two-fifth (40.4%) of the respondents mention that they are at health susceptible of bronchitis. Only 8.7% of the south west coastal respondents point out that they suffer from malaria in these areas.

Table 8.2.25: Percentage distribution of respondents’ perception regarding people of cyclonic disaster-prone area get proper health care access or services

| Getting proper health care access or services | Frequency | Percent |
|---|-----------|---------|
| Yes | 9 | 1.1 |
| No | 823 | 98.0 |
| Don't Know | 8 | 1.0 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.25 portrays that the people of cyclonic disaster-prone area get proper health care access or services in the cyclone/flood centers or their houses during and post cyclonic disaster period. A significant portion (98%) of the respondents claim that the people of cyclonic disaster-prone area do not get proper health care access or services in the cyclone/flood centers or their houses during and post cyclonic disaster period. Only 1% respondent claims that they don’t know about the people of cyclonic disaster-prone area get proper health care access or services or not in the cyclone centers or their houses during and post cyclonic disaster period. On the contrary, only 1.1% of the respondents admit that people of cyclonic disaster-prone area get proper health care access or services in the cyclone/flood centers or their houses during and post cyclonic disaster period.

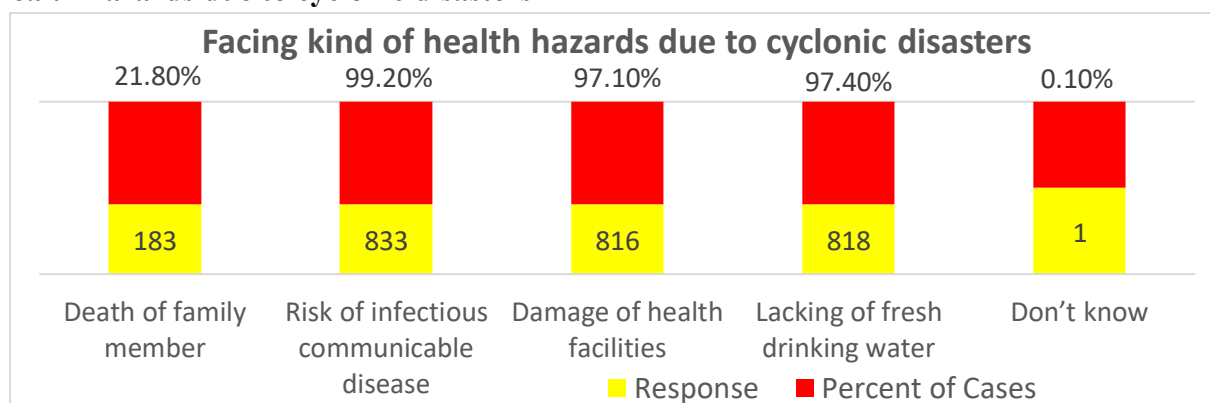
Table 8.2.26: Percentage distribution of respondents’ perception regarding pregnant women, neonatal baby, aged people, disable or chronic illness people of cyclonic disaster-prone area get proper health care access or services

| Pregnant women, neonatal baby, aged people, disable or chronic illness people of cyclonic disaster-prone area get proper health care access or services | Frequency | Percent |
|---|-----------|---------|
| Yes | 11 | 1.3 |
| No | 821 | 97.7 |
| Don't Know | 8 | 1.0 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.26 portrays that the pregnant women, neonatal baby, aged people, disable or chronic illness people get proper health care access or services in the cyclone centers during and post cyclonic disaster. Almost all (97.7%) of the respondents claim that the pregnant women, neonatal baby, aged people, disable or chronic illness people do not get proper health care access or services in the cyclone/flood centers during and post cyclonic disaster period. Only 1% of the respondents claim that they don't know regarding the pregnant women, neonatal baby, aged people, disable or chronic illness people get proper health care access or services or not in the cyclone/flood centers during and post cyclonic disaster period. On the contrary, only 1.3% respondents admit that the pregnant women, neonatal baby, aged people, disable or chronic illness people get proper health care access or services in the cyclone/flood centers during and post cyclonic disaster period.

Graph 8.2.6: Percentage distribution of respondents' perception regarding facing kind of health hazards due to cyclonic disasters



(Source: Field Survey, 2023)

Multiple Responses*

During disaster and aftermath of disaster, the people of the southwest coastal area face several kinds of health hazards due to cyclonic disasters. Among these, almost all or significant portion (97.4%) of the respondents said that there is lack of fresh drinking water, almost all (99.2%) of the respondents claim that cyclonic disasters affect the risk of infectious communicable disease, almost all (97.1%) of the respondents claim that cyclonic disasters damage the health facilities and even almost one-fourth (21.8%) of the respondents confess that they loss their family members due to cyclonic disasters.

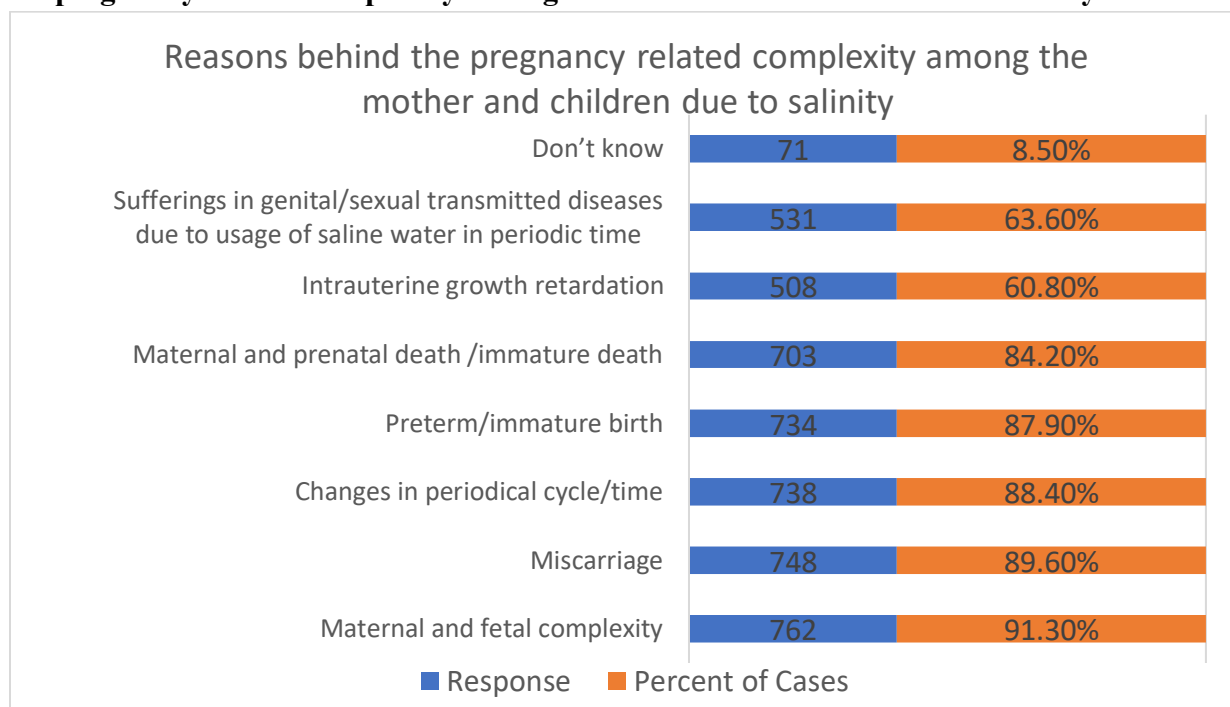
Table 8.2.27: Percentage distribution of respondents’ perception regarding adverse health implications due to cyclonic disasters in coastal belt

| Adverse health implications due to cyclonic disasters in coastal belt | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Hypertension/blood pressure | 747 | 10.3% | 88.9% |
| Stroke/heat disease | 779 | 10.8% | 92.7% |
| Heart disease/failure reverse effect on expecting mother and their children lime pre-eclampsia | 694 | 9.6% | 82.6% |
| Multiorgan disorder | 211 | 2.9% | 25.1% |
| Osteoporosis | 3 | 0.0% | 0.4% |
| Cold | 394 | 5.5% | 46.9% |
| Prevalence of diarrhea | 750 | 10.4% | 89.3% |
| Hyponatraemia due to dehydration | 23 | 0.3% | 2.7% |
| Feel physical irritation and hazards due to saline water in the paddy fields, fishing & other agricultural work | 658 | 9.1% | 78.3% |
| Spread of water borne diseases like cholera, dysentery, jaundice | 768 | 10.6% | 91.4% |
| Malnutrition leading kwashiorkor and marasmus | 37 | 0.5% | 4.4% |
| Prevalence of skin diseases like itch, boil/blister | 568 | 7.9% | 67.6% |
| Pregnancy related complexity | 803 | 11.1% | 95.6% |
| Respiratory illness such as asthma, stomach cancer and obesity | 778 | 10.8% | 92.6% |
| Don’t know | 7 | 0.1% | 0.8% |
| Total | 7220 | 100.0% | 859.5% |

(Source: Field Survey, 2023) Multiple Responses*

Cyclonic disasters create adverse health implications during and post disasters. A significant portion 88.9%, 92.7%, 82.6%, 46.9%, 89.3%, 78.3%, 91.4%, 67.6%, 95.6%, and 92.6% of the respondents claim that they face hypertension, stroke/heat disease, heart diseases, cold, diarrhea, physical irritation, water borne diseases, skin diseases, pregnancy related complicacy, and respiratory illness such as asthma, stomach cancer and obesity respectively due to cyclonic disasters. One fourth (25.1%) of the respondents claim that cyclonic disasters create multiorgan disorder of their health.

Graph 8.2.7: Percentage distribution of respondents' perception regarding reasons behind the pregnancy related complexity among the mother and children due to salinity



(Source: Field Survey, 2023) Multiple Responses*

Graph 8.2.7 shows the various reasons behind the pregnancy related complexity among the mother and children due to salinity. The significant portion (91.3%) of the respondents mention that maternal and fetal complexity arises due to salinity. The various pregnancy related complexity among the mother and children like miscarriage, changes in periodical cycle/time, preterm/immature birth, maternal and prenatal death/immature death are occurred due to salinity and these types of problem mentioned about 89.6%, 88.4%, 87.9%, and 84.2% of the respondents respectively. Furthermore, three-fifth (60.8%) of the respondents note that intrauterine growth retardation arises due to salinity. Besides, almost two-third (63.6%) of the respondents claim that sufferings in genital/sexual transmitted diseases of women and adolescent girls are occurred due to usage of saline water in periodic time. On the contrary, only 8.5% of the respondents admit that they do not know the reasons behind the pregnancy related complexity among the mother and children due to salinity or cyclonic disasters.

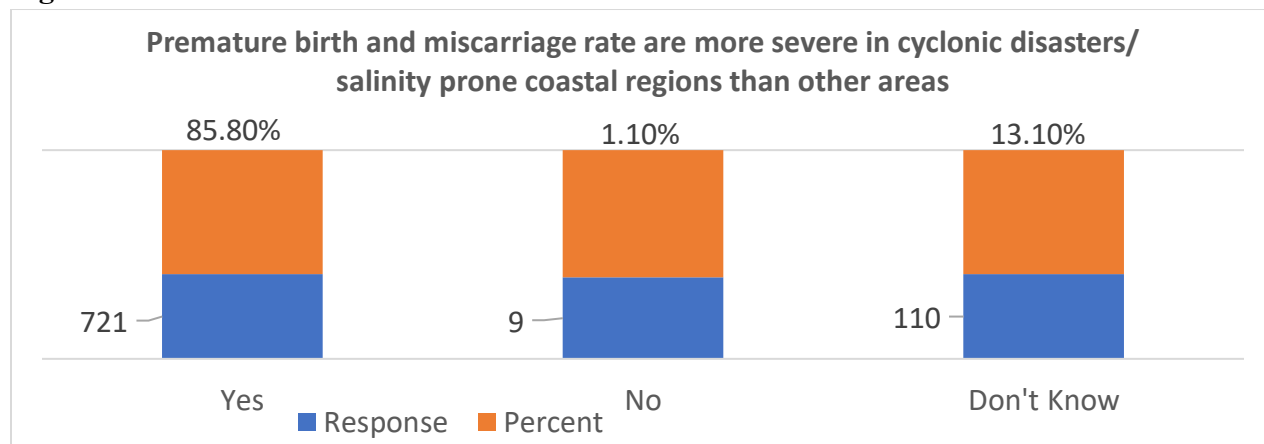
Table 8.2.28: Salinity is responsible for abnormal growth/mental retardation of a child

| Salinity is responsible for abnormal growth/mental retardation of a child | Frequency | Percent |
|---|-----------|---------|
| Yes | 727 | 86.5 |
| No | 5 | .6 |
| Don't Know | 108 | 12.9 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 8.2.28 displays the abnormal growth/mental retardation of a child due to salinity or cyclonic disasters. There is a significant portion of the respondents (86.5%) claim that the abnormal growth/mental retardation of child are observed more in salinity prone coastal regions than other areas and these are happened due to salinity or cyclonic disasters. On the contrary, only 0.6% of the respondents claim that the abnormal growth/mental retardation of child are not observed severely in salinity prone coastal regions than other areas. On the other hand, 12.9% of the respondents claim that they don't know about the abnormal growth/mental retardation of child are observed more or not in salinity prone coastal regions than other areas due to salinity or cyclonic disasters.

Graph 8.2.8: Premature birth and miscarriage rate are more severe in salinity prone coastal regions than other areas

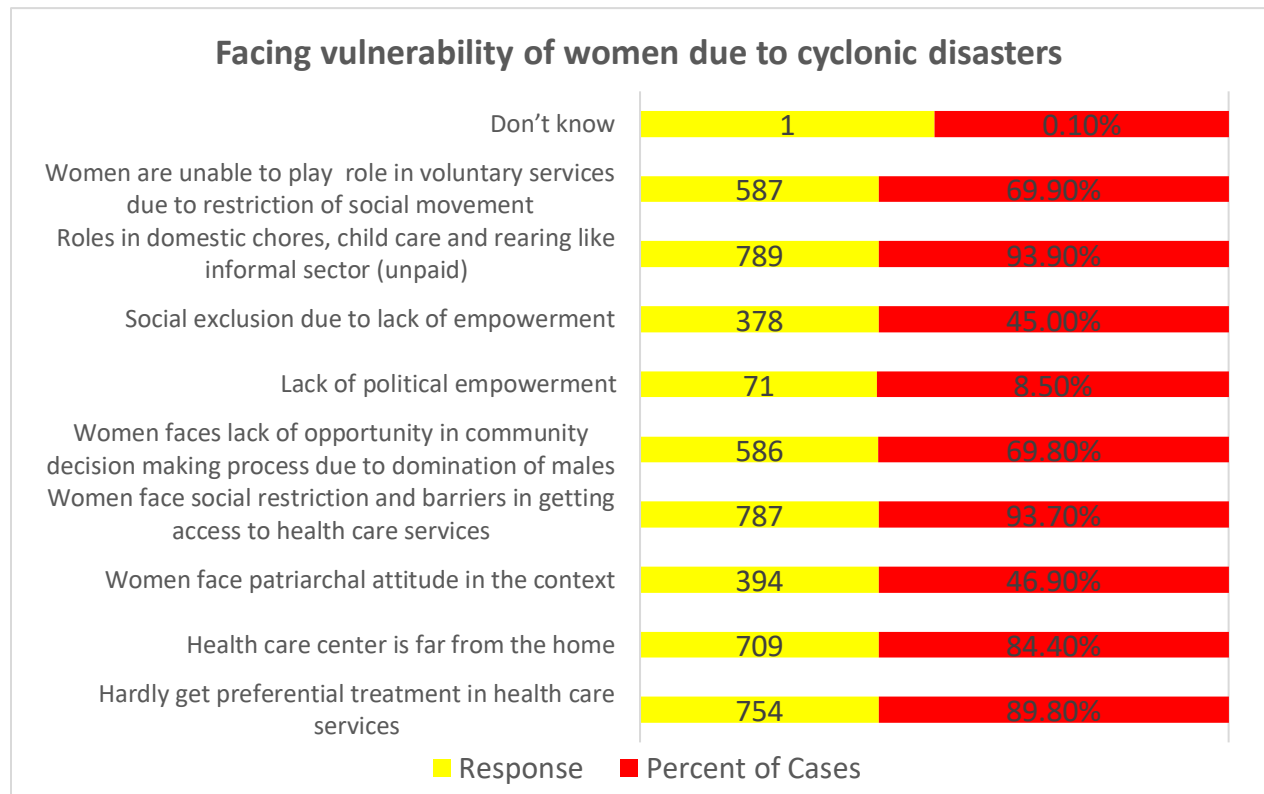


(Source: Field Survey, 2023)

The above graph displays the prevalence of premature birth and miscarriage due to salinity or cyclonic disasters. There is a significant portion of the respondents (85.8%) claim that the premature birth and miscarriage are more severe in salinity prone coastal regions than other areas and these are happened due to salinity or cyclonic disasters. On the contrary, only 1.1% of the respondents claim that the premature birth and miscarriage are not observed severely in salinity

prone coastal regions than other areas. On the other hand, 13.1% of the respondents claim that they don't know about the prevalence rate of the premature birth and miscarriage are more severe or not in salinity prone coastal regions than other areas.

Graph 8.2.9: Percentage distribution of female respondents faced various challenges



(Source: Field Survey, 2023) Multiple Responses*

Graph 8.2.9 portrays the facing vulnerability of women due to cyclonic disasters. About 93.7% of the respondents express that women face social restriction and barriers in getting access to health care services, about 89.8% of the respondents point out that they hardly get preferential treatment in health care services, about 93.9% of the respondents mention that their roles in domestic chores, child care and rearing include in informal sectors or sometimes even unpaid, about 84.4% of the respondents note that health care center is far from their home. Almost two-third (69.9%) of the respondents claim that women are unable to play role in voluntary services due to restriction of social movement. Almost half (46.9% and 45%) of the total respondents admit that women face patriarchal attitude in the context and socially excluded due to lack of empowerment respectively. Only 8.5% of the respondents express that women face vulnerability/ deprived situation because of lack of political empowerment and due to cyclonic disasters.

Table 8.2.29: Association between cyclonic disasters and various health vulnerability indicators through Pearson Chi-Square (χ^2) Tests

| Pearson Chi-Square (χ^2) Tests | | | | | | |
|--|---|--------------------|-----------|-------|-------|--------------------------------------|
| | | Cyclonic Disasters | | | | P-value |
| | | Cyclone | Salinity | Tidal | Flood | |
| | | Count | Intrusion | Surge | Count | |
| Geographic area | Shyamnagar | 105 | 105 | 100 | 105 | .024* $\chi^2 = 44.72$ Df = 28 |
| | Ashashuni | 105 | 102 | 101 | 105 | |
| | Koyra | 105 | 105 | 102 | 105 | |
| | Dacope | 105 | 104 | 102 | 105 | |
| | Patharghata | 105 | 105 | 105 | 103 | |
| | Betagi | 105 | 102 | 105 | 105 | |
| | Charfassion | 105 | 100 | 105 | 104 | |
| | Tajumuddin | 105 | 105 | 105 | 105 | |
| Division-based area | Khulna | 420 | 416 | 405 | 420 | .001* $\chi^2 = 19.63$ Df = 4 |
| | Barishal | 420 | 412 | 420 | 417 | |
| Vulnerability | Economically | 840 | 828 | 825 | 837 | 0.066 $\chi^2 = 35.13$ Df = 24 |
| | Socially | 748 | 740 | 736 | 745 | |
| | Physically | 117 | 113 | 112 | 117 | |
| | Psychology | 814 | 803 | 799 | 811 | |
| | Culturally | 57 | 55 | 56 | 56 | |
| | Health | 819 | 809 | 805 | 816 | |
| Getting proper health care services | No | 823 | 811 | 810 | 820 | .001* $\chi^2 = 25.45$ Df = 8 |
| | Yes | 9 | 9 | 9 | 9 | |
| | Don't know (People of cyclonic disaster-prone area) | 8 | 8 | 6 | 8 | |
| Getting proper health care services | No | 821 | 809 | 809 | 818 | .000* $\chi^2 = 65.45$ Df = 8 |
| | Yes | 11 | 11 | 10 | 11 | |
| | Don't know (Pregnant women, neonatal baby, aged, disable or chronic illness people of cyclonic disaster-prone area) | 8 | 8 | 6 | 8 | |
| Carry underweight for getting in-sufficient nutritional food | No | 38 | 38 | 35 | 37 | .042* $\chi^2 = 16.05$ Df = 8 |
| | Yes | 774 | 762 | 763 | 772 | |
| | Don't know (pregnant/breast feeding women carry underweight for getting in-sufficient nutritional food during reproductive period in your cyclonic disasters prone area) | 28 | 28 | 27 | 28 | |
| Residence condition | Filthy | 127 | 125 | 126 | 126 | 0.168 $\chi^2 = 44.02$ Df = 36 |
| | Dusty and nasty | 337 | 333 | 331 | 334 | |
| | Extremely heated | 153 | 152 | 150 | 152 | |
| | Risky and unhygienic | 654 | 646 | 645 | 651 | |
| | Dirty and polluted environment | 452 | 450 | 444 | 449 | |

| | | | | | | |
|-------------------------|---|-----|-----|-----|-----|--------------------------------------|
| | Toxic environment | 150 | 149 | 148 | 150 | |
| | Suffocating environment | 586 | 578 | 577 | 584 | |
| | Low height | 39 | 39 | 38 | 39 | |
| | Good | 27 | 24 | 27 | 27 | |
| Condition of the toilet | Open space | 51 | 51 | 51 | 51 | 0.449 $\chi^2=20.14$ Df = 20 |
| | Bamboo made latrine surrounded by plastics | 222 | 217 | 216 | 221 | |
| | Bamboo made latrine surrounded by straw/jute straw | 144 | 143 | 144 | 144 | |
| | Bamboo made toilet surrounded by corrugated tin | 358 | 355 | 349 | 356 | |
| | Pucca latrine | 46 | 43 | 46 | 46 | |
| | High commode toilet | 0 | 0 | 0 | 0 | |
| | Hanging Latrine | 17 | 17 | 17 | 17 | |
| Kinds of problems | Scarcity of suitable places for baby's breastfeeding | 754 | 743 | 739 | 751 | 0.465 $\chi^2=36.07$ Df = 36 |
| | Scarcity of suitable places for changing proper sanitary materials | 796 | 786 | 783 | 794 | |
| | Scarcity Do not get medical treatment | 814 | 803 | 799 | 811 | |
| | Health care access are found insufficient | 819 | 807 | 804 | 816 | |
| | The essential medical goods and services like contraceptives, birth control pills etc. Are found insufficient | 802 | 791 | 787 | 799 | |
| | Increase the chance of sexually transmitted diseases | 50 | 48 | 50 | 50 | |
| | Absence of hygienic facilities for women & girls | 802 | 793 | 788 | 799 | |
| | Lack of privacy at latrines are seen | 799 | 788 | 784 | 796 | |
| | Unavailability of separate toilets, showers, and tents for women, men and adolescent girls | 726 | 715 | 711 | 723 | |
| Health implication | High rates of diseases | 803 | 791 | 789 | 801 | .000* $\chi^2 = 28.77$ Df = 8 |
| | Heat related illnesses and deaths | 548 | 538 | 535 | 546 | |
| | Extreme weather events –related health effects | 779 | 767 | 768 | 777 | |
| | Air pollution related health effects | 150 | 144 | 144 | 148 | |
| | Water and food borne diseases | 812 | 801 | 799 | 809 | |
| | Vector and rodent borne diseases | 799 | 788 | 788 | 796 | |
| | Mental, nutritional, infectious and other health effects | 805 | 793 | 791 | 802 | |
| Health risks | Fever | 828 | 816 | 813 | 826 | .012* $\chi^2 = 57.79$ Df = 36 |
| | Cold | 834 | 822 | 819 | 831 | |
| | Bad headache | 785 | 775 | 771 | 782 | |
| | Diarrhea | 817 | 805 | 802 | 814 | |
| | Malaria | 73 | 71 | 70 | 73 | |
| | Bronchitis | 339 | 335 | 331 | 339 | |
| | Astma/breath taking problem | 779 | 769 | 768 | 776 | |

| | | | | | | |
|------------------------------|---|-----|-----|-----|-----|---------------------------------------|
| | Whooping cough | 786 | 776 | 774 | 783 | |
| | Skin disease | 789 | 780 | 775 | 786 | |
| Health hazard | Death of family member | 183 | 181 | 175 | 182 | 0.392 $\chi^2 = 16.90$ Df = 16 |
| | Risk of infectious communicable disease | 833 | 821 | 818 | 830 | |
| | Damage of health facilities | 816 | 804 | 803 | 813 | |
| | Lacking of fresh drinking water | 818 | 806 | 803 | 815 | |
| Adverse health complication | Hypertension/blood pressure | 747 | 740 | 732 | 744 | .000* $\chi^2 = 114.52$ Df = 56 |
| | Stroke/heat disease | 779 | 769 | 766 | 776 | |
| | Heart disease/failure reverse effect on expecting mother and their children lime pre-eclampsia | 694 | 688 | 680 | 692 | |
| | Multiorgan disorder | 211 | 209 | 206 | 211 | |
| | Osteoporosis | 3 | 3 | 3 | 3 | |
| | Cold | 394 | 390 | 393 | 391 | |
| | Prevalence of diarrhea | 750 | 742 | 738 | 747 | |
| | Hyponatraemia due to dehydration | 23 | 22 | 23 | 23 | |
| | Feel physical irritation and hazards due to saline water in the paddy fields, fishing & other agricultural work | 658 | 652 | 647 | 655 | |
| | Spread of water borne diseases like cholera, dysentery, jaundice | 768 | 760 | 753 | 765 | |
| | Malnutrition leading kwashiorkor and marasmus | 37 | 36 | 35 | 37 | |
| | Prevalence of skin diseases like itch, boil/blister | 568 | 560 | 565 | 565 | |
| | Pregnancy related complexity | 803 | 793 | 790 | 800 | |
| | Respiratory illness such as asthma, stomach cancer and obesity | 778 | 770 | 765 | 775 | |
| Pregnancy related complicity | Maternal and fetal complexity | 762 | 750 | 747 | 760 | .001* $\chi^2 = 56.98$ Df = 28 |
| | Miscarriage | 748 | 736 | 736 | 746 | |
| | Changes in periodical cycle/time | 738 | 728 | 724 | 736 | |
| | Preterm/immature birth | 734 | 723 | 722 | 732 | |
| | Maternal and prenatal death /immature death | 703 | 693 | 692 | 701 | |
| | Intrauterine growth retardation | 508 | 503 | 495 | 507 | |
| | Sufferings in genital/sexual transmitted diseases due to usage of saline water in periodic time | 531 | 526 | 518 | 530 | |
| Women face vulnerability | Hardly get preferential treatment in health care services | 754 | 744 | 744 | 751 | .000* $\chi^2 = 80.62$ Df = 36 |
| | Health care center is far from the home | 710 | 701 | 697 | 707 | |
| | Women face patriarchal attitude in the context | 393 | 385 | 389 | 391 | |
| | Women face social restriction and barriers in getting access to health care services | 787 | 777 | 777 | 784 | |

| | | | | | | |
|--|---|-----|-----|-----|-----|------------------------------------|
| | Women faces lack of opportunity in community decision making process due to domination of males | 586 | 581 | 575 | 584 | |
| | Lack of political empowerment | 71 | 71 | 66 | 70 | |
| | Social exclusion due to lack of empowerment | 378 | 377 | 372 | 376 | |
| | Roles in domestic chores, child care and rearing like informal sector (unpaid) | 789 | 780 | 775 | 786 | |
| | Women are unable to play role in voluntary services due to restriction of social movement | 587 | 579 | 572 | 585 | |
| Cyclone & salinity is responsible for child growth retardation | No | 5 | 4 | 4 | 5 | .001* $\chi^2 = 27.41$ Df =8 |
| | Yes | 727 | 716 | 717 | 725 | |
| | Don't know | 108 | 108 | 104 | 107 | |

(Source: Field Survey, 2023)

Multiple Responses*

8.4 Presenting result in APA 6th Style of chi-square test (χ^2)

Pearson chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=28, N=840) =44.72, $p<0.05$ (0.024*) indicating that there is a relationship between occurring cyclonic disasters and geographical area. Another chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to division based geographical area. The chi-square test (χ^2) was statistically significant, χ^2 (df=4, N=840) =19.63, $p<0.05$ (0.001*) indicating that there is a relationship between occurring cyclonic disasters and division categorized geographical area.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to various hardships like economic, social, psychological, cultural and health vulnerabilities. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=24, N=840) =35.13, $p>0.05$ (0.066) indicating that there is no association between cyclonic disasters and vulnerabilities. But it is apparently said from the response of participants, cyclonic disasters exacerbate the various vulnerabilities of southwest coastal communities including economic, social, psychological, cultural and health vulnerabilities.

To test the association of the people the community getting proper health care services and the cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=8, N=840) =25.45, $p<0.05$ (0.001*) indicating that

there is an association between cyclonic disasters and getting proper health care services of southern coastal communities.

Regarding the pregnant women, neonatal baby, aged people, disable or chronic illness people of cyclonic disaster-prone area get proper health care services by cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =65.45, $p<0.05$ (0.000*) indicates that there is a relationship between the pregnant women, neonatal baby, aged people, disable or chronic illness people of cyclonic disaster-prone area get proper health carer services and occurring of cyclonic disasters.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the pregnant/breast feeding women carry underweight for getting in-sufficient nutritional food during reproductive period due to cyclonic disasters. The chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =16.05, $p<0.05$ (0.042*) indicating that there is a relationship between occurring cyclonic disasters and the pregnant/breast feeding women carry underweight for getting in-sufficient nutritional food during reproductive period.

Pearson chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to residence condition. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=36, N=840) =44.02, $p>0.05$ (0.168) indicating that there is no relation between occurring cyclonic disasters and condition of residence. But descriptive statistics show that cyclonic disasters promote the adversity of residence condition aftermath of disasters.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters were related to sanitation/ toilet condition. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=20, N=840) =20.14, $p>0.05$ (0.449) indicating that there is no relation between occurring cyclonic disasters and condition of toilet facilities. But descriptive statistics show that due to cyclonic disasters the adversity of sanitation facilitates jeopardize the health system and exacerbate the health risks and diseases aftermath of disasters.

To test the association of cyclonic disasters and the community facing at risks in cyclone shelter and homes, a chi-square test (χ^2) for independence with $\alpha=0.05$ has been used. The chi-square test (χ^2) is statistically insignificant, χ^2 (df=36, N=840) =36.07, $p>0.05$ (0.465) indicates that cyclonic disasters and community facing at numerous risks in cyclone shelter are not associated.

Whether people are adversely health complicated in coastal belt due to cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. Chi-square test (χ^2) was statistically

significant, χ^2 (df=28, N=840)=28.77, $p<0.05$ (0.000*) indicates that there exists positive relation between occurring cyclonic disasters and adverse health implications of various diseases.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters trigger the health risks in coastal belt. The chi-square test (χ^2) was statistically significant, χ^2 (df=36, N=840) =57.79, $p<0.05$ (0.012*) indicating that there exists a positive relationship between occurring cyclonic disasters and adverse health risks of various diseases.

To test the association of health hazards facing by the cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=16, N=840) =16.90, $p>0.05$ (0.392) indicating that there is no association between cyclonic disasters and health hazard the community facing. But from the response of fieldwork participants, it is observed that cyclonic disasters exacerbate the health vulnerabilities.

Regarding the association between cyclonic disasters and adverse health implications of the community, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=56, N=840) =114.52, $p<0.05$ (0.000*) indicates that there is an association between cyclonic disasters and negative health implications of the community.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the cyclonic disasters trigger the pregnancy related complexity among the mother and children. The chi-square test (χ^2) was statistically significant, χ^2 (df=28, N=840) =56.98, $p<0.05$ (0.001*) indicating that there exists an association between occurring cyclonic disasters and the pregnancy related complexity among the mother and children.

Whether the association between cyclonic disasters and women facing vulnerability, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=36, N=840) =80.62, $p<0.05$ (0.000*) indicating that there exists an association between occurring cyclonic disasters and women facing vulnerability.

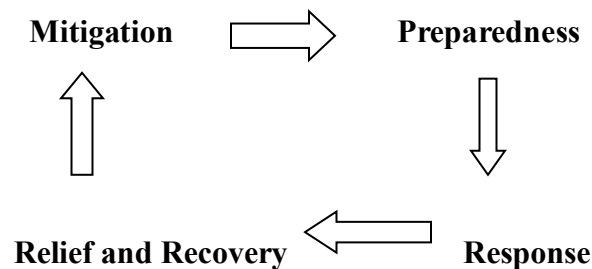
Regarding the cyclone & salinity is responsible for child growth retardation, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=8, N=840) =27.41, $p<0.05$ (0.001*) showed that there is an association between occurring cyclonic disasters and child growth retardation.

So, finally it can be said that cyclonic disasters exacerbate the health vulnerability of southern coastal community.

Chapter Nine: Disaster Preparedness and Management

9.1 Disaster Preparedness and Management

The significant number of poor people resides in the southern coastal prone vulnerable areas in Bangladesh. The vulnerability is so deplorable that the community have to go and settle in the newly accreted land in Bay of Bengal and its surrounding areas which is occasionally hit by tidal bore or devastating cyclone. On realization of this reality and considering the existing disaster risks as well as community resilience, the Government of Bangladesh, the Ministry of Disaster Management and Relief (MoDMR) formulate policies, prepare plans, and monitor and coordinate all aspects of disaster activities like disaster reduction through disaster management. Management means preparing for, mitigating and managing all activities that can reduce impact, save lives, recover normalcy, and rehabilitate communities (The Commonwealth of Learning, 2004). Disaster management is the process of forming common objectives and common values in order to encourage stakeholders to plan for and deal with potential and actual disasters (Pearce et al, 1993). The process of emergency management is a cycle of four phases for each event which is shown here.



Mitigation: Mitigation is the term that use of strategies to reduce risks prior to, during, and post disaster. It is related to short-term and long-term measures; for instance, preventing or reducing risk to property or lives by developing the capacities of people and strengths of habitats, infrastructure, and critical facilities (The Commonwealth of Learning, 2004). Thus, mitigation is called prevention or risk reduction, but often considered the “cornerstone of disaster management” (FEMA, 2005), while the other components of the disaster management cycle (preparedness, response, and recovery) are performed in reaction to hazards or in anticipation of their consequences (Coppola 2011, Rahman et al, 2017).

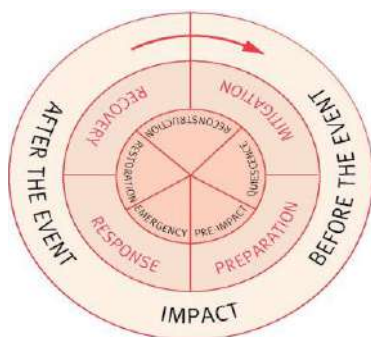
Preparedness: Preparedness is the way of reducing the adverse effects of a hazard through precautionary actions and measures. It entails a series of actions to ensure speedy, effective, and

efficient organization and delivery of relief and related responses following the onset of sudden disaster (The Commonwealth of Learning, 2004, Rahman et al, 2017). Generally, it refers to building an emergency response capability before disasters occur, to facilitate effective and efficient response (Rahman et al, 2017, Mileti).

Response: Response is the warning phase in which the actions taken immediately before, during, and after a disaster that can help save lives, minimize damage to property, and enhance effectiveness of recovery (Rahman et al, 2017, Mileti). Therefore, Response is actions and capability to react to the sudden onset of a disaster under stress, uncertainty, various constraints, and limited resources. Timing is very crucial during the response period (Rahman et al, 2017).

Relief and Recovery: Relief and recovery is the fourth phase of disaster management where the step is taken immediately following a disaster or during the slow onset of a severe impact require exceptional measures to save and sustain the lives of survivors and meet their basic needs until normalcy is restored. These measures involve fulfilling basic needs of shelter, protection, water, food, and medical facilities. This phase could form a part of the response period as well as recovery period (The Commonwealth of Learning, 2004). Recovery is also a post-disaster phase where actions are taken to comeback the situation to normal which depends on the intensity of disaster and the magnitude of its impacts. Sometimes it may take a long time. Recovery includes the rehabilitation, restoration of economic activities, livelihoods, infrastructure services, basic living conditions, medical treatments, and reconstruction of damaged properties and shelters (The Commonwealth of Learning, 2004, Rahman et al, 2017).

Fig 9.1: The Disaster Management Cycle



(Source: Coppola, 2011)

The Government of Bangladesh has formulated a set of mechanisms and taken a number of significant steps during the last few years for building up institutional arrangements like as top-down approach from national to the union levels for effective and systematic disaster management

and facilitating mitigation to the sufferings of disaster victims in Bangladesh. It is necessary to maintain proper coordination amongst the concerned Ministries, departments, line agencies, Local Government Body (LGD) and community people, and to ensure their proper functioning to resilient or to mitigate sufferings of the people.

9.2 Data Analysis, Interpretation and Findings of the Quantitative Study

Table 9.2.1: Percentage distribution of respondents’ perception regarding having technical knowledge about coping mechanism of disaster response and risk reduction

| Having technical knowledge about coping mechanism of disaster response and risk reduction | Frequency | Percent |
|---|-----------|---------|
| Yes | 362 | 43.1 |
| No | 248 | 29.5 |
| Slightly | 198 | 23.6 |
| Don’t know | 32 | 3.8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 9.2.1 shows that majority (43.1%) of the respondents have technical knowledge about coping mechanism of disaster response and risk reduction. Almost one-third (29.5%) of the respondents do not have that knowledge, about 23.6% of the respondents have slightly technical knowledge. In contrast, only 3.8% of the respondents do not even know what is technical knowledge and they do not have that knowledge regarding coping mechanism of disaster response and risk reduction.

Table 9.2.2: Percentage distribution of respondents’ perception regarding technical knowledge known and implied by

| Respondents’ perception regarding technical knowledge known and implied by | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Database management | 301 | 22.3% | 37.7% |
| Management information system | 199 | 14.8% | 24.9% |
| Decision support system | 430 | 31.9% | 53.8% |
| Geographical information system | 127 | 9.4% | 15.9% |
| None | 292 | 21.6% | 36.5% |
| Total | 1349 | 100.0% | 168.8% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 9.2.2 shows the various modes of technical knowledge/ technologies by which the respondents know the disaster risk, response and risk reduction. Majority (53.8%) of the respondents knows the technical knowledge/ technology by decision support system from the

relatives, neighbors and surroundings, almost two-fifth (37.7%) of the respondents know the technical knowledge/ technology through database management from the radio communication system, remote sensing etc., about 24.9% of the participants know via management information system and almost one-sixth or only 15.9% of the respondents know the disaster risk, response and risk reduction of technical knowledge/ technology through geographical information system (GIS). The community of coastal areas know the mechanism of disaster risk, response and risk reduction through these technologies. But it is about 36.5% who do not know about any of these technologies those are detecting the various disasters and their intensity and severity of disaster risk and loss and damages.

Table 9.2.3: Percentage distribution of respondents’ perception regarding having vocational knowledge about coping mechanism of disaster response and risk reduction

| Having vocational knowledge about coping mechanism of disaster response and risk reduction | Frequency | Percent |
|--|-----------|---------|
| Yes | 309 | 36.8 |
| No | 258 | 30.7 |
| Slightly | 199 | 23.7 |
| Don’t know | 74 | 8.8 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 9.2.3 portrays that more than one-third (36.8%) of the respondents have vocational knowledge about coping mechanism of disaster response and risk reduction. Almost one-third (30.7%) respondents do not have that knowledge, about 23.7% respondents have slightly some vocational knowledge about coping mechanism of disaster risk, response and risk reduction. Only 8.8% of the respondents do not even know what is vocational knowledge and they do not have that knowledge regarding coping mechanism of cyclonic disaster risk, response and risk reduction.

Table 9.2.4: Respondents’ perception regarding vocational knowledge known and implied

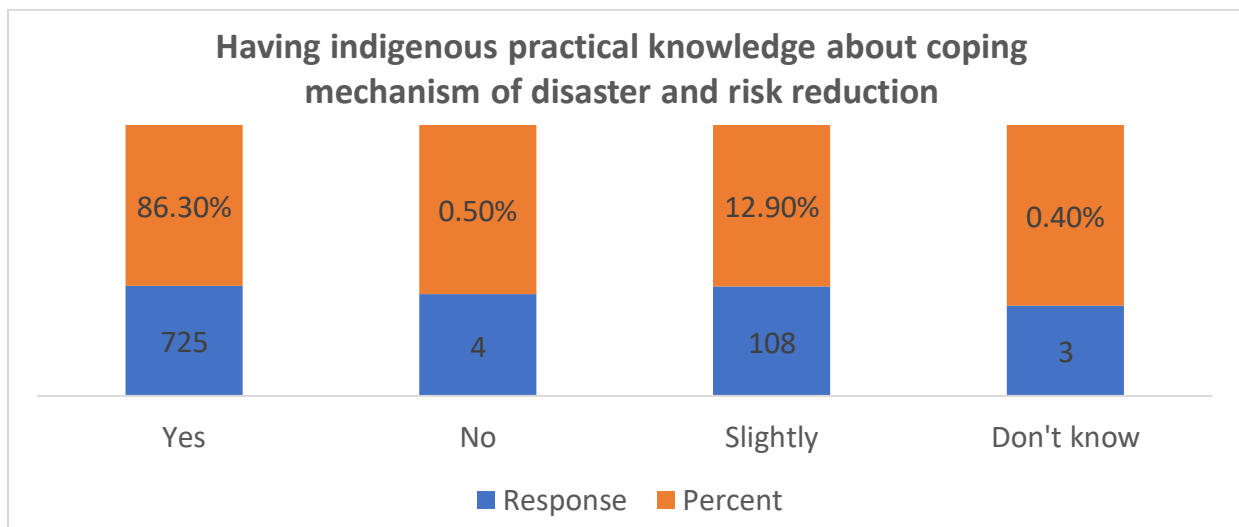
| Vocational knowledge known and implied by | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Prevention or mitigation knowledge | 394 | 25.8% | 55.3% |
| Reduction of vulnerabilities | 125 | 8.2% | 17.6% |
| Strengthening capacity for disaster risk reduction | 357 | 23.4% | 50.1% |
| Coping with hazard | 372 | 24.4% | 52.2% |
| None | 278 | 18.2% | 39.0% |
| Total | 1526 | 100.0% | 214.3% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 9.2.4 shows about the respondents' vocational knowledge known and implied for some strategies. A significant portion (55.3%) of the total respondents have known vocational knowledge and applied to prevention or mitigation knowledge of disaster risk reduction, more than half (52.2%) of the total respondents have knowledge coping with hazard, more than half of the total respondents or 50.1% have knowledge about strengthening capacity for disaster risk reduction through technical and vocational knowledge, and one-sixth (17.6%) of the participants have knowledge about reduction of vulnerabilities. But almost two-fifth (39%) do not have any vocational knowledge.

Graph 9.2.1: Percentage distribution of respondents' perception regarding having indigenous practical knowledge about coping mechanism of disaster and risk reduction



(Source: Field Survey, 2023)

Graph 9.2.1 displays that a lion sheer (86.3%) of the respondents have indigenous knowledge about coping mechanism of disaster risk, response and risk reduction. Only 0.5% of the respondents do not have that knowledge, about 12.9% of the respondents have slightly some indigenous knowledge about coping mechanism of disaster risk, response and risk reduction but only 0.4% of the respondents do not even know what is indigenous knowledge and they do not have that knowledge regarding coping mechanism of disaster risk, response and risk reduction.

Table 9.2.5: Percentage distribution of respondents' perception regarding indigenous practical knowledge known and implied by

| Indigenous practical knowledge known and implied by | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Community behaviour towards disaster | 730 | 21.5% | 87.0% |
| Own survival mechanism of victim | 800 | 23.5% | 95.4% |
| Migration due to disaster | 746 | 21.9% | 88.9% |
| Moving higher ground in the time of flood (shifting cyclone/flood shelter) | 738 | 21.7% | 88.0% |
| Religious activities | 379 | 11.2% | 45.2% |
| None | 6 | 0.2% | 0.7% |
| Total | 3399 | 100.0% | 405.1% |

(Source: Field Survey, 2023) Multiple Responses*

Table 9.2.5 shows that a lion sheer (88%) of the respondents move higher ground or shifting in cyclone center in the time of flood or cyclone. Almost all (95.4%) of the total respondents cope up by their own survival mechanism through which they adapt during and aftermath of cyclonic disasters. About 87% and 88.9% of the respondents have idea about community behavior towards disaster and cope up by migration during and aftermath of cyclonic disasters. About 45.2% of the respondents pray to Almighty and do their own religious activities to get rid of from disaster risk.

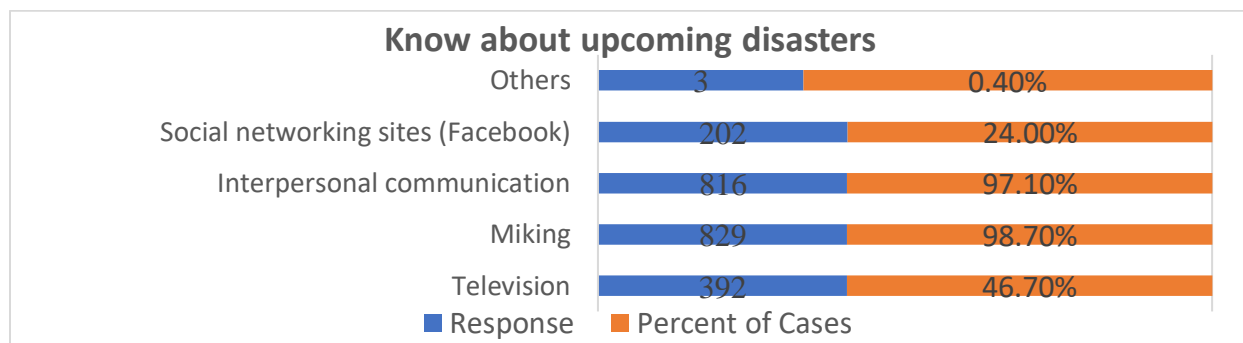
Table 9.2.6: Percentage distribution of respondents' perception regarding availability of early warning system

| Availability of early warning system | Frequency | Percent |
|--------------------------------------|-----------|---------|
| Yes | 840 | 100.0 |
| No | 0 | 0 |
| Don't know | 0 | 0 |
| Total | 840 | 100.0 |

(Source: Field Survey, 2023)

Table 9.2.6 portrays the availability of early warning system. All (100.0%) of the respondents express their opinion that they have early warning system in their area. Cyclone Preparedness Volunteer, Red Crescent Volunteer and the government institution provide early warning knowledge by miking and interpersonal communication.

Graph 9.2.2: Percentage distribution of respondents’ perception regarding knowing about upcoming disasters



(Source: Field Survey, 2023) Multiple Responses*

Graph 9.2.2 presents the knowing system about upcoming disasters. Almost all (98.7%) of the respondents get to know about upcoming disaster from miking of CPP volunteers. Along with this almost half (46.7%) of the total respondents know about upcoming disaster via television. A considerable portion 97.1% of the respondents know about upcoming disaster through interpersonal communication whereas almost two-fifth (24%) of the participants know about upcoming disaster by social networking sites (SNSs) which is mainly Facebook.

Table 9.2.7: Percentage distribution of respondents’ perception regarding recover from the damages of properties by

| Recover from disaster the damages of properties by whom | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| NGO support | 501 | 30.0% | 59.7% |
| Govt support | 265 | 15.9% | 31.6% |
| Stakeholder support | 77 | 4.6% | 9.2% |
| Capacity from their own resources | 827 | 49.5% | 98.6% |
| Total | 1670 | 100.0% | 199.0% |

(Source: Field Survey, 2023) Multiple Responses*

Table 9.2.7 exhibits the recovering ways from the damage properties due to cyclonic disasters. Aftermath of any disastrous event it takes time and support to recover from the loss and damages. Almost all (98.6%) of the respondents claim that they recover the loss and damages due to cyclonic disasters with their capacity from their own resources. The significant portion (59.7%) of the respondents express their opinion that they got NGO support, almost one-third (31.6%) of the respondents opine that they got support from government and only 9.2% of the respondents received support from stakeholder to recover from the loss and damages due to disasters.

Table 9.2.8: Percentage distribution of respondents' perception regarding need times to recover the damage properties and setback in regular life activities

| Need times to recover the damage properties and setback in regular life activities | Frequency | Percent |
|--|-----------|---------|
| 15 to 30 days | 17 | 2.0 |
| 1 to 2 months | 81 | 9.6 |
| 3 to 6 months | 358 | 42.7 |
| 7 to 12 months | 153 | 18.2 |
| More than 1 year | 231 | 27.5 |
| Total | 836 | 100.0 |

(Source: Field Survey, 2023)

The recovery time mainly depends on the amount of loss and damages due to disasters. Majority of the respondents note that it takes 3 to 6 months to recover the losses which are 42.5% of the respondents. More than one-fourth (27.4%) of the respondents express their opinion that the people of cyclonic disasters prone areas need to more than a year, 18.1% and 9.5% of the respondents point out that the disaster-prone people need 7 to 12 months and 1 to 2 months respectively, and only 2% of the participants point out that the disaster-prone people can recover it in 15 to 30 days to recover the losses and damages of severity due to disasters.

Table 9.2.9: Association between cyclonic disasters and practical knowledge about disaster risk reduction indicators through Pearson Chi-Square (χ^2) Tests

| Pearson Chi-Square (χ^2) Tests | | | | | | |
|---|--|--------------------|--------------------|-------------|-------|--------------------------------------|
| | | Cyclonic Disasters | | | | p-value |
| | | Cyclone | Salinity Intrusion | Tidal Surge | Flood | |
| | | Count | Count | Count | Count | |
| Indigenous practical knowledge implied by | Community behaviour towards disaster | 730 | 720 | 719 | 727 | .121 $\chi^2 = 27.53$ Df = 20 |
| | Own survival mechanism of victim | 801 | 789 | 787 | 798 | |
| | Migration due to disaster | 747 | 735 | 735 | 744 | |
| | Moving higher ground in the time of flood (shifting cyclone shelter) | 738 | 728 | 730 | 735 | |
| | Religious activities | 379 | 373 | 371 | 378 | |
| Knowing upcoming disaster | Television | 392 | 387 | 381 | 391 | .500 $\chi^2 = 15.34$ Df = 16 |
| | Miking | 829 | 818 | 815 | 826 | |
| | Interpersonal communication | 816 | 804 | 801 | 813 | |
| | Social networking sites (Facebook) | 202 | 198 | 199 | 202 | |
| Recovery system | Ngo support | 501 | 496 | 494 | 499 | .013* $\chi^2 = 31.10$ Df = 16 |
| | Govt support | 265 | 262 | 260 | 265 | |
| | Stakeholder support | 77 | 76 | 71 | 76 | |
| | Capacity from their own resources | 827 | 816 | 813 | 824 | |

| | | | | | | |
|--|-----------------|-----|-----|-----|-----|---|
| Need times to recovery from the damaged properties | 15 to 30 days | 17 | 16 | 16 | 17 | .000* $\chi^2 =$ 44.58 Df = 16 |
| | 1 to 2 months | 80 | 74 | 75 | 80 | |
| | 3 to 6 months | 357 | 355 | 349 | 355 | |
| | 7 to 12 months | 152 | 151 | 151 | 151 | |
| | More than 1year | 230 | 228 | 230 | 230 | |
| | Don't know | 0 | 0 | 0 | 0 | |

(Source: Field Survey, 2023)

Multiple Responses*

9.4 Presenting result in APA 6th Style of chi-square test (χ^2)

Pearson chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the indigenous practical knowledge has been known & implied by the community during cyclonic disasters. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=20, N=840) =27.53, $p>0.05$ (0.121) indicating that there is no relationship between occurring cyclonic disasters and having the indigenous practical knowledge. But it is apparently said from the response of participants, cyclonic disasters induced risks can be mitigate through the various the indigenous practical knowledge implementation of southwest coastal communities.

To test the association of knowing the upcoming cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=16, N=840) =15.34, $p>0.05$ (0.500) indicating that there is no association between cyclonic disasters and knowing the upcoming disasters. But from the response of fieldwork participants, it is said that having the knowledge of upcoming cyclonic disasters, minimize the loss of lives and properties.

Regarding the community recover from the damages properties after cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. Chi-square test (χ^2) was statistically significant, χ^2 (df=16, N=840) =31.10, $p<0.05$ (0.013*) indicates that there is a relationship between occurring cyclonic disasters and recover from the damage properties of the community.

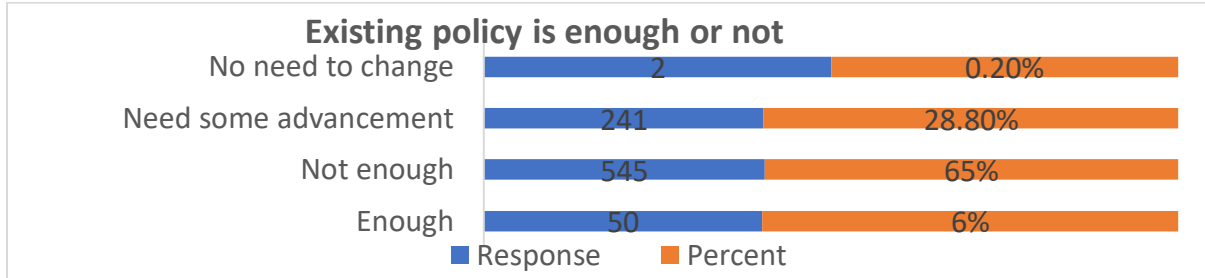
Whether the people need times to recover the damages properties and setback in regular life activities during and post- cyclonic disasters, Pearson chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=16, N=840) =44.58, $p<0.05$ (0.000*) indicating that there is a relationship between occurring cyclonic disasters and requiring times to recover the damages properties and setback in regular life activities during and post- cyclonic disasters.

At last, it can be said that if the technical, vocational and indigenous practical knowledge implied properly, then the cyclonic disasters risks can be reduced of southern coastal community.

Chapter Ten: Recommendations and suggestions for further policy formulation

10.1 Suggestions for further policy formulation

Graph 10.1.1: Respondents' perception regarding existing policy is enough or not



(Source: Field Survey, 2023)

Regarding the present disaster risk reduction programs for the coastal community, about 64.9% of the respondents says that the present risk reduction programs are not enough for the community, 28.7% of the respondents opine that there is need some advancement. On the contrary, only 6% of the participants think that this current risk reduction program is good enough for the community and only 0.2% of the respondents think that there is no need to change the programs the present disaster risk reduction programs for the coastal community, in that cases only need to implementation properly.

Table 10.1: Percentage distribution of respondents' perception regarding skill-based policy should be taken by government to reduce/mitigate this problem

| Skill based knowledge should be taken by government to reduce/mitigate this problem | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Need to empower local community | 826 | 25.5% | 98.3% |
| More sustainability community risk management system is need | 832 | 25.7% | 99.0% |
| Need to build disaster risk reduction skills | 832 | 25.7% | 99.0% |
| Need to link local community to local government | 742 | 23.0% | 88.3% |
| Above all | 1 | 0.0% | 0.1% |
| Total | 3233 | 100.0% | 384.9% |

(Source: Field Survey, 2023)

Multiple Responses*

The community people suggest that some skill-based initiatives should be taken by the government. Among these, almost all (99%) of the respondents express their opinion that the community risk management system should be sustainable, almost all (98.3%) of the respondents claim that it is needed to empower local community, nearly all (99%) of the participants point out that need to build disaster risk reduction skills and a notable portion (88.3%) of the respondents suggests that it is needed to link local community to local government.

Table 10.2: Percentage distribution of respondents’ perception regarding infrastructure-based policy should be taken by government to reduce/mitigate this problem

| Infrastructure based policy should be taken by government to reduce/mitigate this problem | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Embankment should be required and maintain | 835 | 33.3% | 99.4% |
| Carefully planning should be required for sufficient sluice gate | 836 | 33.3% | 99.5% |
| Cyclone shelter should be secure and hygiene | 837 | 33.3% | 99.6% |
| Above all | 2 | 0.1% | 0.2% |
| Total | 2510 | 100.0% | 298.8% |

(Source: Field Survey, 2023) Multiple Responses*

The community people suggest that some infrastructure-based initiatives should be taken by the government to reduce/mitigate disaster risks. Among them, nearly all (99.5%) of the respondents express their opinion that careful planning should be required for sufficient sluice gate. Almost all (99.4%) of the respondents suggest that government should be maintained required embankment. Almost all (99.6%) of the respondents admit that cyclone shelter should be secured and hygienic to reduce/mitigate cyclonic disaster risks.

Table 10.3: Respondents’ perception about kind of environment related initiatives

| Environment related initiative should be taken by government to reduce/mitigate this problem | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Reforestation | 745 | 23.3% | 88.7% |
| Ensure safe drinking water | 834 | 26.1% | 99.3% |
| Ensure medical facilities during and after disaster | 835 | 26.2% | 99.4% |
| Need a MHM corner for disadvantages women | 777 | 24.3% | 92.5% |
| Total | 3191 | 100.0% | 379.9% |

(Source: Field Survey, 2023) Multiple Responses*

Table 10.3 show that the modes of environment related initiative is needed for health and wellbeing regarding onset and aftermath of disasters. About 99.3% of the respondents opine that ensuring the access of safe drinking water is needed for sound health and good wellbeing of south western coastal disastrous people. The lion sheer (99.4%) of the respondents opine that ensure medical facilities during and aftermath of disaster is needed for sound health and wellbeing of disastrous people. The significant portion (92.5%) of the respondents express that the menstrual hygiene management (MHM) corner for disadvantaged women during and aftermath of disaster is needed for sound health and wellbeing of coastal belt disadvantaged disastrous people. About 88.7% respondents opine that reforestation or afforestation is needed for good health of disastrous people.

Table 10.4: Percentage distribution of respondents' perception regarding awareness build-up related initiatives should be taken by government to reduce/mitigate this problem

| Needed Awareness build-up related initiatives should be taken by government to reduce/mitigate this problem | Responses | | Percent of Cases |
|---|-----------|---------|------------------|
| | N | Percent | |
| Awareness should be focused on public health and hygiene | 835 | 25.6% | 99.4% |
| Public awareness | 827 | 25.3% | 98.5% |
| Meeting and comprehensive training module | 803 | 24.6% | 95.6% |
| Preparedness programs should be more enriched | 798 | 24.5% | 95.0% |
| Total | 3263 | 100.0% | 388.5% |

(Source: Field Survey, 2023) Multiple Responses*

Awareness building is essential to reduce the disaster risk, disaster severity and intensity. The significant portion (99.4%) of the respondents express their opinion that awareness should be focused on public health and hygiene to reduce the disaster risk. Almost all (98.5%) respondents claim that public awareness is needed to reduce the disaster risk, nearly all (95%) of the respondents point out that preparedness programs should be more enriched to reduce the disaster risk and almost all (95.6%) of the respondents also included that meeting and comprehensive training module should be prioritized to reduce the disaster risk, intensity and severity.

Table 10.5: Percentage distribution of respondents' perception regarding received any social protection/assistance from Govt/NGOs

| Received any social protection/assistance from Govt/NGOs | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Child Education Stipend | 265 | 17.7% | 31.6% |
| Vulnerable Group Development (VGD) | 299 | 20.0% | 35.7% |
| Vulnerable Group Feeding (VGF) | 288 | 19.3% | 34.4% |
| Food for Work | 83 | 5.6% | 9.9% |
| Integrated Food Security | 56 | 3.8% | 6.7% |
| Test Relief (TR) | 19 | 1.3% | 2.3% |
| Gratuitous Relief (GR) | 13 | 0.9% | 1.6% |
| Handicap/Autistic Scheme | 31 | 2.1% | 3.7% |
| Poor People Livelihood Program | 259 | 17.3% | 30.9% |
| Widow Allowance | 4 | 0.3% | 0.5% |
| Aged Scheme Allowance | 30 | 2.0% | 3.6% |
| Do not get at all | 146 | 9.8% | 17.4% |
| Total | 1493 | 100.0% | 178.2% |

(Source: Field Survey, 2023) Multiple Responses*

Aftermath of the cyclonic disasters, the community people get different social support from Government. The notable portion (35.7%) of the respondents get Vulnerable Group Development (VGD), almost one-third (31.6%) of the respondents get child education stipend, more than one-third (34.4%) of the total respondents received Vulnerable Group Feeding (VGF), almost one-third (30.9%) of the respondents get poor people livelihood program facilities. The southwest coastal people received some other social supports like food for work, integrated food security, handicap/autistic scheme, aged scheme allowance, test relief (TR), gratuitous relief (GR), widow scheme and these accounts for 9.9%, 6.7%, 3.7%, 3.6%, 2.3%, 1.6%, and 0.5% of the respondents respectively. On the other hand, 17.4% of the southwest coastal respondents claim that they do not get social support/ assistance at all from government or non-governmental organizations (NGOs).

Table 10.6: Percentage distribution of respondents' perception regarding modes of resilience/coping strategies/ policy can be implemented/recommended

| Modes of resilience/ coping strategies | Responses | | Percent of Cases |
|--|-----------|---------|------------------|
| | N | Percent | |
| Palm oil tree plantation scheme can be introduced | 93 | 1.2% | 11.1% |
| Plantation of betel leafs, napier grass | 221 | 2.7% | 26.3% |
| Salinity tolerant crop variety needs to be introduced | 571 | 7.1% | 68.0% |
| Embroidery, tailoring and knitting project can be initiated | 505 | 6.3% | 60.1% |
| Introduced with the technical and financial support of GO and NGOs so that they can organize local level training on disaster preparedness, resilience, coping mechanism, adaptation, risk management and risk response etc. | 165 | 2.0% | 19.6% |
| Motivational and awareness campaign | 799 | 9.9% | 95.1% |
| Needs to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing, marketing | 254 | 3.1% | 30.2% |
| Links to be introduced with local youth club and citizens' committee | 37 | .5% | 4.4% |
| To prepare/grant khash land for the farmer & vulnerable women group for plantation of palm trees and vegetation | 119 | 1.5% | 14.2% |
| A central aquifer can be set up to collect and preserve rain water | 410 | 5.1% | 48.8% |
| Supply of roof materials | 739 | 9.2% | 88.0% |
| Supply of water reservoirs and pipe line | 615 | 7.6% | 73.2% |
| Climate affected people can be provided job opportunities in the business sector | 63 | .8% | 7.5% |

| | | | |
|--|------|--------|--------|
| Links with cultured fisheries, fish processing, fish trading especially shrimp and sweet water fishes, fruits like coconut, sofeda, mango, water melon, kul, papaya, litchis, nut, guava; soya bean, vegetables, poultry, animal fodder, agro-based raw mate | 153 | 1.9% | 18.2% |
| Education, computer skills, basic vocational skills & technological training | 761 | 9.4% | 90.6% |
| Linkages between the producers, local retailers, distributors and in some cases, exporters | 43 | .5% | 5.1% |
| Develop advocacy systems and will focus on social safety net, supply pure drinking water, health and sanitation | 198 | 2.5% | 23.6% |
| Principles of good governance | 471 | 5.8% | 56.1% |
| Crab fattening project can be introduced for vulnerable women | 255 | 3.2% | 30.4% |
| Reconstructs of devastated coastal embankments, dams, and polder | 790 | 9.8% | 94.0% |
| Tree plantation and vegetable gardening activities | 812 | 10.1% | 96.7% |
| Total | 8074 | 100.0% | 961.2% |

(Source: Field Survey, 2023)

Multiple Responses*

Table 10.6 exhibits the coping strategies with cyclonic disasters of south west coastal belt people in Bangladesh. About 11.1% respondents mention that palm oil tree plantation scheme can be implemented for adapting with cyclonic disasters. About 26.3% participants note that plantation of betel leaf, napier grass is required for diversified livelihoods. A significant portion (68%) participants claim that salinity tolerant crop variety needs to be introduced. About 60.1% respondents mention that embroidery, tailoring and knitting project can be initiated so that they can be learned how to minimize losses and damaged from the disasters. About 19.6% mention that introduced with the technical and financial support of GO and NGOs so that they can organize local level training on disaster preparedness, resilience, coping mechanism, adaptation, risk management and risk response etc. A significant portion or 95.1% of the respondents mention that motivational and awareness campaign is needed to coping with disasters. About 30.2% participants mention that it is needed to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing and marketing. About 4.4% respondents mention that links to be introduced with local youth club and citizens' committee. About 14.2% of the participants mention that it is needed to prepare/grant khash land for the farmer & vulnerable women group for plantation of palm trees and vegetation. Almost half (48.8%) of the total respondents mention that a central aquifer can be set up to collect and preserve rain water so that the community fulfill their safe drinking water. A larger portion (88%) claim that supply of roof materials is needed to cope with cyclonic disasters. A lion share (73.2%) of the respondent points out that supply of water reservoirs and pipe line is demanded for

disaster risk mitigation. About 7.5% participants mention climate affected people can be provided job opportunities in the business sector. About 18.2% respondents agree that links with cultured fisheries, fish processing, fish trading especially shrimp and sweet water fishes, fruits like coconut, sofeda, mango, water melon, kul, papaya, litchis, nut, guava; soya bean, vegetables, poultry, animal fodder, agro-based raw materials, handicraft products etc. is needed for self-reliance. A significant portion (90.6%) of the respondents point out that education, computer skills, basic vocational skills & technological training is needed to reduce disaster risks. Only 5.1% respondents claim that linkages between the producers, local retailers, distributors and in some cases, exporters are required. Almost 23.6% of the respondents mention that develop advocacy systems and focus on social safety net, supply pure drinking water, health and sanitation. More than half (56.1%) of the respondents recommend for principles of good governance. Almost 30.4% respondents note that crab fattening project can be introduced for vulnerable women. A lion-share (94%) respondent claim that reconstructs of devastated coastal embankments, damps, and polder is fundamentally required to reduce the disaster risks. A large portion (96.7%) of the respondents mention that tree plantation and vegetable gardening activities is required for reducing the cyclonic disaster risks.

Table 10.7: Association between cyclonic disasters and recommending indicators for disaster risk reduction through Pearson Chi-Square (χ^2) Tests

| Pearson Chi-Square (χ^2) Tests | | | | | | |
|---------------------------------------|--|--------------------|--------------------|-------------|-------|--------------------------------------|
| | | Cyclonic Disasters | | | | P-value |
| | | Cyclone | Salinity Intrusion | Tidal Surge | Flood | |
| | | Count | Count | Count | Count | |
| Existing policy is enough or not | Enough | 50 | 50 | 50 | 50 | .968 $\chi^2 = 4.685$ Df = 12 |
| | Not enough | 545 | 535 | 535 | 542 | |
| | Need some advancement | 241 | 239 | 236 | 241 | |
| | No need to change | 2 | 2 | 2 | 2 | |
| | Don't know | 0 | 0 | 0 | 0 | |
| Skill-based policy | Need to empower local community | 826 | 814 | 812 | 823 | 0.32 $\chi^2 = 18.06$ Df = 16 |
| | More sustainability community risk management system is need | 832 | 821 | 817 | 829 | |
| | Need to build disaster risk reduction skills | 832 | 821 | 817 | 829 | |
| | Need to link local community to local government | 742 | 732 | 728 | 739 | |
| | Embankment should be required and maintain | 835 | 823 | 820 | 832 | .036* $\chi^2 = 22.15$ Df = 12 |
| | Carefully planning should be required for sufficient sluice gate | 836 | 824 | 821 | 833 | |

| | | | | | | |
|---|--|-----|-----|-----|-----|--------------------------------------|
| Infrastructure based policy | Cyclone shelter should be secure and hygiene | 837 | 826 | 822 | 834 | |
| Environment related initiatives | Reforestation | 745 | 737 | 731 | 743 | 0.171 $\chi^2=21.20$ Df = 16 |
| | Ensure safe drinking water | 834 | 822 | 820 | 831 | |
| | Ensure medical facilities during and after disaster | 835 | 823 | 820 | 832 | |
| | Need a MHM corner for disadvantages women | 777 | 767 | 762 | 775 | |
| Awareness building program | Awareness should be focused on public health and hygiene | 835 | 823 | 820 | 832 | 0.164 $\chi^2 = 21.38$ Df = 16 |
| | Public awareness | 827 | 817 | 812 | 824 | |
| | Metting and comprehensive training module | 803 | 791 | 788 | 800 | |
| | Preparedness programs should be more enriched | 798 | 787 | 783 | 795 | |
| Received social assistance/ support | Child Educational Stipend | 265 | 262 | 262 | 265 | 0.848 $\chi^2 = 38.04$ Df = 48 |
| | Vulnerable Group Development (VGD) | 299 | 296 | 296 | 298 | |
| | Vulnerable Group Feedingt (VGF) | 288 | 284 | 279 | 287 | |
| | Food for work | 82 | 82 | 78 | 81 | |
| | Integrated Food Security | 56 | 56 | 54 | 56 | |
| | Test Relief (TR) | 19 | 18 | 19 | 19 | |
| | Gratuitous Relief (GR) | 13 | 13 | 13 | 13 | |
| | Handicap/Autistic Scheme | 31 | 29 | 30 | 31 | |
| | Poor People Livelihood Program | 259 | 258 | 255 | 259 | |
| | Widow allowance | 4 | 4 | 4 | 4 | |
| | Aged Scheme allowance | 30 | 30 | 29 | 30 | |
| | Do not get at all | 146 | 144 | 146 | 145 | |
| Recommended resilience/ coping strategies | Palm oil tree plantation scheme can be introduced | 93 | 92 | 89 | 92 | .000* $\chi^2=376.61$ Df = 84 |
| | Plantation of betel leaves, napier grass | 221 | 219 | 216 | 221 | |
| | Salinity tolerant crop variety needs to be introduced | 571 | 563 | 562 | 568 | |
| | Embroidery, tailoring and knitting project can be initiated | 505 | 497 | 504 | 502 | |
| | Introduced with the technical and financial support of GO and ngos so that they can organize local level training on disaster preparedness, resilience, coping mechanism, adaptation, risk management and risk response etc. | 165 | 163 | 164 | 164 | |
| | Motivational and awareness campaign | 799 | 788 | 786 | 796 | |
| | Needs to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing and marketing | 254 | 250 | 251 | 253 | |

| | | | | |
|--|-----|-----|-----|-----|
| Links to be introduced with local youth club and citizens's committee | 37 | 36 | 36 | 37 |
| To prepare/grant khash land for the farmer & vulnerable women group for plantation of palm trees and vegetation | 119 | 119 | 119 | 117 |
| A central aquifer can be set up to collect and preserve rain water | 410 | 406 | 402 | 408 |
| Supply of roof materials | 739 | 728 | 725 | 736 |
| Supply of water reservoirs and pipe line | 615 | 607 | 602 | 613 |
| Climate affected people can be provided job opportunities in the business sector | 63 | 62 | 63 | 63 |
| Links with cultured fisheries, fish processing, fish trading especially shrimp and sweet water fishes, fruits like coconut, sofeda, mango, water melon, kul, papaya, litchis, nut, guava; soya bean, vegetables, poultry, animal fodder, agro-based raw mate | 153 | 151 | 153 | 152 |
| Education, computer skills, basic vocational skills and technological training | 761 | 750 | 750 | 758 |
| Linkages between the producers, local retailers, distributors and in some cases, exporters | 43 | 43 | 43 | 43 |
| Develop advocacy systems and will focus on social safety net, supply pure drinking water, health and sanitation | 198 | 198 | 198 | 198 |
| Principles of good governance | 471 | 467 | 458 | 470 |
| Crab fattening project can be introduced for vulnerable women | 255 | 255 | 247 | 255 |
| Reconstructs of devastated coastal embankments, dams, and polder | 790 | 779 | 780 | 787 |
| Tree plantation and vegetable gardening activities | 812 | 800 | 800 | 809 |

(Source: Field Survey, 2023)

Multiple Responses*

10.3 Presenting result in APA 6th Style of chi-square test (χ^2)

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to explore whether the existing policy is enough or not regarding the cyclonic disasters. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=12, N=840) =4.685, $p>0.05$ (0.968) indicating that the existing policy is not enough regarding the cyclonic disasters of southern coastal communities.

Regarding the skill-based policy should be taken by government to reduce/mitigate the risks of cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=16, N=840) =18.06, $p>0.05$ (0.32) indicates

that there is no relationship between occurring cyclonic disasters and skill-based policy that should be taken by government to reduce/mitigate the risks of cyclonic disasters of the community. But from the response of fieldwork participants, it can be said that the skill-based policy should be taken by government to reduce the risks of cyclonic disasters of south west coastal community.

To test the association of the infrastructure-based policy should be taken by government to reduce/mitigate the risks of cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was used. The chi-square test (χ^2) was statistically significant, χ^2 (df=12, N=840) =22.15, $p<0.05$ (0.036*) indicates that there is relation between cyclonic disasters and infrastructure-based policy that should be taken by government to reduce the risks of cyclonic disasters of the community.

In terms of the environment related initiative needed by the government to reduce/mitigate the risks of cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=16, N=840) =21.20, $p>0.05$ (0.171) indicates that there is no relationship between occurring cyclonic disasters and environment related initiative needed by the government to reduce/mitigate the risks of cyclonic disasters of the community. But from the response of fieldwork participants, it can be said that environment related initiative is needed by the government to reduce/mitigate the risks of cyclonic disasters of south west coastal community.

Whether the awareness building program is needed by the government to reduce/mitigate the risks of cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=16, N=840) =21.38, $p>0.05$ (0.164) indicates that there is no relationship between occurring cyclonic disasters and awareness building program is needed by the government to reduce/mitigate the risks of cyclonic disasters of the community. But from the response of participants, it is said that awareness building program is needed by the government to reduce/mitigate the risks of cyclonic disasters of southern coastal community.

To test whether the family received any social protection/assistance from the government or NGOs to mitigate the risks of cyclonic disasters, a chi-square test (χ^2) for independence with $\alpha=0.05$ was calculated. The chi-square test (χ^2) was statistically insignificant, χ^2 (df=48, N=840) =38.04, $p>0.05$ (0.848) indicates that there is no relationship between cyclonic disasters and the family received any social protection/assistance from the government or NGOs to mitigate the risks of cyclonic disasters of the community. But from the response of fieldwork participants, it can be said

that the family received any social protection/assistance from the government or NGOs to mitigate the risks of cyclonic disasters of southern coastal community.

A chi-square test (χ^2) for independence with $\alpha=0.05$ was used to assess whether the various kinds of resilience/coping strategies/ policy can be implemented to mitigate the risks of cyclonic disasters. The chi-square test (χ^2) was statistically significant, χ^2 (df=84, N=840) =376.61, $p<0.05$ (0.000*) indicating that there is a relationship between implementation of the various kinds of resilience/coping strategies/ policy and cyclonic disasters.

In concluding remarks, it can be said that various recommending indicators should be implemented for cyclonic disasters risk reductions of south west coastal community.

Chapter Eleven: Findings of the Qualitative Study

11.1 Key Findings of the Case Study Analysis

11.1.1 Socio-demographic Profile

Among the eighty-two respondents, almost one-seventh of them belongs to eleven to twenty ages. Two-third (fifty-five respondents) of the total respondents belongs to thirty-one to sixty years of ages, and almost one-thirteenth of them belongs to more than sixty years old. Almost two third of the participants are male and rest of the one third are female. Almost four-fifth of the participants are married and one-sixth of them are single. More than one third respondents are illiterate, and almost one third and one-fourth of the participants are primary and secondary educated respectively and the rest of the respondents exists above higher secondary category. Almost two third (fifty-four) respondents consist their family with three to six family members, one fourth of the family consists with seven to ten family members. Eighty-two case study or in-depth interview (IDI) has been conducted from the following stakeholders: Mawali/Honey collector, Bawali, Golpata collectors, Crab collectors, Bede community, fish fry collectors, Medicinal plant collectors, fisherman, Boatman, daylabor, marginal farmer/landless poor, women, pregnant women, adolescent girls, young adult women, elder people, children, and person with disabled. The income distribution showed that only one third family earn five thousand to ten thousand taka, almost two-fifth (thirty-one) of the participants earn from ten thousand to fifteen thousand and the rest of others earn fewest money to lead their life. Almost two-fifth (thirty-one) family expenses five thousand to ten thousand taka, almost one-third (twenty-seven participants) of the participants expense from ten thousand to fifteen thousand and the rest of others expense scant money to maintain their life.

11.1.2 Risk, challenges and social vulnerability due to cyclonic disasters

All of the respondents mention that they faced cyclones, floods and tidal surges in their lifetime. And almost two third of them faced salinity and water logging while Charfashion, Tajumuddin and Betagi are least salinity prone area. Almost four-fifth of them claimed that they faced cyclonic disasters in their region at every year and rest of the one-fifth claimed that they faced sometimes cyclonic disasters in their area. All of the respondents mentioned that they understand cyclones, tidal surges, salinity intrusion, and floods are cyclonic disasters. Almost all point out that they faced bitter experiences caused by cyclonic disasters. All of the participants faced negative effects on their economy, two third of them faced adversely social, psychological and health effects caused

by cyclonic disasters, and rest of the other faced physical adverse effect by cyclonic disasters. Almost all of the participants mentioned that the area has cyclone shelter or multipurpose building used as a cyclone shelter during cyclonic disasters. Two third of the participants observed that the distance between cyclone centre and their home is almost one kilometer and four-fifth of the participants mentioned that cyclone shelter exists within two kilometers far away from their residence. More than two-fifth of the respondent claimed that the inside condition of the cyclone center is satisfactory, almost one-third (twenty-five) of them claimed that the condition of cyclone center is moderate to stay the cyclone center during and after disaster.

Almost all (seventy-five and seventy-two respondents) of them outlined that their infrastructures are destructed and ruined the shelter respectively due to cyclonic disasters. Almost half (thirty-seven) of them claimed that their cattle became death during several cyclonic disasters. Three-fourth (sixty participants) of the participants observed their farmland became destroyed due to cyclonic disasters. All of the participants claim that cyclonic disasters negatively exacerbate/ effect on their livelihood and social life respectively.

Regarding the community faced negatively by cyclonic disasters, all of the participants claimed that their daily activities became hinder due to cyclonic disasters. Two-third and nearly three-fourth of the participants faced hindrance of cultural activities, food insecurity, and break out of diseases, and their communication became disrupted respectively due to cyclonic disasters. One third of them claimed that their prayers became disrupt during cyclonic disasters.

All of them mentioned that social network and communication system became disrupted respectively caused by cyclonic disasters. Two third of the respondent observed that cyclonic disasters trigger the hindrance to movement of children, damage of educational institution, increasing rate of mental health issues, prevalence of skin disease, and forced migration and three-fourth of the respondent claimed that the impediment to women's income, disruption of the means of livelihood, and spread of water borne diseases appear for that. One third participants mentioned that increasing rate of crime, spread of vector borne diseases, malnutrition kwashiorkor and marasmus diseases, and gender-based vulnerability occurs for cyclonic disasters.

Almost all (eighty participants) of the participants mentioned that cyclonic disasters create the problem of water, sanitation and hygiene (WASH) and also safe drinking water. Almost everyone (seventy-six respondents) claimed that pure drinking water became scarce because of salinity and tubewells became far from their house during cyclonic disasters. Almost half of them mentioned

that level of groundwater is lower and water are polluted by waste disposal which create the crises of safe drinking water during cyclonic disasters.

Regarding the facing vulnerability of women, two third of the participants claimed that they hardly get preferential health care services, women face restriction access to healthcare and their roles in informal sector which is unpaid. Four-fifth of them mentioned that healthcare centre is far from their home. One third of the participants mentioned that women face patriarchal attitude, lack of opportunity in decision making and social exclusion due to lack of empowerment.

Children, pregnant women and disable person are more vulnerable group during cyclonic disasters period claimed more than four-fifth of the total respondents. Three-fourth of the respondent mentioned that adolescent girl and aged people are more vulnerable group during cyclonic disasters period. Three fifth of the respondent mentioned that young adult women are the more vulnerable group during cyclonic disasters period.

Regarding the impact of children, almost all the respondent mentioned that cyclonic disasters create lack of food security, damage of infrastructure, and economic uncertainty that adversely impact on children during disaster period. Three fourth of the respondent claimed that cyclonic disasters exacerbate the increasing rate of children death, and risk of infectious diseases are the impacts on children during disaster. Rest of the respondent claimed that Juvenile delinquency became increase on children and loss of books also affects children's education during disaster.

Regarding the adverse impact of women and adolescents, four fifth of the participants mentioned that they faced lack of secured shelter, and three fourth of the participants mentioned that drop out from school, lack of menstrual hygiene, lack of healthcare, lack of food and nutrition and more domestic household respectively during disaster. Almost half of the participants mentioned that they face lack of maternity health, socio-cultural barriers and mobility problem due to cyclonic disasters.

In terms of vulnerability of aged and physically challenged people, nearly all of the participants mentioned that transportation barriers, and lack of toilet aggravate vulnerability of elderly and disabled people. More than four fifth of the participants noted that lack of shelter, lack of water, sanitation and hygiene (WASH) create vulnerability on aged and disabled people.

Three fourth (sixty-two and twenty) and one fifth of the participants note that people face more intensity of cyclonic disasters in Baishakh-Jaistha and Ashar- Shrabon months. Almost all of the participants mentioned that Poush-Magh month found in least cyclonic disasters.

Almost all of the participants mentioned that cyclonic disasters adversely affect or exacerbate the economic insecurity, food insecurity, lack of shelter, loss of infrastructure, damage of homestead garden, threat to various livelihoods, lack of pure drinking water, health risk and chance of life risks in their households. One third of the respondent mentioned that damage of standing crops, damage of fisheries, reduce of domestic livestock and soil degradation create negative effects due to cyclonic disasters in their households.

Regarding social disruptions, nearly all mentioned that social network and communication create the such problem due to cyclonic disasters induced salinity intrusion. Two third of them noted the women's income are impeded, forced migration and disruption of the means of livelihood create the social disruptions by dint of cyclonic disasters. One fourth identified social exclusion, lack of social bondage, increase of domestic violence and lack of enrollment in formal education those create the social disruptions due to cyclonic disasters.

Three fourth mentioned that coastal community migrated because of recurrent cyclonic disasters and water salinity. Regarding negative impact of literacy, three fourth of the respondents mentioned that cyclonic disasters force to increase illiteracy and rate of drop out students of this territory. All of them outlined that the community face vulnerability with social and mental depression and financial insecurity due to cyclonic disasters. Almost two-third of them claimed that cyclonic disasters create mental and economic depression. One fourth of them face social depression due to cyclonic disasters. Two-third of them think that cyclonic disasters deplete the morality due to cyclonic disasters.

11.1.3 Risk, challenges and economic vulnerability due to cyclonic disasters

Cyclonic disasters are harmful for economic activities mentioned by all of the participants. Regarding the occupational hazards and challenges, almost all or more than four fifth of the respondents noted that workers suffer due to cyclonic disasters, low wage and salary, health hazards due to cyclonic disasters of coastal area. On the other hand, two-third respondents claim that due to cyclonic disasters induced salinity they feel physical irritation and women are discriminated from the work.

Regarding the threatening sectors of economic insecurity, almost everyone mentioned that food production and lack of employment sectors threat for cyclonic disasters induced salinity intrusion. Two-fifth of the participant mentioned that damage of domestic livestock, forestry, and increasing non-arable land are threats to economic insecurity for cyclonic disasters induced salinity intrusion.

Almost three-fifth of the participants mentioned that fisheries also are threats to economic in security for cyclonic disasters induced salinity intrusion.

Regarding the decreasing of food productivity, almost all mentioned that cyclonic disasters trigger the reduced food productivity due to disasters and salinity. Almost all of them mentioned that seasonal crops are affected due to cyclonic disasters. Three-fourth of the participants noted that vegetables and fruit trees cannot be grown due to disasters and saline water. Almost all mentioned that nursery, sapling plantation and timber trees are damaged due to salinity. Almost all of the respondent assume that sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture is decreasing gradually due to cyclonic disasters and salinity intrusion. Almost two third of them observed that cyclonic disasters severely affected in these areas and the rest of them mentioned moderately and slightly adverse effect due to cyclonic disasters.

Due to cyclonic disasters and unavailability of work, one fifth of them works ten to fifteen days and twenty-five to thirteen days respectively in a month. Almost two third earns two hundred to two hundred fifty taka. Two fifth people earn more money in Ashar and sraon month. On fifth of them earn more money in Baishakh-Jaistha and Vadro- Ashwin season. One third mentioned Poush-Magh become their more income season. One third and one-fifth of the respondents claim that the community earn less money in Ashar-sraon and Vadro-Ashwin, and Baishakh-Jaistha season respectively due to cyclonic disasters.

Regarding the least income behind the season, almost all claimed that cyclonic disasters and salinity is the biggest reason in a particular season. More than two third of them noted that unavailable of fish, lower agriculture productivity and lack of employment opportunity exacerbate of their lowest income in a particular season.

Regarding the environmental change affecting livelihood, almost everyone mentioned that cyclone, flood, tidal surge, and salinity effect the main environmental change which is affecting the livelihood. Three fourth of them mentioned that cyclonic disasters induced salinity intrusion promote the social infertility and degradation.

In terms of hampering the environmental balance, three-fourth of them mentioned that creating heat wave, changes in vegetation, disruption of ecosystems, loss of biodiversity, disease of fish may increase, deforestation and intensifying global warming hamper the environmental and ecological balance.

11.1.4 Risk, challenges and health vulnerability due to cyclonic disasters

Three-fourth of the respondents mentioned that they are conscious about their health, do not get proper food and nutritious food during disaster. Almost four-fifth of the respondents mentioned that they take their meal in three times in a day and one-sixth take two times meal in a day during disaster.

Almost four-fifth of the respondents mentioned that pregnant and lactating women and adolescent girls do not get sufficient nutritious food during or post cyclonic disaster period in their area. Three fourth mentioned that the pregnant and breastfeeding women face iron deficiency during reproductive period in cyclonic disasters prone area. Two third noted that the pregnant and breastfeeding women carry underweight baby for getting insufficient nutritional food during reproductive period. More than two third claimed that they do not get health right, and even women, adolescent girl, pregnant women don't get sexual and reproductive health and rights. Three-quarter of the respondents mentioned that pregnant, breastfeeding and menstruating women are at risk of health during and after disasters.

Due to disasters, almost four-fifth of the respondents mentioned that women face numerous problems including scarcity of suitable places for breastfeeding and changing sanitary materials, do not get medical treatment, healthcare access are found insufficient, medical goods including birth control pills are found insufficient, absence of hygienic facilities, lack of privacy at latrine, and unavailability of separate toilet for women and adolescent girls in cyclone shelters.

Half of them get safe drinking water and sanitation facilities during or post cyclonic disasters and the rests do not get pure drinking water and sanitation facilities during or post cyclonic disasters. Regarding the condition of residence, one third respondents claimed that their habitat is filthy and suffocating environment respectively. One fifth mentioned that their houses are extremely heated and toxic environment. Half of them noted that their homes are risky and unhygienic, dirty and polluted. Even, some respondents built their houses in low height.

Mentioning the condition of toilet, one third and half of the respondents mentioned that the condition of their toilet is bamboo made latrine surrounded by plastic and bamboo made toilet surrounded by corrugated tin respectively.

Almost everyone mentioned that the family planning center or union health complex providing a little bit health care service. Almost all of them mentioned that the government health care services institution of upazila exists almost ten kilometers far away from their residence. Regarding the

health care services are satisfactory or not, half of the participants mentioned that the health care services are satisfactory for them and the rest of the participants mentioned that the healthcare services are not satisfactory. Two-third of them mentioned that they do not get free medical goods or services and the area has not any private clinic or private hospitals.

Regarding getting menstrual hygiene, two third of them mentioned that women and adolescent girl do not get menstrual hygiene facilities in the cyclone or flood centers during the cyclonic disasters. Even, one third respondents mentioned that women and adolescent girl faced sexual harassment or psychological trauma in the cyclone or flood centers during the cyclonic disaster-prone area.

Almost four-fifth of the respondents mentioned that high rates of diseases, water and food borne diseases, mental and nutritional infectious diseases arise due to cyclonic disasters in coastal belt. Two third of them mentioned that due to cyclonic disasters the community suffers heat related illnesses, extreme weather events health effects, and vector borne diseases in coastal belt.

Almost all respondents notes that coastal community suffer from fever and cold due to cyclonic disasters. Two third referred that cyclonic disasters create the health risk of bad headache, diarrhea and whooping cough. Almost three-fifth mentioned that cyclonic disasters exacerbate the health risk of Asthma and skin diseases. One fifth mentioned the malaria and bronchitis are occurred due to cyclonic disasters.

Almost four-fifth of the respondents mentioned that the people particularly the pregnant women, aged people, disable or chronic illness people of cyclonic disaster-prone area do not get proper healthcare access or services.

Almost all of the respondents mentioned that they faced the risk of infections communicable diseases due to cyclonic disasters. Four-fifth mentioned that cyclonic disasters aggravated the health hazards of damaging of health care facilities and lacking of fresh drinking water. One third mentioned that they faced the death of family members caused by cyclonic disasters.

Regarding the adverse health implications, three fourth of the respondents mentioned that the due to salinity intrusion hypertension, stroke and skin diseases arise in coastal belt. Half of them mentioned that due to salinity intrusion heart disease, prevalence of diarrhea, spread of water borne diseases, respiratory illness and pregnancy related complexity are occurred in coastal belt. One fourth mentioned that due to salinity intrusion multiorgan disorder, cold, feel physical irritation and malnutrition are observed in coastal belt.

In terms of reason behind the pregnancy complexity among the mother, two third of the respondents mention that maternal and fetal complexity, miscarriage, and changes in periodical cycle are observed due to salinity. Almost three-fifth mention that immature birth and immature death are occurred frequently in the southern coastal people in Bangladesh due to salinity.

Two third of them mentioned that salinity is the responsible for abnormal growth and mental retardation of a child.

11.1.5 Disaster Preparedness and Management

Having technical knowledge, almost three-fifth respondents mentioned that they have technical knowledge about resilience of cyclonic disaster response and risk reduction. Rest of others mentioned that they don't have any technical knowledge to reduce the cyclonic disaster risks.

One fifth of them mentioned that the technologies has been known and implied by the respondent are database management and management information respectively. Half of the respondent mentioned that they have technical knowledge of decision support system. One third of them mentioned that they don't have any technical knowledge to reduce the disaster risks.

Having vocational knowledge, two-fifth of the respondents mentioned that they have vocational knowledge about resilience of cyclonic disaster response and risk reduction.

One third of the respondents mentioned that vocational knowledge has been known and implied by the respondent via prevention of mitigation knowledge, strengthening capacities for disaster risk reduction and cope with hazards. Half of them don't have any vocational knowledge.

Regarding having indigenous knowledge, almost all of the respondents mentioned that they have indigenous knowledge and practice for resilience or coping mechanism of cyclonic disaster risk reduction (DRR).

Four-fifth of the respondent mentioned that the indigenous practical knowledge has been known and implied by the community behavior, own mechanism and migration or shortly shifted cyclone or flood center during disasters.

Regarding the existence of early warning systems availability, all the respondents mention that their area has different kind of early warning system. Almost everyone mentioned that they know about upcoming disaster through Miking and interpersonal communication. Two third of them mentioned that through television and facebook they know about upcoming disasters.

All the respondents mention that they recover the damaged properties through capacities their own resources and almost half of the respondent mention that they recover the damage properties through NGO, stakeholders, and government support.

Almost half, one-sixth and one-fourth of the respondents mention that they need 3 to 6 month, 7 to 12 months, and more than a year respectively for recovering the damaged properties and setback in regular life activities.

Regarding the existing policy enough or not, half of the total respondents noted that the existing policy is not enough and the rest of half note that there is need advancement for policy to recover. Almost all mentioned that need to empower local community, more sustainable communities, need to build disaster risk reduction skills and need to link local community to local government should be taken by government to reduce or mitigate this problem.

More than four-fifth of the respondents mentioned that the government should be taken to reduce or mitigate this problem like embankment should be prepared and maintained, created of sufficient sluice gate, and cyclone center should be created, secured and hygienic.

Regarding the environment related initiative, almost everyone mentioned that reforestation, ensure safe drinking water, ensure medical facilities should be taken by the government.

Almost everyone mentioned that awareness should be focused on public health, public awareness program, meeting and comprehensive training, and preparedness programs is needed to reduce the disaster risks.

One third of the respondents mentioned that their family received social assistance like child education stipend, vulnerable group development, vulnerable group feeding and poor people livelihood program. A few of them mention that they get food for work, integrated food security and old age allowance from the government.

Regarding the resilience or coping mechanism, two third mentioned that salinity tolerant group variety needs to be introduced, embroidery, tailoring and knitting project can be initiated, motivational and awareness campaign, supply of roof materials, supply of water reservoirs and pipeline, education, computer skills, basic vocational skills and technical training, reconstructs of devastated coastal embankments, tree plantation and vegetable gardening activities policy can be implemented. One third respondents mentioned that plantation of betel leaves, Napier grass, introduced with the technical and financial support, needs to integrate approach and development including effective training on nursery development of seedlings, saplings, management of trees

harvesting, processing and marketing, climate affected people can be provided job opportunities in the business sector, principle of good governance, linkage between the producers local retailers distributors and in some cases exporter, focus on social safety net, supply drinking water health and sanitation can be implemented so that the coastal community can self-reliant.

11.2 Key Findings of the Key Informant Interviews (KIIs) Analysis

11.2.1 Socio-demographic profile

Among the sixty-eight key informant interviews, almost one-tenth of the respondents are aged 21–30 years. Almost two-fifth of the respondents are aged 31–40 years. Almost one-third of the respondents are aged 41–50. And one-fifth of the respondents are aged 51–60. More than four-fifths of the respondents are male, and almost one-sixth of the respondents are female. More than nine-tenths of the respondents are married. Less than one-tenth of the respondents are illiterate. More than one-tenth of the respondents have completed their primary, secondary, and graduation level education respectively. More than one-fourth (fifteen respondents) of the respondents have completed their higher secondary education. More than two-fifth of the respondents have completed their post-graduation degree. Approximately three-fourth of the respondents consists of 3-6 family members. Almost one-fourth of the respondents have seven to ten family members. Less than one-tenth of respondents have a family income of 5,000 taka monthly. More than one-tenth of the respondents have a family income of 5001–10000 and 10001–15000 taka respectively. More than one-sixth of the respondents have a monthly family income of 15001–20,000 taka. More than half of the total respondents have a family income of 20001–25,000 taka monthly. More than one-tenth of the respondents' monthly family expense of 5,001–10,000 and 10,001–15,000 taka respectively. More than one-sixth of the respondents' family expense of 15,001–20,000 taka per month. More than half of the total respondents have a family expenditure of 20,001–25,000 taka per month.

11.2.2 Risk, challenges and social vulnerability due to cyclonic disasters

All of the respondents said that cyclones and floods are occurred in their coastal belt. More than nine-tenths of the respondents said salinity intrusion and tidal surges are occurred, and less than one-tenth of the respondents said drought occurred in their coastal belt. All of the respondents faced cyclonic disasters or hazard at every year. All of the respondents seem the term cyclonic disaster as a cyclone. More than nine-tenth of the total population seem the term cyclonic disaster

as a tidal surge, salinity, and flood. Almost all of the respondents faced bitter experiences caused by cyclonic disasters. All of the respondents are negatively affected economically, psychologically and in terms of health due to the cyclonic disaster. More than two-thirds of the total respondents are negatively affected socially, one-third of the total population is negatively affected physically, and more than two-fifths of the total respondents are negatively affected culturally due to the cyclonic disaster. Almost all of the respondents said they have enough cyclone shelter in their region. Only few of them noted they have no cyclone shelter in their region. Less than one-tenth, more than half of the total respondents and more than one-third of the total respondents said the cyclone centre is within 500 meters, within 1 kilometer and within 2 kilometers respectively from their home. More than two-thirds and almost one-fifth of the respondents are satisfied and moderate respectively. Only, one-tenth of the respondents are very satisfied or not satisfied about the structural condition of those cyclone centers.

There are some economic hazards faced the respondent due to the cyclonic disaster. All of the respondents face the destruction of infrastructure; more than three-fourth of the respondent face ruining the shelter; more than two-fifths of the respondents face the death of cattle; and another two-fifths face the destruction of farmland. All of the respondents are negatively affected by cyclonic disasters on their livelihood and entire social life.

The community were negatively affected by the cyclonic disasters. Almost all of the respondents faced hindrances to their daily activities and broke out of diseases. Two-third of the respondent face hindrances to cultural activities like wedding ceremonies and rituals. Almost nine-tenths of the respondent face food insecurity. More than half of the total respondent face disruption of prayers, and more than nine-tenths of the total respondent face disruption of communication due to cyclonic disasters.

All of the respondents mention that cyclonic disasters lead to disruptions of social networks and communication. More than two-thirds of the total respondents mentioned that they face hindrances to movement of children and the spread of vector-borne disease. More than two-fifths of the total respondents mentioned that disasters negatively effect on the impediment of women's income and increases the rate of mental health issues. More than four-fifth of the respondents mentioned that cyclonic disasters damage to educational institutions and the prevalence of diarrhea respectively. Almost two-fifths of the respondents said that it is increasing the rate of crime and gender-based vulnerability due to disasters. Almost nine-tenth of the total respondents mentioned

that waterborne diseases and forced migration is increasing due to disasters. More than nine-tenths of the total respondents said that the prevalence of skin diseases is increased. Almost all of the respondents mentioned that cyclonic disasters disrupt the means of livelihood.

Almost all of the respondents face the problem of safe drinking water and water, sanitation, and hygiene (WASH) respectively. Almost all of the respondents said cyclonic disasters created the problem of pure drinking water; one-fifth of the respondents said disasters created a lower level of groundwater; and more than half of the respondents said cyclonic disasters polluted water through waste disposal.

Regarding facing the vulnerability of women, almost all of the respondents mentioned that most of the women hardly get health care services. More than four-fifths of the total respondents mentioned that the health care centre is far away, and women face restrictions on access to health care and have to play an unpaid role in the informal sector. More than two-fifths of the total respondents mentioned that women face patriarchal attitude and women have lack of opportunity in decision-making respectively. Less than one-tenth of the total respondents mentioned that women have lack of political empowerment. More than half of the total respondents mentioned they are socially excluded due to lack of empowerment. And one-fourth of the total respondents mentioned that women are unable to play a role in voluntary services.

All of the respondents said the most vulnerable groups are children, pregnant and lactating women, disabled people, and old people during cyclonic disasters. Two-fifths of the total respondents said young adult women are a more vulnerable group.

More than nine-tenths of total respondents said that as a result of the cyclonic disaster, there is an increasing rate of child mortality, a lack of food security, and a risk of infectious diseases. More than half of the total respondents said it increased juvenile delinquency. Almost all of the respondents said that during a cyclonic disaster, schools are closed and infrastructure is damaged, which affects children's education. All of the respondents said they face economic uncertainty, and almost two-thirds of the total population mentioned that during this time children lost their books. That's why they cannot continue their education during a cyclonic disaster.

Regarding the impact of women and adolescent, more than nine-tenths of the total respondents mention that at this time, women and adolescent girls face the problem of a lack of secure shelter and menstrual hygiene. More than four-fifths of the total respondents mentioned that most of the women and adolescent girls drop out of school, face a lack of health care, and have a heavier

domestic housework load respectively. More than three-fourths mentioned they face a lack of maternity health, and almost three-fourths mentioned they face mobility problems. Almost nine-tenths of the total respondents mentioned they face a lack of food and nutritional problems. More than two-fifths of the total respondents mentioned they face sociocultural barriers.

Regarding the vulnerability of aged and physically challenged people, all of the respondents mentioned that elderly and physically disabled people face transportation barriers. More than nine-tenths of the total respondents mentioned that aged and disabled people face a lack of shelter and toilets. Almost all of the respondents mentioned that old or elderly people face a lack of wash.

Almost all of the respondents mentioned that they face more intense of cyclonic disasters during the Baishakh-Jaistha (summer season). All of the respondents mentioned that they face the least intense of cyclonic disasters during the Poush-Magh (winter season).

All of the respondents mentioned that the community suffer from the negative effects of economic insecurity caused by cyclonic disasters. More than nine-tenths of the total respondents mentioned that cyclonic disasters exacerbate food insecurity, risk of death or life, loss of infrastructure, health risk, and lack of pure drinking water respectively. Almost nine-tenths of the total respondents mention that the community face lack of shelter, threat to various livelihoods, and migration. Almost four-fifths of the respondents mentioned that it damages of standing crops. More than half of the total respondents said that it damages of fisheries and reduce of domestic livestock and cattle. More than four-fifths of the total respondents mention that it damages of homestead garden. More than one-fourth of the total respondents mentioned that it damages soil degradation and infertility.

More than nine-tenths of the total respondents mention that cyclonic disasters create disruption of social networks, communication and transportation, and also induce forced migration respectively. More than four-fifths of the total respondents mention that cyclonic disasters hinder to women's income and employment, lack of enrollment in formal education and gender-based vulnerability due to lack of security respectively. More than two-fifths of the total respondents mentioned that it creates an irritated mind or a short temper. More than one-third of the total respondents mentioned that it increases the abnormality of norms, attitudes, and practices. More than half of the total respondents mentioned that cyclonic disasters create social exclusion and a lack of social cohesion respectively. Almost all of the respondents mentioned that cyclonic disasters disrupted the means of livelihood which creates vulnerability.

More than four-fifths of the total respondents mentioned that they migrate because of the salinity of the water.

More than four-fifths of the total respondents mentioned that they face negative impacts of cyclonic disasters over increasing illiteracy and the rate of dropout students in this territory.

Almost all of the respondents mentioned that they face economic hardship to social and mental depression due to cyclonic disasters. More than half of the respondents said that they face mental depression. More than one-third of the total respondents said that they face economic depression, and less than one-tenth of the total respondents mentioned that they face social depression. More than half of the total respondents said that cyclonic disasters deplete morality.

11.2.3 Risk, challenges and economic vulnerability due to cyclonic disasters

All of the respondents mentioned that cyclonic disasters are harmful to their economic activities.

Three-fourths of the total respondents mentioned that they are working 10–15 days in a month.

More than one-tenth of the respondents said that they work for 15–20 days, and less than one-tenth of the total respondents said that they work for 20–25 and 25–30 days in a month.

Regarding occupational hazards and challenges, all of the respondents said that workers suffer due to cyclonic disasters. More than three-fourths of the total respondents mention that they feel physical irritation and women are discriminated. More than nine-tenths of the total respondents mention that they get low wages and salaries and face health hazards due to cyclonic disasters.

Regarding the threatening sectors, all of the respondents mentioned that food production and lack of employment opportunity is a threat to cyclonic disasters. Four-fifths of the total respondents mentioned that fisheries are a threat to cyclonic disasters. More than two-thirds of the total respondents mention that domestic livestock, damage to forestry, and increasing of non-arable land are threats due to disasters.

More than nine-tenths of the total respondents mentioned that food production is decreasing gradually and seasonal crops are seriously affected. Three-fourths of the total respondents said that vegetable and fruit trees cannot be grown due to saline water.

Almost all of the respondents mentioned that nursery, sapling plantations, and timber trees can be damaged due to salinity.

More than nine-tenths of the total respondents said that sweet water fish, cultured fish, carp cultured fishes, hatcheries, and aquaculture are decreasing gradually. More than two-thirds of the

total respondents mention that it is severely affected. Almost one-fifth of the total respondents mentioned that it is moderately affected.

All of the respondents mentioned that cyclonic disasters induced salinity is the main reason behind their lowest income. Almost all or nine-tenths of the total respondents mentioned that lack of employment opportunity and unavailability of fish is the reason behind their lowest income. More than two-thirds of the total respondents mentioned that lower or no agricultural productivity and lower vegetation were the reasons behind their lowest income.

All of the respondents said that cyclones, coastal flooding and tidal surges are the main environmental change affecting livelihoods. More than four-fifths of the total respondents said that salinity is the main environmental change affecting livelihood. More than nine-tenths of the total respondents said they think salinity intrusion promotes soil infertility or degradation, but one-tenth of the respondents mentioned that they do not think or don't know about it.

More than four-fifths of the total respondents said that cyclonic disasters trigger global warming, deforestation, heat waves, hindrance of vegetation and plant species, changes in vegetation, loss of biodiversity, and disruption of ecosystems creates the environmental imbalance. More than three-fifths of the total respondents said that salinity creates a lack of homestead and kitchen garden and soil fertility degradation. Moreover, more than half of the total respondents said that cyclonic disaster induced salinity may create disease of fish may increase. More than one-third of the total respondents said that for salinity production of carp and sweet water fish will extinct.

11.2.4 Risk, challenges and health vulnerability due to cyclonic disasters

More than four-fifths of the total respondents mentioned that they are conscious of their health get nutritious food in their meals. Almost four-fifths of the total respondents mentioned that they are getting their proper food. All of the respondents mentioned that they take their meal three times in a day.

More than four-fifths (fifty-eight respondents) of the total respondents said that adolescent girls, pregnant women and breastfeeding women do not get sufficient nutritious food respectively during or after the cyclonic disaster.

More than four-fifths of the total respondents said that pregnant or breast-feeding women face iron deficiency during reproductive period and carry underweight baby for receiving insufficient nutritious food. Almost all of the respondents mentioned that pregnant, breastfeeding, and menstruating women are at risk of health during and after disasters.

More than one-fifths of the total respondents said that they know about getting their health right. More than one-tenths of the total respondents claimed that women, adolescents, and pregnant women get SRHR.

More than four-fifths of the total respondents said that they have water, sanitation, and hygiene facilities.

Regarding facing kinds of problem of women, more than nine-tenths of the total respondents mention that women facing scarcity of suitable places for baby's breast feeding, for changing proper sanitary materials, healthcare access are found insufficient, unavailability of separate toilets respectively. More than four-fifths of the total respondents mention that women do not get medical treatment; the essential goods and services are found insufficient; the absence of hygienic facilities; and the lack of privacy at latrines.

Almost nine-tenths of the respondents mentioned that they have drinking or potable water during or after a cyclonic disaster. One-tenth of the respondents mentioned that they haven't drinking or potable water during or after a cyclonic disaster. More than nine-tenths of the total respondents mentioned that they have proper sanitation facilities during or after a cyclonic disaster.

Regarding the condition of residence, more than one-tenths of the total respondents mentioned that the conditions of residence after a cyclonic disaster are filthy, the environment polluted, and other problems are facing. More than one-third of the total respondents said that the conditions of residence after a cyclonic disaster are dusty and nasty, toxic, and suffocating environment. More than two-fifths of the total respondents mentioned that the conditions of residence after a cyclonic disaster are extremely heated and risky, and unhygienic, dirty and polluted respectively.

Regarding the condition of sanitation/toilet, less than one-tenths of the total respondents said that they use bamboo-made latrine surrounded by plastic and bamboo-made latrine surrounded by straw or jute straw. More than one-fifth of the total respondents mentioned that they use bamboo-made toilets surrounded by corrugated. More than two-thirds of the total respondents mentioned that they use pucca latrine.

Regarding knowing family planning, more than nine-tenths of the total respondents mentioned that they knew about the family planning centre or community health clinic. More than two-fifths of the total respondents mentioned that government (upazila) health service institutions were within 10 kilometers. Almost three-fourths of the total respondents mentioned that the health care services are satisfactory. Almost half of the total respondents mentioned that there are free medical goods

or services. More than half of the total respondents mentioned that there aren't any private clinics or hospitals in their territory.

Four-fifths of the total respondents mentioned that women or adolescent girls do not get menstrual hygiene facilities during or post disasters. Two-thirds of the respondents mentioned that women or adolescent girls do not face sexual harassment or psychological trauma in cyclones or flood centers.

More than nine-tenths of the total respondents said that marginalized community face high rates of diseases, extreme weather, waterborne and foodborne diseases, and mental, nutritional, and infectious implications due to cyclonic disasters. More than four-fifths of the total respondents mentioned that marginalized community face heat related illnesses, vector and rodent borne diseases respectively due to cyclonic disasters.

All of the respondents mention that coastal community are more affected by fever. More than nine-tenths of the total respondents said that coastal community are affected by cold, bad headaches, diarrhea, asthma, or breath-taking problems. Almost three-fourths of the respondents mentioned that they are affected by bronchitis. More than four-fifths of the total respondents said that they're affected by whooping cough and skin disease.

More than four-fifths of the total respondents said that coastal people particularly pregnant women, neonatal baby, aged people, disable or chronic illness people in cyclonic disaster-prone areas do not get proper healthcare access.

Only one-tenth of the total respondents said that they faced the death of a family member by disaster. More than nine-tenths of the total respondents said that they face the risk of infectious communicable disease, damage of health facilities, and lacking of fresh drinking water due to disasters.

More than nine-tenths of the total respondents mentioned that they face adverse health implications like hypertension or blood pressure, stroke, heart disease and spread of water borne disease like cholera, dysentery, jaundice, and cold etc. More than four-fifths of the total respondents mentioned that they face adverse health implications like pre-eclampsia, prevalence of diarrhea, and pregnancy related complexity. More than two-thirds of the total respondents mentioned that they face health implications like feel physical irritation and hazards due to saline water in the paddy fields, fishing and other agricultural work. Almost three-fourths of the total respondents mentioned

that they face prevalence of skin diseases like itch, boil, or blister, and respiratory illnesses such as asthma, stomach cancer, and obesity.

Regarding the reason behind the pregnancy complexity, almost nine-tenth of the respondents mentioned that due to salinity, they face maternal and fetal complexity, miscarriage, changes in periodical cycle, and immature birth. Almost four-fifths of the total respondents said that due to salinity, they face maternal paternal death and intrauterine growth retardation. Two-thirds of the total respondents said that they sufferings in sexually transmitted diseases due to usage of saline water in periodic time.

11.2.5 Disaster Preparedness and Management

Having technical knowledge, more than nine-tenth of the total respondents mentioned that they have technical knowledge about resilience of cyclonic disaster response and risk reduction. More than four-fifths of the total respondents mentioned that the technologies are known and implied by the database management system and the management information system, and decision support system respectively. More than half of the total respondents mentioned that the technologies have been known and implied by the geographical information system.

Having vocational knowledge, almost nine-tenth of the respondents mentioned that they have vocational knowledge about the resilience of cyclonic disaster response and risk reduction. More than one-third of the total respondents mentioned that vocational knowledge implied prevention or mitigation knowledge. More than three-fourths of the respondents mentioned that it implied via strengthening capacities for disaster risk reduction. Almost all of the respondents said that it implied coping with hazards.

Having indigenous knowledge, all of the total respondents said that they have indigenous practical knowledge. More than four-fifths of the total respondents mentioned that indigenous knowledge is known by the community's behavior towards disaster, migration due to disaster, and moving higher ground in times of flood.

Regarding the existence of early warning system, all of the respondents mentioned that there is early warning system available. All of the respondents said that they knew about the upcoming disaster and early warning system through miking and interpersonal communication. More than nine-tenths of the total respondents said that they knew about the early warning system through television.

All of the respondents mentioned that they recover from the damaged properties by capacities from their own resources. More than nine-tenths, almost four-fifths and one-third of the total respondents said that they recover by government, NGO and stakeholder's support respectively.

Almost one-third, two-fifths and more than one-tenth of the respondents noted that they need 3-6 months, 7 to 12 months, and more than a year respectively to recover the damaged properties.

Regarding the existing policy enough or not, almost two-fifth and nearly two-third of the respondents mentioned that the existing policy is not enough and need some advancement policy.

Almost all of the total respondents mentioned that they need to empower the local community and need to increase disaster risk reduction skills. More than four-fifths of the total respondents mentioned that more sustainable community risk management system and link with local community to the local government is needed to reduce the disaster risks.

All of the respondents said that the government should take some steps: embankments should be repaired and maintained, careful planning should be required for sufficient sluice gates, and cyclone center should be secured and hygienic.

More than four-fifths of the total respondents said that reforestation should be done so that cyclonic disasters do not strike the coastal belt. Almost all of the respondents said that safe drinking water and medical facilities should be ensured during and after disasters. More than three-fourths of the respondents said that MHM corner for disadvantaged women is needed.

More than nine-tenths of the total respondents mentioned that awareness should be focused on public health and hygiene issues and also building meeting and comprehensive training module. Almost nine-tenths of the total respondents mentioned that building a public awareness program and preparedness programs should be more enriched.

Regarding receiving social assistance, more than almost two-fifth of the total respondents mentioned that they received a child education stipend. Nearly one-tenth of the total respondents mentioned that they received vulnerable group development, integrated food security, test relief, vulnerable group feeding and poor people's livelihood programs. Almost two-third of the participant mentioned that they did not get social assistance at all.

Regarding the resilience or coping strategies with disasters, all of the respondents recommended the motivational and awareness campaign, education, computer skills, basic vocational skills and technological training and reconstructs of devastated coastal embankments, damps, and polder.

Almost three-quarter of the respondents recommended coping strategies like salinity-tolerant crop

variety needs to be introduced, a central aquifer can be set up to collect and preserve rain water and develop advocacy systems and will focus on social safety net, supply pure drinking water, health and sanitation. More than nine-tenths of the total respondents recommended with coping strategies like embroidery, tailoring and knitting project, supply of roof materials, and tree plantation and vegetable gardening activities can be initiated. Less than one-tenths of the total respondents recommended coping strategies like palm oil tree plantation scheme can be introduced, linkages between the producers, local retailers, distributors, and, in some cases, exporters. More than one-tenths of the total respondents recommended coping strategies like plantations of betel leaves, Napier grass, and climate-affected people can be provided job opportunities in the business sector. More than half of the total respondents recommended introduced with the technical and financial support of GO and NGOs; needs to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing and marketing and principles of good governance. More than one-third of the total respondents recommended to prepare khash land for the farmers and vulnerable women group for plantation of palm trees and vegetation. More than two-fifths of the total respondents recommended links with cultured fisheries, fish processing, fish trading especially shrimp and sweet water fish, and fruit. Half of the respondents recommended crab fattening project can be introduced for vulnerable women.

11.3 Key Findings of Focus Group Discussions (FGDs)

11.3.1 Socio-demographic Profile

Almost one-fourth of the respondents are aged in the range of 31–40, 41–50 and 51–60 years respectively. More than four-fifth of the respondents are male, and the rests are female. Almost all of the respondents are married, and less than one-tenth of the respondents are single. More than half of the respondents are illiterate. Almost one-fourth of the respondents have completed their primary education. Nearly about four-fifth of the respondents consists of 3 to 6 family members. More than one-third of the respondents have a family income is the range of 5001–10000 and 10001–15000 taka per month respectively. Almost one-fifth of the respondents have a monthly family income is 15001 to 20000 taka. More than two-fifth of the respondent expenses 5001 to 10000 taka per month for their family. One-third of the respondent expenses 10001 to 15000 taka per month for their family have a family expenditure of taka.

11.3.2 Risk, challenges and social vulnerability due to cyclonic disasters

All of the participants (fifty-seven participants) of FGD said cyclones and floods occurred in their coastal belt. Almost nine-tenths and more than nine-tenths of the respondents said salinity and tidal surge are occurred in their coastal belt. Almost all of the respondents faced a cyclonic disaster or hazard at every year. Less than one-tenth of the total respondents mentioned that they sometimes faced cyclonic disaster. All of the respondents said they face flooding, cyclones, and storm surge. Almost three-fourths of the total respondents said that they face river bank erosion. Almost nine-tenths of the respondents said they face salinity. All of the respondents seem the term cyclonic disasters as cyclone, tidal surge, salinity, and flood. All of the respondents said they faced bitter experiences caused by cyclonic disasters.

All of the respondents are negatively affected economically, psychologically and in terms of health due to the cyclonic disaster. More than one-third of the total population affected socially and culturally by cyclonic disaster. More than one-fourth of the total respondents are affected physically due to the cyclonic disaster.

Almost all of the respondents said they have enough cyclone shelter in their region. Less than one-tenth of the total respondents said they have no cyclone shelter in their region. Almost one-fifth of the total respondents said the cyclone centre is within 500 meters of their home and more than one-fifth respondents said it is within 1 km. More than half of the total respondents said the cyclone centre is within 2 km from their home. Less than one-tenth of the total respondents said the cyclone centre is within 5 km. More than half of the total respondents are satisfied, More than one-fourth of the respondents are moderately satisfied about the structural condition of cyclone centres.

All of the respondents face the destruction of infrastructure and farmland respectively due to cyclonic disasters; more than nine-tenths of the respondents face ruining the shelter; more than two-fifths of the respondents face the death of cattler.

All of the respondents are negatively affected by cyclonic disasters on their livelihood and their entire social life.

The people of their community were negatively affected by the cyclonic disaster. All of the respondents faced hindrances to their daily activities, food insecurity, disruption of communication and break out of diseases. More than half of the total respondents faced hindrances of cultural activities. Almost half of the respondents faced disruption of prayers.

All of the respondents mention that cyclonic disasters disrupted social networks, communication and the means of livelihood. Almost all or more than nine-tenths of the respondents mentioned that they face hindrances to movement of children, impediment of women's income, damage of educational institutions, increasing rate of mental health issues, prevalence of diarrhea, spread of water borne diseases and forced migration etc. More than two-fifths of the total respondents mentioned cyclonic disaster increased the rate of crime. More than four-fifths of the respondents mentioned that cyclonic disasters spread of vector-borne disease. More than three-fourths of the respondents said that prevalence of skin diseases and gender based vulnerability are occurred due to cyclonic disasters.

Nearly all of the respondents face the problem of safe drinking water, water, sanitation, and hygiene (WASH), and less than one-tenth of the respondents do not face the problem of WASH. Almost all of the respondents said cyclonic disasters created the problem of pure drinking water; nearly one-fourth of the respondents said disasters created a lower level of groundwater; and more than two-fifths of the respondents said cyclonic disasters polluted water through waste disposal.

Regarding the facing vulnerability of women, nearly all of the respondents mentioned that women hardly get health care services during disasters. More than two-thirds of the respondents mentioned that the health care centre is far away. Almost three-fifths of the total respondents mentioned that women face restrictions on access to health care, women face patriarchal attitude and lack of opportunity in decision-making respectively. More than two-fifths of the respondents mentioned that women have lack of political empowerment and socially excluded due to lack of empowerment. All of the respondents mentioned that women play key role in the informal sector which is almost unpaid or underpaid. And almost half of the total respondents mentioned that women are unable to play a role in voluntary services.

All of the respondents said that children, pregnant women, disabled person and old people are more vulnerable group during a cyclonic disaster. More than four-fifth of the total respondents said adolescent girls and young adult women are a more vulnerable group.

More than four-fifth of the respondents noted that cyclonic disasters lead is an increasing rate of child and mortality. All of the respondents mentioned that economic uncertainty, lack of food security and a risk of infectious diseases are increased due to disasters. More than two-fifths of the total respondents said it increased juvenile delinquency. Nearly all of the respondents said that during cyclonic disaster, schools are closed and infrastructure is damaged, which affects children's

education. More than half of the total population mentioned that during this time children lost their books. That's why they cannot continue their education.

Regarding the impact of women and adolescent girls, nearly all of the respondents mention that women and adolescent girls face the problem of a lack of secured shelter, lack of menstrual hygiene, lack of health care, lack of food and nutrition, and more domestic household works load respectively. Almost three-fifths of the total respondents mentioned that most of the women and adolescent girls drop out of school. More than two-thirds of the total respondents mentioned they face a lack of maternity health. More than half of the total respondents mentioned they face mobility problems and socio-cultural barriers.

Regarding the vulnerability of aged and disabled people, nearly all of the respondents mentioned that elderly and disabled people face transportation barriers. More than two-thirds of the respondents mentioned that disabled and elderly community face a lack of shelter. More than four-fifths of the respondents mentioned that disabled and elderly people face sanitation problem. All of the respondents mentioned that aged and disabled people face lack of water, sanitation and hygiene (WASH).

More than four-fifth of the respondents mentioned that they face more intense cyclonic disasters during the Baishakh-Jaistha (summer season). Nearly all of the respondents mentioned that they face the least intense of cyclonic disasters during the Poush-Magh (winter season).

All of the respondents mentioned that they suffer from the adverse effects of economic insecurity, food insecurity, death or life risk, loss of infrastructure, health risk, problem, or hazard, lack of pure drinking water and threat to various livelihoods respectively caused by cyclonic disasters. Nearly all of the respondents are facing lack of shelter, cyclonic disasters exacerbate the damages of standing crops, damages of homestead garden and increasing migration. Almost three-fourths of the respondents mentioned that it damages of fisheries. More than half of the total respondents said that domestic livestock and cattle are decreased due to cyclonic disasters. Nearly one-third of the respondents mentioned that it damages soil degradation and infertility.

All of the total respondents mention that cyclonic disasters aggravate the disruption of social networks, disruption of communication, impediments to women's income and disruption of the means of livelihood. More than three-fifth of the total respondents mentioned that it creates an irritated mind or a short temper, increases of domestic violence and gender-based vulnerability. Almost half of the total respondents mention that it increases the abnormality of norms, attitudes,

and practices and a lack of social cohesion. Nearly two-third of the respondents mentioned that cyclonic disasters create social exclusion as well as a lack of enrollment in formal education. All of the total respondents mention that forced migration are increased due to cyclonic disasters induce salinity intrusion. Almost one-fourth and more than half of the of the total respondents said that 200–300 and 400–500 people are migrated respectively from this village due to cyclonic disasters.

Almost all of the respondents noted that they face many negative impacts of cyclonic disasters on the rate of dropout students in this territory.

Regarding facing vulnerability/depression, all of the respondents notified that the community face vulnerability from economic hardship to social or mental depression due to cyclonic disasters. More than half of the respondents said that they face mental depression. More than two-fifths of the total respondents said that they face economic depression, and less than one-tenth of the total respondents mentioned that they face social depression. Almost three-fifths of the respondents said that cyclonic disasters lead to deplete the morality.

11.3.3 Risk, challenges and economic vulnerability due to cyclonic disasters

All of the respondents mentioned that cyclonic disasters are harmful to their economic activities. Regarding occupational hazards and challenges, nearly all of the respondents said that workers suffer due to cyclonic disasters, get low wages and salaries, and face health hazards due to cyclonic disasters. Two-thirds of the total respondents mention that they feel physical irritation. More than nine-tenths of the respondents said that women are discriminated terms of wage and work environment due to disasters.

All of the respondents claimed that food production and employment is threatening sectors due to cyclonic disasters. More than four-fifths of the total respondents mentioned that fisheries sector is a threat to cyclonic disasters. More than half of the total respondents mention that domestic livestock and damage of forestry are threats. One-third of the respondents noted that cyclonic disasters increased the non-arable land.

All of the total respondents mentioned that food production and seasonal crops are decreasing gradually. More than two-fifths of the respondents said vegetable cannot be grown due to saline water. Almost three-fifth of the total respondents said that fruit trees cannot be grown due to saline water. Nearly all of the respondents mentioned that nursery, sapling plantations, and timber trees can be damaged due to salinity.

Nearly all of the respondents said that sweet water fish, carp cultured fish, hatcheries and aquaculture are decreasing gradually due to salinity. Almost two-thirds of the respondents noted that it is severely affected. One-third of the respondents mentioned that it is moderately affected, and less than one-tenth of the respondents mentioned that it is slightly affected due to salinity.

All of the respondents said that cyclone, tidal surges, salinity intrusion and coastal flooding are the main environmental change affecting livelihoods.

More than four-fifths of the total respondents said they think salinity intrusion promotes soil infertility or degradation, and more than one-tenth of the respondents mentioned that salinity intrusion does not promote soil infertility or degradation.

All of the respondents mentioned cyclonic disasters exacerbate deforestation and intensifying global warming. Nearly all of the respondents said that cyclonic disasters create heat waves, hindrance of vegetation, lack of homestead garden, changes in vegetation, loss of biodiversity, and disruption of ecosystems. Almost three-fifths of the total respondents said that salinity creating soil fertility degradation, disease of fish may increase, and production of carp and sweet water fish will extinct.

11.3.4 Risk, challenges and health vulnerability due to cyclonic disasters

Only one-fourth of the participants of FGD mentioned that they are conscious of their good health. More than two-thirds of the respondents mentioned that they are not conscious of their health. More than three-fourths of the total respondents said that they are not getting the proper food. Almost two-fifths of the total respondent mentioned that they take their meal two times in a day. More than three-fifths of the total respondent noted that they take their meal three times in a day. More than four-fifth of the total respondents mentioned that they do not get nutritious food in their meals.

Nearly all of the respondents said that adolescent girls, pregnant and breastfeeding women do not get sufficient nutritious food during or after the cyclonic disaster.

Almost all of the respondents said that pregnant or breast-feeding women face iron deficiency during and after disasters. Nearly two-fifth of the respondents mentioned that pregnant or breast-feeding women do not carry underweight baby for lack of receiving balanced diet. Almost all of the respondents mentioned that pregnant, breastfeeding, and menstruating women are at risk of health during and after disasters.

Almost three-fourths of the respondents said that they do not get their health right properly. Almost one-fourth of the respondents said that women, adolescents, and pregnant women get SRHR. Almost three-fourth of the respondents said that they do not get their SRHR.

Almost one-fifth of the participants of FGD said that they have drinking or potable water, water, sanitation, and hygiene (WASH) facilities. Nearly four-fifths of the respondents said that they don't have water, sanitation, or hygiene facilities. More than two-thirds of the total respondents mentioned that they didn't have proper sanitation facilities during or after cyclonic disasters.

Regarding the facing kinds of problem of women, all of the respondents mention that women faced numerous problems including scarcity of suitable places for baby's breast feeding, changing proper sanitary materials, insufficient medical treatment, lack of healthcare access, and the essential goods and services are found insufficient. More than half of the total respondents mentioned that the chance of sexually transmitted diseases is increased. Nearly all of the total respondents mention that women and adolescent girls faced the absence of hygienic facilities, lack of privacy at latrines and unavailability of separate toilets, showers, and tents.

Regarding the condition of residence, more than half of the total respondents mentioned that the conditions of residence are filthy, dusty and nasty, and the toxic environment. Almost two-fifths of the respondents said that the conditions of residence are extremely heated. More than four-fifth of the respondents noted that the conditions of residence are risky, unhygienic and suffocating. More than three-fifth of the respondents mentioned that the conditions of residence are dirty and polluted.

Regarding the usage of sanitation or toilet, almost one-fourth of the respondents said that they use open space and bamboo-made latrine surrounded by plastic. Nearly half of the total respondents claimed that they use bamboo-made latrine surrounded by straw or jute straw. Almost one-third of the total respondents mentioned that they use bamboo-made toilets surrounded by corrugated.

All of the respondents mentioned that they knew about the family planning centre or union. Almost one-third of the total respondents mentioned that government (upazila) health service institutions were within 10 kilometers far away from their home. One-third of the total respondents claimed that government health service institution within 5 km. Almost three-fourth of the respondents mentioned that the health care services aren't satisfactory. More than four-fifths of the total respondents mentioned that they did not receive any free medical goods or services. More than two-third of the respondents noted that there are not existed any private clinics or hospitals.

Regarding getting menstrual hygiene, more than three-fourth of the respondents mentioned that women or adolescent girls do not get menstrual hygiene facilities. Regarding facing the sexual harassment, more than two-thirds of the respondents admitted that women or adolescent girls do not face sexual harassment or psychological trauma in cyclones or flood centers.

All of the respondents claim that the community face high rates of diseases, heat related illnesses and deaths, extreme weather, waterborne and foodborne diseases, and vector and rodent borne diseases due to disasters. Nearly all of the respondents said that the coastal people face mental, nutritional, infectious and other health effects due to disasters.

All of the respondents mention that due to disasters the community suffer from fever, cold and bad headache. Nearly all of the respondents said that coastal people are affected by diarrhea, whooping cough, asthma, or breath-taking problems and skin diseases. More than two-fifths of the total respondents mentioned that the community are affected by malaria during disasters.

Almost all of the respondents said that people particularly pregnant women, neonatal baby, aged people, disable or chronic illness people in cyclonic disaster-prone areas do not get proper healthcare access.

All of the respondents said that they face the risk of infectious communicable disease, damage of health facilities and lacking of fresh drinking water. nearly one-fifth of the total respondents said that they faced the death of a family member by disaster.

Nearly nine-tenths of the participants mentioned that they face adverse health complications like hypertension or blood pressure, stroke or heart disease and prevalence of diarrhea. Almost all of the total respondents mentioned that they face health implications like spread of water borne disease like cholera, dysentery, jaundice and pregnancy related complexity. All of the total respondents mentioned that they face prevalence of skin diseases like itch, boil, or blister, and respiratory illnesses such as asthma, stomach cancer, and obesity. More than two-fifths of the total respondents mentioned that they face health implications like multiorgan disorder. Almost three-fourths of the respondents admitted that they face physical irritation and itching and boil hazards due to saline water in the paddy fields, fishing and other agricultural work due to salinity.

Regarding reason behind the pregnancy complexity, nearly nine-tenths of the total respondents mentioned that due to salinity, they face maternal and fetal complexity, miscarriage, and changes in periodical cycle. More than four-fifth of the respondents said that due to salinity, increasing immature birth, maternal and paternal death and intrauterine growth retardation. Almost four-fifths

of the total respondents said that due to salinity they are sufferings in sexual transmitted diseases due to usage of saline water in periodic time.

11.3.5: Disaster Preparedness and Management

Having technical knowledge, nearly three-fifth of the participants mentioned that they have technical knowledge about resilience of cyclonic disaster response and risk reduction.

Almost one-fifth of the total respondents mentioned that the technical knowledge is known and implied by the management information system and geographical information system respectively. More than half of the total respondents said that the technical knowledge has been known and implied by the decision support system. One-fourth of the respondents mentioned that they do not have technical knowledge.

Having vocational knowledge, more than four-fifths of the respondents mentioned that they have no vocational knowledge about the resilience of cyclonic disaster response and risk reduction.

More than one-tenth of the total respondents mentioned that vocational knowledge implied prevention or mitigation knowledge, strengthening capacities for disaster risk reduction and coping with hazards respectively.

Having indigenous practical knowledge, nearly all of the total respondents said that they have indigenous practical knowledge about resilience of cyclonic disaster response and risk reduction. More than four-fifths of the total respondents admitted that indigenous knowledge is known and implied by the community's behavior towards disaster and migration due to disaster. All of the respondents said that it implied their own survival mechanism. Almost all of the respondents said that it implied by the respondents moving higher ground in times of floods or cyclones.

All of the respondents mentioned that early warning system is available there. More than four-fifths of the respondents said that they know about the upcoming disasters and early warning system through television. All of the respondents said that they knew about the upcoming disasters and early warning system through miking and interpersonal communication. More than half of the total respondents said that they knew about the upcoming disasters through social networking sites.

All of the respondents mentioned that they recover from the damaged properties by capacities from their own resources. More than half of the total respondents mentioned that they recover from the damaged properties by NGO support. More than nine-tenths of the total respondents said that they

recover by government support. More than one-fourth of the total respondents mentioned that they recover by the stakeholder's support.

Almost one-fourth of the total respondents mentioned that they need 3 to 6 months to recover the damaged properties and setback in regular life activities. More than half of the total respondents said that they need 7 to 12 months to recover the damaged properties. Nearly one-fifth of the respondents mentioned that they need more than a year to recover the damaged properties.

Regarding the existing policy enough or not, more than one-fifth of the total respondents mentioned that the existing policy is not enough. More than three-fourth of the total respondents mentioned that it is needed some advancement policies.

Almost all of the total respondents mentioned that they need to empower the local community, and need to link the local community to the local government. Two-third of the respondents mentioned that a more sustainable community risk management system is needed. All of the respondents noted that need to build skills to reduce the disaster risks.

All of the respondents said that the government should take initiatives including embankments should be repaired and maintained, careful planning should be required for sufficient sluice gates, and cyclone center should be secured and hygienic to reduce the cyclonic disaster risks.

Regarding the environment related initiative, nearly three-fourth of the respondents said that reforestation should be implemented for reducing the disaster risks. All of the respondents said that safe drinking water and medical facilities should be ensured during and after disasters. Almost nine-tenths of the total respondents said that they needed a MHM corner for disadvantaged women. All of the respondents noted that awareness should be focused on public health and hygiene issues and preparedness programs should be enriched. Almost all of the total respondents mentioned that meeting and comprehensive training module program is needed. Nearly three-fourth of the respondents mentioned that public awareness program is needed.

Regarding getting social assistance, almost half of the respondents mentioned that they received assistance like child education stipend. More than half of the respondents mentioned that they got vulnerable group development and vulnerable group feeding assistance. Almost one-fourth of the respondents mentioned that they received food for work. Less than one-tenth of the total respondents mentioned that they received integrated food security and gratuitous relief. Two-third of the total respondents mentioned that they received poor people's livelihood programs.

Regarding resilience or coping strategies with disasters, more than three-fifths of the respondents recommended salinity-tolerant crop variety needs to be introduced. Nearly all of the respondents recommended such as embroidery, tailoring and knitting project can be initiated, motivational and awareness campaign, supply of roof materials, and education, computer skills, basic vocational skills and technological training. One-third and almost one-third of the total respondents recommended introduced with the technical and financial support of GO and NGO and principles of good governance respectively. More than one-fourth of the total respondents recommended needs to be integrated approach and development including effective training on nursery development of Seedlings, saplings, management of trees, harvesting, processing and marketing. Less than one-tenth of the respondents recommended to prepare khash land for the farmers and vulnerable women group for plantation of palm trees and vegetation, linkages between the producers, local retailers, distributors, and, in some cases, exporters and crab fattening project can be introduced for vulnerable women. More than four-fifth of the total respondents recommended that supply of water reservoirs and pipe line is needed. All of the respondents recommended that reconstructs of devastated coastal embankments, dams, and polder, and tree plantation and vegetable gardening activities is needed to reduce the cyclonic disaster risks.

11.4 Synthesis Result of Quantitative Findings & Qualitative Findings (KII, Case Study, FGD)

11.4.1 Socio-demographic Profile

The study area is divided by eight upazila from the four districts under the two division of Barishal and Khulna in Bangladesh. From the quantitative data findings, among the 840 respondents, 24.2%, 19.2% and 18.2% of the respondents belongs to 31-40, 41-50, and 21-30 age group respectively. Only 14.6% respondents belong to more than 60 years old. Almost two-third of total respondents or 60.7% of male respondents, while 39.3% are female. Among the 840 respondents, married and single are 88.8% and 10.1% respondents respectively. Almost two-third or 66.2% of the total respondents (including 39.8% illiterate and 36.4% in primary) and exist under primary level education. Among the 840 respondents, about 13.9%, 28.9%, 16.7%, 0.2%, 4.0%, 3.1% 1.1%, 2.6%, 2.6%, 0.6%, 7.7%, 4.3%, 3.8%, 2.0%, 3.6%, 0.4%, 3.3%, and 0.4% of the respondents engaged in agriculture, fishing, homestead gardening, shrimp cultivation, Job sector, crab collector, wood collector, honey collector, medicinal plant collector, day labor, marginal farmer,

landless poor, CPP volunteer, business, housewife, boatman, bed community respectively. 78.1% and 16% of the respondents consists of 3 to 6 and 7 to 10 family members respectively. Almost 80.2% (9.6% earn <5000, 31.1% earn 5000-10000, and 39.5% earn 10001 to 15000 taka) of the respondents earn up to 15000 taka per month. Almost 79.7% (8.7% expense <5000, 33.3% expense 5000-10000, and 37.7% expense 10001 to 15000 taka) of the respondents' expense monthly up to 15000 taka.

On the other hand, from the qualitative data findings, nearly one-seventeenth (twelve out of two hundred seven) belongs to 11-20 years old, while about one-tenth participants are aged 21-30 years. More than one-fourth of the respondents belong to the 31-40 years age group. Roughly one-fourth (forty-eight out of two hundred seven) are in the 41-50 years range, with one-fifth of the respondents exist in 11-20 years. Around one fifteenth (fifteen out of two hundred seven) belongs to age above sixty years. Approximately three-fourth of the participants are male, while the remaining one-fourth are female. Of the two hundred seven respondents, nearly nine-tenth of the respondents are married, while the remaining one tenth are single. Out of two hundred seven respondents, nearly one third are illiterate, one fifth have primary education, nearly one fifth have secondary education, one-fourth of the participants achieved above higher secondary education. Among the two hundred seven participants, almost three-fourth of the respondents' family consist of 3 to 6 members, and around one-fourth households have 7 to 10 members. Among two hundred seven respondents, approximately one third earn between 5001 to 10000 BDT. Another one third earn between 10001 to 15000 BDT, and the remaining more than two-third earn over fifteen thousand taka. Approximately one-third of the respondents spend between five to ten thousand taka, one fourth spend between ten to fifteen thousand taka, nearly one sixth expenses between fifteen to twenty thousand taka, about one-fifth of the respondents expenses between twenty to twenty-five thousand taka.

11.4.2 Risk, Challenges and Social Vulnerabilities due to cyclonic disasters

From the quantitative data findings, all of the respondents or 100%, 98.6%, 98.2% and 99.6% of the respondents' face cyclone, salinity intrusion, tidal surge and flood respectively in their lifetime. About 91% of the south west coastal respondents faced various kinds of disasters frequently and 8.8% of the respondents claimed that they sometimes or often faced of cyclonic disasters. expressed bitter experiences they faced at the period of or post cyclonic disasters.

Among two-hundred and seven respondents (KII, Case study, and FGD), nearly all have faced cyclones, while around nine-tenth have faced salinity and tidal surges. Almost all have experienced floods, and approximately two third have encountered river erosion. Charfashion, Tajumuddin, and Betagi are regions with the least salinity prone areas. Among two hundred seven respondents, around nine-tenth claim to have frequently faced cyclonic disasters, while the rest state that they have faced cyclonic disasters occasionally and very rarely. Nearly all of the respondents witnessing cyclones, tidal surges, salinity, and floods. Almost all of the respondents mentioned that they are experiencing bitter consequences due to cyclonic disasters.

Various vulnerabilities: From the quantitative data findings, cyclonic disasters effect on the communities economic, social, physical, psychological, cultural, and health vulnerabilities which accounts for 100%, 89%, 13.9%, 96.9%, 6.8% and 97.5% respectively. On the contrary, qualitative data show that almost all of the participants faced economic repercussions, nearly about nine-tenth faced psychological and health effects due to cyclonic disasters. Almost three-fifth of the respondents faced social vulnerability, and one fourth experienced physical and cultural repercussions due to cyclonic disasters.

Condition of Cyclone Shelters: From the quantitative data findings, 98.7% of the respondents mention that there exists enough cyclone center in their region. Almost all or 90.9% of the respondents express that the cyclone center exists (13.2%, 33.1%, and 44.6% cyclone shelter is within 500 meters, 1 km and 2 km) 2 kilometers far from their houses. Only 1.9%, 4.4%, 1.1% and 0.1% participants note that the cyclone center is far away from their houses like within 3 km, within 4 km, within 5 km, and within 6 km respectively. About 49.4% and 31.5% of the respondents opine that the structural condition of the cyclone center is satisfactory and moderately satisfactory condition. Only 12.6% of the respondents noted that it is not satisfactory.

On the contrary, qualitative data show that almost all respondents stated that their area has cyclone shelters or designated buildings used as shelter during cyclonic disasters. Around three-fifth of the two hundred seven participants noted that distance of one kilometer between the cyclone center and their homes, while almost two-fifth of the participants mentioned that distances of cyclone center is within two kilometers from their home. A few of them mentioned that cyclone center is 5 kilometers or more than far away from their residence. Out of two hundred seven respondents, more than half of the total participants assessed the inside environment of cyclone shelters as

satisfactory, one fourth noted as moderately satisfied, and the rest deemed them structurally unsatisfactory.

Economic Hazards: Cyclonic disaster creates economic hazards or vulnerability. A significant portion 98.9%, 96.1%, 92.3% and 47% of the respondents opine that the most effect of cyclonic disasters destructed the infrastructure, farmland, ruining the shelter and death of cattle respectively. On the contrary, qualitative data present that approximately all of the respondents mentioned that cyclonic disasters exacerbate the destruction of infrastructure, more than four-fifth of the respondents claimed that damages of shelter and destructions of farmland. Nearly half reported that livestock losses are observed due to cyclonic disasters.

Livelihood and social life: From the quantitative survey, about 99.8% and 99.6% of the participants confess the adverse effect of cyclonic disasters on their livelihood and social life respectively. On the contrary, qualitative data present that all respondents indicated that negative impacts on their livelihoods and entire social life due to cyclonic disasters.

Facing Challenges of Community: Quantitative survey display that about 99.4% and 75.6% of the respondents observed hindrance of daily activities and cultural activities respectively of the respondent observed hindrance of cultural activities. 95.5%, 95.7% and 93% of the respondents mention that they feel food insecurity, disrupted the communication and outbreak of diseases respectively during and aftermath of natural disasters.

Qualitative data present that almost all experienced the disruptions to daily activities, while two-third faced hindrances to cultural activities due to cyclonic disasters. More than four-fifth of the respondents claimed that the community faced food insecurity, communication disruptions, and outbreaks of disease due to cyclonic disasters. Almost two-fifth noted disruptions to prayers.

Adverse Social Implications: Quantitative survey data shows that cyclonic disaster impacts negatively the socio-cultural, economic and health sectors of the south west coastal marginal community. 98.5% respondents claim that cyclonic disasters create the disruption of social network and disruption of communication and transportation respectively. Cyclonic disasters disrupt the women employment opportunity that is 91.7%, hinder to movement of children responded by 86.3%, damage the educational institution which is 91.5%, 92.6% of the respondents opine that cyclonic disaster creates and continues with increasing pressure on mental health. 92.1%, 64.6%, 91.3%, and 95.6% respondents claim that they suffer prevalence of diarrhea, vector borne diseases, water borne diseases and skin diseases respectively. About 94.6%, 93.3% and 7.3%

of the respondents claim that disasters accelerate forced migration, disrupt the means of livelihood and gender-based vulnerability respectively.

Qualitative data depict that almost all participants cited adverse social implications including disrupted social networks and communication, hindrances to children's movement, women's income, means of livelihood disruptions, educational institutions, increased mental health issues, waterborne diseases, skin ailments, and forced migration due to cyclonic disasters. Two-third noted the increasing of crime rates, vector-borne diseases, malnutrition, and gender-based vulnerabilities are occurred due to cyclonic disasters.

Challenges of WASH: Quantitative survey display that about 99.6% and 99.5% of the respondents respond that cyclonic disasters create the problem of WASH and potable water respectively.

Qualitative data present that almost all of the respondents mentioned shortage of safe drinking water, and water, sanitation, and hygiene (WASH) problems are observed during and aftermath of cyclonic disasters, with existing facilities being inadequate. Almost everyone mentioned that rare availability of pure drinking water due to salinity and distant tube wells during cyclonic disasters. One third noted lower groundwater levels, and almost half of the respondents mentioned water pollution from waste disposal, exacerbating safe drinking water problems during cyclonic disasters.

Women's Vulnerability: Findings from quantitative data, 92.4%, 92% and 89% of the respondents point out that during disasters women hardly get preferential treatment in health care services, their roles in domestic chores and informal work, and health care center is too far respectively. 44.8% of the respondents claim that women face lack of opportunity in community decision making process, and lack of political empowerment respectively.

Qualitative data show that about four fifth of participants noted that women face vulnerability and deprivation during disasters, such as limited access to healthcare, distant health care center, and restricted roles in the informal sector due to unpaid work. Almost half of them highlighted the patriarchal attitudes, lack of opportunities in decision-making, the distance of healthcare centers from women's homes. Additionally, two-fifth mentioned political disempowerment, and others noted women's inability to engage in voluntary services.

Groups at Higher Risk: The quantitative data exhibits that regarding the more vulnerable group, about 99.3%, 98.7%, 96.3%, 93.2%, and 92.1% respondents opine that the more vulnerable group is pregnant women, disable person, old/aged people, children and adolescent girls respectively.

Qualitative data present that nearly all of respondents identified children, pregnant women, elderly and disabled individuals as more vulnerable during cyclonic disasters. Three-fourth observed that adolescent girls and the young adult women are also more vulnerable during such disasters.

Impact on Children: Quantitative survey data portrays that about 98.5%, 99.5% and 91.8% respondents express that cyclonic disasters increase the risk of infectious diseases, lack of food security, and increase the rate of child mortality among children. Besides, 99.5%, 98.6% and 99.4% opine that cyclonic disasters disrupt the regularity of children education, children drop out from school, and tends to economic uncertainty.

On the contrary, qualitative data present that nearly all respondents mentioned that lack of food security significantly impacts children during disasters. More than four-fifth of the respondents claimed that the increased risk of infectious diseases and rising rates of deceased due to cyclonic disasters., while one-third noted juvenile delinquency are also impacts on children during disasters. Furthermore, all of the participants claimed the closure of schools, damages of infrastructure, and economic hardship of the children are arisen due to cyclonic disasters.

Impact on Women and Adolescents: Quantitative survey data presents that 98.8% respondents express women face lack of security in shelter and lack of food and proper nutrition respectively. About 98.7%, 97.4%, 82.5%, 94.9% and 60.6% of the respondents opine that women face lack of menstrual hygiene management kit, lack of health care services, lack of maternity health advantages, more domestic household work load, and mobility problem respectively during cyclonic disasters period.

On the other hand, qualitative data present that nearly all of the participants highlighted that the lack of secure shelters is observed among the women and adolescent girls during disasters. Four fifth of them mentioned dropout rates from school, lack of menstrual hygiene, healthcare, food, nutrition, and increased domestic household workload as impacted on women and adolescent girls due to cyclonic disasters. Two third of them mentioned that lack of maternity health and mobility problem faced by women and adolescent girls during disasters.

Vulnerability of the Elderly and disabled: Quantitative survey delineates that 100%, 99.4%, 99.2% and 98.0% of the participants said that disabled and aged people face transportation barriers, lack of water, sanitation and hygiene (WASH) facilities, sufficient toilet facilities, and lack of shelter facilities respectively. On the contrary, qualitative data present that transportation barriers were cited by almost everyone as a vulnerability for the elderly and disable people. More than

four-fifth of the respondents mentioned the lack of shelter, toilets, and water sanitation and hygiene (WASH) facilities as additional vulnerabilities for the disabled and elderly during cyclonic disasters.

Intensity of Cyclonic Disasters: According to quantitative survey data, about 89% of the respondents express that in Baishakh-Jaistha (summer), people face more intensity due to cyclonic disasters. 95.7% of the respondents express that cyclonic disasters are found in the least of Poush-Magh (winter).

Qualitative data present that more than four fifth of the participants observed that the months of Baishakh and Jaistha have a higher intensity of cyclonic disasters. About one-fifth noted Ashar-Shrabon months as having more intense cyclonic activity. On the other hand, Poush-Magh months were reported almost all of the respondents to have less intensity of cyclonic disasters.

Negative Effects: Quantitative survey data show that about 99.4%, 99.4%, 99%, 95.7%, 98.1%, 97.7%, 97.4%, 36.3%, 77.4%, 92.7%, 95.8% and 84.8% of the respondents faced economic insecurity, food insecurity, lack of shelter, death risk, infrastructural losses, health risks, scarcity of safe drinking water, damage of standing crops, loss of fisheries, homestead/kitchen garden, threats to various livelihoods, and migration respectively due to cyclone and cyclone induced disasters.

On the other hand, qualitative data present that almost all of the participants mentioned economic insecurity and food insecurity as adverse effects of cyclonic disasters. More than four-fifth mentioned lack of shelter, death risk, loss of infrastructure, health risks, threats to various livelihoods and lack of clean drinking water as negative effects on livelihood due to cyclonic disasters. Three-fifth highlighted damages of homestead garden and forced migration are seen due to cyclonic disasters. Additionally, almost two-third mentioned damage to crops, fisheries, domestic livestock, and soil degradation as negative effects on households due to disasters.

Social Disruptions: Quantitative survey data shows that about 99.3%, 99.2%, 92.9%, 94.9% and 94.4% of the respondents mentioned that cyclonic disasters promote the disruption of social network, communication and transportation, impediment to women's income and employment, migration, and disruption of the means of livelihood respectively. About 41.1%, 32.1% and 20.2% of the respondents are socially excluded, experienced with short temper and increased of domestic violence are occurred due to disruptions in cyclone disasters period.

Qualitative data present that almost all respondents mentioned disruptions in social networks and communication during disasters become high. Almost four fifth observing impediments to women's income, forced migration and disruption of the means of livelihoods become heightened. One third mentioned that irritated mind, abnormality of norms attitudes and social exclusion and lack of social cohesion create the adverse social disruptions due to cyclonic disasters.

Migration Patterns: Quantitative survey data show that 91.7% of the participants point out that south west coastal belt people migrated because of cyclonic disasters/water salinity. In contrast, qualitative data present that more than four-fifth of the respondents mentioned migration are occurred due to cyclonic disasters and water salinity.

Negative Impact on Literacy: Among the 840 respondents of quantitative survey, 93.9% of the respondent mention that cyclonic disasters have negative impact on increasing illiteracy and rate of drop out students in southern coastal Bangladesh. On the contrary, qualitative data depict that almost nine-tenth note that negative impact on increasing illiteracy due to cyclonic disasters, which leads to an increase in school dropout rates of children.

Facing Vulnerability and Depression: Quantitative survey data show that 95.4% of the respondents admit that the southwest coastal people are facing the financial hardship with social/mental depression due to cyclonic disasters. 58.4%, 33.6% and 8% of the respondents admit that the southwest coastal people faced the mental depression, economic depression and social depression respectively due to cyclonic disasters.

Qualitative data present that almost all of the respondents noted the community faced financial vulnerability with social and mental depression due to cyclonic disasters. Among them, three fifth mentioning as economic depression due to cyclonic disasters.

Impact on Morality: Quantitative data display that 71.9% of the respondents admit that the cyclonic disasters deplete the morality in southwest coastal people. On the contrary, qualitative data reveals that more than half of the total respondents mentioned as depletion of morality occurs due to cyclonic disasters, with almost one third having no comment in this aspect.

11.4.3 Risk, Challenges and Economic Vulnerabilities due to cyclonic disasters

Impact on Economic Activities: Quantitative survey data show that 98.5% of respondents claim that cyclonic disasters are harmful for economic activities, while qualitative data presents that almost all of the respondents noted that cyclonic disasters significantly adverse impact on economic activities in their regions.

Occupational Hazards and Challenges: Quantitative survey data present that 96.9% of the respondents claim that workers suffer less demand for human labor and health hazards respectively due to cyclonic disasters and saline water. 96.4% of the respondents claimed that they faced lower wage and salary, and 45% of the respondents claimed that women are discriminated in terms of wage and work environment. On the contrary, qualitative data present that about all observed that workers suffer during cyclonic disasters, and also get low wages and salary, and health hazards due to cyclonic disasters. Almost half of them experiencing physical irritation and itching, boil etc. Among them, two third reported discrimination against women during cyclonic disasters.

Threatening sectors: Quantitative survey data represent that 99%, 93.3%, 68.2% and 33.3% of the respondents respond that the food production and employment opportunity/income diversity, fisheries and domestic livestock sectors is threatened respectively due to cyclonic disasters.

Qualitative data present that almost all respondents highlighted threats to various sectors including food production, crop damage, and employment insecurity due to cyclonic disasters. Additionally, more than two-third mentioned fisheries as another threat sectors during disasters, while almost half of them cited damage to livestock, forestry, and land degradation due to disasters.

Food Productivity: Quantitative survey data display that 98.2% of respondents admit that food productivity is decreasing gradually due to cyclonic disasters. 99.5%, 76% and 67.7% of the respondents claim that seasonal crops, fruit trees, and vegetables cannot be cultivated due to salinity. Qualitative data show that almost all respondents mentioned that cyclonic disasters harmfully effects on food productivity which decreases gradually. Almost all noted the adverse impact of cyclonic disasters on seasonal crops, with two third observing the inability to grow vegetables due to saline water and three fourth mentioning the inability to grow fruit trees.

Impact on Nursery and Saplings: Whether quantitative survey data display that 97.7% of the respondents admit that nursery, sapling plantation and timber trees can be damaged due to salinity, but qualitative data note that almost all of the respondents noted damage to nursery, saplings and timber trees due to salinity and cyclonic disasters.

Impact on Sweet Water Fish: About 99.2% of respondents from quantitative survey express that sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture is decreasing gradually due to cyclonic disasters. Qualitative data display that almost all respondents mentioned a decrease in carp cultured fishes, sweet water cultured fish, hatcheries, and aquaculture due to cyclonic disasters.

Severity of Adverse Effects: About 61% and 25.2% of the respondents respond that their fisheries sectors or sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture productivity are severely adverse affected and moderately adverse affected respectively due to cyclonic disasters. Qualitative data display that almost two-third point out severe adverse effects of cyclonic disasters in their areas, while the rest mentioned moderate to slight adverse effects.

Main livelihood practice: Among the 840 respondents, 13.9%, 28.9% and 16.7% respondents engaged in agriculture, fishing activities, homestead garden activities. The rest of others 0.2%, 4.0%, 3.1% 1.1%, 2.6%, 2.6%, 0.6%, 7.7%, 4.3%, 3.8%, 2.0%, 3.6%, 0.4\$, 3.3%, 0.4 of the respondents engaged in shrimp cultivation, Job sector, crab collector, wood collector, honey collector, medicinal plant collector, day labor, marginal farmer, landless poor, CPP volunteer, business, housewife, boatman, and Bede community respectively.

Least income season: Quantitative survey data exhibits that about 40.2%, 6.1% and 41.2% of the respondents respond that they earn least money in the rainy season, summer season and winter season respectively. Reasons behind the lowest income, 100%, 76.1%, 70.7% and 33.8% of the respondents admit that cyclonic disasters, low/ no agricultural productivity, lack of employment opportunity, and lower vegetation/ plantation respectively.

Environmental Change Affecting Livelihoods: Quantitative survey data portray that 99.5%, 95.8%, 97.3%, and 96.5% of the participants claim that cyclone, salinity, coastal flooding and tidal surge affect their livelihood respectively. On the contrary, qualitative data present that almost all of the respondents mentioned cyclones, salinity intrusion, and coastal flooding affecting environmental changes induced livelihood. Others mentioned tidal surge and heavy rainfall are affecting their livelihoods.

Soil Fertility Degradation: More than four-fifth mentioned salinity intrusion promoting soil infertility and degradation.

Hampering Environmental Balance: Quantitative survey data exhibit that 93.8%, 94.5%, 92.9%, 94.5%, 94.6%, 96.1% and 68.7% of the respondents claim that cyclonic disasters create heat wave/hot weather, deforestation, global warming, changes in vegetation, loss of biodiversity, disrupt the ecosystem, and lack of homestead and kitchen garden respectively.

Qualitative data present that more than four-fifth of the participants mentioned cyclonic disasters hampering environmental and ecological balance through heat waves, intensifying global warming, hindrance of vegetation, lack of homestead garden, loss of biodiversity, disruptions of

ecosystems and deforestation. Almost half of them mentioned cyclonic disasters induced salinity promotes the decreases of fish.

11.4.4 Risk, Challenges and Health Vulnerabilities due to cyclonic disasters

Conscious about health: Quantitative survey data depict that 31.7% of the respondents claim that they are conscious about their sound health while 68.3% of the respondents are not conscious about their health. In contrast, qualitative data show that almost three-fifth of the respondents mentioned they are being conscious about health and trying to consume proper nutritious food, while the rest were not conscious and faced difficulties in accessing nutritious food during cyclonic disasters.

Availability of Proper Food: Quantitative survey data display that 79.8% and 83.6% respondents do not get proper and nutritious food respectively in their meal. Only 20% and 15% participants claim that they get proper and nutritious food respectively in their meal. On the other hand, qualitative data present that almost half or more than a little bit of two-fifth respondents mentioned having access to proper and nutritious food, while more than half noted the unavailability of proper and nutritious food due to cyclonic disasters leading economic crisis.

Meal Consumption: Quantitative survey data exhibit that 91.5% and 8.5% of the respondents take 03 meals and 02 meals respectively in a day during or post cyclonic disasters. On the contrary, qualitative data show that almost five-sixth of the participants mentioned consuming meals three times in a day, despite facing challenges in accessing proper and nutritious food, while one-sixth noted that they consumed two times meal in a day.

Quantitative survey data exhibit that 94.6%, 95.1%, 95.4% of the respondents note that adolescent girls, pregnant and breastfeeding women do not get nutritional food in their meal. In contrast, qualitative data present that more than four fifth of the respondents mentioned that adolescent girls, pregnant and breastfeeding women suffered inadequate nutritious food during disasters.

Iron Deficiency in Pregnant Women: Quantitative survey data portray that 95.1% of the respondents claim that the pregnant or breast-feeding women face iron deficiency during reproductive period during and post cyclonic disaster period where qualitative data presents that nearly four-fifth of the participants mentioned that pregnant and breastfeeding women facing iron deficiency during reproductive periods in cyclonic disaster-prone areas.

Health right and SRHR: Quantitative survey data show that about 85.6% and 80.1% of the respondents claim that the respondents do not get health rights and even women do not get sexual and reproductive health and rights (SRHR) during and post cyclonic disaster period. Qualitative

data present that almost three-fourth mentioned that they do not get health rights and even women do not get sexual and reproductive health and rights (SRHR) also during and after disasters.

Water, sanitation and hygiene (WASH) facilities: Quantitative survey data portray that 78.6% of the respondents mention that the respondents do not have water, sanitation and hygiene (WASH) facilities during and post cyclonic disaster period, while qualitative data presents that almost half of the total respondents mentioned that they have water, sanitation, hygiene (WASH) facilities during cyclonic disasters. Rest of others do not access of water, sanitation, hygiene (WASH) facilities during cyclonic disasters.

Risk to Pregnant Women: Quantitative survey data portray that 92.4% of the respondents claim that the pregnant, breastfeeding and menstruation women are at risk of health during and post cyclonic disaster period. On the other hand, qualitative survey data present that more than four-fifth noted that pregnant, breastfeeding, and menstruating women are at risk of health issues during and after disasters.

Various Problems Faced: Quantitative survey data present that 89.8% and 94.8%, 96.9%, 97.5%, and 95.5%, 95.5%, 95.1%, and 86.4% of the respondents claim that women face the scarcity of suitable places for baby's breast feeding, for changing proper sanitary materials, do not get medical treatment, insufficient of healthcare access, and inadequate of the essential medical goods and services, absent of hygienic facilities of women, lack of privacy and unavailability of separate toilets respectively during and post disasters in cyclone shelters.

Qualitative data show that almost everyone mentioned that scarcity of suitable places for breastfeeding and changing sanitary materials, inadequate medical treatment, healthcare access, and hygienic facilities, privacy of latrines, as well as economic constraints affecting hygiene facilities provision.

Water and Sanitation: Quantitative survey data portray that 69.9% of the respondents mention that the respondents do not have drinking/potable water facilities during and post cyclonic disaster period. On the contrary, qualitative data show that more than half of the total respondents mentioned that inadequate access to proper drinking water, sanitation and hygiene facilities during and after cyclonic disasters.

Condition of Residences: Quantitative survey data show that 25.9%, 23.2%, 17.9% and 13.4% of the respondents mention that the condition of the residence is risky and unhygienic, suffocating, dirty and polluted, and dusty and nasty. Very few 5%, 6.1%, 5.9%, and 1.5% of the respondents

opine that the condition of their habitat is filthy, extremely heated, toxic, and low height houses respectively.

On the contrary, qualitative data present that around one fourth observed filthy and toxic environments, two fifth mentioned that their surrounded area is dusty and nasty, one third mentioned extremely heated environment, two third mentioned risky and unhygienic, half of them mentioned that dirty, polluted and suffocated environment inside their residence.

Toilet Conditions: Quantitative survey data show that 26.5%, 17.1% and 42.6% of the respondents opine that the condition of the toilet is bamboo made toilet surrounded by plastics, straw/jute straw, and corrugated tin respectively. 6.1% and 2% of the respondents opine that they use open space and hanging latrine respectively.

On the other hand, qualitative data present that around one fifth of them noted they use bamboo-made latrine surrounded by plastics and straw respectively, with one third mentioning bamboo-made toilets surrounded by corrugated tin, while one-fourth mentioning that they use pucca latrine. It shows the devastating scenarios of latrines which is almost unable to usage during and aftermath of disasters.

Access to Family Planning: Quantitative survey data depict that 95.2% of the respondents said that they know the family planning centre/ union health complex/ upazila health complex who are providing the health services. In contrast, Qualitative data present that almost all respondents mentioned knowing about family planning services.

Distance to Health Services: Quantitative survey data show that 15%, 26%, 35% and 10.1% of the respondents point out that the government health services institution is situated within 01 kilometer, 02 kilometers, 05 kilometers and 08 kilometers distance from their houses.

Qualitative data present that around one seventh mentioned government health services being half kilometers away, with one fifth of them mentioning that the government health services withing one kilometer, two kilometers, and within five kilometers respectively. On the contrary, one tenth mentioning the government health services between five to eight kilometers.

Satisfaction with Healthcare Services: Quantitative survey data depict that 31% respondent mention that their health care services are quite satisfactory. On the contrary, 68.2% of the respondents noted that their health care services are not satisfactory. In contrast, qualitative data present that half of the total respondents are satisfied to receive healthcare services, while the rest expressed dissatisfied.

Access to Medical Goods and Services: Quantitative survey data show that 28.9% of the respondent note that they get free medical goods and services. 70.1% of the respondents noted that they do not receive free medical goods and services. On the other hand, qualitative data present that about two third mentioned do not receiving free medical goods or services.

Existence of Private Medical Facilities: Quantitative survey data display that only 13.9% of the respondent note that private clinic or hospitals exist in their territory. On the contrary, 85.5% of the respondents mention that private clinic or hospitals do not exist in their territory. Whether qualitative data present that almost three fourth of the respondents noted the absence of private clinics or hospitals in the southern coastal area.

Menstrual Hygiene Facilities: Quantitative survey data illustrate that 84.4% of the respondents claim that the women or adolescent girl do not get menstrual hygiene facilities in the cyclone/flood centers during and post cyclonic disaster period. In contrast, qualitative data present that around three fourth noted their unavailability of menstrual hygiene facilities during cyclonic disasters.

Sexual Harassment: Quantitative survey data describe that 76.2% respondents claim that the women or adolescent girl do not face sexual harassment or psychological trauma in the cyclone/flood centers during and post cyclonic disaster period. Whether qualitative data present that almost one fifth noted instances of sexual harassment or psychological trauma in cyclone or flood centers, while two third denied such occurrences.

Adverse Health Implications: Quantitative survey data show that 96.7%, 95.8%, 95.6%, 95.1%, 92.7% and 65.2% of the respondents claim that they suffer various diseases like water and food borne diseases, mental, nutritional, infectious and other diseases, high rates of diseases, vector and rodent borne diseases, extreme weather events –related diseases and heat related illness and death in south west coastal Bangladesh due to cyclonic disasters. On the other hand, qualitative data present that about nine-tenth mentioned the high disease rates and more than four-fifth mentioned heat related illness and extreme weather events health effects and water borne diseases, vector borne diseases, and mental, nutritional and infectious diseases are happened due to cyclonic disasters.

Specific Health Risks: Quantitative survey data present that 98.6%, 99.3%, 93.5% 97.3%, 92.7%, 93.6% and 93.9% of the total 840 respondents note that they suffer from fever, cold, bad headache, diarrhea, asthma/ breath taking problem, whooping cough and skin diseases health risks respectively. On the contrary, qualitative data present that almost all mentioned that they suffer

from fever and colds as health risks, and more than four-fifth noted that they suffer from headaches, diarrhea, and whooping cough due to disasters. Three fourth mentioned asthma exacerbations and skin diseases, while half of the total respondents mentioned bronchitis and malaria outbreaks are occurred during disasters.

Adverse health Complications: Quantitative survey data present that a significant portion 88.9%, 92.7%, 82.6%, 46.9%, 89.3%, 78.3%, 91.4%, 67.6%, 95.6%, and 92.6% of the respondents claim that they face adverse health complications like hypertension, stroke/heart disease, heart diseases, cold, diarrhea, physical irritation, water borne disease, skin diseases, pregnancy related complicacy, and respiratory illness respectively due to cyclonic disasters. Whether qualitative data present that nearly four-fifth of the respondents mentioned that they face hypertension, stroke, spread of water borne diseases, and skin diseases during disasters. nearly-three-fourth of the respondents claimed that they suffer from heart diseases, prevalence of diarrhea, pregnancy related complicacy, and respiratory illness during cyclonic disasters. More than half of them mentioned that cold, and physical irritation including itching and boil are observed during and post disasters. Almost two-third noted that they faced multiorgan disorder and malnutrition during disasters.

Reasons for Pregnancy Complications: Quantitative survey data present that about 91.3%, 89.6%, 88.4%, 87.9%, and 84.2% of the respondents mention that maternal and fetal complexity, miscarriage, changes in periodical cycle/time, preterm/ immature birth, maternal and prenatal death/ immature death are occurred due to salinity. On the other hand, qualitative data show that almost four fifth mentioned maternal and fetal complications, miscarriages, and changes in menstrual cycles as primary reasons for pregnancy-related complexities due to salinity. Two third mentioned immature birth and death, maternal death, more than half of them mentioned immature growth retardation and sufferings in genital diseases due to salinity.

Child growth retardation: Quantitative survey data depict that 86.5% claim that the abnormal growth/mental retardation of child are observed more in salinity prone coastal regions than other areas and these are happened due to salinity or cyclonic disasters.

11.4.5 Disaster Preparedness and Management

Technical Knowledge: Quantitative survey data exhibit that 43.1% and 23.6% of the respondents have technical knowledge severely and slightly about coping mechanism of disaster response and risk reduction, while 23.6% respondents confessed to lacking such knowledge. Whether qualitative data present that almost three-fifth of the respondents claimed that they have technical knowledge

about cyclonic disaster response and risk reduction, while another one third admitted to lacking such knowledge.

Technical knowledge Implied by: Quantitative survey data show that 53.8%, 37.7%, 24.9% and 15.9% of the respondents know the technical knowledge/ technology about decision support system from the relatives, neighbors and surroundings, database management system from the radio communication system, remote sensing, management information system, and geographical information system (GIS) respectively. On the other hand, qualitative data present that around two-fifth noted that they are familiar with technical knowledge by using of database management, and management information systems to reduce the disaster risks. Three-fifth mentioned that they are familiar with technical knowledge by using of decision support systems. One fourth admitted that they have lacking of technical knowledge to reduce the disaster risks.

Vocational Knowledge: Quantitative survey data describe that 60.5% of the respondents have vocational knowledge about coping mechanism of disaster response and risk reduction, while qualitative data responses that half of the total respondents mentioned that they have vocational knowledge about resilience of cyclonic disasters response and risk reduction. The rests have no technical knowledge about disaster risk reduction.

Vocational Knowledge are Implied By: Quantitative survey data show that 55.3%, 52.2%, 50.1% and 17.6% of the respondents said that vocational knowledge is known and applied to prevention or mitigation knowledge, coping knowledge with hazard, strengthening capacity for disaster risk reduction, and reduction of vulnerabilities respectively. In contrast, qualitative data present that nearly two-fifth mentioned acquiring vocational knowledge via prevention or mitigation knowledge and reduction of vulnerabilities about resilience and coping mechanisms. More than two-third mentioned strengthening capacities for disaster risk reduction, while almost half of them noted a lack of proper vocational training in risk reduction.

Indigenous Practical knowledge: Quantitative survey data present that 99.2% of the respondents have indigenous knowledge about coping mechanism of disaster risk, response and risk reduction. Whether, qualitative data present that almost all of the respondents mentioned that they have indigenous practical knowledge about resilience of disaster risk reduction (DRR). A few of them mentioned that they have no indigenous practical knowledge to reduce disaster risk.

Indigenous Knowledge are known By: Quantitative survey data show that 88%, 87%, 95.4%, and 45.2% of the respondents said that they cope up by indigenous practical knowledge including

move to higher ground or shifting in cyclone center, community behavior towards disaster, own survival mechanism and pray to Almighty and do their own religious activities respectively during and aftermath of cyclonic disaster. But, qualitative data present that almost four fifths mentioned that indigenous practical knowledge is known and implied via community behavior, and migration, while almost all of the respondents mentioned own mechanisms while half of them noted that they are engaged with religious activities during disasters.

Existence of Early Warning Systems: Quantitative survey data describe that all the respondents express that they have early warning system for about upcoming disaster. But, qualitative data show that all respondents noted the availability of various early warning systems in their area.

Methods of Disaster Awareness: Quantitative survey data show that 98.7%, 97.1%, 46.7% and 24% of the respondents get to know about upcoming disaster from miking of CPP volunteers, interpersonal communication, television and Facebook respectively. Whether, qualitative data present that almost all respondents mentioned knowing the upcoming disasters and receiving disaster alerts through public announcements via miking and interpersonal communication, with three-fourth also citing television and nearly half mentioning the facebook.

Recover damage properties: Quantitative survey data display that 98.6%, 59.7% and 31.6% of the respondents claim that they recover from damages with their capacity from their own resources, NGO support, and government support respectively due to cyclonic disasters. But, qualitative data show that almost all of the respondents claimed that they recover their damage properties through via own resources. Nearly two-third of them mentioned that they recover their damaged properties through government and NGO support, while one third mentioning about stakeholders' support.

Property Recovery: Quantitative survey data show that 42.5%, 27.4%, 18.1% and 9.5% of the respondents express their opinion that the people of cyclonic disasters prone areas need 3 to 6 months, more than a year, 7 to 12 months and 1 to 2 months respectively to recover the loses and damages of severity due to disasters. Whether, qualitative data present that more than one-third of the respondents stated they need 3 to 6 months, and 7 to 12 months respectively to recover their damaged properties from cyclonic disasters and setback their regular activities, while one-fifth mentioning that they need more than a year to recover their damaged properties from cyclonic disasters and setback their regular activities.

Policy Adequacy: Quantitative survey data show that about 64.9% of the respondents says that the present risk reduction programs are not enough for the community, 28.7% of the respondents

opine that there is need some advancement. But, qualitative data present that two-third of respondents deemed existing policies is inadequate to eradicate from the disaster risks, and three-fifth of the respondents noted that they need some advancement policy to reduce the disaster risks.

Skills-Based Policy Recommendations: Quantitative survey data describe that about 99% of the respondents express their opinion that the community risk management system should be sustainable and need to build disaster risk reduction skills respectively. 98.3% and 88.3% of the respondents claim that it is needed to empower local community, and link with local community to local government respectively to reduce disaster risks. On the other hand, qualitative data show that almost all of the respondents emphasized empowering local communities, building disaster risk reduction skills, and establishing links between local communities and governments to mitigate disaster impacts.

Infrastructure-Based Policy Recommendations: Quantitative survey data recommend that 99.6%, 99.5% and 99.4% of the respondents admit that cyclone shelter should be secured and hygienic, sufficient sluice gate and embankment should be constructed. Whether, qualitative data present that nearly all of the respondents called for infrastructure improvements as embankment maintenance, sluice gate management, and securing cyclone shelters to provide proper facilities during and post disasters.

Environmental Initiatives: Quantitative survey data show that 99.3%, 99.4%, 92.5%, and 88.7% respondents opine that ensuring the access of safe drinking water, medical facilities, menstrual hygiene management (MHM) corner, and reforestation is need to reduce the disaster risks. On the other hand, almost all respondents emphasized the need for reforestation, ensuring safe drinking water, and providing medical facilities as environmental initiatives.

Awareness Building: Quantitative survey data suggest that 99.4%, 98.5%, 95.6% and 95% of the respondents express their opinion that awareness should be focused on public health and hygiene, public awareness, meeting and training, and preparedness program should be enriched to reduce the disaster risks. Moreover, qualitative data show that all respondents highlighted the importance of awareness programs focused on public health, comprehensive training, and empowering women and youth so that the disaster risks can be minimized.

Social Assistance: Quantitative survey data show that 35.7%, 31.6%, 34.4%, 30.9%, 9.9%, 6.7%, 3.7%, 3.6%, 2.3%, 1.6%, 0.5% of the respondents said that coastal people received some social supports like VGD, child education stipend, VGF, poor people livelihood program, food for work,

integrated food security, handicap/ autistic scheme, aged scheme allowance, test relief (TR), gratuitous relief (GR), widow scheme allowances. Whether, qualitative data present that almost two-fifth of respondents reported that they received social assistance such as child education stipends, vulnerable group development, vulnerable group feeding and poor people livelihood program from the government. Others enjoyed some kind of social assistance like integrated food security, widow allowance, disability allowance, old age allowances, test relief, gratuitous relief and food for work.

Resilience/ Coping Strategies: Quantitative survey data recommend that 68%, 60.1% and 19.6% and 48.8% of the respondents mentioned salinity tolerant crop variety, and embroidery, tailoring and knitting project, and technical and financial support, and central aquifer can be set up to collect and preserve rain water can be initiated. 95.1% and 73.2%, 90.6% and 56.1% of the respondents mentioned that motivational and awareness campaign, supply of water reservoirs and pipe line, education, computer skills, basic vocational skills & technological training, and good governance is needed to coping with disasters. About 94% and 96.7% respondents claimed that reconstructs of devastated coastal embankments, dams, and polder, and tree plantation and vegetable gardening activities is required for reducing the cyclonic disaster risks.

On the contrary, qualitative data show that almost two third mentioned that salinity tolerant crop variety needs to be introduced, three fourth mentioned about embroidery, tailoring, and knitting project can be initiated and supply of water reservoirs and pipe line to cope up with disasters. Half of them mentioned that introduced with the technical and financial support of GO and NGOs so that they can recognize local level training on disaster preparedness, resilience and risk management also a central aquifer can be set up to collect and preserve rainwater, and principles of the good governance to coping with disasters. More than four fifth of them mentioned motivational awareness campaign, supply of root materials, education, computer skills, basic vocational skills and technological training, reconstructs of devastated coastal embankments, dams, and polder, tree plantation and vegetable gardening activities to resilience or coping with cyclonic disasters.

Chapter Twelve: Recommendations and Conclusion

12.1 Conclusion

Bangladesh is familiar as one of the disaster-prone countries of the world with extremely limited resources. Its real development is not possible without the integration of disaster mitigation programs. Among them, cyclone, storm surge, and flood are devastating, recurrent and severe in nature due to the damage of houses, property, losses of life and injuries. Cyclone, tornado and nor'-wester occurs in April-May and though cyclone occurs in October-November. Due to the heavy rainfall, landslide occurs in July-August in Chittagong Hill Tracts (CHT) and flood occurs in all over the country in the same period (Rahman et al 2017). People of all classes especially the marginal community like women, adolescent girl, child, aged, physically disable and poor including fisherman, marginal farmers, day laborers, mawali or honey collectors, bawali or wood cutters, golpata collectors, medicinal plant collectors, fish fry collectors, crab collectors, chunery or oyster and snail collectors, riders and other vulnerable or destitute etc. are the most vulnerable group to experience those disasters and sometimes they are socially excluded. The vulnerability of marginal people in Bangladesh like women, girl, child and old aged, disable and poor people is much higher than men, boys, young and able and rich people during these disasters due to their poverty, their attitudes, social norms, and marginal position in the social system.

This study tries to depict and distinguish the different disasters like cyclone, flood and salinity (drinking salt water) affects differently on socio-economic vulnerability, health system, morbidity and mortality of selected regions in Bangladesh. For instance, cyclone hit suddenly and massive destruction with mass human casualties and morbidity; flood brings precarious situation on human life and brings water borne and vector borne diseases diarrhea, malaria, dengue fever and also mortality; and salinity affects directly on heart disease, heat stroke, diarrhea, dehydration, skin diseases etc. which prolongs morbidity and brings mortality. Regarding the cyclonic disasters it was seen the segmented or different morbidity, health and mortality trends which were tried to depict the research.

Almost 80.2% (9.6% earn <5000, 31.1% earn 5000-10000, and 39.5% earn 10001 to 15000 taka) of the respondents earn up to 15000 taka per month, whereas, almost 79.7% (8.7% expense <5000, 33.3% expense 5000-10000, and 37.7% expense 10001 to 15000 taka) of the respondents' expense monthly up to 15000 taka. Cyclonic disasters effect on the communities economic, social, physical, psychological, cultural, and health vulnerabilities which accounts for 100%, 89%, 13.9%, 96.9%,

6.8% and 97.5% respectively. Cyclonic disasters destructed the infrastructure, farmland, ruining the shelter and death of cattle. Cyclonic disasters disrupted social networks and communication, hindrances to children's movement, women's income, means of livelihood disruptions, educational institutions, increased mental health issues, waterborne diseases, skin ailments, and forced migration, increasing of crime rates, vector-borne diseases, malnutrition, and gender-based vulnerabilities. It also creates the problem of WASH and potable water respectively. Cyclonic disasters disrupt the regularity of children education, children drop out from school, and tends to economic uncertainty. Physically disabled and aged people face transportation barriers, lack of water, sanitation and hygiene (WASH) facilities, sufficient toilet facilities, and lack of shelter facilities. Economic insecurity, food insecurity, lack of shelter, death risk, infrastructural losses, health risks, scarcity of safe drinking water, damage of standing crops, loss of fisheries, homestead/kitchen garden, threats to various livelihoods, and migration respectively due to cyclone and cyclone induced disasters. Workers suffer during cyclonic disasters, and also get low wages and salary, and health hazards due to cyclonic disasters. Food production and employment opportunity/income diversity, fisheries and domestic livestock sectors is threatened due to cyclonic disasters. The coastal community faced the mental depression, economic depression and social depression due to cyclonic disasters. The marginal community including adolescent girls, pregnant and breastfeeding women are not conscious and face difficulties in accessing proper and nutritious food during cyclonic disasters. Even, they do not get health rights and sexual and reproductive health and rights (SRHR). Pregnant, breastfeeding, and menstruating women are at risk of health issues during and after disasters.

Women face vulnerability and deprivation during disasters, such as limited access to healthcare due to distant health care center, and restricted roles in the informal sector due to unpaid work, patriarchal attitudes, lack of opportunities in decision-making, lack of opportunity in community decision making process, and lack of political empowerment etc. Women face the scarcity of suitable places for baby's breast feeding, for changing proper sanitary materials, do not get medical treatment, insufficient of healthcare access, inadequate of the essential medical goods and services, absent of hygienic facilities of women, lack of privacy and unavailability of separate toilets during and post disasters in cyclone shelters. About 91.3%, 89.6%, 88.4%, 87.9%, and 84.2% of the respondents mention that maternal and fetal complexity, miscarriage, changes in periodical cycle/time, preterm/ immature birth, maternal and prenatal death/ immature death, and child

growth retardation are occurred due to salinity.

About 15%, 26%, 35% and 10.1% of the respondents point out that the government health services institution is situated within 01 kilometer, 02 kilometers, 05 kilometers and 08 kilometers distance from their houses. About 96.7%, 95.8%, 95.6%, 95.1%, 92.7% and 65.2% of the respondents claim that they suffer various diseases like water and food borne diseases, mental, nutritional, infectious and other diseases, high rates of diseases, vector and rodent borne diseases, extreme weather events –related diseases and heat related illness and death in south west coastal Bangladesh due to cyclonic disasters. Fever, cold, bad headache, diarrhea, asthma/ breath taking problem, whooping cough and skin diseases of health risks are observed frequently.

About 99.2% of the respondents have indigenous knowledge about coping mechanism of disaster risk, response and risk reduction. Respondents get to know about upcoming disaster from miking of CPP volunteers, interpersonal communication, television and Facebook. They recover from damages of properties with their capacity from their own resources, NGO support, and government support respectively due to cyclonic disasters. The respondents emphasized empowering local communities, building disaster risk reduction skills, and establishing links between local communities and governments to mitigate disaster impacts. Cyclone centers, embankment, and sluice gate should be constructed. Access of safe drinking water, medical facilities, menstrual hygiene management (MHM) corner, and reforestation is needed to reduce the disaster risks. Public health and hygiene, public awareness, meeting and training, and preparedness program should be enriched to reduce the disaster risks. Government and NGOs provided social assistance program should be extended and maintained properly.

The Government of Bangladesh has formulated a set of mechanisms and taken a number of significant steps during the last few years for building up institutional arrangements like as top-down approach from national to the union levels for effective and systematic disaster management and facilitating mitigation to the sufferings of disaster victims in Bangladesh. It is necessary to maintain proper coordination amongst the concerned Ministries, departments, line agencies, Local Government Body (LGD) and community people, and to ensure their proper functioning to resilient or to mitigate sufferings of the people.

During last six decades, Bangladesh has learnt how to adapt to recurrent cyclones and has succeeded significantly by reducing deaths. This has been achieved by modernizing early warning systems, developing shelters and evacuation plans, constructing coastal embankments,

maintaining and improving coastal forest cover and raising awareness at the community level. Under the Cyclone Preparedness Programme (CPP), Bangladesh has implemented awareness campaigns to disseminate information about cyclone warning signals and preparedness measures, using meetings, discussions, posters, leaflets, and demonstration performance.

Finally, H1, H2, H4, H5 are found statistically significant. Regarding H3 it is evident by descriptive statistics through field survey observations, but could not test of statistically significant or not for diverse situations.

12.2 Recommendations

By conducting the research, it can be said that regarding the suggestions of disaster risk reduction programs taken by government further policy should be formulated. The community people expect to some advancement works are very important to make community people disaster resistant and foster sustainable disaster risk management system.

It is also needed some kind of steps and initiatives those should be taken to reduce the disaster risks by individual level. They are as follows:

- Everyone needs to be more aware including strengthening education, taking balanced diet
- To build disaster resistant houses
- To conserve crops, water resources and forest resources particularly planting more trees in Barishal zone and protect mangrove forest Sundarbans in Southwest zone
- To keep the cultivable land with diversified crops eg. salinity tolerant crops and fisheries
- To create diversified livelihood opportunities
- To preserve dry food, medicine and necessary things at home
- To create health awareness at individual level by taking nutritious food and balanced diet
- To take proper, sufficient and nutritious food of women, pregnant women, lactating women, adolescent girls and aged people
- To available of feminine sanitary materials at menstruation period and essential medical goods and services like contraceptives, birth control pills etc.
- To ensure clean water, sanitation and hygiene (WASH)
- To go nearby hospitals and clinics for any medical treatment, and psychologists for trauma for taking health care services even during cyclonic disasters
- To prepare for tackling disasters

- To become aware about disaster
- To be aware about early warning systems and prediction
- To enhance mitigation measures such as adoption of zoning, land-use practices, and housing codes

There are also needed some kind of steps and initiatives those should be taken to reduce the disaster risks by community level. These are as follows:

- Establish a local disaster management group
- Develop and approve a local disaster management plan
- Be capable of responding if an event occurs
- Community leader creation and enable local disaster response team.
- Creation of co-ordination among CPP volunteers, red crescent volunteers and union disaster council members
- Gaining community engagement training to stand by disaster affected people during disaster crisis.
- Creation more public awareness and encourage people to go cyclone shelter and take safe shelter
- Extending the agro-forest and community forest by planting more trees

There are some kinds of policy and initiatives should be taken to reduce the disaster risks through state level. Development policy and initiative should be taken by government at national level to reduce the disaster risk and create the nation as disaster resistant. Those policies and initiatives follow as:

- Disaster risk identification and assessment of vulnerabilities
- Creation of disaster management plans and its implementation
- Training and yard meetings should be arranged. The technical and vocational education opportunities should be given to the local youth.
- Strengthening the inter-ministerial coordination and regulatory framework
- Creation of diversified employment opportunities in coastal zone
- Construction and maintenance of more cyclone shelters and infrastructural developments eg. roads, bridges, culvert, sluice gates and renovation of canals etc.
- Maintenance and extension of Mujibkella (earthen fort)

- Maintenance and extension of embankments particularly attention of height (at least 12 feet) of embankments
- Awareness should be focused on public health & hygiene issues
- Integrating DRR across multiple sectors, develop advocacy systems and will focus on social safety net, supply pure drinking water, health and sanitation, environment, etc.
- A central aquifer can be set up to collect and preserve rain water. Supply of roof materials, water reservoirs and pipe line should be ensured.
- Hospitals with sufficient doctors and equipment are needed at union level. More medicines should be kept in health complexes. Medical support should be available in cyclone center in an urgent basis. Basic health care should be ensured for all during the time of disaster.
- Improving early warning system and disseminate information at every upazila and district
- Ensuring for equal distribution of relief goods during disaster operations.
- Relief dependency should be reduced. The local communities should learn to be self-reliant. Capacities should be strengthened. Financial grants, low-interest or interest-free loans can be arranged for them to create diversified livelihood opportunities. Embroidery, tailoring and knitting project can be initiated.
- Needs to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing and marketing
- Education, computer skills, basic vocational skills & technological training should be developed
- Different NGOs, aid organizations and the government should coordinate and work together
- Strengthening govt. national policies and legislative arrangements
- Fostering disaster research and its associated training system

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Appendix 1: Research Questionnaire

Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh

Section 1: Socio demographic information

1. Name of the respondents:
2. Age (in years):
3. Geographical area
 - a. Patharghata
 - b. Betagi
 - c. Charfasson
 - d. Tajumuddin
 - e. Koyra
 - f. Batiaghata
 - g. Shyamnagar
 - h. Ashashuni
4. Gender:
 - a. Male
 - b. Female
 - c. Third gender
 - d. Not interested to mention
5. Marital status
 - a. Married
 - b. single
 - c. Separation
 - d. widow
 - e) divorced
6. Educational Qualification
 - a. Illiterate
 - b. Primary
 - c. Secondary
 - d. higher secondary
 - e. Graduate
 - f. Post graduate
7. Occupation
 - a. daylabour
 - b. marginal farmer
 - c. landless poor
 - d. CPP volunteer
 - e. fisherman
 - f. boatman/majhi
 - g. Bede community
 - h. Bawali/wood cutter
 - i. Mawali/honey and bee wax collector
 - j. Nypa/golpata collector
 - k. medicinal plant collector
 - l. fish fry collector
 - m. crab collector
 - n. chunery/oyster and snail collector
 - o. other destitute
8. Data collection by category
 - a. Women
 - b. pregnant women (15-49 years)
 - c. Adolescent girls (12-17 years)
 - d. young adult women (19-25 years)
 - e. aged people (more than 60 years)
 - f. child (7-14 years)
 - g. Internally displaced people (IDP)
 - h. physically displaced people
 - i. health attendant/service providers
 - j. health care seeker/patient in hospital
9. Number of family member
 - a. < 3 person
 - b. 3-6 persons
 - c.7-10 persons
 - d. more than 10 persons
10. Family Income (BDT per month)
 - a. < 5000
 - b. 5001-10000
 - c. 10001-15000
 - d. 15001-20000
 - e. 20001-25000
 - f. >25000
11. Family expenditure (BDT per month)
 - a. < 5000
 - b. 5001-10000
 - c. 10001-15000
 - d. 15001-20000
 - e. 20001-25000
 - f. >25000

Section 2: Risk, challenges and socio-economic vulnerability due to cyclonic disasters

12. What types of natural disasters are occurred /arose in coastal belt?
 - a) Cyclone
 - b) Salinity intrusion
 - c) Tidal surge
 - d) Flood
 - e) Drought
 - f) Earthquake
 - g) Arsenic contamination
 - h) Others
 - i) Don't know
13. Have you ever faced any kind of cyclonic disaster or hazard?
 - a. Yes
 - b. No
 - c. Sometimes /often
 - d. Very rare
 - e. Don't know
14. If yes, what kind of disaster do you face?
 - a. Flood
 - b. cyclone
 - c. storm surge
 - d. River bank erosion
 - e. salinity
 - d. earthquake
15. How many times have you faced cyclonic disaster in your lifetime?
 - a. Every year
 - b. very often
 - c. sometimes
 - d. rare
16. What do you seem the term cyclonic disasters?
 - a. Cyclone
 - b. tidal surge
 - c. salinity intrusion
 - d. flood
 - e. water logging
 - f. drought
 - g. earthquake
 - h. both a and b
 - i. a, b and c
 - j. a, b, c and d
 - k. a, b, c, d and e
 - l. both a and c
 - m. both a and d
 - n. both b and c
 - o. both b and d
 - p. Don't know

17. Have you faced any bitter experiences caused by cyclonic disasters? a. Yes b. No
18. If yes, how do you face negatively by cyclonic disasters?
a. Economically b. Socially c. physically d. psychologically e. culturally f. health
19. Is there any cyclone/flood shelter in your regions? a) Yes b) No c) Don't know
20. If yes, how far it is from your home?
a) Within 500 meters b) within 1 km c) Within 2 km d) Don't know e) Others
21. What is the structural condition of those cyclone centres?
a) Satisfactory b) Very satisfactory c) Moderate d) Not satisfactory e) very unsatisfactory
f) Don't know
22. What kind of economic hazards do you face by cyclonic disasters?
a. Destruction of infrastructures b. Ruining the shelter c. Death of cattle
b. Destruction of farmland e. Above all f. Don't know
23. Do you think cyclonic disasters affect negatively on your livelihood activities?
a. Yes b. no c. Don't know
24. Do you think cyclonic disasters affect negatively on your social life?
b. Yes b. no c. Don't know
25. If yes, how the people of your community faced negatively by cyclonic disasters?
a. Hindrance of daily activities b. hindrance of cultural activities like wedding ceremony, rituals
c. food insecurity d. disruption of prayers e. disruption of communication f. break
out of diseases g. Don't know
26. What are the negative social implications of cyclonic disasters?
a) Disruption of social network b) Hindrance to movement of children c) Disruption of communication
and transportation d) Impediment to women's income and employment e) damage of educational
institutions f) increasing rate of crime g) increasing rate of mental health issues h) Prevalence
of diarrhea i) Spread of different vector borne diseases like dengue, malaria j) Spread of
water borne diseases like dysentery, jaundice, k) Hyponatraemia due to dehydration l) Malnutrition
leading kwashiorkor and marasmus m) Prevalence of skin diseases n) Forced migration
o) Disruption of the means of livelihood p) Gender based vulnerability due to lack of security
q) Other (specify) r) Don't know
27. Do you think cyclonic disasters create the problem of water, sanitation and hygiene (WASH)?
a). Yes b. No c. Don't know
28. Do you think cyclonic disasters create the problem of safe drinking water?
a). Yes b. No c. Don't know
29. If yes, how do the cyclonic disasters create the problem of safe drinking water?
a. Pure drinking water b. level of groundwater lower c. water polluted by waste disposal d. Don't know
30. By how women face vulnerability/ deprived situation?
a. Hardly get preferential treatment in health care services b. Health care center is far from the home
c. Women face patriarchal attitude in the context d. Women face social restriction and barriers in getting
access to health care services e. Women faces lack of opportunity in community decision making
process due to domination of males f. Lack of political empowerment g. Social exclusion due to lack
of empowerment h. Roles in domestic chores, child care & rearing like informal sector (unpaid) i.
Women are unable to play role in voluntary services due to restriction of social movement j. Don't know
31. Who are the more vulnerable group during cyclonic disasters period?
a) Children b) Adolescent Girls c) Young adult Women c) Pregnant women
d) Disabled persons e) Old people f) Others g) Don't know
32. What are the impacts on children of disaster?
a. Increasing rate of children death b. Lack of food security c. Juvenile delinquency
d. Risk of infectious diseases e. Don't know

33. How cyclonic disaster effects on your children's education?
 a. School was closed (use as a shelter) b. Damages of infrastructure c. Economic uncertainty
 d. Loss of books or other accessories e. others f. Don't know
34. What are the impacts on women & adolescent girl of disaster?
 a. Lack of secured shelter b. Drop out from school c. Lack of menstrual hygiene
 management kit d. Lack of maternity health advantages e. Mobility problem that causes life risk
 f. Lack of health care services g. Lack of food and nutrition h. More domestic household
 works load i. Socio-cultural barriers j. Don't know
35. What kinds of vulnerability old or aged people face?
 a. Transportation barriers b. lack of shelters c. lack of toilet facilities
 d. Lack of water, sanitation and hygiene facilities e. others f. Don't know
36. What kinds of vulnerability disabled people face?
 a. Transportation barriers b. lack of shelters c. lack of toilet facilities
 d. Lack of water, sanitation and hygiene facilities e. others f. Don't know
37. In which season people face more intensity of cyclonic disasters?
 a. Baishakh-jaistha (summer) b. Ashar-srabon (rainy season) c. Vadro-ahwin (autumn) d. Kartik-
 agrahayan (Late-autumn) e. Poush-Magh (winter) f. Falgun-chaitra (spring) g. Don't know
38. Which season is found in least cyclonic disasters?
 a. Baishakh-jaistha (summer) b. Ashar-srabon (rainy season) c. Vadro-ahwin (autumn) d. Kartik-
 agrahayan (Late-autumn) e. Poush-Magh (winter) f. Falgun-chaitra (spring) g. Don't know
39. What are the adverse /negative effects of cyclonic disasters in your households?
 a) economic insecurity b) food insecurity c) lack of shelter d. death/life risk e. Loss of
 infrastructure f. health risk/problem/hazard g) lack of pure drinking water h) damage of standing
 crops/crop productivity i) damage of fisheries j) damage of homestead/kitchen garden
 k) reduce of domestic livestock/cattle l) threat to various livelihoods m) soil degradation/infertility
 n) migration o) others p) Don't know

Section 3: Economic challenges related information

40. Do you think that cyclonic disasters are harmful for economic activities?
 a) Yes b) no c) Don't know
41. Whether your main occupation and source of income was/are affected by cyclonic disasters?
42. How many months/days in a year you remain unemployed due to cyclonic disasters?
43. Occupational hazards and challenges
 1=Workers suffer due to cyclonic disasters and less demand for human labor: 2=feel physical
 irritation and hazards due to saline water in the paddy fields 3=low wage and salary
 4=women are discriminated in terms of wage and work environment; 5=health hazards due to
 cyclonic disasters and saline water while fishing and other agricultural work 6= Don't know
44. Which sectors are threats to economic insecurity for cyclonic disasters induced salinity intrusion?
 a) Food production b) fisheries/shrimp cultivation c) domestic livestock/ cattle d) damage of
 forestry e) increasing non-arable land f) lack of employment opportunity/ income diversity
 g) Others (specify) h) Don't know
45. Do you assume that food productivity is decreasing gradually? a) yes b) no c) Don't know

46. If yes, what kinds of food grains are seriously affected?
 a. Seasonal crops (paddy/wheat/pulse/onion/brinjal/garlic/ginger/coriander/cucumber/jute/chilly) cannot be cultivated due to salinity in land (how many seasonal crops.....)
 b. Vegetables cannot be grown due to saline water (Amount of vegetable land and types of vegetables)
 c. fruit trees (Mango, guava, jackfruit, blackberry etc.) cannot be grown due to saline water
 d. Don't know
47. Can nursery, sapling plantation and timber trees be damaged due to salinity? a) yes b) no c) Don't know
48. Do you assume that sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture is decreasing gradually? a) yes b) no c) Don't know
49. If yes, how much it is adversely affected? a. severely b. moderately c. slightly d. Don't know

Section 4: Livelihood challenges related information

50. What is your main livelihood practice now?
 a) Agriculture b) fishing c) shrimp cultivation d) homestead/kitchen garden plantation
 e) employment f) others (Specify) g) Don't know
51. How many days in a month are you working?
 a) 10-15 b) 15-20 c) 20-25 d) 25-30
52. What is your daily income?
 a) 50- 100 tk b) 100- 150 tk c) 150- 200 tk d) 200-250 tk e) 250-300 tk f) more than 300 tk.
53. In which season people earn more money, though it is found in intensity of salinity?
 a) Baishakh-jaistha (summer) b) Ashar-srabon (rainy season) c) Vadro-ahwin (autumn) d) Kartik-agrahasyan (Late-autumn) e) Poush-Magh (winter) f) Falgun-chaitra (spring) g) Don't know
54. In which season your income is found in the lowest?
 a) Baishakh-jaistha (summer) b) Ashar-srabon (rainy season) c) Vadro-ahwin (autumn) d) Kartik-agrahasyan (Late-autumn) e) Poush-Magh (winter) f) Falgun-chaitra (spring) g) Don't know
55. What is the reason behind our lowest income in a particular season?
 a) Salinity b) unavailable of fish c) low/no agricultural productivity d) lower vegetation/
 plantation e) lack of employment opportunity f) others..... g) Don't know

Section 5: Socio-cultural challenges related information

56. What are the social disruptions of cyclonic disasters induced salinity intrusion?
 1=Disruption of social network 2=Disruption of communication and transportation 3=Impediment to women's income and employment 4=irritated mind/short temper 5= abnormality of norms, attitude, practices 6. Social exclusion 7=Lack of Social cohesion/ bondage 8= increase of domestic violence 9=lack of enrollment in formal education 10= Forced migration 11=Disruption of the means of livelihood 12=Gender based vulnerability due to lack of security 13=Other (specify) 14= Don't know
57. Have people migrated because of water salinity? a) yes b) no c) Don't know
58. If yes, how many people migrated from this village due to cyclonic disasters including salinity last 10 years? a) b) c) Don't know
59. Have any negative impact of cyclonic disasters over increasing illiteracy and rate of drop out students of this territory? a) yes b) no c) Don't know
60. Do the people face the vulnerability with social/mental depression due to cyclonic disasters? a) yes b) no c) Don't know
61. If yes, what kinds of depression happened?

62. Do you think that cyclonic disasters deplete the morality? a) yes b) no c) Don't know

Section 6: Environmental challenges related information

63. What is the main environmental change that affecting livelihood?
a) Cyclone b) salinity c) coastal flooding d) decrease rainfall e) Precipitation/ heavy rainfall
f) tidal surge g) others h) Don't know
64. Do you think salinity intrusion promote the soil infertility/degradation? a) yes b) no c) Don't know
65. How salinity hamper the environmental /ecological balance?
a) creating heat wave/hot weather b) damage of zooplankton and phytoplankton cycle c) hindrance of vegetation and plant species
d) lack of homestead and kitchen garden e) soil fertility degradation
f) deforestation g) intensifying global warming h) Increasing CFC gas i) changes in vegetation
j) loss of biodiversity k) disruption of ecosystems l) disease of fish may increase
m) production of carp and sweet water fish will extinct n) others..... o) Don't know

Section 7: Health risk/hazard related information

66. Are you conscious about your health? a) yes b) no c) Don't know
67. Have you get your proper food? a) yes b) no c) Don't know
68. How much time do you take your meal in a day? a) 01 b) 02 c) 03
69. Have you get nutritional food in your meal? a) yes b) no c) Don't know
70. Do you think that the pregnant women get sufficient nutritional food during or post-cyclonic disaster period in your cyclonic disasters prone area? a) yes b) no c) Don't know
71. Do you think that the breast feeding women get sufficient nutritional food during or post-cyclonic disaster period in your cyclonic disasters prone area? a) yes b) no c) Don't know
72. Do you think that the adolescent girl get sufficient nutritional food during or post-cyclonic disaster period in your cyclonic disasters prone area? a) yes b) no c) Don't know
73. Do you think that the pregnant/breast feeding women face iron deficiency during reproductive period in your cyclonic disasters prone area? a) yes b) no c) Don't know
74. Do you think that the pregnant/breast feeding women carry underweight for getting in-sufficient nutritional food during reproductive period in your cyclonic disasters prone area?
a) yes b) no c) Don't know
75. Have you known about getting your health rights? a) yes b) no c) Don't know
76. Do you think that women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR)? a) yes b) no c) Don't know
77. Do you have water, sanitation and hygiene facilities? a) yes b) no c) Don't know
78. Do you think that Pregnant, breastfeeding and menstruating women are at risk of health during and after disasters? a) yes b) no c) Don't know
79. If yes, what kind of problems they face?
a. Scarcity of suitable places for baby's breastfeeding b. Scarcity of suitable places for changing proper sanitary materials
c. Do not get medical treatment d. Health care access are found insufficient
e. The essential medical goods and services like contraceptives, birth control pills etc. are found insufficient
f. Increase the chance of sexually transmitted diseases g. Absence of hygienic facilities for women and adolescent girls
h. Lack of privacy at latrines are seen i. Unavailability of separate toilets, showers, and tents for women, men and adolescent girls
80. Do you have drinking/potable water during or post cyclonic disasters? a) yes b) no c) Don't know
81. Do you have proper sanitation facilities during or post cyclonic disasters? a) yes b) no c) Don't know

82. What is the condition of your toilet? a. Open space b. bamboo made latrine surrounded by plastics
c. bamboo made latrine surrounded by straw/jute straw d. bamboo made toilet surrounded by corrugated
tin e. pucca latrine f. high commode toilet
83. Do you know the family planning centre/ union health complex/ upazila health complex who are
providing the health services? a) yes b) no c) Don't know
84. How far away the government health services institution? a. within 500 meter b. within 01 km
c. within 02 km d. within 05 km e. within 8 km f. within 10 km g. \geq 10 km
85. Do you think that the health care services are satisfactory? a) yes b) no c) Don't know
86. Is there found any free medical goods or services? a) yes b) no c) Don't know
87. Is there exists any private clinic or hospitals? a) yes b) no c) Don't know
88. How many days have you been sick or ill?
89. Do you think women/adolescent girl get menstrual hygiene facilities in the cyclone/flood centers during
the cyclonic disasters period? a) yes b) no c) Don't know
90. Do you think that women/adolescent girl faced sexual harassment or psychological trauma in the cyclone/
flood centers during the cyclonic disasters period? a) yes b) no c) Don't know
91. What are the condition of residence/ habitat have you observed after the cyclonic disasters?
a. Filthy b. dusty and nasty c. extremely heated d. risky and unhygienic e. dirty
and polluted environment f. toxic environment g. suffocating environment h. Others
92. What are the adverse health implications of marginal people due to cyclonic disasters in coastal belt?
a. High rates of diseases b. Heat related illnesses and deaths c. Extreme weather events –
related health effects d. Air pollution related health effects e. Water and food borne diseases f. Vector
and rodent borne diseases g. Mental, nutritional, infectious and other health effects h. others
93. What are the health risks observed in marginal people of coastal belt due to cyclonic disasters?
a. Fever b. cold c. bad headache d. diarrhea e. malaria f. bronchitis
g. asthma/breath taking problem h. whooping cough i. skin disease j. others
94. Do you think that the people of cyclonic disaster prone area get proper health care access or services?
a) yes b) no c) Don't know
95. Do you think that the pregnant women, neonatal baby, aged people, disable or chronic illness people of
cyclonic disaster prone area get proper health care access or services? a) yes b) no c) Don't know
96. What kind of health hazards do you face by disaster?
a. Death of family member b. Risk of infectious communicable disease c. Damage of health
facilities d. Lacking of fresh drinking water e. Don't know
97. What are the adverse health implications due to salinity intrusion in coastal belt?
1= Hypertension/blood pressure 2= stroke/heat disease 3= heart disease/failure reverse effect on
expecting mother and their children lime pre-eclampsia 4= multiorgan disorder 5= osteoporosis
6= cold 7=Prevalence of diarrhea 8=Hyponatraemia due to dehydration 9=feel physical irritation
and hazards due to saline water in the paddy fields, fishing & other agricultural work 10=Spread of water
borne diseases like cholera, dysentery, jaundice 11=malnutrition leading kwashiorkor and marasmus
12=Prevalence of skin diseaseslike itch, boil/blister 13=pregnancy related complexity 14=respiratory
illness such as asthma, stomach cancer and obesity 15= Don't know 16=Other (specify)
98. What are the main reasons behind the pregnancy related complexity among the mother and children due to
salinity? 1=maternal and fetal complexity 2=miscarriage 3=changes in periodical cycle/time
4= preterm/immature birth 5= maternal and prenatal death /immature death 6=intrauterine
growth retardation 7=sufferings in genital/sexual transmitted diseases due to usage of saline water
in periodic time 8=others (mention)..... 9= Don't know

99. Is salinity responsible for abnormal growth/mental retardation of a child? a) yes b) no c) Don't know
100. Do you think that premature birth and miscarriage rate are more severe in salinity prone coastal regions than other areas? a) yes b) no c) Don't know
101. By how women face vulnerability/ deprived situation?
- a. Hardly get preferential treatment in health care services
 - b. Health care center is far from the home
 - c. Women face patriarchal attitude in the context
 - d. Women face social restriction and barriers in getting access to health care services
 - e. Women faces lack of opportunity in community decision making process due to domination of males
 - f. Lack of political empowerment
 - g. Social exclusion due to lack of empowerment
 - h. Roles in domestic chores, child care and rearing like informal sector (unpaid)
 - i. Women are unable to play role in voluntary services due to restriction of social movement
 - j. Don't know

Section 8: Practical knowledge about disaster risk management

102. Do you have any technical knowledge about resilience of cyclonic disaster response and risk reduction?
- a. Yes
 - b. No
 - c. Slightly
 - d. Don't know
103. The technologies has been known & implied by the respondent.
- a. Database management system
 - b. Management information system
 - c. Decision support system
 - d. Geographical information system
 - e. None
104. Do you have any vocational knowledge about resilience of cyclonic disaster response and risk reduction?
- a. Yes
 - b. No
 - c. Slightly
 - d. Don't know
105. The vocational knowledge has been known & implied by the respondent.
- a. Prevention or mitigation knowledge
 - b. Reduction of vulnerabilities
 - c. Strengthening capacities for disaster risk reduction
 - d. Cope with hazards
 - e. None
106. Do you have any indigenous practical knowledge about resilience/coping mechanism of cyclonic disaster response and risk reduction? a. Yes b. No c. Slightly d. Don't know
107. The indigenous practical knowledge has been known & implied by the respondent.
- a. Community behavior towards disaster
 - b. Own survival mechanism of victim
 - b. Migration due to disaster
 - d. Moving higher ground in the time of flood (shifting cyclone center)
 - c. Religious activities
 - f. None
108. Is there any early warning system available? A. Yes b. No c. Don't know
109. How do you know about upcoming disasters?
- a. Television
 - b. Miking
 - c. Interpersonal communication
 - d. Social Networking sites (Facebook)
 - e. Others
 - f. Don't know
110. How do you recover from the damages properties?
- a. NGO support
 - b. Govt Support
 - c. Stakeholder's support
 - c. capacities from their own resources
111. How many times do you need to recover the damages properties and setback in regular life activities?
- a. 15 to 30 days
 - b. 1 to 2 month
 - C. 3 to 6 month
 - b. 7 to 12 month
 - d. More than a year
 - c. Don't know

Section 9: Suggestion of further policy formulation

112. Do you think existing policy is enough or not?
- a. Enough
 - b. Not enough
 - c. Need some advancement
 - b. No need to change
 - e. Don't know
113. What can be the environmental livelihood options for the coastal belt people in your views?

114. What kind of policy should be taken by government to reduce/mitigate this problem? (skill based)
- Need to empower local community
 - More sustainable community risk management system is needed
 - Need to build disaster risk reduction skills
 - Need to link local community to local government
 - Above all
 - Don't know
115. What kind of policy should be taken by government to reduce/mitigate this problem? (infrastructure based)
- Embankments should be repaired & maintained
 - Careful planning should be required for sufficient sluice gate
 - Cyclone center should be secure & hygienic
 - Above all
 - Don't know
116. What kind of environment related initiative needed?
- Reforestation
 - Ensure safe drinking water
 - Ensure medical facilities during and after disaster
 - Need a MHM corner for disadvantaged women
 - Above all
 - Don't know
117. What kind of awareness building program is needed?
- Awareness should be focused on public health & hygiene issues
 - Public awareness program
 - Meeting & comprehensive training
 - Preparedness programs should be more enriched
 - Don't know
118. What should be done by NGOs/foreign aid organizations to solve the problem or desalination process?
119. Have you/your family received any social protection/assistance from Govt/NGOs?
- Child Educational Stipend
 - Vulnerable Group Development (VGD)
 - Vulnerable Group Feeding (VGF)
 - Food for work
 - Integrated Food Security
 - Test Relief (TR)
 - Gratuitous Relief (GR)
 - Handicap/Autistic Scheme
 - Poor People Livelihood Program
 - Do not get at all
120. What kind of resilience/coping strategies/ policy can be implemented/recommended?
- Palm oil tree plantation scheme can be introduced
 - Plantation of betel leaves, napier grass
 - Salinity tolerant crop variety needs to be introduced
 - Embroidery, tailoring and knitting project can be initiated
 - Introduced with the technical & financial support of GO & NGOs so that they can organize local level training on disaster preparedness, resilience, coping mechanism, adaptation, and risk management etc.
 - Motivational and awareness campaign
 - Needs to be integrated approach and development including effective training on nursery development of seedlings, saplings, management of trees, harvesting, processing and marketing
 - Links to be introduced with local youth club and citizens's committee
 - To prepare khash land for farmers and vulnerable women group for plantation of palm trees & vegetation
 - A central aquifer can be set up to collect and preserve rain water
 - Supply of roof materials
 - Supply of water reservoirs and pipe line
 - Climate affected people can be provided job opportunities in the business sector
 - Links with cultured fisheries, fish processing, fish trading especially shrimp and sweet water fishes, fruits like coconut, sofeda, mango, water melon, kul, papaya, litchis, nut, guava; soya bean, vegetables, poultry, animal fodder, agro-based raw materials, handicraft products etc
 - Education, computer skills, basic vocational skills and technological training
 - Linkages between the producers, local retailers, distributors and in some cases, exporters
 - Develop advocacy systems and focus on social safety net, supply pure drinking water, health & sanitation
 - Principles of good governance
 - Crab fattening project can be introduced for vulnerable women
 - Reconstructs of devastated coastal embankments, dams, and polder
 - Tree plantation and vegetable gardening activities
 - Don't know

Thank you for your cooperation!

Appendix-2: Checklist of Research Questionnaire (For KII, Case Study & FGD)

Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh

Section 1: Socio demographic information

Section 2: Risk, Challenges and Socio-economic Vulnerabilities of Cyclonic Disaster

Facing kinds of natural disasters and how many times

Cyclonic disasters & bitter experiences

Existence of cyclone center & structural condition

Cyclonic disasters affect negatively on livelihood & social life activities

Community faced negatively by cyclonic disasters

Adverse social implications of cyclonic disasters

Cyclonic disasters affect negatively on water, sanitation and hygiene (WASH)

By how women face vulnerability/ deprived situation?

More vulnerable group during & post disaster period

Impacts of disaster on socio cultural vulnerability:

Effects of disaster on health hazards

Impacts of cyclonic disasters on children and children's education

Impacts of cyclonic disasters on women and adolescent girls

Kinds of vulnerability facing aged people

Kinds of vulnerability facing disabled people

Facing more intensity of cyclonic disasters in season

Facing less intensity of cyclonic disasters in season

Adverse /negative effects/consequences of cyclonic disasters

Section 3: Economic challenges related information

Cyclonic disasters are harmful for economic activities

Occupational hazards and challenges

Threatening sectors to economic insecurity for cyclonic disasters induced salinity intrusion

Impacts of cyclonic disasters on food productivity and food grains

Impacts of cyclonic disasters on nursery, sapling plantation and timber trees:

Cyclonic disasters on fisheries eg., sweet water cultured fishes, carp cultured fishes, hatcheries and aquaculture:

Impacts of cyclonic disaster on Economic vulnerability

Section 4: Livelihood challenges related information

Main livelihood practice now

Working days and daily income

Earn more money in which season

Earn least money in which season

Reason behind the lowest income

Section 5: Socio-cultural challenges related information

Social disruptions of cyclonic disasters induced salinity intrusion

Migrated/ shortly displaced due to cyclonic disasters last 20 years

Literacy and drop out rate due to cyclonic disasters

Facing the vulnerability with social/mental depression due to cyclonic disasters

Section 6: Environmental challenges related information

What is the main environmental change that affecting livelihood

How salinity hamper the environmental /ecological balance?

Section 7: Health risk/hazard related information

Consciousness of health & getting proper, nutritious and sufficient food

Women, adolescent girl, pregnant women get proper, nutritious and sufficient food

Pregnant/breast feeding women face iron deficiency during cyclonic disasters period

Women, adolescent girl, pregnant women get sexual and reproductive health and rights (SRHR)

Condition of residence/ habitat

Condition of sanitation/ toilet

Knowing health service provider and health service institutions/complex

Getting proper health care access or services of marginal people

Getting proper health care access or services of pregnant women, neonatal baby, aged people, disable or chronic illness people

Having water, sanitation and hygiene (WASH) facilities

Risks/ problems/ challenges of pregnant, breastfeeding and menstruating women during cyclonic disasters period
Adverse health implications of marginal people due to cyclonic disasters in coastal belt
Health risks of marginal people due to cyclonic disasters in coastal belt
Facing kind of health hazards by disaster
Reasons behind the pregnancy related complexity among the mother and children due to salinity
Salinity is responsible for abnormal growth/mental retardation of a child
Salinity is responsible for abnormal growth/mental retardation of a child
By how women face vulnerability/ deprived situation?

Section 8: Practical knowledge about disaster risk management

Technical knowledge of community people about coping mechanism of disaster response and risk reduction
Vocational knowledge of community people about coping mechanism of disaster response and risk reduction:
Indigenous practical knowledge of community people about coping mechanism of disaster response and risk reduction
Early warning system of Disaster Risk Reduction and Management
Recover system from the damages properties

Section 9: Suggestion of further policy formulation

Present disaster risk reduction programs are enough for community
Kinds of responsibilities and initiatives should be taken to reduce the disaster risk: (Individual level)
Kinds of responsibilities and initiatives should be taken to reduce the disaster risk: (Community level)
Kinds of policy and initiatives should be taken to reduce the disaster risk: (State level)
Kind of environment related initiative needed
Kind of awareness building program is needed
Received any social protection/assistance from Govt/NGOs
Kind of resilience/coping strategies/ policy can be implemented/recommended

Appendix 3: Case Study Analysis

Case 1: Pregnant women (Vetkhali, Shyamnagar, Satkhira)

Purnima (pseudonym) who comes from Vetkhali village of Shyamnagar upazila in Satkhira district is a 32-year-old woman completed with primary level education. This study focuses on her experiences as a pregnant woman during cyclonic disasters. She belongs to a low-income household, earning just above five thousand BDT, which is insufficient to support her family of six members.

Purnima describes encountering various natural disasters like cyclone, salinity intrusion, flood and riverbank erosion, which have significant economic, social, and psychological impacts. These disasters create food crisis, lack of pure drinking water and sanitation etc. along with human displacement. She also mentioned that these natural disasters are not only create economic hazards but also create the displacement of the cattle.

She faced the natural disasters frequently in her life like SIDR and BULBUL which create dangerous problem in her life because her first baby was born after BULBUL which destroys their house and damaged their main transportation route. She explains “We stayed our neighbour house more than two weeks and then slowly we repair our house”. Purnima expresses with frustration at the distance to cyclone shelters, approximately three kilometers far away from her home. She interprets that cyclonic disasters create long term of economic problems. NGOs offering loans exacerbate this by trapping people in cycles of debt to meet basic needs, leading to chronic poverty. During the cyclonic disasters, Purnima highlights the heightened vulnerability of pregnant women, the disabled, and the elderly, who struggle to access medical care due to economic constraints. She criticizes the lack of support from distant government hospitals. They can't provide free medicines to them. Regarding the relief distribution from the government and stakeholders, relief efforts from local leaders are insufficient to meet the community's needs. She identified that there is the absence of professional and vocational training provided by the government to lessen the disaster risks. She thought that only Vulnerable Group Feeding (VGF) or Vulnerable Group Development (VGD) can't meet all the needs for achieving long-term economic stability during these periods.

Case 2: Crab Collector (Mirgang, Shyamnagar, Satkhira)

Mohendro Kumar Mondol (pseudonym), resides Mirgang village of Shyamnagar uazila in Satkhira district, is fifty-three years old, has completed secondary level education. He has been involved in crab farming for the past twelve years. Sometimes crab collecting give them high income but sometimes it compels him to take loan for meet the basic needs.

Mondol has encountered severe economic challenges during disaster periods, facing floods, cyclones, storm surges, and salinity intrusions etc. Waters entering by cyclones and floods those often lead to prolonged waterlogging for three to six months, destroying both his income source and daily livelihood. Despite living far from cyclone shelters, approximately two and a half kilometers away, the transportation route to these shelters becomes severely bad during disasters. Mondol expresses that if he prevents the impact of the disasters, he has plan to take the business on the broader aspect. Also, he upsets about the governmental help on the time of disasters, “There is no permanent help we found from the government”.

While winter poses the challenges for crab growth due to cold weather, it remains a period of higher income for Mondol, lasting four to five months.

‘During the flood my crab farming was disrupted about four times and I suffered a loss of about three lakh takas due to drowning of crabs. If the flood water lasts for a long time, the crabs are damaged’. But since their income is a little higher during the winter, they face less damage. But if the water or flood is in the form of inundation for a long time, then they suffer a lot because the crabs do not grow and the small crabs weigh less, so the price is not high.

Despite exporting to countries like China and Mongolia and contributing to remittances, Mondol feels neglected by the government. While some NGOs offer loans, the high interest rates are burden to make profits. Additionally, Mondol experiences health problems during winter, with economic crises exacerbating mental health issues like hypertension and insomnia.

Mondol has not received any training from the government or NGOs but has taken initiatives to mitigate risks independently. Also, he doesn't get any assistance from the government to meet the basic needs during the cyclonic disasters period.

Case 3: Physically Challenge/Disable People (Mirgang, Shyamnagar, Satkhira)

Golam Hosain is the resident of Mirgang village within the Munshiganj union of Shyamnagar upazila in Satkhira district. He is a physically disabled of 35 years old with lower level of education. He has just done his secondary education but not further go to advance more. His family

consists of six members, and their monthly income barely exceeds five thousand, and this money is completely to expend to his family and he has no money left the rest of the other month. Living in a community to natural disasters like cyclones, floods, tidal surges and river bank erosion, Hosain witnesses the adverse effects on destruction of infrastructure, ruin shelters, and deceased of livestock, and impacting his own livelihood. These also hamper his specific earnings source. The cyclone center is not far away from his home but for the situation of his physical existence he can't move away from home during this unwanted cyclonic disastrous condition. He faced SIDR badly when he damaged his home in the disaster period and lending money from stakeholders to repair it. Cyclonic disasters also bring about sleep disturbances and disrupt the daily life and cultural activities, communication, and health, contributing to social problems such as interruption to social networks, increasing rate of crimes, expansion of water borne diseases, and gender-based vulnerability etc. According to Mr. Hosain, cyclonic disasters worse impact on women and adolescent girls. They faced more difficulties like lack of secured shelter, insufficient of healthcare services, unnecessary of social restriction and barriers faces lack of opportunity in decision making, lack of empowerment also unable to play role in voluntary services. He anxious about children, old people, disable person and pregnant women who are more vulnerable during cyclonic disaster period in the season of 'Baishakh-Jaisthya' and 'Ashar-Srabon' in which people face more intensity, and also less struggle in the season of 'Poush- Magh' and 'Falgun-Chaitra' which are found in least cyclonic disasters. Despite experiencing physical hardships annually but he can't get any vocational training to mitigate the disaster risks. He thought about awareness of people to reduce the risk of disaster. Although he receives a disability allowance from the government, it does little to improve his present situation.

Case 4: Boatman (Munshiganj, Shyamnagar, Satkhira)

Probhas Das (pseudonym) is a boatman who has been plying his boat for over twenty years at Munshiganj union of Shyamnagar upazila in Satkhira district. He has six family members and his family income is more than fifteen thousand who claimed that natural disasters create severe adverse impact on livelihood, particularly noting the increased threats posed by climate change-induced phenomena like siltation, water surges, cloudbursts, and flash floods.

Although ferrying being his family's tradition, Probhas hopes for a better future for his children, especially his college-bound daughter. He regrets his inability to take days off, as the demand for

ferrying is stagnant during cyclonic disasters, particularly from daily wage workers reliant on his services to sustain themselves.

He vividly describes the hazardous task of ferrying lives during disaster periods. Moreover, he expresses that natural disaster is a curse for the boatman because they face serious problems like as economic hardship and food insecurity, lack of shelter and pure drinking water, death and life risk also.

Due to cyclonic disasters, it is observed his deteriorates of physical health and dirty and filthy house. Sometimes, they suffer from sleeplessness, their mental health is sick day after day and fever, cold, cough these are continuous break out in their daily life. It is very difficult for them to eat proper non-vegetarian food if they stop work for a month or twice. Due to flood and cyclone we have to eat twice meals in a day. Boats are closed during cyclone and flood, but even if the boats are not closed, the number of passengers is very low, resulting in sometimes low or out income.

They have never been given any training by the government or any organization to reduce the damage caused by disaster and also they have not been given any long term help other than government relief.

Case 5: Internally displaced people (IDP) (Mirgang, Shyamnagar, Satkhira)

Konika (pseudonym) migrated Mirgang for over twenty years ago in search of work opportunities. She and her husband primarily collects crab and golpata (known as nypa) from the Sundarbans to lead her family consisting with three members. Their family income is little bit more than five thousand taka per month which is very low to maintain their family expenses. She faced numerous of natural disasters notably cyclones, floods, and salinity issues repeatedly which ruined her family and sometimes disrupted her livelihood activities. According to Konika these natural disasters negatively affected on economically as well as psychologically. The devastating problem she faced in SIDR and AMPHAN when her means of livelihood closed more than two months but she can't get any notable help from the government.

Konika revealed that they moved here on the quest of income but cyclonic disasters like cyclone, flood and salinity gradually destroyed their earning source. She also anxious for her children's health, as they often consume saline water, leading to mental health issues and increased domestic violence.

Having abandoned their ancestral home due to river erosion, Konika and her family continue to face challenges from other natural disasters. As there is no job opportunity, they have to earn daily wages. During cyclone and flood, their daily wage is closed due to cyclonic disasters for which they have to eat for two times in a day and sometimes they have to go out of food in a day because they don't get relief all the time.

Due to build mud houses, their houses are destroyed by cyclone and coastal flood. They don't have to spend a lot of money to rebuild their concrete houses. She emphasized that the help of government and non-government organizations (NGOs) should be strengthened, criticizing the inadequacy of programs like Vulnerable Group Development (VGD) and Vulnerable Group Feeding (VGF) in meeting basic needs. She calls for increased disaster risk mitigation training for communities and urges the government to expand healthcare services, making them more accessible and providing free medical services.

Case 6: Mawali/ Honey collector (Mirgang, Shyamnagar)

Mr. Shirajul Islam (Anonymous) is the resident of Vetkhali village of Shyamnagar upazila who farmed honey as his occupation. He is thirty-two years old and completed primary education. He is married who meet his livelihood to collect honey from the Sundarbans. He thought that cyclonic disasters moderately impacted negatively on his occupation. He earns more than fifteen thousand taka monthly and maintains six members of his family.

While cyclonic disasters moderately affect his honey farming, he believes they lead to long-term economic crises. Mr. Islam saw natural disasters as the synonyms of the close of income. Although he cannot concern about the natural disasters but the increasing price rate of sugar create their economic crisis because honey is cultivated with sugar.

Bee movement comprises five types, including honey collection by 'Kolmi' bees and egg-laying by 'Queen' bees. Cyclones and floods destroy beehives, halting honey production, and floods also spoil bee food made with sugar and water, hindering honey production further. Despite these challenges, artificial honey cultivation isn't pursued due to the sugar price hike and associated risks of bee stings and illness.

He expresses that cyclone center is not so far from his home but the transportation system totally breakdown during the time of disasters. Health risks during floods and cyclonic disasters include cold and fever, with long-term illnesses affecting children. But if their income is off, insomnia, hypertension, etc. mostly affected on them. Economic instability leads to insomnia and

hypertension when income is disrupted. There is no government help in beekeeping and the government hospital is far from their home which makes it very difficult for them to get medical care even if they fall ill.

There is a lack of formal training to mitigate cyclonic disaster risks, although NGOs occasionally provide motivation to reduce vulnerabilities.

Case 7: Young adult women (Vetkhali, Shyamnagar, Satkhira)

Jerin, a young adult woman, is twenty-two years old and lives with seven family members. Her family income is more than twenty thousand taka monthly but her family expenses range between twelve to thirteen thousand taka. She strongly agrees that cyclonic disasters have severely impacted negatively on their occupational status.

While she contributes to her family's welfare with her husband's income, during disaster periods, their income is completely halted. Cyclones like SIDR, AMPHAN, and BULBUL have been particularly devastating. While SIDR didn't harm them significantly, AMPHAN and BULBUL led to long-term unemployment, prompting some people to migrate permanently. Despite the proximity of the cyclone center, poor communication during disasters leaves them feeling insecure. Jerin emphasizes that natural disasters cause long-term unemployment and displacement. The family has resorted to taking loans due to the shutdown of income. According to her, the devastating problem she faced in her life at the time of natural disasters in *SIDR*, *AMPHAN* and *BULBUL*. Cyclonic disasters have disrupted children's movement, communication, and transportation, hindered women's income opportunities, and exacerbated mental health issues due to the distant healthcare centers and lack of free medical services. Cyclonic disasters adversely negatively effect on health like creating insomnia or sleeplessness, colds, fevers and coughs. These coastal areas people are conscious about the proper health but they cannot get proper food just because of the economic crisis and also the food crisis.

Jerin notes that there is no technical and vocational training given by the government or non-governmental organizations. They get only vulnerable group feeding assistance from government each month.

Case 8: Women (Vetkhali, Shyamnagar, Satkhira)

Padma Rani, aged thirty-five years old, is a landless poor as well as day labour. She has seven family members lead by her monthly income eight thousand BDT. As she is a day labor and landless poor, cyclone, flood and other natural calamities negatively affect her income.

In Padma's view, humanitarian efforts should consider the repercussions of disasters on individuals to aid them in returning to normalcy. She acknowledges that if disasters could not pose a direct threat to human life or livelihoods, they are not a major concern. However, she stresses that disasters are not merely about physical displacement caused by cyclones, floods or storm surges. According to Padma, salinity and waterlogging are present almost throughout the year. Her house was destroyed during Cyclone Sidr, compelling her to take a loan of approximately two lakhs from the bank for reconstruction. The rise in water levels often leads to the drowning of fish in ponds, and their livestock, including cows and goats. Lack of pure drinking water is met by collecting rain water, saline water is available almost throughout the year, tube wells cannot be installed due to the high salinity levels.

She outlines that the food grains are seriously adversely affected by natural disasters like seasonal crops, vegetables cannot be grown due to saline water and fruit trees are also adversely affected by the saline water.

She expressed with frustration that the main environmental changes affected the livelihood strategies due to cyclone, salinity, coastal flooding but the government has not created any permanent solution to reduce the livelihood risk.

They concern about their sound health and try to get proper food but they cannot meet the basic needs due to economic crisis, exposing them to significant health risks. Padma doesn't know any technical knowledge about resilience strategies in response to cyclone disasters and its reduction. She also does not get any relief or any governmental assistance from the governmental or non-governmental organization.

In summary, Padma Rani's narrative sheds light on the struggles of landless laborers in coastal areas, whose livelihoods are deeply intertwined with the unpredictable forces of nature. The absence of robust government interventions and support mechanisms leaves vulnerable communities like Padma's at the mercy of recurrent disasters and their aftermath.

Case 9: Adolescent girl (Vetkhali, Shyamnagar, Satkhira)

Shimla who is sixteen years old and studying in secondary school of her village at Vetkhali of Shyamnagar upazila in Satkhira district. She asserts that cyclonic disasters have severe impact on their livelihoods adversely. Her family's income and expenses are between five thousand to ten thousand BDT. Cyclonic disasters create the significant damages by economically, socially and

psychologically in their area. Cyclone, tidal surge, flood, river bank erosion and salinity intrusion etc. are frequently observed in their areas. She expresses in word that except the river bank erosion, these are the cyclonic disasters.

Her father's fish-selling business is greatly affected during cyclones, leading to heavy debt burdens as sales halt. Cyclone center is about two kilometers far from the house but the cyclone center is very unhygienic due to the presence of cows, goats and poultry. So, it is not possible to go there. Tubewells cannot be installed because of the saline water which creates the lack of pure drinking water and forcing them to rely on rainwater for drinking.

Cyclonic disasters peak in intensity during the months of Baisakh-Jaishtha and Bhadra-Ashwin, compared to Poush-Magh and Falgun-Chaitra. These disasters bring about household insecurities, economic instability, food shortages, shelter problems, life-threatening situations, infrastructure damage, health risks, lack of pure drinking water, damage of fisheries and damage of their boat.

Shimla highlights that the financial struggles of her family faces during certain months, particularly Baishakh-Jaistha and Ashar-Srabon, making it challenging to meet their needs. During the rainy season, they often reduce their meals from three to two per day. There is no private clinic in their area. Besides, the government hospital is situated too far from their house. So, they are almost reaching out of proper health care services.

The prevalence of diseases, heat-related illnesses, deaths, extreme weather-related ailments, water and food-borne illnesses, mental health issues, and malnutrition are observed due to cyclonic disasters. Shimla criticizes the inadequacy of government hospital services during and immediate after disasters, stating they fail to meet basic needs adequately.

Case 10: Fisherman (Vetkhali, Shyamnagar, Satkhira)

Mr. Faruk as a fisherman who involved with this occupation since his childhood. He earns ten thousand taka per month and maintains his five family members with this income. However, he faces significant uncertainty during disaster periods.

Fishing operations are halted, especially during Baisakh and Jaishtha months, despite the availability of hilsa fish, due to the presence of Kalbaisakhi storms and intense tides in the rivers. As a consequence, their income is too scant during these two months.

Daily ailments such as fever, colds, and coughs are common, exacerbated by prolonged exposure to cold weather during fishing expeditions, leading to respiratory problems. Since the medical

center is far away from their homestead and due to economic crisis, it must be very difficult to cure from them.

Despite of lacking life jackets and formal training, fishermen like Mr. Faruk venture into the rivers and deep seas for fishing, putting their lives at risk during natural calamities. Although warnings are issued, they often cannot avoid these risky situations. Mr. Faruk highlights the life-threatening risks involved in boat riding and deep-sea fishing during cyclonic disasters, viewing disasters as the synonymous of their life risks for fishermen. It is observed that the absence of adequate safety measures and training exacerbates their vulnerability.

Case 11: Elderly (Vetkhali, Shyamnagar, Satkhira)

Bharati Rani, aged eighty-four years old, earns her livelihood as a crab collector, supporting her small family of three on a meager income of less than five thousand taka. She says that she observed her locality is with the abundant problem of salinity intrusion through the tidal surge and river channel of brackish water from birth. Initially, salinity was less severe, but it is become a persistent issue, affecting their lives every month. Although the construction of dams has somewhat mitigated inundation problems, daily wage earners and boatmen suffer job losses due to cyclones and coastal flooding.

Having experienced various natural disasters throughout her lifetime, including cyclones, tidal surges, salinity intrusion, floods, earthquakes, and riverbank erosion, Bharati recalls the devastating impact of the 1970 cyclone and cyclone Sidr. She thinks that her village has not developed so much in her life time even what she has been observed is set back due to cyclonic disasters or other calamities.

Bharati Rani has been suffered from many diseases like hypertension, heart problem, lung issues, colds, and coughs. However, the absence of nearby hospitals and poor road infrastructure, particularly during the rainy season and the months of Baishakh-Jaisthya, hampers access to medical care. Their roads are so bad and slippery in the rainy season, so they can't go to hospital even cyclone center during disasters and can't get any medical/health care.

While Bharati receives old age allowances and vulnerable group feeding assistance from the government, she notes that other villagers often receive no support. There is no permanent solution from the government to mitigate risks posed by natural disasters.

Case 12: Marginal farmer (Vetkhali, Shyamnagar, Satkhira)

Abdul Hamid is a marginal farmer lives in Vetkhali who meet their family needs through cultivating crops on the field. He claims that his monthly income is not so much to maintain his eight family members. He also claims that the rainy season, the period of natural disasters, compelled them earn to lessen their income or even sometimes their income became closed.

Furthermore, farming practices and other aspects of agriculture are seriously hampered by the natural disasters. Cyclonic disasters severely impact on their livelihood and sometimes displaced the people. The challenges faced by farmers due to cyclonic disasters are typically unnoticed by the government and the nongovernmental organization which also anxious the marginal people. Farmer's life is negatively impacted by these issues both directly and indirectly. Moreover, farming practices and other factors of agriculture can demand time and resources. Disasters clearly damaged the standing crops which create the burden on their life and the overall country economies. They admit that there is no doubt on they don't have the control of nature but they think that only proper management taken by the individuals and government, the damages and sufferings may be lessened.

He explains that the natural hazards including cyclonic disasters also create the enormous problem on the mental as well as physical health but there are not enough facilities to overcome from the risk of natural disasters.

While Hamid appreciates the government's provision of thirty kilograms of rice per month, he believes it falls short of significantly improving the lives of marginal farmers. He stresses the need for permanent solutions from the government to alleviate chronic poverty in marginal areas.

Case 13: Bawali/ Wood cutter (Vetkhali, Shyamnagar, Satkhira)

Since 2003, Morshed has been collecting wood from the Sundarbans to sustain his family of five, which includes two daughters. However, during disaster periods, such as cyclones, obtaining wood becomes challenging. While Morshed obtains a pass from the Munshiganj Forestry Division to cutting wood from the Sundarbans, natural disasters often disrupt this activity, depriving him of his main source of livelihood.

Although the Forest Department issues pass for woodcutting at a cost of eight hundred taka for two weeks, Morshed's ability to benefit from this resource is hindered during disaster periods when work becomes impossible. He relies heavily on forest wood for his livelihood but struggles to access it during pass periods.

Morshed notes that sometimes they get pass at the winter season which create more profitable than the rainy season. They also don't get any permanent assistance to solve their challenges and damages due to cyclonic disasters. He believes that if passes were obtained during the rainy season, when they faced enormous problem to maintain their livelihood would be less severe.

To sustain their family expenses, Morshed and others in his community often resort to taking loans from non-governmental organizations. He acknowledges the mental stress and long-term health issues, such as lung problems and insomnia, caused by economic tension exacerbated by cyclonic disasters.

There is no permanent solution as they don't get any assistance from the government or non-governmental organization to reduce their disaster risks. It is needed to be increased the vocational training to reduce their existing risks. He claims that only vulnerable group feeding or vulnerable group development do not offer long-term remedies of disaster risks.

Case 14: Golpata collector (Vetkhali, Shyamnagar, Satkhira)

Hiran Mondol, aged sixty-five years, who completing primary school education, he relies on this occupation to sustain his family of six, with a monthly income and expenditure ranging between ten to twelve thousand taka.

Having experienced various natural disasters like cyclones, salinity intrusion, tidal surges, and floods, Hiran emphasizes the severe negative impact of cyclonic disasters on both his livelihood and overall well-being. Cyclonic disasters not only create to economic challenges but also social and psychological problems, as well as health hazards.

The cyclone center is 2 kilometers far away from his home. Hiran and his family often avoid seeking refuge there due to the poor transportation and communication systems, as well as the unhygienic conditions at the center. The negative social implications of cyclonic disasters are disruption of social network, movement hindrance, and damage of educational institutions. Moreover, they face many shortages of pure drinking water as tube wells cannot be installed due to salinity for which they preserve rainwater to drink.

While collecting golpata during cyclones is not inherently difficult, the lack of sunlight during floods complicates the drying process, affecting the price fetched for the golpata. Hiran notes that obtaining passes from the forest department during disasters makes collecting leaves challenging, particularly during the months of Baisakh-Jaistha and Ashar-Srabon.

Despite receiving warnings via miking before cyclonic disasters, Hiran and others in his community face lack of vocational training to mitigate the disaster risks effectively. While the government provides moderate relief through the Cyclone Preparedness Programme (CPP) and Red Crescent volunteers, the assistance, including thirty kilograms of rice per month, is deemed too scant.

Case 15: Golpata collector (Sreepur, Ashashuni, Satkhira)

Yunus Mollah, aged 56, lives in Sreepur Union of Ashashuni upazila at Satkhira district. His family consists of eight members, and their entire income is dedicated to sustaining their livelihood. Yunus works as a golpata collector, facing numerous challenges in his occupation. They are called as nypa or golpata collectors who are facing many challenges when they go to collect nypa leaf. They go to the Sundarbans forest to collect nypa leaf twice a year. They receive permission for a 28-day pass in December and January, during which 5-6 day laborers accompany a boatman to collect the leaves, staying in the Sundarbans for one month. The mahajon pays 13,200 taka for the pass of one month, and each boat can collect approximately 50-60 kaun of golpata leaves, each kaun selling for 2500 taka. Those who work as labour are paid 15000 taka for the month. They face economic hardship when the Sundarbans side is closed. As a result, they have to engage in day labour. The government gives 30 kilograms of rice in a month during this closure period.

During summer season (Baishakh and Jaistha), people earn more money while they earn less money in winter season for the lacking of golpata collection. As a result, they face economic and social challenges. Their children do not get proper educational facilities as well as health care facilities due to limited income. As a result, majority of the children remain uneducated and suffer from various cyclonic disaster related diseases. They have been sick during 10-15 days.

Due to cyclonic disasters, they have lost most of their own properties such as homestead land, cattle and farmland. Recovery is slow due to their poverty, often taking 7 to 12 months and even more than a year. After cyclonic disasters, their environment can be very toxic. As a result, they can not produce food grains properly due to salinity. During the cyclonic disasters, people do not get proper safe drinking water and sufficient sanitation facilities. At the time of disaster, they lost their occupation and many are being unemployed. Also, majority of homestead land destroy in every year due to river bank erosion. Even they do not get proper nutritious food. They can not recover their damage properties from cyclonic disasters. They need to 6 to 7 months or sometimes more than a year to recover their damage properties. Existing policy formulation is inadequate,

requiring implementation of measures like tree plantation activities and public awareness campaigns by the government to effectively address the challenges faced by Yunus and others in similar circumstances.

Case 16: Pregnant Woman (Sreepur, Ashashuni)

Sanjida Khatun, aged 35, resides in Sreepur union of Ashashuni upazila in Satkhira district with her family, which typically consists of 3-6 members. She is a pregnant woman. In every year, she faces with natural disasters such as cyclone, tidal surge, flood, river bank erosion etc. These disasters have multifaceted adverse effects on her economic, social, psychological, and health vulnerabilities.

Due to the limited number of cyclone shelters, many individuals have to stay at home during disasters, resulting in significant property damages and losses. Saline water poses detrimental effects on both humans and the environment, exacerbating health issues for children, particularly pregnant women who suffer more during pregnancy. They do not get proper nutritious food and health care facilities. Majority of the people in these areas are not conscious about sound health. As a result, pregnancy related complexity arisen severely. At the time of disasters, pregnant women face iron deficiency during reproductive period. Even they do not get menstrual hygiene facilities properly. The Upazila Health complex is little far away that is why they do not get adequate health care service as well as they do not get sufficient medicine.

Saline water also impacts fetal health, causing miscarriages and difficulties in conception. During the cyclonic disasters, they can not get sufficient menstrual hygiene facilities. As a result, they use napkin instead of pads resulting in the risk of infections, cancer and pregnancy-related complexity among the mothers and are very high risks of miscarriage, immature birth etc. due to salinity.

While they receive social protection like Vulnerable Group Feeding (VGF) from the government, existing policies fall short in addressing their developmental needs. Above all, some coping strategies can be ensured like motivational awareness program and the establishment of menstrual hygiene management corner. However, more comprehensive policies and interventions are required to adequately support individuals like Sanjida Khatun and her community in facing the complex challenges posed by natural disasters and their associated health implication.

Case 17: Physically disabled (Kurikahunia, Ashashuni, Satkhira)

Mohibullah, aged 42, has been living with his family long since at Kurikahunia village in Protapnagar union of Ashashuni upazila in Satkhira district, where they consist of 7-10 members and have a family income of less than 5000 taka. Mohibullah is physically disabled, having broken his leg three years ago, rendering him unable to walk without assistance and reliant on a wheelchair for mobility. His family spent later one lakh taka to extract the iron. The family faced significant financial strain due to Mohibullah's disability, with considerable expenses incurred for medical treatment, including the extraction of a rod from his son's leg. To cover these costs, they sold three cows and obtained loans 40,000 taka from each organization like Asha and Grameen Bank. For this reason, he has to pay Asha as installment of taka 1600 with the condition of repayment in 46 installments. Despite his disability, Mohibullah engages in work for about 10-15 days per month, earning 200-250 taka, which is insufficient to afford proper nutrition

Their income fluctuates, with higher earnings during the rainy season and lower earnings in winter. Their living situation worsened during cyclone *Aila*, their houses were all washed away due to river erosion. She notes that it is needed to recover the damage properties and setback 7 to 12 month and even more than a year. The family, especially pregnant women and physically disabled individuals like Mohibullah, faces heightened vulnerability during disasters, as their mobility is severely limited. While the government provides 30 kg of rice per month, it's insufficient to meet their needs adequately. Mohibullah emphasizes the importance of public awareness campaigns to educate communities about disaster preparedness and mitigation measures, urging the government to implement such policies effectively.

Case 18: Boatman (Protapnagar, Ashashuni)

Muktarul Majhi, aged 36, resides in Protapnagar Union of Ashashuni upazila in Satkhira district, with a family size of 6 persons and his family income is between 15001 to 20000 taka. He works as a boatman and faces various challenges during disasters each year. Cyclone *Aila*, for instance, caused extensive damage to their homeland, homestead, and kitchen garden, resulting in the losses of their entire property.

To cope with these challenges, Muktarul's family has taken loans from BRAC Bank. The high salinity of water in the area forces them to rely on rainwater, which, if stored for long, can lead to waterborne diseases like diarrhea and dysentery etc. He mentions that food and water have to be

fetched from far away, their income is cut off, and domestic violence is very high due to cyclonic disasters.

As a fish seller, Muktarul's income fluctuates, with higher earnings during the rainy season and lower earnings in winter. However, disruptions in fishing activities due to floods lead to economic vulnerability. One of his children had been died last year due to lack of treatment.

His income is higher during rainy seasons and lowest income during winter seasons. He can earn ten to twelve thousand taka per trip. They are exposed to natural disasters every year, especially cyclone and river erosion, resulting in economic, social and psychological as well as health vulnerabilities. Every year due to natural disaster many people migrated from their village like 300-400 people. During periods of low income, Muktarul Majhi experiences mental depression due to financial constraints. Proper nutrition and health awareness are lacking during disasters, further jeopardizing their well-being. Recovery from property damage can take 7 to 12 months or even sometimes more than a year. Fortunately, government and various NGOs operate in the area to address these challenges, focusing on infrastructure projects like embankments and sluice gates to mitigate the impact of natural disasters on the community.

Case 19: Fisherman (Kurikahunia, Ashashuni, Satkhira)

Tobarak Hossen, aged 53, lives at Kurikahunia village in Protapnagor union of Ashashuni upazila at Satkhira district. His family member consists of seven including four of daughters and one son. His family income belongs to between 5001 to 10000 taka monthly, and he occasionally engages in business by buying *kewra* fruit and selling it in the local market for 70-80 taka per kg. They are victims of natural disasters every year resulting severe damage of economic, social, psychological, and health related challenges. He took loan from Grameen Bank to repair their damaged house. Their houses were severely damaged during Aila. They have been suffering from various kinds of diseases like cholera, fever and cough due to salinity. Access to safe drinking water is limited to only three months throughout of the year, with the remaining nine months dominated by saline water, affecting their health and livelihoods.

Their income is very high during the cyclones. They are trapped while fishing in the river, because they go to the deep sea to catching fish, so ever often hearing the forecast of disaster. When they can not come out of the river. During the disasters it is observed that the children's school are closed and majority of those children drop out from school, road can be destroyed and lack of secured shelter. Physically challenged people, elderly, and pregnant women are more vulnerable

during disasters. People are not conscious about their health and they can not get proper nutritious food at that time. But if they have income then can have nutrition food. Their health complex is so far away that they can not get medical services properly. It is needed to 7 to 12 months, and sometimes more than a year to recover from the damages of properties. The government provides some assistance, including 50 kilograms of rice through fishing cards during disasters, but more proactive measures are needed. Motivational awareness campaigns and infrastructure projects like embankments and sluice gates are essential to address the recurring challenges faced by Tobarak Hossen's community.

Case 20: Adolescent girl (Protapnagar, Ashashuni, Satkhira)

Muslima Khatun, aged 15 years adolescent girl, lives with her parents in Protapnagar union of Ashashuni upazila at Satkhira district. Her family members are made of five persons, among of them two daughters and one son. Their monthly family income falls in the range of 5001 to 10000 taka. There is a lot of damages occurred due to recurrent natural disasters, so they took loans from different organizations. Due to the cyclonic disasters, Muslima had to pause her studies for a year. They use schools as cyclone centers due to lack of adequate cyclone centers but do not go due to lack of security. During the cyclones, their houses were destroyed and they forced to go to school. Especially, the pregnant women and adolescent girls are more vulnerable during cyclonic disasters. The adolescent girls do not get of their usage daily utensil like menstrual kit, they use alternative menstrual hygiene facilities. They faced natural disasters at every year such as cyclone, salinity intrusion and tidal surges. They adversely affected economic, social, psychological as well as health. The vulnerability of adolescent girls, pregnant women, and the elderly is heightened during disasters, with transport barriers and inadequate shelter exacerbating their plight. Economic hardships are exacerbated by the loss of employment opportunities. At the time of disaster majority of those people become unemployed. They faced more challenges of occupational hazard, low wages salary. Her father main occupation is fishing but during disaster he is doing work as day labor. In a month they do work for 15-20 days and their daily income is 200-250 taka. People earn more during the rainy season, and earn less income during the winter season. Due to cyclonic disasters, it is observed that unavailable of fish and lack of employment opportunities. They are not conscious about health, as a result, they face various kinds of vector borne diseases. They do not get proper nutritious and sufficient food, majority of the new born babies become malnourished and pregnant and breast-feeding women face iron deficiency during reproductive period. Women

can not conceive quickly due to salinity as well as adolescent girl can not get menstrual hygiene facilities during disasters. Health complex is far away from his home. As result, they do not receive proper health care facilities. Need to recover from the damage properties 7 to 12 month sometimes more than a year. They receive social protections from the government like vulnerable group feeding and food for work. To improve their resilience of disasters, initiatives focusing on education, healthcare access, and livelihood support are required. Additionally, raising awareness about menstrual hygiene and providing proper nutrition support can enhance the well-being of vulnerable populations like Muslima Khatun and her family.

Case 21: Physically disabled (Protapnagar, Ashashuni, Satkhira)

Maruf Billah, aged 34, lives with his family at Protapnagar union of Ashashuni upazila in Satkhira district. His family member consists of five persons. And his family income is 10001-15000 taka. Maruf himself is physically disabled, relying on a wheelchair for mobility. Despite his disability, he manages a small shop as his main source of livelihood. He is struggling and going to economic hardship to maintain his family. He can do the work 10-15 days in a month and earns 200-250 taka daily, so they do not get proper nutrition food due to lack of money. He earns more money during the rainy season and lowest income during the winter seasons. His family faced significant losses during cyclone Aila, with their homes washed away due to cyclonic disasters. Maruf notes that to recover the damage properties and setback in regular life the coastal people need 7 to 12 months and even more than a year. They are not conscious about health and can not get proper nutritious food. Maruf's disability makes him more vulnerable during disasters, as he cannot relocate without assistance. Children, pregnant women, elderly and physically disable people are more vulnerable during disasters because they can not move from one place to another place without help. While the government provides 30 kg of rice per month, it falls short of addressing the broader issues faced by the disabled and vulnerable populations. To address these challenges, Maruf emphasizes the importance of public awareness campaigns and government interventions. Effective government policies and community-based initiatives are essential for addressing these challenges and enhancing the resilience of marginalized communities. He suggests implementing policies focused on disaster preparedness and resilience-building, such as the construction of sluice gates, dams, polder and embankments, and afforestation initiatives.

Case 22: Young Adult Women (Protapnagar, Ashashuni)

Josna Parvin, aged 24, lives with her husband at Protapnagar village of Ashashuni upazila in Satkhira district. Her family comprises with six persons. They have encountered numerous challenges or bitter experiences during disaster period. Cyclones, tidal surges and river erosion wreak havoc on their homes and livestock, leading to profound economic hardships and mental distress. At the time of disaster, the pregnant women, young adult women, elder people, physically disabled person are more vulnerable.

The coastal people of this area are worst affected during Aila when their houses were completely swept away by the cyclone. As the cyclone shelter is far away and even the nearby schools are far away, they can not go to safer shelter during cyclones and floods while people loss in lives at that time. Relief assistances are insufficient, especially during cyclonic disasters, exacerbating the devastation caused by excess salinity, which inhibits the carp fish production and destroys plants, vegetables and livestock. Her main occupation is fishing. She works 10- 15 days in a month and earns 200 to 250 taka per day. People earn more money during the rainy season, but lower in particular season for unavailable of fish and lack of employment opportunities, leads to be mental depression. Women face many challenges during disasters especially concerning pregnancy-related complications. They do not get adequate health care services due to the remoteness of the health complex. Pregnant women often lose their new born babies due to malnutrition and experiencing iron deficiency during reproductive periods. The high salinity levels also contribute to delays in conception and hinder access to menstrual hygiene facilities. Recovery from property damage often spans over a year. She has a relief card. While they receive 30 kg of rice per month from the government through relief cards, more comprehensive solutions are needed to address their challenges. Public awareness program and reconstructions of embankments and sluice gates must be needed to ensure effective disaster preparedness and response for them.

Case 23: Aged People (Protapnagar, Ashashuni)

Dr Ayub Ali, aged 62, lives at Protapnagar village of Ashashuni upazila in Satkhira district, where he serves as a quack doctor in the village. His community has faced recurring disasters, including cyclones, floods, tidal surges, and salinity intrusion, leading to adverse economic, social, psychological, and health vulnerabilities. Due to the limited number of cyclone shelter, a significant number of people have to stay at home during disasters, creating significant damages. The harmful effects of saline water on both humans and the environment exacerbate the challenges

faced by the community. Due to excessive saline water most of the children suffers a lot. Pregnant women suffer more at that time of cyclonic disasters, experiencing iron deficiency and inadequate access to healthcare and menstrual hygiene facilities. They do not proper nutritious food and health care facilities. Majority of the people in this area are not conscious about health and pregnancy related complexity. The Upazila health complex is a far distance from their home, that is why they do not get adequate health care services as well free sufficient medicine and medication.

Due to excess saline water their babies are spoiled even they can be unable to conceive quickly. During the cyclonic disasters, they do not get sufficient menstrual hygiene facilities. As a result, they used wool instead of sanitary pads resulting in genital wound formation and cancer. It is observed that pregnancy related complexity among the mother like miscarriage, immature birth and death, intrauterine growth retardation of children are very high due to salinity.

Despite the severity of the damage property by disasters, government assistance is often insufficient. Implementing coping strategies such as tree plantation initiatives and motivational campaigns is required to mitigate the impact of disasters and enhance community resilience.

Case 24: Fish fry collector (Protapnagar, Ashashuni, Satkhira)

Golam Rasul, aged 35, resides in the Protapnagar union of Ashashuni upazila in Satkhira district, where he works as a fish fry collector. His community faces the brunt of natural disasters each year, including cyclones, floods, salinity intrusion, and river erosion. During cyclone Aila, they have lost their whole properties and a family member. He expresses that the southern coastal people are experiences negatively affected economic, social, psychological and health well-being. Their infrastructure destroys during disaster period. Pregnant women and disable people are one of the most vulnerable during natural disasters. People don't get clean water. Hampering child morality and food insecurity can be seen during natural disaster. There are not enough shelter and toilet facilities. They are not aware of health even some people are deceased without treatment. While they collect food three times in a day, but it is not covered their calorie intake. They suffer acute diseases and malnutrition due to lack of sufficient food. They are facing various water and food borne diseases due to lack of safe water.

Women don't use the kit during menstrual cyclical periods. They use different types of cloths which creates rags, fatal diseases like cancer and other unwanted diseases. Moreover, the absence of clean water exacerbates health issues, leading to diseases like dysentery. Recovery efforts rely on support from NGOs and the community's own resources, but the process often takes several months to

over a year. To alleviate their plight, the government must prioritize the construction of sufficient sluice gates and embankments. Additionally, social protection measures, such as child education stipends, provide some relief but are insufficient to address the magnitude of the challenges faced. The government should be implemented a comprehensive public awareness campaign for them.

Case 25: IDP (Protapnagar, Ashashuni, Satkhira)

Azmira Khatun, aged 45, is an internally displaced person (IDP) residing in the Protapnagar union of Ashashuni upazila in Satkhira district. She migrated from Satkhira two years ago and at present she is a permanent residence in this area. Azmira has endured bitter experiences during disaster periods, including cyclones, salinity intrusion, floods, and river erosion, which leads to extensive property damages. Due to river bank erosion, she has mostly adversely affected by economically and psychologically. Due to river bank erosion, she has lost shrimp cultivation with two lakh taka. At present, she decides to migration into another place. Due to excess drinking of saline water her babies are spoiled even she are unable to conceive further baby. During the cyclonic disasters, she does not get sufficient menstrual hygiene facilities. As a result, she used wool and napkins instead of sanitary pads resulting in wound formation of vagina, and cancer. Pregnancy related complexity like miscarriage among the mother and death of infants are very high due to salinity. She notes that despite these adversities, Azmira and others in similar situations aim to rebuild their lives with resources available to them. However, the recovery process can be prolonged, often lasting between 7 to 12 months or even longer. The existing policy is not enough for them. Establishing sluice gates can help mitigate the impact of natural disasters and protect the vulnerable communities. Social safety net programs such as Vulnerable Group Feeding (VGD) providing some support from the government and comprehensive policies and initiatives are required to address the challenges encountered by IDPs. Public awareness campaigns and tree plantation activities are needed to enhance resilience and promote sustainable development within affected communities.

Case 26: Mawali (Uttar Bedkashi, Koyra, Khulna)

Komol Munda, a resident of Patharkhali village of Uttar Bedkashi in Koyra of Khulna district, has been engaged in beekeeping for two decades, relying on this occupation to support his family. While the income from beekeeping brings occasional joy, it also brings its share of challenges.

During cyclones, the honeydew break, causing the sugar-water mixture essential for bee nutrition to lose its solidity quickly. This impacts the growth of tea plants, which bees depend on, leading to reduced honey production. In addition, during floods or prolonged rainy periods, bees nesting in the area resort to purchasing water due to saltwater intrusion, incurring additional costs.

While beekeepers are accustomed to bee stings, the mixing of sugar with saltwater diminishes the quality of honey, depriving bees of vital nutrients. Cyclones and other disasters have a significant impact on artificial honey cultivation, further complicating matters.

The rising prices of sugar in recent months pose a threat to beekeepers like Komol, who practice artificial bee farming. The increased cost of sugar jeopardizes the viability of their businesses over the long term. In beekeeping, if the communication system is damaged, they don't have much problem but when they keep bees artificially, since they are fed or farmed. Prolonged waterlogging in bee farms hinders the proper application of sugar mixtures, depriving bees of essential nutrition, as a result, bees don't get nutritious food, since sugar is the only source of bees.

The escalating sugar prices exacerbate the impact of natural and man-made disasters on beekeepers like Komol. Despite receiving thirty kilograms of rice per month from the government, they lack access to other resources or facilities. During cyclones or floods, relief efforts and warnings typically consist of basic amenities are offering minimal support through mike and television.

Case 27: Bawali (Uttar Bedkashi, Koyra, Khulna)

Bala Munda (pseudonym) is a resident of Uttar Bedkashi in Koyra, relies on woodcutting in the Sundarbans to sustain his family. He believes that he has inherent right to access the natural resources of the Sundarbans, but acknowledges the severe impact it has on their daily lives.

Obtaining a pass from the Forestry Department during floods or the rainy season proves essential for woodcutting endeavors. Harvesting becomes difficult for them because it is difficult to bring wood from Sundarbans to dry market during that time, compounded by the decreased market prices. Also, due to frequent cyclones, wood from Sundarbans and trees are also decreasing, which greatly affects the livelihood of the area posing a significant threat.

During floods or other natural calamities or high tides the biggest threat is fetching timber and preparing it for market. However, obtaining a pass during the winter season mitigates this challenge.

Aftermath of cyclones and coastal floods, communication systems are often destroyed, and road conditions deteriorate, hampering access to medical facilities in Khulna or neighboring areas. This

exacerbates health risks such as fever, colds, and coughs, compounded by the constant threat of disasters in the region, which takes a toll on mental well-being.

Despite the lack of vocational training, residents receive early warnings system of disasters via loudspeaker announcements, and some relief efforts are provided by CPP volunteers in the area. Local leaders occasionally intervene to address their plight and offer assistance during such times. While legal avenues for woodcutting with permits are limited for many, some resort to illegal activities, cutting wood from the Sundarbans under the cover of darkness. Despite the risks involved, the illegal timber trade yields substantial income for those involved.

In fine, Bala Munda's reliance on woodcutting from the Sundarbans underscores the complex interplay between environmental challenges, economic livelihoods, and the need for sustainable resource management in the region.

Case 28: Pregnant women (Uttar Bedkashi, Koyra, Khulna)

Shilpi Rani, an anonymous resident of Borobari village of Uttar Bedkashi union of Koyra upazila in Khulna district. She is 32 years old and currently pregnant. She depends on her husband, who earns through fishing on the river, to support their family.

Shilpi expresses disappointment. She elaborates on the challenges her family faces, particularly during her pregnancy. Pregnancy poses a significant challenge in Uttar Bedkashi due to the lack of nearby hospitals. Accessing medical care during disasters becomes especially arduous, as the area is highly susceptible to cyclonic disasters, making it challenging to reach hospitals. Consequently, pregnant women like Shilpi often depend on village quack doctors or the assistance of other women in the community for support during pregnancy.

The transportation system in Uttar Bedkashi, Patharkhali, and Kathkata is heavily depends on the river, but during disasters, this system is frequently disrupted or destroyed entirely. This exacerbates the challenges faced by residents, particularly during emergencies when access to medical facilities is critical.

Despite efforts to promote proper nutrition, economic crises and a lack of nutritious food in the region have a significant impact on health, increasing the likelihood of premature births. Shilpi has received multiple training sessions and received allowances to prepare and mitigate for cyclonic disasters. However, the given assistance is limited to vulnerable group feeding and occasional distributions of rice from the local government.

In conclusion, Shilpi Rani's experience shed lights the vulnerability of pregnant women in disaster-prone areas like Uttar Bedkashi. Access to healthcare, transportation, and nutritious food are significant challenges, further compounded by the unpredictability of cyclonic disasters.

Case 29: Women (Uttar Bedkashi, Koyra, Khulna)

Mona Rani is a 50-year-old woman whose family relies on the income generated by her elder son and husband's crab farming. Despite their efforts, supporting a family of seven proves to be a struggle. According to Mona, the significant challenges for women during disasters is that they have to maintain the entire family and the burden of feeding the entire family. As a result, her husband's income halted during disasters and it becomes very difficult for them to provide food for the whole family.

During disasters, it becomes difficult to find for them to get sanitary pads or other kits. This issue is compounded by their lack of awareness regarding the associated health risks. Many women in the area marry young and bear children early, placing them at greater health risk during menstruation.

Local leaders are hesitant to provide substantial relief during disasters. CPP volunteers warn through miking and arrange shelters or life support or those who are seeking cyclone center during disaster.

No such training has been done for anyone in the area to reduce the disaster damage but CPPs has been informed several times that women in the affected areas what to do during disaster, when to go to the cyclone center or which signal number is more dangerous for them. They are not aware of the life risk during disaster and also they are not given any training on how to reduce the risk of disasters. As they are not well trained and the village people are less educated so everyone is in a bit of unawareness at that time and as a result the damage is increased. Fair price rice is given to them occasionally but no such help is given but little food is given when they go to cyclone center or some say that they are in cyclone center when local leaders provide food but no permanent help is provided.

In summary, Mona Rani's experience sheds light on the unique challenges faced by women in disaster-prone areas like Uttar Bedkashi. Lack of access to essential resources, limited awareness of health risks, and insufficient training contribute to their vulnerability during disasters. Despite efforts by organizations like the CPP, more comprehensive support and education are needed to empower women and mitigate the impact of disasters on their lives and livelihoods.

Case 30: Young adult women (Uttar Bedkashi, Koyra, Khulna)

Bobita Rani is a resident of Uttar Bedkashi union of Koyra upazila in Khulna district. She has long witnessed the devastating impact of various natural disasters on her community. She reveals that her husband who is the sole provider for their seven members family and suffers losses during disaster.

In Bobita's view, cyclonic disasters exacerbate the plight of the poor, forcing them into debt as disruptions of livelihoods hamper their ability to earn income. The repeated destruction of their homes by cyclones pushes them to depend on loans from NGOs, exacerbating their economic hardship.

She claims that Koyra, within Khulna area, is particularly vulnerable to disasters in Bangladesh. While the risk may be comparatively lower, the community still bears the brunt of this natural disaster, severely impacting their livelihoods.

The negative impact on their livelihoods is in the strip and along with the roads other communication systems are completely exhausted and the electricity does not last for a long time. Additionally, the seasonal crops are frequently damaged and facing multifaceted challenges by the different natural calamities.

The stigma surrounding menstrual hygiene exacerbates the challenges faced by girls in the community, particularly during disasters. According to Bobita, the people of this area have no technical and vocational knowledge except little bit indigenous practical knowledge to save themselves from cyclonic disasters. While some relief and awareness efforts are made through making announcements, there is a notable absence of training or sustained cooperation to address the long-term effects of natural calamities.

Despite efforts of some assistance from local leaders and the government, Bobita believes that the support provided falls short of addressing their fundamental problems. Despite the resilience of the community, more comprehensive support and proactive measures are needed to mitigate the long-term impact of floods and other calamities on their livelihoods and well-being.

Case 31: Golpata collector (Uttar Bedkashi, Koyra)

Solaiman is a golpata collector from Uttar Bedkashi in Koyra who supports his family of five members through collecting golpata. However, the income from golpata collection fluctuates. When the income is low, it affects his livelihood because he has to run the family with debt.

Cyclonic disasters season proves to be particularly challenging for golpata collectors like Solaiman. During this time, if the golpata growth is hindered and they fail to obtain passes from the Forestry department, their ability to profit from their work is severely compromised. Without adequate sunlight for drying the leaves, the quality of the golpata diminishes, leading to reduced profits or even complete loss of income. This can force them to taking loans from the banks or NGOs to sustain their families.

Cyclonic disasters not only disrupt their livelihood but also promotes them to health risks due to the lack of access to nutritious food and remote healthcare facilities. Despite being aware of the risks associated with living in a disaster-prone area, the distance to hospitals exacerbates the precarious situation of their health.

They can aware through television or miking before the cyclone occurs, as well as CPP volunteers or other volunteers who give them small relief items during the disaster but have no knowledge of what needs to be done to reduce the disaster risk. Despite their awareness, Solaiman feels that the overwhelming force of nature often renders their mitigation efforts ineffective.

Mere awareness through miking does not reduce the risks at all. Despite receiving government aid, local leaders do not provide adequate support or training on evacuation procedures during cyclones, floods or storm surges.

Case 32: Crab collector (Uttar Bedkashi, Koyra, Khulna)

Sumon Munda, an anonymous resident at Patharkhali village of Uttar Bedkashi union of Koyra upazila in Khulna district, has been involved in crab cultivation since childhood, depends on it as his main source of income. Supporting a family of eight on his meager income, Sumon finds that it is a challenging to meet up with an income of ten thousand taka, which he considers insufficient for such a large family.

Their crab enclosure has been submerged several times due to cyclones and floods and they have invested several lakhs of taka in it which is being repaid later through loans. The financial burden of these losses is compounded by the need to repay loans taken out for crab farming, which continues despite the ongoing risk of flooding.

The threat of flood and cyclone poses a significant risk to crab farmers like Sumon. If floodwaters persist for longer period, it leads to the death of the crabs because small crab don't tolerate new water, resulting in substantial losses for farmers and most of them have to take loans from banks

or NGOs to farm crabs. Traders who sell the crabs instead of farming them benefit greatly as there is no chance of their investment being washed away by floods.

Crab farmers are at great health risk as no tubewells can be installed due to salinity and salt water has to be consumed occasionally if rainwater cannot be stored. Crab farmers receive minimal support and they are not given any kind of training but sometimes relief is provided by various NGOs and through miking they are made aware before cyclone and floods.

They don't get anything from the government at the time of disasters but sometimes they get fair price rice. They hoped long time help from the government and also from the NGO. Sumon and his fellow crab farmers hope for more substantial and long-term support from both the government and NGOs to mitigate the impact of disasters on their livelihoods.

Case 33: Disable people (Uttar Bedkashi, Koyra, Khulna)

Javed, an anonymous resident of Uttar Bedkashi in Koyra, is a person with disable who relies on his family and local support to manage his household, as he lacks a personal monthly income. It is very difficult for him to run his personal household on that limited income as he is sick throughout the year and he does not get much help from the local leaders.

People with disabilities like Javed face unique challenges during natural disasters, including difficulties in mobility, difficulty accessing evacuation routes and emergency shelters, communication barriers, and reliance on specialized equipment or caregivers. It is essential for disaster preparedness plans to include accommodations and support services tailored to the needs of people with disabilities to ensure their safety and well-being during emergencies. Community outreach and education can also play a vital role in raising awareness and promoting inclusive disaster preparedness efforts.

The health impact on disabled people during natural disasters can be severe, due to various factors such as difficulty in accessing necessary medical care, disruption of medication and assistive devices, increased risk of injury, and heightened stress and anxiety. Additionally, inaccessible evacuation routes and shelters can further exacerbate their vulnerability. Furthermore, tubewells cannot be installed in this area due to salinity. The scarcity of drinking water is acute, but rainwater cannot be stored all the time, resulting in the need to purify food with alum and then consume it. Javed get handicapped allowance from the government, but this is insufficient for him to maintain his family's needs and medical care adequately. Despite this support, Javed continues to face

significant challenges in managing his household and coping with his disabilities during natural disasters.

Case 34: Health care seeker (Uttar Bedkashi, Koyra, Khulna)

Salma, an anonymous resident of Uttar Bedkashi in Koyra, highlights the challenges faced by healthcare seekers during natural disasters, particularly floods, which significantly impact both their livelihoods and health. During any natural calamity it becomes very difficult for them to get medical care as they have to go to Khulna Sadar which is far away for treatment.

Community clinics in the area provides very poor-quality services and are closed three to four days a week. Sometimes the community clinic is closed for months. Consequently, the patients do not get much help from there and the people of the area do not depend much on the community clinic. Patients experience a multitude of difficulties during natural disasters, such as restricted access to healthcare, prescription loss, injuries, exacerbation of existing medical conditions, and psychological distress. It is imperative to guarantee prompt access to medical aid, emergency supplies, and mental health support in order to address patient requirements during such crises.

Cyclones do not occur throughout the year but the people of the area face the health risk of saline water almost throughout the year as tubewells cannot be installed and rainwater can be stored and consumed throughout the year.

There are no good hospitals around and people have low income so they depend a lot on quack. However, the residents receive limited assistance from local leaders, who prioritize their own needs.

The community people don't have any vocational training to reduce the disaster risks, and, there is no knowledge to cope with the disaster. Furthermore, they do not receive relief from Community Preparedness Programs (CPP) or local leaders, resorting to loans from NGOs to cope with the aftermath of disasters. Salma and others in the community urge the government to provide permanent assistance to reduce vulnerability and mitigate damages caused by natural disasters.

Case 35: Fisherman (Uttar Bedkashi, Koyra, Khulna)

Badal is a fisherman by profession who has to support his family by fishing in the river. But as the income halted for about six months, his family members struggled to run their families and were forced to take loans from NGOs. Badal notes that much of the NGOs became create in their area to provide them loan and also perpetuates the cycle of poverty. With a monthly income ranging

from eight to nine thousand taka, Badal finds it challenging to sustain his family of seven members on such limited earnings.

During floods and cyclones, fishing is completely stopped according to him, as loans need to be repaid while meeting the family's needs becomes increasingly difficult. Consequently, some fishermen are compelled to seek alternative occupations elsewhere. While they are generally alert to natural disasters, sudden storms at sea pose a significant threat to their lives, prompting them to entrust their safety to divine providence. Tragically, Badal has witnessed fatalities firsthand, as boats capsized during cyclones.

They don't have a problem with awareness during natural disasters but if they are at sea, and sudden storm is a big threat to their life. In that case they leave everything to Almighty and go fishing in the river. However, due to cyclonic disasters, many people died in front of their eyes by sinking the boat in the sea.

Cyclonic disasters not only increase their debt burden but they also remain in debt to the moneylenders from whom they borrow for sea fishing, perpetuating their poverty. Despite receiving training during calamities, the community lacks knowledge on permanent risk reduction strategies. Government assistance primarily comes in the form of '*Jellecard*' and a modest rice allocation of fifty to sixty kilograms when fishing is suspended. There is only '*Jellecard*' from the government and when catching fish is closed, they get about fifty to sixty kg of rice from the '*Jellecard*'.

Case 36: Boatman (Uttar Bedkashi, Koyra, Khulna)

Forkan, fifty-five years old fisherman, has worked as a boatman for over 25 years. Forkan is illiterate, although he is capable of handling six family numbers with his limited income. His income is heavily reliant on boating in the river, but this source of livelihood is frequently disrupted by natural calamities, rendering him without income for approximately six months. Navigating the river during cyclones poses significant risks. Life is always at risk during natural disasters as he doesn't have life jackets.

While the months without floods bring in substantial income, economic crises arise during disaster periods. However, Forkan appreciates the efforts of organizations like CPP and other volunteers who raise public awareness through mike announcements and signal warnings to deter boating during cyclones and floods, prioritizing safety.

During cyclonic disasters, the river's high tides present greater challenges than damaged roads near his home, instilling fear and adversely affecting his livelihood. Boats cannot be steered in the river during storms and it increases the risk as well as there is a high chance of capsizing even if one swims in a storm.

Although governmental organizations and NGOs have provided training on surviving natural calamities, the lack of practical knowledge during disasters makes it challenging to implement these skills effectively. Despite repeated requests, government-provided life jackets have not been forthcoming, leaving boatmen like Forkan vulnerable to the perils of the river, particularly in disaster-prone areas near the Sundarbans.

Case 37: Golpata collector (Kalabogi, Sutarkhali, Dacope, Khulna)

Abdul Kader Sheikh, aged 53, has been living at Kalabogi village of Sutarkhali union of Dacope upazila in Khulna district with his family for long since. He worked as sarder (Leader) of nypa leaf collector in his living area nearby Sundarbans. He has a large family consisted of 6 members and two of his brothers earn whom. The whole income of the family is consumed to lead their days. Their main occupation is the collection of golpata leaves, an arduous task that presents them with numerous challenges when they go to collect nypa leaf.

Twice each year, typically in December and January, Abdul Kader and his fellow collectors venture into the forests for a 28-day stint of nypa leaf collection. Accompanied by 5-to-6-day laborers, they spend a month in the Sundarbans, paying a fee of 13,200 Bangladeshi Taka for their permits. On average, they can gather 50 to 60 kaun leaves in a single boat, with each kaun leaf fetching a price of 2500 BDT. Those who work as day labour are paid 15000 taka per month. They are economically worse off when the Sundarbans side is closed, forcing them to resort to day labor for income. The government gives 30 kg of rice in a month due to the closure of the Sundarbans side. Seasonal people earn more money (Baishakh and jaistha) as well as seasonal income are found in the lowest winter seasons. Consequently, Abdul Kader and his community are facing more challenges like economic and social hardships. Their children do not get proper educational facilities as well as health care facilities due to limited income. As a result, many children become illiterate and suffers from various cyclonic disasters related diseases. On average, members of the community suffer from illness for 10 to 15 days each month.

Due to cyclonic disasters, they have lost most of their own properties like homeland, farmland and livestock. But they can not recover very early for their poverty. Recovery is slow and difficult,

often taking anywhere from 7 to 12 months or even longer due to their impoverished circumstances. Aftermath of cyclone, their environment can be very toxic and they can not grow properly grain of food due to salinity. During the disaster, people do not get proper safe drinking water and sufficient sanitation facilities. At the time of disaster, they lost their occupation and many are unemployed. Due to river bank erosion homestead land can be destroyed every year. Even they do not get proper nutritious food. The existing policy is not enough for them to address their needs. The government should be ensured implemented comprehensive measures for them including public awareness campaigns, to ensure their welfare and security.

Case 38: Pregnant women (Kalabagi, Sutarkhali, Dacope, Khulna)

Rina Mondal, aged 28, lives at Kalabagi village of Sutarkhali union of Dacope upazila in Khulna district. She is currently pregnant woman. Her family members comprise of six people. The monthly income of her family is the range of 10001 to 15000 taka. The region experiences recurrent natural disasters such as cyclones, tidal surges and floods, which inflict significant social, economic, and psychological burdens on its residents. In addition, the prevalence of excess saltwater leads to various waterborne diseases like cholera, diarrhea, dysentery, fever, and cough are occurred in this region. However, pregnant women, disable and elderly are particularly more vulnerable during these crises.

The south west coastal people do not get adequate health care facilities due to the remoteness of the health complex. On the other hand, majority of these people are not very health conscious and do not get proper nutrition food. Many pregnant women lose their new born babies due to malnutrition. The main reasons behind the pregnancy related complexity among the mother and children are occurred due to saline water. Especially excess salinity causes the effects of miscarriage and the complicity of ovary. Pregnant women do not get menstruating hygiene facilities properly at maximum times due to financial constraints. Pregnant or breast-feeding women face iron deficiency during the reproductive period. Salinity is much more responsible for abnormal growth of child retardation.

Access to clean water is also a pressing issue, with most residents relying on expensive water supplies priced at 30 taka per liter or 250 taka per week. Despite efforts to rebuild damaged properties using their own resources, the recovery process often extends beyond a year, sometimes taking 7 to 12 months.

The coastal people received social protection programs like VGD, VGF, TR, GR and poor people livelihood program from the government. However, comprehensive policy implementation is crucial to address the myriad challenges faced by pregnant women and their families in the region.

Case 39: Honey Collector (Kalabogi, Sutarkhali, Dacope, Khulna)

Eman Dhali, aged 55, has been living at Kalabogi village of Sutarkhali union of Dacope upazila in Khulna district, where his family consists of five members with a monthly income ranging from 5001 to 10000 taka. He earns his living as a honey collector, a profession fraught with challenges, particularly when venturing into the Sundarbans.

The Mowal, an indigenous community, who depend on the *Sundarbans* forest resources for their livelihoods. Their lives are full of poverty and uncertainty, compounded by a lack of formal education that limits their ability to embrace modern technology. Instead, they rely on indigenous techniques for survival. Throughout the year, they engage in honey collection considering it is more profitable than other endeavors. Typically, they keep themselves busy around three months of the year to collect honey, while the rest of the year involves the informal work.

Since the mowal go to economic hardship, they need to thought not only about themselves but also about their family before going to the forest. They need to go to ‘mohajon’ to cover their expenses. They collect honey once a week and the forest officers give pass for 15 days by exchanging 800 taka per person. They go to Sundarbans forest for honey collect six people together as well as they stay in the forest for two weeks. When the Sundarbans site is closed by foresters the honey collectors face much more economic hardship. In such instances, they receive 30 kilograms of rice from the government, but they also face additional financial burdens, including payments of 2000 taka to local "jungle terrorists" to continue honey collection. If they fail to give this amount to the terrorists they are excluded to collect honey from the Sundarbans.

During cyclonic disasters, the Mowals experience heightened vulnerabilities by economically, socially, psychologically, and in terms of health. Pregnant women, disabled, aged and children are particularly at risk such times, facing various vector-borne diseases exacerbated by the unhygienic. Access to medical facilities for remoteness of upazila health complex and nutritious food is limited, leading to widespread malnutrition among children.

They recover their properties by NGO and capacities from their own resources, although the process can take anywhere from three to six months, sometimes even longer. While they receive social protection from the government, such as Vulnerable Group Feeding (VGF), VGD. The

existing policy is not enough for them to address their needs. Comprehensive policy implementation and public awareness campaigns are essential to improving the situation for the Mowals and similar marginalized communities.

Case 40: Fisherman (Sutarkhali, Dacope, Khulna)

Ibrahim Gazi, aged 32, resides in the Sutarkhali union of Dacope upazila in the Khulna district, with a family comprising five members and a monthly income ranging from 10,001 to 15,000 taka. His primary occupation is fishing. They are the victims of natural disasters recurrently that has severely impacted his family's economic, social, and psychological well-being, particularly their health.

The aftermath of cyclone Aila, Ibrahim's family is with severely damaged houses, leading him to seek loan from Grameen Bank for repair their house. They have been suffering from various kinds of diseases like cholera dysentery, fever and cough during disasters. Pure drinking water is only available during the Ashar and Srabon months. They can get fresh water for 3 months and the rest of nine months they drink saline water. Despite these challenges, Ibrahim's income peaks during floods, although the risk of being stranded in the river while fishing during disasters remains a concern.

Disasters disrupt normal life significantly, resulting in the closure of schools, road damage, and a lack of secure shelter, leading to a high dropout rate among children. Disable people and pregnant women are more vulnerable during disaster. Limited awareness about health and nutrition exacerbates the situation, compounded by the scarcity of medical services due to the remote location of upazila health complex. They need 7 to 12 months to recover from damaged properties and even longer a year. Ibrahim has a fishing card. During disaster, he got 50 kg of rice from the government. More comprehensive measures are needed to reduce the cyclonic disaster risks. Furthermore, motivational awareness programs could play a crucial role in empowering communities like Ibrahim's to better prepare for and respond to natural disasters, ensuring their resilience and well-being.

Case 41: Golpata Collector (Nalian, Sutarkhali, Dacope, Khulna)

Samad Gazi, aged 45, lives at Nalian village of Sutarkhali union of Dacope upazila in Khulna district, a family comprising 6 members and a monthly income is more than 25000 taka. Engaged

in golpata (nypa leaf) collection, Samad's livelihood is significantly adversely impacted by the recurrent natural disasters like cyclones, storm surges, floods, and river erosion.

Golpata collectors involve collecting golpata leaves into the Sundarbans twice in a year, with the first pass lasting 28 days in December and January. Altogether five to six golpata collectors spend a month in Sundarbans for collecting nypa leaves. Mahajon pays to forest office 13,200 taka for the pass. Each boat typically contains the yields of 50 to 60 kaun leaves by selling 2,500 taka per kaun. Laborers earn a monthly wage of 15000 taka.

Golpata collectors are economically worse off when the Sundarbans site is closed leads them as day labor. The government gives 30 kg of rice in a month due to the closure of the Sundarbans site. Cyclonic disasters result in significant property loss, including homestead and agricultural land and livestock. The south west coastal people are facing more challenges of economic and social hardship. Consequently, educational attainment and healthcare access for children is limited, leading to illiteracy and susceptibility to cyclone-related diseases. Recovery efforts are often spanning 7 to 12 months or longer due to financial constraints.

After cyclonic disaster, the food grains cannot grow properly due to salinity. During disasters, people do not get proper safe drinking water and sufficient sanitation facilities. Even they do not proper nutritious food. They lost their occupation, many are unemployed. Due to river bank erosion, a significant portion of homeland destroys in every year.

The formulating policy is not enough for them to reduce disaster risks. They receive social protection from the government. Comprehensive policy interventions, including public awareness campaigns and tree plantation initiatives, are imperative to mitigate the adverse impacts of natural disasters and safeguard the livelihoods of vulnerable communities like Samad's.

Case 42: Physically disabled (Kalabogi, Sutarkhali, Dacope, Khulna)

Namita Dhali, aged 32, resides at Kalabogi village of Sutarkhali union of Dacope upazila in Khulna district with her mother. Her family comprises two members with a family income less than 5000 taka per month. Namita, being physically disabled and unable to walk due to immobile legs, depends entirely on her mother's care. Together, they engage in stacking wood along the riverbank for livelihood, as Namita's mother also fishes in the river.

Despite several appeals for a wheelchair, Namita's mobility needs remain unmet. She holds a disable card, entitling her to 2500 taka every six months. However, their primary income source,

fishing, becomes untenable during disasters, rendering Namita's mother unable to work as a day laborer, further straining their finances.

Her mother can do the work 10-15 days in a month and earn 200-250 taka, so they do not get proper nutritious food due to lack poverty. She earns more money during the rainy season and lowest income during winter seasons. During cyclone Aila, their houses are all washed away due to excess water in the river erosion. She needs more than a year to recover from the damaged properties and setback in normal activities. They are not conscious about health and do not get proper nutritious food. Pregnant women, lactating women and physically disabled people are more vulnerable during disasters, because they can not move from one place to another place easily. Despite receiving 30 kilograms of rice monthly from the government, their overall well-being remains precarious, underscoring the need for comprehensive policy interventions, including public awareness campaigns, to address the unique vulnerabilities faced by physically disabled individuals in disaster-prone areas like Kalabagi village of Sutarkhali union.

Case 43: Women (Kalabagi, Sutarkhali, Dacope, Khulna)

Ratna Mondal, aged 32, resides at Kalabagi village of Sutarkhali union of Dacope upazila in the Khulna district, with a family size of 6 members and a monthly income between 10,001 to 15,000 taka. During periods of financial strain, Ratna receives loans from local Bangladeshi organizations named 'HEED Bangladesh' to alleviate her economic hardships. However, she struggles of recurring natural disasters like cyclones, river erosion, and floods which exacerbate their financial and psychological distress annually.

They are worst affected during Aila, their houses were all swept away by the tidal surges. As the cyclone shelter is far away and even the nearby school is far away, they can not go to safe shelter during cyclones, resulting in fatalities. Ratna can not get relief or assistance during disasters.

The excessive cyclones and tidal surges induced salinity of water impedes their main occupation of fishing, causing substantial losses in fish production, agricultural crops, and livestock. In a month, she works between ten to fifteen days and earns 200-250 taka daily. People earn more money during the rainy season and lower income in particular season for unavailability of fish and lack of employment opportunities. Poverty creates them as mentally depressed. Women face numerous challenges during disasters especially pregnancy related complexity. They can not get adequate health care facilities due to the remoteness of the health complex. Sometimes, pregnant women lose their new born babies due to malnutrition. Even they face iron deficiency during

reproductive period. Majority of the women becomes sub-fecund due to salinity as well as they can not get menstrual hygiene facilities. The lack of menstrual hygiene facilities exacerbates their vulnerabilities.

Ratna, like the community others, needs more than a year to recover from the damaged properties. She has a relief card and every month receives 30 kg of rice from the government. Comprehensive policy implementations are necessary, including public awareness programs, construction of dams, sluice gates, tree plantation, to address the multifaceted challenges faced by vulnerable communities like Ratna's and ensure their resilience in the face of recurrent natural disasters.

Case 44: Adolescent Girl (Nalian, Sutarkhali, Dacope, Khulna)

Suriya Parvin, aged 13-year adolescent girl, has been living with her parents at Nalian village of Sutarkhali union of Dacope upazila in Khulna district. Her family members consist of 6 persons with a family income of 10001-15000 taka. Her father is a fisherman. They struggle with natural disasters such as cyclone, salinity intrusion and tidal surge at every year. Cyclonic disasters negatively affected on economic, social, psychological as well as health sectors. During disasters, elderly, pregnant women, and physically disable people are more vulnerable. Especially they face transport barriers, lack of shelter, and lack of WASH facilities. People have experienced the more intensity of cyclonic disasters during the summer season and least cyclonic disaster during winter seasons. At the time of disaster, significant portion of people are unemployed. They face more challenges of occupational hazard like lower wages. Her father's main occupation is fishing but during disaster he has compelled to do his works as day labor. In a month he is doing work 15-20 days and daily income 200-250 taka. People have more income during the rainy season and lowest income during winter seasons due to unavailability of fish and lack of employment opportunities. People migrate frequently from there. The south west coastal people are not conscious about sound health. They do not get proper nutritious food, even do not get sometimes sufficient times of meal. A significant portion of the new born babies are malnourished. Pregnant and breast-feeding women face iron deficiency during reproductive period. Women as well as adolescent girl do not get menstrual hygiene facilities during disasters. Health complex is as far away causing unavailability of proper health care services. The southern people need 7 to 12 months or sometimes more than a year to recover from the damaged properties. The existing policy is not enough for them to reduce the disaster risks. They receive some social safety net protection from the government like educational stipend facilities, VGD, VGF, TR, GR, food for work, and poor people livelihood

program. The government must be needed to ensure implemented policy like tree plantation activities as well as public awareness programme.

Case 45: Landless poor (Kalabagi, Sutarkhali, Dacope, Khulna)

Nilpodo Mondal, aged 48, resides at Kalabagi village of Sutarkhali union of Dacope upazila in Khulna district, with a family size of 6 members and a monthly income between 10,001 to 15,000 taka. His livelihood strategies depend on river resources. His current occupation mainly is fishing. He is a landless poor people. However, recurring natural disasters disrupt their lives every year. During cyclone Aila, his houses remained submerged for 37 days, resulting in extensive damage from floods, cyclones, and river erosion. So, he took loan from 'HEED Bangladesh organizations' to recover their damaged properties due to natural disasters. His main occupation is catching fish and sometimes day-laborer. He encounters occupational hazard with lower wages. He is doing work for 15 to 20 days in a month and earns 150-200 taka daily. People earn more money during rainy season and lower income seasons is winter. Pregnant and lactating women do not get sufficient nutritious food and face iron deficiency. Pregnant women are most vulnerable during disaster as well as can not receive menstrual hygiene kits during cyclonic disasters. Also, he has lost all land due to river erosion and his house are washed away last couple of years. He needs more than a year to recover the damaged properties. The existing policy is not enough for them. The government should formulate policy for marginal people as well as public awareness campaign.

Case 46: Golpata Collector (Nalian, Sutarkhali, Dacope, Khulna)

Abdul Majid Gazi, aged 55, resides at Nalian village of Sutarkhali Union of Dacope upazila at Khulna district. His family member consists of seven persons. He earns more money like 35000 taka per month. He is a golpata collector. He faces many challenges when go to collect nypa leaf. Twice a year they go to the Sundarbans forest to collect nypa leaf as collectively of six members, obtaining a 28-day pass for December and January. To acquire the necessary pass, it incurs a cost of 13,200 taka. Each boat can contain 50 to 60 kaun leaves, with a single kaun sells of 2500 taka. Laborers receive a modest monthly wage of 15000 taka. They are economically worse off when the Sundarbans site is closed, compelling them as day labour. The government gives 30 kg of rice in a month due to the closure of the Sundarbans site. Seasonal people earn more money in Baishakh and jaistha as well as lower in winter seasons. As a result, they are going to more challenges of

economic and social hardship. This fluctuation in income adversely impacts their ability to provide adequate education and healthcare for their children, resulting in illiteracy and susceptibility to cyclone-related ailments among the youth. Moreover, cyclonic disasters inflict substantial losses on Majid's family, including property damage, loss of livestock, and farmland devastation. However, their impoverished state impedes swift recovery, often prolonging the process for months or even years. Aftermath of cyclone, the foodgrains can not grow properly due to salinity. During the disasters, access of safe drinking water and sufficient sanitation facilities becomes severely compromised, exacerbating health risks for the community. The lack of proper nutrition further compounds their challenges. The coastal people need 7 to 12 months or even sometimes more than a year to recover from their damaged properties. The formulating policy is not enough for them to mitigate the disaster risks. The government's intervention is imperative, focusing on initiatives such as tree plantation practices and public awareness campaigns to uplift communities like Abdul's and bolster their resilience in the face of recurrent natural disasters.

Case 47: Adolescent girl (Patharghata, Barguna)

Rukaiya Saima, a 14-year-old adolescent girl, is a resident of word no. 9 of Patharghata Union of Barguna district. She is unmarried and has completed Secondary School Certificate. Her family income is ten thousand to twelve thousand taka and this money is completely spent for the households and there is no surplus money undoubtedly. They are sometimes subjected to cyclone, storm surges, flood and various natural calamities. She continues to experience physical discomfort during the natural disasters and still get it sometimes.

Rukaiya feels embarrassed to purchase sanitary pads from departmental stores, opting instead to use cloth and tissues for menstrual hygiene. The recurrent occurrence of natural disasters has inflicted significant economic losses on their family.

Although a cyclone shelter is available in their vicinity, it is situated approximately 2 kilometers far away from their residence and is only moderately structural conditions of cyclone shelters. This lack of secure shelter exacerbates the challenges faced by women, pregnant and lactating women, and adolescent girls, particularly in managing menstrual hygiene and ensuring adequate food and nutrition during disasters.

The months of Baishakh to Jaistha and Ashar to Shrabon are particularly prone to natural calamities, intensifying the struggles experienced by the community. However, proactive measures

such as early warning systems and media broadcasts, including television, help raise awareness and mitigate the impact on those residing near dams.

During the cyclonic disasters Rukaiya and her family are unable to do any work for two to three months. Even, if the employment opportunities arise during such times, the wages offered are meager.

In summary, Rukaiya highlights the multifaceted challenges faced by her community during natural disasters, including economic losses, inadequate menstrual hygiene management, and limited access to secure shelter and nutritional resources. Efforts to address these issues are crucial for enhancing the resilience and well-being of vulnerable populations like Rukaiya and her family.

Case 48: Boatman (Gohorpur, Horinghata, Patharghata, Barguna)

Yusuf Majhi, aged 56, is the resident Gohorpur village of Haringhata union of Patharghata upazila in Barguna district. Yusuf is a sailor by profession and he is illiterate. He has six members in his family and his family income is on an average ten thousand to fifteen thousand taka.

Yusuf experienced the loss of his brother during a fishing expedition in the sea during the cyclone, where they faced the perilous risks associated with their profession. The lives of boatmen like Yusuf are constantly endangered, particularly during cyclones, as they have to stay.

Every year they are subjected to some natural disasters resulting in financial damaged and hardship. They don't run any boat during the month of the Baishakh and Jaishtha. They have to drink salty river water. Their income is good except in winter. There is no agricultural land. So, they cannot produce crops. As they catch fish in the river or deep sea and there is no mobile network in such time. So, they cannot communicate with each other. Due to poverty, there are heightened for mental stress and sleepless nights. Due to the salinity, fish do not grow very large. During natural calamities, people suffer from various types of fatal diseases like diarrhea, cholera, dysentery. Access to medical treatment is limited, with hospitals often lacking free medications, leaving boatmen like Yusuf without proper care, sometimes leading to prolonged periods of illness without adequate funds for treatment.

Case 49: Wood Cutter (Patharghata, Barguna)

Younus, a fifty-six-year-old resident of Patharghata Union, earns his livelihood as a woodcutter. Despite receiving only primary education, he has chosen woodcutting as his occupation. Younus supports a family of twelve members, with a monthly income ranging from fifteen to twenty thousand taka.

Living in Patharghata, they are victims of various types of natural disasters, with cyclones and floods are mostly prevalent. These cyclonic disasters pose significant threats to their lives and livelihoods, often resulting in fatalities and exacerbating health and economic challenges.

The elderly and children suffer more during natural calamities. Due to natural disasters, their wood is cut off this time and their economic crisis arose. They want to cut seven to eight woods together with the pass then it takes them to ten thousand to fifteen thousand to pass a person.

During disaster, wood cutting operation is closed for one to two months. Additionally, the destruction of animals further compounds their financial woes. With a daily income of two hundred to two hundred fifty taka, they struggle to afford nutritious food, perpetuating their cycle of poverty. Although forestry department permits are occasionally granted between February and March, restrictions often hinder their ability to resume woodcutting activities.

There is no medical treatment if they get sick. The upazila health complex who provide care service is located almost 10 km far away from his house.

Recovering from the aftermath of natural disasters typically takes two to six months, during which government financial assistance remains insufficient. Despite their hardships, Younus and his family persevere, navigating the challenges posed by frequent natural calamities in Patharghata Union.

Case 50: Red crescent volunteer (Patharghata, Barguna)

Rabbi Hasan, a nineteen-year-old resident of Ward No. Seven in Patharghata union of Barguna district, serves as the President of the Red Crescent Volunteer unit at Patharghata College. Despite being unmarried and pursuing higher secondary studies, Rabbi plays an active role in coordinating relief efforts during natural calamities.

Residing with a family of four, Rabbi's household earns a modest monthly income of ten thousand taka. He narrates that Patharghata witnesses a variety of natural disasters recurrently, including cyclones and floods, as well as man-made disasters. During disasters, Rabbi and his team face challenges in conducting rescue operations due to limited equipment and resources.

Economically disadvantaged individuals receive substantial assistance, although accessibility to shelters remains an issue, often located about one kilometer away from their residences. Despite the lack of resources and funding, Rabbi and his team endeavor to aid affected individuals during natural calamities. The salinity levels in Patharghata Sadar are typically low, except during times of natural disasters, when work opportunities become scarce for two to three months. Aftermath

of disasters, relief efforts are given people by NGOs and government. But it is very scant. Various NGOs send financial aid which is provided via them. They alert the coastal people during natural disasters with announce of hand Mike.

Case 51: Fish fry collector (Patharghata, Barguna)

Mahfuzur Rahman, a forty-year-old resident of Ward No. 09 in Patharghata union, earns a livelihood as a fish fry collector. Despite having only a primary education, Mahfuzur earns a monthly income ranging from seventeen to twenty thousand taka with a family of five members. Due to natural disasters, Mahfuzur and his fellow of fish fry collectors face significant challenges including rough weather which almost destroy their processing of dry fish. As a result, they face financial loss. Even if the fish collection is halted, the staffs have to be paid, due to which they have to face economic hardship.

They don't use any cyclone center. Their communication system is not that advanced here. The effects of natural calamities can sometimes last for seven to ten days. At this time they have to take loans from banks or NGOs to pay their stuff.

Their income is found a little higher during summer and monsoon. Their average income is around five hundred to eight hundred taka per day. During disasters, it is a big challenge for fish fry collectors because the sunlit environment is very important for fish fry, resulting in losses for Mahfuzur and his colleagues.

Winters witness a slight decline in income, exacerbating food shortages among staff. They do not have access to medical facilities and information here. There is a hospital about five km from our house. Due to financial constraint, Mahfuzur relies on direct assistance from NGOs for his sustenance. They do not receive any government or private financial support.

Case 52: Internally Displaced People (Horinghata, Patharghata, Barguna)

Ashraf Ali, a fifty-year-old resident of Horinghata village in Patharghata union, finds himself among the internally displaced people in the region. Despite having a secondary level education, Ashraf earns a monthly income ranging from ten to fifteen thousand taka for support of his four family members.

Horinghata is the area of experiences of various natural calamities with salinity and cyclone being prominent concerns. These calamities result in significant losses including uproot the trees,

damage to crops, and disruptions in daily life. During such times, cyclone shelters are damaged, homes are destroyed, and livestock are lost, compounding their hardships.

During disasters, there is an extreme shortage of fresh drinking water. Due to salinity, it is observed that the scarcity of drinking water in the region. Tubewell can not be installed. Pond sand filter (PSF) is installed in the pond in this area and by filtering that water they meet the scarcity of drinking water. Besides, they have to collect drinking water more than 2 km, 1.5 km, 3 km far away from every house.

Many like Ashraf migrate to this area aftermath of natural calamities. But even the risk of disaster is high, making their lives miserable if they are brought under the shelter scheme, they are slightly more likely to end this threat. Lack of electricity during disasters exacerbates their challenges, further amplifying their struggles.

Case 53: Pregnant women (Patharghata, Barguna)

Bithi, an anonymous resident of Patharghata, relies on her husband's meager income to support their family of six. Significant portion of the locals work as fishermen, occasionally taking up odd jobs like driving vans when fishing is not an option. With a monthly income of nine thousand taka, she struggles to make ends meet.

The largest issue of pregnant women is that there are no hospitals nearby area. Accessing medical treatment becomes even more difficult during cyclones and floods, which frequently affect the region. The absence of proper transportation exacerbates the worse situation. Leaving the river is the only viable route, which is often impassable during disasters. As a result, village doctors and other pregnant women need assistance. In addition, flooding has a greater impact on this area than other areas, making it even harder for pregnant women to get to the hospital.

To address the shortage of drinking water, PSF systems are installed in ponds, but residents still need to walk long distances to fetch water like more than 2 km to 3 km. Nutritious food is essential, especially during pregnancy, but their financial constraints limit their access to such meals. Cyclonic disasters and economic insecurity heighten the risk of premature births and adversely affects overall health.

Government assistance in the form of vulnerable group feeding and a monthly allocation of thirty kilograms of rice provides some relief, but it falls short of meeting the community's needs during disasters.

Case 54: Women (Patharghata, Barguna)

Shima, a resident of Patharghata, identifies the biggest risk for women during cyclone is that she has to maintain the entire family and the burden of feeding the entire family rests on them. As a result of which her husband's income halted during cyclones and it becomes very difficult for them to provide food for the whole family.

During disasters, it becomes difficult for them to get menstrual pads or hygiene kits as it is a sensitive issue and they are not aware of the health risks as the girls marry at a very young age and have children at a young age which puts them at a serious health risk.

Although PSF systems are installed in every pond to address water shortages, women still have to walk long distances to fetch drinking water, often exceeding 2 to 3 kilometers from their homes.

Local leaders don't want to provide sufficient relief or assistances, but the CPP warns through miking and arrange shelters or other life support if they go to the cyclone center during cyclones.

Despite being informed multiple times about cyclone preparedness, including what to do during cyclones, when to seek shelter and the significance of different warning signals, the lack of formal training exacerbates the community's vulnerability.

The community urgently requires permanent solutions to mitigate these risks, but neither the government nor local leaders have been able to provide viable long-term solutions.

Case 55: Bede Community (Patharghata, Barguna)

Mr. Sufian originally born in Bikrampur but he is a floating community they are now staying in Patharghata for the past four months and they anticipate staying for another two to three months, as their lifestyle involves frequent relocations. With three wives and eleven children, Mr. Sufian's family has traditionally been the main breadwinner for the women, and his wives have been the main breadwinners. He earns five to six thousand taka, derived from begging or menial work.

Natural disasters pose significant challenges for them, often displacing them and necessitating resettlement, which threatens their livelihoods. Moreover, these calamities disrupt their income streams and expose them to waterborne and airborne diseases. Their house consists mainly of a single house for each or three members raised one and a half cubits above the ground surrounded by polythene.

Traditionally, their main occupation is begging as well as selling amulets and running their families by swindling people or selling medicinal plant. What natural calamities do to them is that they evict them from one place, they have to be evicted due to various natural calamities and have to

build in another place, so if they ever go to a disaster-prone area, they cannot stay there for long. As they are not permanent residents of the area where they live, they do not get much facilities from the government but the present government has tried to bring them under the asylum scheme. They do not have the necessary knowledge to survive various natural calamities. So, they migrate from one area to other places without any reason and they mostly try to stay away from disaster-prone areas so they do not stay much in Khulna area because these are disaster prone areas, they will not be able to survive for long.

Case 56: Nurse (Patharghata, Barguna)

Thirty-year-old Nazneen lives in Patharghata. She is nurse by profession and her educational qualification is graduation. Her family has five members and monthly income is twenty thousand to twenty-five thousand taka.

They faced various types of natural calamities including cyclone, flood. Every year some kinds of disaster happen here. People cannot mentally set up during natural calamities. There is a cyclone shelter but is located about two kilometers far from the house. Adequate facilities are available at cyclone center here. During natural calamities, outbreaks of various diseases such as dengue and malaria are observed there.

Women get adequate medical care at health centre. Children, adolescent girls then pregnant women are seen to suffer more during natural disasters. Hospitals are used as cyclone centers. During natural calamities, people are made aware about health. Sometimes, they are given some medicine that are not enough in quantity. Pure water is not available there.

Village people believe that help in natural calamities does not show much awareness about health. Her daily income is eight hundred taka. Village hospital usually has one doctor and five nurses and they live there. They have no unethical harassment but patients give depression. Out breaks of the diarrhea, fever and many other diseases are more common during floods.

Case 57: Young adult women (Patharghata, Barguna)

Salma and her family migrated to Patharghata ten years ago after losing everything to river erosion. They are exposed to various natural calamities. Their monthly income fluctuates sometimes more than ten thousand taka and sometimes falling below which sometimes makes it very difficult to manage their family as they have a family of eight members.

Every one of their family is involved in business, leading to fluctuate earnings. However, their livelihoods are precarious, especially as fishing at sea and borrowing from moneylenders significantly impact on their income.

Due to its salinity, tubewells cannot be installed in the area and the people of the area rely on purifying pond water for consumption. Although salinity is not observed throughout the year, the water becomes very salty for four months of the year. Salma emphasizes that without permanent government assistance, poverty and vulnerability will persist longer.

Access to drinking water poses a significant challenge, requiring them to walk long distances of two to four kilometers, particularly daunting during disasters. In such time, they consume rain water.

Cyclonic disasters not only damage roads but also impede access to the Upazila Health Complex for medical assistance, compounding their difficulties. She only gets vulnerable group feeding or sometimes vulnerable group development, she lacks sustained support. Salma stresses the need for permanent solutions to uplift the community from vulnerability.

Case 58: Red crescent leader, Teacher (Patharghata, Barguna)

Belal Hossain, a teacher affiliated with the Red Crescent, resides in ward no. 9 of Patharghata union. Holding a postgraduate degree, he teaches at a college and earns a monthly income of greater than twenty-five thousand taka. He claims that the community regularly confronts various natural calamities, notably cyclones, salinity, tidal flooding, and more.

Children, elderly, disable people, and pregnant women are usually the worst sufferer during natural disasters. The scarcity of drinking water exacerbates during natural calamities, leading to increased risks of diseases like cholera, diarrhea, dysentery, and jaundice.

Natural disasters impose significant mental and physical stress on affected individuals. The Red Crescent creates awareness campaigns to educate the community about disaster preparedness and encourages them to seek refuge at cyclone centers. They also provide training on how to rescue themselves during disasters or after disasters. While the Red Crescent doesn't directly distribute relief but if any organization provides them to distribute it, then they arrange that. Despite efforts to provide necessary facilities, the Red Crescent faces limitations in their relief efforts.

Case 59: Marginal farmer (Betagi, Barguna)

Rashid, a resident of Betagi, is a 45-year-old marginal farmer whose monthly income amounts to seven thousand taka, supporting his family of five. Throughout his life, he has faced various disasters such as floods, cyclones, river bursts, and salinity issues.

Rashid produces a variety of crops on his land, the crops are washed away by the disasters and the crop is destroyed, leaving him in debt of several lakhs of takas, which he is still struggling to repay. While he occasionally cultivates crops on others' land, he doesn't receive any subsidies or assistance in the event of crop damage due to natural calamities and which they trigger in perpetual poverty.

To cope with salinity issues, Rashid and his community must purify pond water to address the shortage of drinking water, particularly during the one to two months of high salinity levels.

Rashid and his community do not have any technical and vocational knowledge of training to survive the cyclone and they are not aware of what to do during the disasters. Despite minimal relief efforts by the government, their assistance remains inadequate.

In essence, Rashid's story reflects the struggles faced by marginalized farmers in Betagi, where the absence of governmental support exacerbates their vulnerability to natural disasters and perpetuates their cycle of poverty.

Case 60: Pregnant women (Betagi, Barguna)

Surma Begum, a thirty-one-year-old pregnant woman residing in Betagi, supports a family of eight with a monthly income of fifteen thousand taka. She has encountered numerous natural disasters throughout her life.

Although the hospital is near from their house, doctors and nurses are not available in the hospital, during the disaster, exacerbating the challenge of accessing proper medical care due to financial constraints.

Since there is observed a lot of disasters, medical services are not available for pregnant and lactating women resulting compelling on local for medication to maintain health. Limited financial resources compel the use of cloth and tissue instead of purchasing sterile cushions, further exacerbating the financial losses incurred during various natural calamities.

While cyclone shelters exist in the vicinity of almost 2 km far from his house, their structural condition is deemed moderate, with insufficient provisions for secured shelter, menstrual hygiene facilities, and adequate nutritious food for women and adolescent girls are affected by disasters.

The period from Baishak to Jaistha witnesses a surge in natural disasters, prompting proactive measures such as public announcements through mike, television broadcasting and interpersonal communication to mitigate the impact of disaster risks.

Relief efforts during floods primarily focus on providing shelter, with limited additional assistance offered, highlighting the need for more comprehensive support systems.

Case 61: Women (Uttar Betagi, Barguna)

Morsheda is a resident of Uttar Betagi who is a thirty-seven-year-old divorced woman supporting a family of six members with a monthly income of six thousand taka. She has encountered various calamities in her life, including floods, cyclones, tidal surges, and river erosion.

During disasters, crops are lost, roads are submerged and sometimes roads are broken, as a result of face numerous hardships in their social interaction and mobility.

Like Morsheda the other fellows of community do not get any help from the government during natural calamities. Their health risk is very heightened and various diseases appear. Access to nutritious food becomes limited, and seeking medical treatment becomes impractical as hospitals do not offer free services during floods, and doctors are often unavailable.

Also, like Morsheda they don't want to go to cyclone shelters due to safety concerns, as men and women have to live together. Even though they are aware of disaster preparedness, cyclonic disasters create them financially crippled, economic hardship and cycle of poverty by aftermath of disasters.

Although relief aid is occasionally provided, cash assistance is scarce, and reliance on loans from NGOs with exorbitant interest rates becomes necessary to navigate the challenges posed by disasters.

Case 62: Young Adult Women (Kewrabuniya, Uttar Betagi, Barguna)

Jakia Aktar, a young adult woman of 19 years, resides with her family in the Kewrabuniya village of Betagi Upazila, located in the Barguna district. Their household consists of six members, and she struggles with recurrent natural disasters like cyclones, salinity intrusion, and tidal surges, causing detrimental effects across various aspects of life, including economic, social, psychological, and health dimensions. The elderly, pregnant women, and those with physical disable are more vulnerable during disasters. The community faces challenges exacerbated by transport limitations, insufficient shelter, and lack of WASH facilities by intensifying the impact

of cyclones. Unemployment rates surge during disasters, forcing individuals like Jakia's father, who relies on fishing as his main occupation, to seek day labor for survival. In a month, he is doing work 15-20 days as a day labor and earns 200-250 taka daily. People have more income during the summer season and lower in winter season due to unavailability of fish and lack of employment opportunities. Inadequate access to nutritious food and healthcare exposes them to vector-borne diseases, contributing to malnutrition among newborns and iron deficiency among pregnant and breastfeeding women during reproductive phases. Salinity exacerbates the fertility challenges, while adolescent girls struggle to access menstrual hygiene facilities during disasters. Health complex is as far away as from their house, resulting unavailability of proper health care services. She needs 7 to 12 months or sometimes more than a year to recover from the damaged properties. The formulating policy is not enough for them. They have received social protection from the government like VGD. Urgent action is required to implement holistic policies, including public awareness campaigns, to effectively address the multifaceted challenges confronting vulnerable communities like Jakia's.

Case 63: Boatman (Kewrabunia, Uttar Betagi, Barguna)

Kalam Gazi, aged 50, resides with his family in the Kewrabunia union of Batagi Upazila, Barguna district. As a boatman and head of the household, he is the only earner of household with a family consists five members. During the cyclone Aila, he was forced to take a loan of one lakh taka from *ASA* organizations by losing his house. Almost all of the fishermen live in his community. Their livelihood depends on daily fish sales, but disruptions in boat operations due to various factors of rough weather led to diminished earnings, causing economic strain. Such financial hardships can have dire consequences, one of his children had been died last year due to lack of treatment. His income is more during the rainy seasons for availability of fish, and lower in winter season due to lack of availability of fish. He earns 10000 to 12000 taka per trip.

The community are exposed to natural disasters every year, especially cyclone and river erosion, resulting in economic, social and psychological as well as health risks or vulnerability. The prevalence of salinity exacerbates health issues, including cholera and skin ailments. Each year, the village experiences a significant out-migration, with three to four hundreds of residents relocating due to the impacts of natural disasters leading to mental depression. Access to nutritious food is limited during disasters, and health awareness is inadequate.

The recovery process from damages incurred during disasters typically spans 7 to 12 months or longer. The existing policy is not enough for them to mitigate disaster risks. It is imperative for the government to prioritize public awareness programs to enhance disaster preparedness and resilience among affected communities.

Case 64: Adolescent girl (Kewrabunia, Uttar Betagi, Barguna)

Sharmin Akhter, a 16-year-old adolescent girl, resides in the Kewrabunia union of Betagi upazila in Barguna district. Her father, worked as a day labor in his living village, is now unable to work because of his old age. She has a small family consisted of five members. During the cyclone Aila, their home was destroyed, disrupting Sharmin's education and exacerbating the vulnerability of pregnant women and adolescent girls during disasters. Sharmin, like many adolescent girls in her community, lacks access to menstrual hygiene facilities, relying on makeshift alternatives learned from older female relatives.

The coastal Kewrabunia community faces recurring natural disasters such as cyclones, salinity intrusion, and tidal surges, with adverse impacts across economic, social, psychological, and health domains. Elderly, pregnant women, and the physically disabled are particularly at risk known as more vulnerable groups during disasters. Transportation barriers, inadequate shelter and lack of WASH facilities compound the severity of cyclonic disasters, with summer seasons are experiencing heightened intensity compared to winters. At the time of disaster majority of the people remain unemployed. They face more challenges at occupational hazard and lower wages. The main occupation of her father is fishing but during disaster he has to compel as doing work of day labor. In a month, he works 15 to 20 days and earns 200-250 taka per day. People have more income during the rainy season and lower in winter seasons due to unavailable of fish and lack of employment opportunities.

Healthcare access is compromised during disasters due to the distance to health facilities, exacerbating health risks. Malnutrition is prevalent among the newborns, pregnant and breast-feeding women due to inadequate eating of nutritious food, while salinity impedes fertility, women and adolescent girls struggle to access menstrual hygiene facilities.

The recovery period for damaged properties spans 7 to 12 months or longer, highlighting the prolonged impact of disasters. Existing policies provide some social protection policies, but they are insufficient. They receive social safety net protection from the government and get aid from

different NGOs and the government. The government should be ensured construction of cyclone centre, dam, sluice gates and public awareness campaign also.

Case 65: Fisherman (Kewrabunia, Uttar Betagi, Barguna)

Faruk Hawlader, aged 50, resides with his family in the Kewrabunia union of Betagi upazila in Barguna district, where he earns around 15000 taka as a fisherman. His primary occupation revolves around fishing, although his community faces the sufferings of natural disasters, resulting in severe economic, social, psychological, and health repercussions. In the aftermath of the Ayla cyclone, Faruk's family, like many others, experienced extensive damage to their homes, recovering them to seek financial assistance from the Grameen Bank for reconstruction. Their income peaks during the summer season. Sometimes, they are trapped while fishing into the deep sea, so ever often hearing the forecast of disaster. During the disaster, madrasa or their children education institution was closed which forcing those children drop out from school, roads and infrastructures destroyed and lack of secure shelter.

Physically challenged people, elderly and pregnant women are more susceptible during disaster. Despite the health risks posed by natural calamities, community members are often lacking awareness of health precautions, and refrains from nutritious food is really a challenge during such times. Healthcare services are hampered by the distance to medical facilities. Recovery efforts for damaged properties due to disasters typically span 7 to 12 months or longer. The government provides some relief assistance, such as a fishing card entitling them to receive 50 kg of rice during disasters, yet there is a need for motivational awareness programs to instill proactive disaster preparedness measures within the community.

Case 66: Bede Community (Uttar Betagi, Barguna)

Jhilik, a member of the Bede community, has been residing in Uttar Betagi for the past four months, and they anticipate staying for another two to three months, as their lifestyle involves frequent relocations. As their main earner is women, they cannot do much work and their income is around five thousand to six thousand depending on how much they can earn from people by begging or sweeping.

Natural disasters pose significant challenges for them, often displacing them and necessitating resettlement, which threatens their livelihoods. Moreover, these calamities disrupt their income streams and expose them to waterborne and airborne diseases.

Since women are the only primary earners, their income is cut off during cyclones and floods, making it arduous to sustain their households. They do not have the adequate knowledge and training to survive with natural disasters exacerbates their vulnerability. During disasters they do not get enough relief materials from the government due to which they have to go without food for days. Since they are not permanent residents of the area, they do not get help from anyone during cyclones and there is less chance that the family will survive by borrowing.

Jhilik notes that those who are floating among them should be tried to make a permanent source of income on their own initiative and brought under the asylum scheme.

Case 67: Physically disabled (Kewrabunia, Uttar Betagi)

Rakib Hawlader, a 15-year-old resident at Kewrabunia village of Betagi upazila in Barguna district, lives with his parents. He is a physically challenged boy, having broken his leg injury three years ago that left him unable to walk without assistance of others. He has no strength and relies on a wheelchair for mobility.

The medical expenses incurred by his injury amounted to one lakh taka, forcing his family to sell three of their cows to cover the expenses. To further collect of finance for Rakib's treatment, his family took out a loan of 40,000 taka from the *ASA* and *Grameen bank* respectively. For this reason, they have to pay in installment of taka 1600 with the condition of repayment in 46 installments. However, financial constraints often prevent them from accessing proper nutrition, particularly during lean periods such as winter. During the *Aila* cyclone, their home was destroyed. Like many in their community, Rakib's family struggles to maintain proper health and nutrition, especially during disasters. Physically disabled individuals like Rakib, along with pregnant women, are particularly vulnerable during such events, as they rely heavily on assistance from others for movement and access to essential resources

To alleviate some of the financial burden, the government provides them with 30 kg of rice every month. However, there remains a need for comprehensive policies and public awareness campaigns to address the challenges faced by vulnerable groups like Rakib's family during disasters.

Case 68: Boatman (Char Kukri Mukri, Charfashion, Bhola)

Motahar Majhi, aged 48, reflects on the frequent occurrence of natural disasters like cyclones, floods, and riverbank erosion in their locality. These events have significant impact on the

community's economy, psychology and health. Despite having a cyclone shelter nearby, its condition is unsatisfactory. Cyclonic disasters disrupt their daily life, communication, and transportation those also affect their social life and livelihood activities. Cyclonic disasters create the problem of safe drinking water scarcity.

Cyclonic disasters disproportionately affect the vulnerable groups such as children, adolescent girls, women and pregnant women, disable and aged people who face numerous diseases, school closures, and educational setbacks. The elderly encounter the transportation challenges, making them particularly susceptible. Economic activities are hampered, resulting in unemployment, decreases of food production, and damages to crops, sapling plantation and timber trees due to cyclonic disasters. Furthermore, fisheries sectors are also damaged due to disasters.

In last 20 years, thousands of people have migrated from this village due to cyclonic disasters. Cyclone and coastal flooding are the main reason of environmental change that affect adversely their livelihood. Pregnant, breastfeeding and menstruating woman are at risk of health during and after disasters because of health care access is found insufficient. After the cyclonic disasters their condition of residents are dirty and polluted. Fever and diarrhea is the most common diseases faced by the people of coastal belt due to cyclonic disasters. They have indigenous practical knowledge like their own survival mechanism, moving higher ground in the time of flood for response of cyclonic disaster and risk reduction. Through miking and interpersonal communication, they know about the upcoming disasters. The existing policy is not enough for them to reduce the disaster risks. Motahar recommends the introduced with the technical and financial support of GOs and NGOs so that they can organize the local level training on disaster preparedness, resilience, coping mechanism, adaptation, risk management and response strategies etc.

Case 69: Crab Collector (Char Kukri Mukri, Charfashion, Bhola)

Tamzid, a 20-year-old resident of our coastal area, highlights the recurring struggles faced by the community due to cyclone, river bank erosion and tidal surge in every year to this coastal belt. He notes that they faced bitter experiences of economic, social, psychological and health due to natural disasters. Despite the presence of cyclone shelters within a 2-kilometer radius but the structural condition is quite satisfactory. Due to disasters, the community still endures economic setbacks such as infrastructure damage, shelter maintenance expenses, and losses in livestock and farmland. Additionally, these disasters disrupt their social life and livelihoods, particularly in terms of accessing safe drinking water and healthcare services. Children and old people are more vulnerable

group during cyclonic disasters. Children face infectious diseases and their educational disruption are occurred during this time. The aged people face transportation barriers and lack of shelters.

The severity of these disasters peak during the summer seasons significantly impacting economic activities like agriculture due to saline soil, communication breakdowns, and transportation disruptions. Government health service institution is 2 km far away from home. Fever, cold and diarrhea are common diseases during cyclonic disaster.

Through miking, interpersonal communication and facebook, the people know about the upcoming disasters. The southern community people like Tamjid do not get government support. They recover their damage properties by capacity of their own resources. Existing policy is not enough for them to reduce the disaster risks. It is required that government should steps careful planning for sufficient sluice gate, public awareness program and preparedness programs should be more enriched, resource mobilization, and skills training for solve the problem. Additionally, emphasis is placed on the importance of adhering to principles of good governance in addressing these challenges.

Case 70: Adolescent Girl (Char Kukri Mukri, Charfashion, Bhola)

Monira, aged 14, witnesses of cyclones, salinity intrusion, tidal surges, floods, and waterlogging periodically in her region. These experiences impact on economic, social, and psychological challenges exacerbated by cyclonic disasters. During such events, they used their school as their cyclone center. Disruption of daily activities, cultural rituals, food insecurity and break out of diseases are negative effect of their livelihood for cyclonic disasters. Besides, natural disaster creates safe drinking water accessibility in her region. Children, adolescent girls, young adult women, pregnant and lactating women, aged and disabled people are the most vulnerable group during cyclonic disasters. The elderly and physically disable people face numerous challenges due to lack of shelters, transportation barriers, lack of toilet facilities and WASH facilities. She and her family face economic hardship due to cyclonic disasters, while socio-cultural disruption include social network breakdowns, disruption of communication and transportation, lack of social cohesion, increased domestic violence, and gender-based vulnerability due to cyclonic disasters. Around 200-300 people have migrated from this village due to cyclonic disasters, contributing to mental health issues such as depression. Monira herself struggles to find suitable places for sanitary needs and breastfeeding during disasters, compounded by limited access to medical treatment, with healthcare institutions located 1 kilometer away.

After cyclonic disaster their habitat condition are characterized by risk, unhygienic and polluted environments, dirty and suffocating environment. Women face lots of problem in cyclonic disasters. Despite efforts to use miking systems for disaster awareness, existing government policies fall short of providing adequate support during natural disasters, highlighting the need for increased public awareness programs and government assistance.

Case 71: Women, House wife (Char Mainka, Charfashion, Bhola)

Samia, aged 36, reflects on the recurrent challenges faced by her community, including cyclones, riverbank erosion, tidal surges, salinity intrusion, floods, waterlogging, and storm surges. These natural disasters lead to profound economic, social, psychological, and health repercussions. Despite the presence of a cyclone shelter within 500 meters, its structural condition is only moderate.

Economically, the community suffers from infrastructure destruction, the operational costs of running shelters, and the loss of farmland. Socially, these disasters disrupt daily life and hinder access to safe drinking water. Women, children, pregnant women and old people are the more vulnerable group in cyclonic disasters. They get hardly preferential treatment in health care services during natural disasters because it is far from the home. Children face infectious diseases and educational disruptions etc. during this time. Aged people face transportation barriers, lack of shelters, lack of toilet facilities. They faced more intensity of cyclonic disasters in summer season. Cyclonic disaster is harmful for economic activities. Food productivity is decreasing gradually, seasonal crops cannot be cultivated due to salinity. Due to cyclonic disasters, disruption of communication, transportation and livelihood, lack of social cohesions are observed.

Over the past decade, the community has witnessed significant migration around 200-300 people due to these disasters. The condition of residence is extremely heated, dirty and polluted, and suffocating environment. Access to government healthcare services, located 5 kilometers away, poses a challenge during emergencies, resulting in common ailments like fever, colds, headaches, skin diseases, whooping cough, and diarrhea going untreated. Women faced vulnerability like hardly get proper treatment, lack of health care access, and lack of decision-making process.

Efforts to mitigate the impact of disaster risks include raising awareness through miking and receiving support from NGOs and government agencies for recovery efforts, which typically take 3 to 6 months. However, existing policy is not enough for addressing the community's needs because of getting inadequate assistance. Furthermore, it is required careful planning, financial

assistance, relief efforts, and infrastructure development like install tube wells, constructed of embankments, polder, sluice gates and cyclone shelter.

Samia emphasizes the importance of enriching public awareness and preparedness programs, along with initiatives by NGOs to raise funds, provide training, and advocacy for the community's needs. She recommends incorporating principles of good governance, promoting afforestation, education, computer literacy, and developing advocacy systems to better cope with cyclonic disasters.

Case 72: Young Adult Women (Char Mainka, Charfashion, Bhola)

Rina, aged 20, recalls experiencing cyclones, salinity intrusion, tidal surges, riverbank erosion, floods, and waterlogging intermittently throughout the year in their region. These events have brought about bitter experiences of economic, social, and psychological challenges due to cyclonic disasters. Despite having a cyclone center within 1 kilometer, its quality is unsatisfactory. Cyclonic disasters exacerbate the disruptions of daily life, cultural activities, rituals, food security, and mental health issues, scarcity of drinking water including waterborne diseases.

Children, adolescent girls, young adult women, pregnant women, disable and aged people are the most vulnerable group in cyclonic disasters. They have lack of shelters, transportation barriers, lack of toilet facilities during disasters. Rina and her family face economic hardship due to cyclonic disasters. Approximately 20-25 days in a year they remain unemployed for natural disasters. Natural disasters disrupt crop production, food security, domestic livestock, and employment opportunities. Socio-cultural challenges including disruptions of social network, communication and transportation, lack of social cohesion, increase domestic violence, gender-based vulnerabilities are occurred due to cyclonic disasters. She faced scarcity of suitable place for changing proper sanitary materials, suitable place for baby's breastfeeding, and even do not get medical treatment properly. Health care institution is 1 km far away from her region. Their habitat condition remains risky and unhygienic, dirty and polluted and suffocating also. Women face numerous encounters during cyclonic disasters. Miking and interpersonal communications are used for awaking upcoming natural disasters. Government existing policy is not enough for them to address the disaster risk. They don't get much assistance from the government during natural disasters. Public awareness program should incorporate for them.

Case 73: Honey collector (Kiamullah, Tajumuddin, Bhola)

Nurunnabi, aged 55, earns in the range of 15000 to 20000 taka living as a honey collector and resides at Kiamullah village of Tajumuddin upazila in Bhola district with five other individuals in his household. He and his son Zihad involves in honey collecting of char land.

Nurunnabi notes that natural calamities such as cyclones, floods, river bank erosion hit there at every year and they face numerous challenges encompassing economic, social, psychological, and physical realms. Despite the presence of a nearby cyclone center, the entire environment of cyclone center is not quite good for which people don't want to go there. Furthermore, there is no adequate safety system for girls and women.

The intensity of cyclonic disasters impact extends beyond the immediate physical destruction, disrupting agricultural activities, social and religious functions, and employment opportunities. Educational institutions, often used as cyclone shelters, remain closed for longer periods, leading to drop out of child education. The breakdown in communication exacerbates social isolation which are observed.

Economically marginalized communities bear the brunt of cyclones, experiencing loss of livelihoods and forced migration from one place to another, often towards urban centers. Despite widespread awareness of available assistance, limited financial resources and inadequate healthcare infrastructure impede access to essential medical services, leading to preventable fatalities

During cyclones, adolescent girls face challenges related to hygiene and sanitation, both at home and in cyclone centers and are often subjected to various forms of sexual harassment. Every year the coastal people are affected like these natural calamities and the aid is given by the government. Nurunnabi emphasizes the imperative for increased government assistance to mitigate the impact of natural disasters and alleviate the suffering of affected communities.

Case 74: Physically disabled girl (Hajikandi, Tajumuddin, Bhola)

Afsana, a 15-year-old physically challenged girl, resides in a household of six individuals, facing the recurring challenges posed by natural disasters, primarily cyclones, floods, and riverbank erosion. These calamities inflict severe economic repercussions as homes, schools, and college buildings are ravaged, disrupting the community's livelihoods. She has been studied at secondary school.

Despite the presence of a nearby cyclone center, which is not structurally good. While a cyclone strike in the land, the coastal people don't want to go there due to safety concerns. Post-cyclone outbreaks of skin diseases, diarrhea, and other ailments underscore the urgent need for safe drinking water, as water borne diseases proliferate in the absence of adequate sanitation. Children, women, pregnant and lactating women, adolescent girls and elderly are disproportionately affected or worst situations. Children's education is halted because schools are closed usage as cyclone centers. Cyclones aggravated the economic hardship due to unemployment, damages of food production and shrimp farms, deceased of livestock including poultry, cows and goats, and reduction of the seasonal crops production.

After occurring a cyclone there is lack of cohesion, fragile of local governmental institutions, and environmental degradation are occurred throughout the country. Despite a heightened awareness of health concerns, limited economic resources and inadequate facilities hinder comprehensive healthcare access.

She says 'our main objective is how we can return to our pre-income status so that we can survive on a little bit'. Healthcare services near Afsana's residence fall short of meeting the community's needs, prompting dissatisfaction among residents and the girls staying at the cyclone center do not get enough sanitation facilities. The community's lack of technical and vocational knowledge hampers their ability to mitigate cyclonic impacts, perpetuating their vulnerability to recurrent disasters and while the providing governmental assistance is not quite enough for the people to address the disaster risks and it is also imperatives that additional relief efforts to alleviate their plight effectively.

Case 75: Day Labor (Kajikandi, Tajumuddin, Bhola)

Asadul, aged 50, faced cyclone, tidal surge and salinity intrusion in every year to this coastal belt. The coastal people precipitate a multitude of adversities encompassing economic, social, and health dimensions. The presence of cyclone shelters within close proximity of 1 km and the structural condition is satisfactory. The region encounters economic repercussion including destruction of infrastructures, ruining the shelter, death of cattle and destruction of farmland, which impedes the social cohesion and livelihood sustainability.

Due to cyclonic disasters, the people struggle the problem of access to safe drinking water. The people get hardly preferential treatment in health care services during natural disasters. Children, pregnant women, physically challenged people, and old people are more vulnerable group during

cyclonic disaster. Children face infectious diseases and also hamper their education during this time. The vulnerability of aged or disable people face is transportation barriers and lack of shelters. The coastal people faced more intensity of cyclonic disasters in summer, rainy season and autumn, compounds economic hardships by diminishing food productivity and impeding agricultural activities like seasonal crops, vegetables and fruit trees cannot be grown due to salinity-induced land degradation. Disruption of communication and transportation further exacerbate social upheaval. while healthcare access remains inadequate despite the government health service institution is within 2 km far away from home. Fever, cold and diarrhea are common diseases during cyclonic disasters.

Despite community efforts to remain vigilant through miking systems of upcoming disasters, the people face multifaceted challenges and do not get enough government support. The burden of recovery largely meets up the affected communities. Existing policy is not enough for effective livelihood resilience.

Asadul advocates for comprehensive planning initiatives, including the construction of sufficient sluice gates, cyclone center and embankments, and ensure of potable water, to mitigate the impact of cyclonic disasters. He emphasizes the importance of public awareness and preparedness programs, NGOs interventions in fundraising, capacity building, and skill training, to foster the community resilience and address the multifaceted challenges posed by recurrent natural disasters.

Case 76: Boatman (Kajikandi, Tajumuddin, Bhola)

Md. Shahin, aged 30, faces the multitude of natural disasters, including cyclones, floods, and riverbank erosion, that have plagued his community over time. These calamities causing socio-economic, and cultural upheavals of bitter experiences. The existence of cyclone shelters within a 1-kilometer radius, the structural condition of these centers is quite satisfactory.

Cyclonic disasters have adverse implications on both social life and livelihood activities, disrupting of daily routines and cultural events such as wedding ceremonies and rituals the community. Furthermore, food insecurity, communication breakdowns, and transportation disruptions further compound the challenges faced by the community. Cyclonic disasters trigger the scarcity of safe drinking water that exacerbates the plight, particularly creating more vulnerable groups such as children and young adult women.

Children suffers from the infectious diseases, school closures, and loss of educational materials. Elderly and physically challenged individuals face transportation barriers, water, sanitation and

hygiene facilities. They are among the most vulnerable during these crises. The intensity of cyclonic disasters is observed to be higher during the Baishakh-Jaistha months (Bengali summer season) compared to the Poush-Magh months (Bengali winter).

Due to cyclonic disasters, the economic activities of coastal people are suffered harmfully. They remain unemployed for several days during disasters. Food production, sapling plantation and timber trees are damaged due to cyclonic disasters.

Last 10 years, there are 70 to 80 people have migrated from this village due to cyclonic disasters. Pregnant, breastfeeding and menstruating women are at risk of health during and aftermath of disasters due to inadequate health care access. Mostly, the condition of residents is dirty and polluted. Southern coastal people use bamboo made toilets surrounded by corrugated tin during cyclone disasters.

Common ailments like fever and diarrhea prevail in coastal communities due to cyclonic disasters. Indigenous knowledge like own survival mechanism of victim, moving higher ground in the time of disaster plays a crucial role in disaster response and risk reduction.

Through miking, the people know about the upcoming disasters. Shahin needs 3 to 6 months to recover from the damaged properties and setback in regular activities. However, existing policy is not enough for disaster risk reduction. The technical and financial support of GOs and NGOs so that they can organize local level training on disaster preparedness, resilience, coping mechanism, adaptation, risk management and risk response is recommended to bolster community readiness and response capabilities.

Case 77: Old People (Keyamullah, Tajumuddin, Bhola)

Romij, aged 70, faces the recurrent disasters of cyclone, river bank erosion and tidal surge for living in coastal belt. They faced bitter experiences of economic, psychological and health hardships among the community due to natural disasters. Despite the presence of cyclone shelters within a 2-kilometer radius, the structural condition of these shelters remains satisfactory.

Natural disasters trigger the economic repercussions like destruction of infrastructures, ruining the shelter, death of cattle and destruction of farmland, all of which impact their social life and livelihood. Access to safe drinking water emerges as a significant challenge during cyclonic disasters, with healthcare services offering limited preferential treatment during such crises.

Children and old people emerge as the most vulnerable groups during cyclonic disasters, facing risks of infectious diseases and disruptions to education. The physically challenged and aged

people encounter the transportation barriers and lack of shelters. The frequency and intensity of cyclonic disasters peak during the summer season leading to gradual declines in food productivity including seasonal crops, vegetables and fruit trees, and hindrances to agricultural activities due to salinity-induced land degradation.

Disruption of communication, transportation and livelihood are the social upheavals disruption of cyclonic disasters. The condition of residence are extremely heated, dirty and polluted, toxic and suffocating environment. They use bamboo made latrine surrounded by plastic during natural disasters. Despite the government health service institution is within 2 km away from home, but they may struggle to adequately address post-disaster health needs. Fever and diarrhea are common diseases during cyclonic disasters. Through miking and interpersonal communication, the southern people are known to upcoming disasters. With the help of government support they need 1 to 2 months to recover from damaged properties and setback regular activities. However, existing policies fall short of meeting community needs, highlighting the need for effective funding, careful planning for infrastructure like sluice gates and cyclone shelters, and ensuring access to safe drinking water. Additionally, public awareness program and preparedness programs should be more enriched, NGOs should be created more fund raising, and skill training are recommended to address the challenges faced by coastal communities. Additionally, adherence to principles of good governance is advocated for effective disaster management.

Case 78: Fish Fry Collector (Hajikandi, Tajumuddin, Bhola)

Maruf, aged 38, recounts the frequent encounters with cyclones, riverbank erosion, tidal surges, salinity intrusion, floods, and storm surges in the region. These natural calamities impacted bitterly on various aspects of economics, social, psychological and health well-being. Despite the presence of cyclone shelters within a 1-kilometer radius, their structural condition is deemed moderate.

Economic adversities manifest through infrastructure damage, operational costs associated with shelter management, and destruction of farmland, all of which have profound negative effects on social life and livelihoods. Due to cyclonic disasters, the daily activities, cultural rituals, food security, religious practices, and communication channels are disrupted, leading to outbreaks of diseases. In addition, the people are struggling to access of safe drinking water. Women, children, pregnant women and old people are the more vulnerable group during the cyclonic disasters. They get hardly preferential treatment in health care services during natural disasters because it is far from the home. Children face infectious diseases and educational disruptions, while the aged and

disabled people face transportation barriers, lack of shelters, and inadequate of toilet facilities. In summer, rainy season we faced more intensity of cyclonic disasters. Cyclonic disaster is harmful for economic activities. Food productivity is decreasing gradually like seasonal crops cannot be cultivated due to salinity.

Disruption of communication, transportation and livelihood, lack of social cohesion are the social disruption of cyclonic disasters. Over the past decade, a significant number of people around 200 to 300 have migrated from the village due to cyclonic disasters.

It is observed that the condition of residence of the coastal people is extremely heated, dirty and polluted environment and suffocating environment. The coastal people use bamboo made latrine surrounded by straw. Government health service institution is within 2 km far away from their home. Fever, cold, bad headache, skin diseases, whooping cough and diarrhea are common diseases during cyclonic disasters. Women faced vulnerability like limited access to healthcare, distant healthcare centers, and exclusion from community decision-making processes.

Despite efforts to remain vigilant through miking systems, recovery from cyclonic disasters typically requires 3 to 6 months with support from NGOs and government agencies. Existing policy is not enough for meeting of community needs. Government should take careful planning required like financial assistance, relief efforts, the establishment of more tube wells to ensure safe drinking water, and construction of sufficient sluice gate and more cyclone enters. Enhanced public awareness and preparedness programs, along with fundraising, skill-building initiatives, and advocacy efforts, are recommended to address the challenges posed by cyclonic disasters. Additionally, promoting principles of good governance, tree plantation drives, education, computer literacy, and advocacy systems can contribute to better coping mechanisms for cyclonic disasters.

Case 79: House wife (Kajikandi, Tajumuddin, Bhola)

Rina, aged 32, reflects on the recurring challenges posed by cyclone, river bank erosion, tidal surge, salinity intrusion, flood, and water logging in the region. These natural disasters created bitter experiences, affecting various facets of life including economics, social dynamics, psychological and health well-being. Despite the presence of cyclone shelters within a 1-kilometer radius, their structural condition is deemed moderate.

Economical hazards they faced like the destruction of infrastructures, ruining the shelter, and destruction of farmland, all of which affect their social life negatively. Rina notes that people of

our community faced hindrance of daily activities, cultural and ritual activities, and food insecurity, disruption of prayers and communication and break out of diseases. For cyclonic disasters, they faced problem acute safe drinking water. Women, children, pregnant women, physically challenged people and aged people are the more vulnerable group during and aftermath of cyclonic disasters. They get hardly preferential treatment in health care services due to distant places from their home during natural disasters. Children face infectious diseases and educational disruptions during this time, while the elderly confront transportation barriers, lack of shelter, and inadequate toilet facilities.

The summer season witnesses heightened the cyclonic activity, further exacerbating the economic hardships and hindering food productivity due to land salinity. Disruptions in communication and transportation amplify social disarray, leading to diminished social cohesion. Over the past decade, a significant number including between 100 and 200 of people have migrated from the village due to cyclonic disasters.

The living conditions of southern coastal people are characterized by extremely heated, dirty, polluted, and suffocating environment. They use bamboo made latrine surrounded by plastics in the meantime of natural disaster. Government health service institution is 2 km far away from their home. Common ailments such as fever, colds, headaches, skin diseases, whooping cough, and diarrhea prevail during cyclonic disasters. Women faced vulnerability in this situation like hardly get proper treatment, long distance of health care center, lack of opportunity in community decision making. Through miking by CPP volunteers and interpersonal communication she aware of upcoming disasters. With the help of capacities from NGOs and govt support Rina needs 3 to 6 months to recover from the damaged properties and setback in regular activities. Existing policy is not enough for them to meet up their needs. Government should take careful planning required like financial aid, relief efforts, installed more tube well for ensuring safe drinking water, and reconstruction of sufficient sluice gate, polder and cyclone shelters.

Enhanced public awareness and preparedness programs, along with fundraising, skill-based and infrastructure-based initiatives, and advocacy efforts, are recommended to address the challenges posed by cyclonic disasters. Additionally, promoting principles of good governance, tree plantation drives, education, computer literacy, and advocacy systems can contribute to better coping mechanisms for cyclonic disasters.

Case 80: Pregnant Women (Kajikandi, Tajumuddin, Bhola)

Laila Akter, aged 23 Years, mention that cyclone, salinity intrusion, tidal surge, river bank erosion, flood, and water logging occurs recurrently in their region, which have brought bitter experiences encompassing economic, social, and psychological hardships due to cyclonic disasters. Despite having a cyclone center within a 1-kilometer radius, she finds its quality unsatisfactory. Cyclonic disasters disrupt their daily activities, cultural events, rituals, and food security being common during such disasters. Natural disaster creates water problem in their region.

Children, adolescent girls, young adult women, pregnant women are the most vulnerable group in cyclonic disasters. Disable and aged people face unavailability of shelters, transportation barriers, lack of toilet facilities. Laila and her family faced economic hardships due to cyclonic disasters. Food production, domestic livestock, lack of employment opportunity is the treats of economic insecurity. She faces socio-cultural challenges like disruption of social network, disruption of communication and transportation, leading to a lack of social cohesion, an increase in domestic violence, gender-based vulnerability due to cyclonic disasters. Over the past decade, thousands of people have migrated from villages due to natural disasters, highlighting the severity of the situation. Fever, cold, bad headache, diarrhea, skin diseases are the most health risk diseases they faced during the natural disasters. She doesn't know what is for her proper food, nutritious food and even doesn't get nutritional sufficient food during cyclonic disasters. She notes that they faced scarcity of suitable place for changing proper sanitary materials, lack of suitable place for baby's breastfeeding, and even they do not get medical treatment. Health care complex is 1 km far away from her region. The residence condition is risky, unhygienic, dirty, polluted, and suffocating environment. Women face lots of problem at the times of cyclonic disasters. Miking, interpersonal communication, TV and facebook are used for awakening the upcoming natural disasters. Government existing policy is not enough for Laila and her community during natural disasters. They don't get much assistance from government during natural disaster. Public awareness programs are deemed essential to address these challenges effectively.

Case 81: Job Holder (Hajikandi, Tajumuddin, Bhola)

Md. Saddam Hosen, aged 31, reflects on the recurring cyclones, salinity intrusion, tidal surges, and floods that plague our coastal area each year. The impact of cyclonic disasters is profoundly detrimental, particularly on our economic stability. Despite having a cyclone shelter located 1 kilometer away, its condition is moderately satisfactory. People of their community face disruption

of communication, social network and their health is at risk for break out various diseases due to cyclonic disasters. Natural disaster creates problem of safe drinking water. Women, children, aged and pregnant women are the most vulnerable group during disaster and also face detrimental challenges due to cyclonic disasters. Women and adolescent girls faced insufficient secured shelter, drop out from school, lack of hygiene management kit. Economic hardships are widespread, compounded by difficulties in communication and transportation.

Like Saddam the community people feel anxiety with significant loss of their house, livestock and vegetation due to disasters. In our community most people have indigenous practical knowledge. Despite possessing indigenous knowledge, they rely on television broadcasts, interpersonal communication system and miking systems for disaster preparedness. However, they believe that NGOs could play a more substantial role by increasing the relief efforts, improving sanitation, providing access to pure drinking water, and raising awareness. Adherence to principles of good governance is crucial in navigating the challenges posed by natural disasters and mitigating their adverse effects.

Case 82: Young Adult Women (Kajikandi, Tajumuddin, Bhola)

Sabina, an 18-year-old young adult woman, shared her experiences witnessing cyclones, salinity intrusion, tidal surges, riverbank erosion, floods, and waterlogging in their region throughout the year. She has encountered the bitter impacts encompassing economic, social, and psychological dimensions due to cyclonic disasters. Despite having a cyclone center within a 2-kilometer radius, Sabina found its environment is quite unsatisfactory. These disasters disrupted their daily activities, cultural rituals, and led to food insecurity, deteriorating mental health, and waterborne diseases. Natural disaster creates the water problem in their region during disasters. Children, adolescent girls, young adult women, pregnant and lactating women, physically challenged and aged people are the most vulnerable group during and aftermath of cyclonic disasters. Aged and physically challenged faces the unavailability of shelters, transportation barriers, lack of toilet facilities and WASH facilities etc. Sabina's family also encountered economic hardships due to cyclonic disasters, affecting food production, livestock, and employment opportunities, thereby exacerbating economic insecurity. Furthermore, she faces the socio-cultural challenges including disruptions of social networks, communication, transportation, lack of social cohesion, increased domestic violence, highlighting gender-based vulnerabilities etc.

Sabina also faces various health risks during natural disasters, including the scarcity of suitable place for changing of proper sanitary materials, lack of suitable place for baby's breastfeeding, and getting inadequate medical treatment. The health care institution is 2 km away from her region. Their living condition is characterized by risk and unhygienic, dirty and polluted, and suffocating. Miking and interpersonal communication system is used for awareness upcoming natural disasters. Sabina emphasized that existing government policies are inadequate, as they receive minimal assistance during natural disasters, enhancing the public awareness programs to address their plight.

Appendix 4: Key Informant Interviews (KIIs)

KII-1: District Relief and Rehabilitation Officer (DRRO), Satkhira

Md. Abdul Baset, aged 59 years, worked as District Relief and Rehabilitation Officer (DRRO) in Satkhira. He highlights the recurring challenges and bitter experiences faced by the community of this region including cyclones, tidal surges, river bank erosion, floods and salinity etc. All of these disasters resulting in damages of educational institutions and houses and infrastructures, people are unemployed, agricultural crops are destroyed and trees are uprooted. All of their agricultural lands become flooded, all of their business become closed and the people who are the day laborers becomes fully unemployed. On the other hand, the marginal people who depends on mangrove forest, they do not collect the resources from the mangrove forest due to natural disasters.

Pregnant women, children, disabled and aged people are more vulnerable during disasters. During disaster, the elderly and physically disable people do not have access to transportation, toilet facilities, adequate food and water at home and women who are over domestic household work at home, faced food and nutrition deficiencies and lack of access to feminine health care. There exists a cyclone center one to two kilometer far away from another and sometimes the cyclone centre exists far away for their density of localities and inhabitants. Everyone is satisfied with the environment in the cyclone center.

The marginal farmers shift from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal people (Bawali, Mawali, chunnery, riders, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their highly risk profession, the

decreasing of mangrove forest resource product, but also climate change induced natural disasters. As most of the people near the Sundarbans area are dependent on mangrove forest, their economic condition, particularly, honey collectors, riders, forest fisheries, crab collectors and the Golpata collectors and those who depends on forest resources are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they have to change their livelihood opportunities. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation. Basically, we are making the awareness of people through all the technologies of meteorological forecast then infrared voice recorder (IVR) and also mobile calls via 1090. And everyone is aware in advance and they know the meteorological forecast or upcoming disasters through television, miking, interpersonal communication system, and also social communication sites like Facebook. After the disaster, the community recover their damaged property through public and private assistance which takes more than a year to recover. He added that the kind of support is not sufficient to back up of their lives but also needs to some more advancement and also they need to get back their normal livelihood as quickly as possible. To reduce the disaster loss and damages, everyone should be aware and cooperate with each other, create social forestry (agro & community forest), organize various awareness meetings and seminars, and increase overall cyclone preparedness programs. Medical facilities should be provided to all. Cyclone centers should be made more secure. Local community people should be empowered and existing government initiatives should be increased if possible.

In fine, Baset suggests a comprehensive approach involving community empowerment, social forestry initiatives, awareness campaigns, and improvements to cyclone shelters and medical facilities to mitigate disaster losses and enhance resilience.

KII-2: Deputy Director of Red Crescent (Sathkhira Sadar)

ASM Akther, aged 55, serves as the Deputy Director of the Red Crescent in Sathkhira Sadar. He notes that floods, cyclones, river erosion, salinity and storm surges disasters occur there in every year. As a consequence, their houses, infrastructures e.g., roads, culverts and bridges, and educational institutions are destroyed, increases unemployment, death of cattle like cows and goats, agricultural crops and land is damaged, and the fisheries industry is greatly damaged.

Agricultural land become flooded, and business is closed and the people who are the day laborers become fully unemployed. On the other hand, the marginal people who depends on mangrove forest, they do not collect the resources from the mangrove forest due to natural disaster. During the disaster, children, pregnant women, adolescent girl and women, disabled and elderly people are more vulnerable group. Children in this period suffer from various infectious diseases, food shortages and child mortality increase. Disasters have negative impacts on our regular activities. Due to school closures, the guardian cannot send the children to school. Due to the closure during this time, women and house girls do not get any treatment for their feminine issues and elderly people with disabilities do not have access to safe water, sanitation, hygiene facilities and toilet facilities. Cyclone Center is almost two or three kilometers far away from one to another. The environment inside the cyclone center is satisfactory. The marginal farmers shift from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal farmers shift from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal people (Bawali, Mawali, Riders, chunnery, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their profession are highly risk but also climate change induced natural disasters. Now-a-days, the availability of mangrove resources product is decreasing. As most of the people near the Sundarbans area depend on mangrove forest, their economic condition, particularly, honey collectors, Riders, forest fisheries, crab collectors and the Golpata collectors and are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they have to change their livelihood opportunities. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

Cyclone Center, Afforestation, CPP and Ministry of Relief and Rehabilitation has taken adequate measures to reduce the damage of cyclonic disasters. Basically, the south west coastal people use indigenous technology in field exercises for early warning system of disaster management. Akther states that we make everyone aware in advance with early warning system and information is given through television, miking, interpersonal communications and also facebook. Their intimate relations come closer or door to door and try to recover their damaged properties with the help of government, NGOs and stakeholders aided and the individual's own efforts. The amount of damage is so intense and severe that they have to look others and it takes them more than a year to recover.

It appears that they can't overcome this loss and damage and another disaster warns to comes again. The current government has taken many initiatives including raising awareness among all by providing training, afforestation and the Ministry of Relief and Rehabilitation Department is increasing relief activities and working on how to do them early rehabilitate. While the disaster is over, they have to look fast aid to do their rescue. The capacity has to be increased so that the socio-economic, health and environmental vulnerability may decrease, the afforestation has to be increased as well as the need to build dams.

KII-3: Project Implementation Officer (PIO) (Shyamnagar, Satkhira)

Md. Shahidul Islam, aged 45 years, worked as Project Implementation Officer (PIO) in Shyamnagar of Satkhira district. He expresses that there have been floods, cyclones, tidal surges, salinity and river bank erosion etc. These disasters happen almost every year at a certain time. When cyclones occur, tidal surge normally happens, salt water enters into the area and fresh water becomes scarce. These calamities disrupt the local economy, particularly affecting fishing, agriculture, infrastructure, and employment rates. Agricultural lands and standing crops are flooded and destroyed, small and medium entrepreneur become closed and the day laborers are fully unemployed due to cyclonic disasters. On the other hand, the marginal people who depends on mangrove forest, they do not collect the resources from the mangrove forest due to natural disasters. The lack of proper sanitation facilities during these times exacerbates health risks including fever, dysentery, malaria, cold, cough, etc., with outbreaks of various diseases including skin infections and waterborne illnesses. Due to the scarcity of pure drinking water, various waterborne diseases are common to all. The environments of cyclone centers are fairly good. 2800 volunteers of CPP, 1400 women and 1400 men are engaged to reduce the disaster risks. When these disasters strike, women, children, disabled, pregnant women are taken to the cyclone center with the help of these Cyclone Preparedness Program (CPP) volunteers. Pregnant women, children and people with disabilities are the most adversely affected by disaster. Children's schools are closed during this period. As a result, school drop-out child rate increases, food shortages occur, children suffer from malnutrition and various diseases such as fever, dysentery, malaria, jaundice, skin diseases etc. At this time, old people are able to move around with the help of others, but they do not have access to toilet facilities as they cannot go to toilet due to rain storms all around. The marginal farmers shift from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal people (Bawali, Mawali, Riders, chunnery, wood cutters, nypa

or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their profession are highly risk but also climate change induced natural disasters. Now a days, the availability of the most important product is decreasing. As most of the south west people live near at the Sundarbans area, they depend on mangrove forest for their economic condition, particularly, honey collectors, Riders, forest fisheries, crab collectors and the Golpata collectors and are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they have to change their livelihood opportunities. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

CPP was formed in 1972 through Bangabandhu's Disaster Risk Reduction Policy in Lakshipur district and at that time 40 affected families sheltered through the shelter scheme. The present government is extending the construction of multi-purpose cyclone center, Mujib kella, Beri badh on the river side, Rescue boat for disaster risk reductions policies and implementation in those regions. However, there is a pressing need for more afforestation and increased awareness and collaboration with the government to reduce damages and losses effectively.

KII-4: UNO (Shyamnagar, Satkhira)

Md. Akthar Hossen, aged 38, serving as a UNO in Shyamnagar, highlights the recurring natural disasters including floods, cyclones, tidal surges, river bank erosion, and salinity, which inflict economic and social damage on the community annually. These calamities lead to destruction of houses and infrastructure, loss of livestock, damage to agricultural crops, and disruption of educational institutions, resulting in increased unemployment rates.

On the other hand, the marginalized communities reliant on mangrove forest and river resources are unable to access these due to the disasters. During disasters among the most vulnerable people, children, pregnant women, disabled and elderly people are particularly at risk. During cyclonic disasters, children suffer from various infectious diseases. They have lack of food and they cannot go to school for economic instability due to disasters. Women, pregnant women and adolescent girls face challenges accessing maternity health facilities during disasters, while persons with disabilities and older individuals have lack of adequate toilet facilities, transportation, water supply, and sanitation and hygiene facilities during disaster. There exists cyclone center one to two kilometers far away from one another. Everyone is quite satisfied with the environment inside the

center. As most of the people near the Sundarbans area depend on mangrove forest, their economic condition, particularly, honey collectors, Riders, forest fisheries, crab collectors and the Golpata collectors and are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they have to change their livelihood opportunities. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

Akthar expresses that the Cyclone Preparedness Program has been instrumental in disaster risk reduction, providing shelter and emergency relief to affected communities. Besides, Mujib Kella often shelters their livestock Through early warning system we alert everyone and bring them to the cyclone center as well as providing emergency relief including dry food, water, clothes, medicine, rice, oil and ready-made food to everyone at door steps. If the programs taken by the current government are adequate, it is possible to make them more advancement. Sufficient number of dams should be constructed and old ones should be renovated, plantation of trees should be done, cyclone centers should be constructed and rivers should be dredged so that the disaster risk reductions is effectively possible.

KII-5: Assistant Engineer (Shyamnagar, Satkhira)

Md. Sajjadul Haque, aged 32, an Assistant Engineer in Shyamnagar, acknowledges the recurring natural disasters such as cyclones, floods, river erosion, and salinity, which prompt the closure of schools and colleges as they are utilized as cyclone centers. Due to the cyclonic disasters, crops are destroyed, livestock including cows, goats and poultry are died, fisheries are damaged. Fishermen cannot go to the river and sea to catch fish, so they spend their days in an economic hardship, sometimes even go to starving without food.

Pregnant women, children, aged people and physically disabled are the worst affected people due to the cyclonic disasters. On the other hand, the marginal people who depends on mangrove forest or rivers, they do not collect the resources from the mangrove forest and rivers due to natural disasters. School closures negatively impact children's education, while initiatives like cyclone centers, social forestry programs, and creation of Cyclone Preparedness Programs (CPPs) aim to mitigate disaster risks through awareness campaigns and evacuation efforts. CPP organizes a meeting almost every month, tries to make everyone aware, and conducts early warning and evacuation system through miking, campaigning, and bringing everyone from most vulnerable area to the cyclone center. The marginal farmers shift from crop production to shrimp farming,

crab collecting and fattening, and oyster collecting etc. The marginal people (Bawali, Mawali, chunnery, Riders, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their highly risk profession but also climate change induced natural disasters. The availability of the most important products is decreasing now a days.

The present government has been set a historic example by following the policy of disaster risk reduction of Bangabandhu government. About 1,020 crores BDT have been allocated there for the management of Beribadh and rivers. 15 cores BDT have been allocated for rehabilitation program of those who are homeless due to disasters. It needs 10 to 12 years to recover the damaged properties caused by disasters. However, more efforts are needed to implement these policies of effectively. Effective training should be provided to mass people, constructing sustainable embankments should be done so that how the Beri badh can protect them and ensure that not damaging of infrastructures during calamities. Sustainable embankments need to be constructed to minimize the losses and damages. Everyone has to work for C C block. The height of Beri badh should be increased so that sea water cannot enter towards the coast through tidal surge. The local people cut the barrage and let the salt water into the coast where they cultivate shrimp which is very profitable to stop the barrage. As well as making durable large beri badh. Although the work of beri badh has started here. The Forest Department has provided 2,500 mangrove forests with the help of Water Development Board for planting along the river banks and in steep and inaccessible areas to minimize damage.

KII-6: Forest Officer (Shyamnagar, Satkhira)

Ziaur Rahman, a forest officer stationed in the Burigoalini forest range of Shyamnagar in Satkhira district, emphasizes the recurrent occurrence of various natural disasters in the area, including cyclones, storm surges, river erosion, and salinity. These calamities inflict the significant economic, social, and cultural hardships on the coastal population, with severe economic repercussions. Many individuals in the region rely on cutting wood as their livelihood, and the devastation of trees during disasters plunges them into precarious financial situations. Local authorities organize community meetings to encourage natural conservation by protecting cutting trees and explain the benefits of trees. Additionally, alternative livelihood options such as poultry farming, nursery management, and livestock rearing are promoted. However, these efforts often

fall short as poultry and livestock also suffer losses during disasters, exacerbating the economic sufferings.

Early warning systems or preparedness programs are disseminated through miking and interpersonal communication systems, and evacuation measures are implemented to ensure the safety of residents. Relief distribution of essential items such as food, rice, pulses, oil, medicines, and water purification tablets should be provided during disasters and post disasters. Recovery from the damage properties incurred during disasters is a prolonged process, requiring collective assistance and resilience.

Bangabandhu's visionary policies and programs for disaster risk reduction started the foundation of contemporary disaster management efforts in Bangladesh. The current government prioritizes the various training programs aimed at raising awareness and enhancing preparedness for disasters, emphasizing immediate response, skill development, and health awareness. However, the current disaster management projects are inadequate for meeting the demands of coastal regions. There is a need for additional initiatives, including the construction and repair of river embankments and reconstructed of cyclone centers, ensuring congenial environment within the cyclone shelters, especially for vulnerable groups like adolescent girls, young adult women, pregnant and lactating women. Furthermore, afforestation efforts should be intensified, and measures such as securing house roofs with ropes should be implemented. Collective effort is essential to strengthen the river embankments, raise awareness, and prepare communities in advance to mitigate disaster risks effectively.

KII-7: Officer in-charge Burigoalini Nou (Naval) Thana (Shyamnagar, Sathkira)

Md. Nazmul Haque, aged 38, serving as Officer in-charge at Burigoalini Nou (Naval) Thana of Shyamnagar upazila in Sathkira district, highlights the annual occurrence of floods, tidal waves, river erosion, and salinity in the area. Every year 15 to 20 villages are inundated by the coastal floods and cyclones. Due to cyclonic disasters resulting in broken of West Durga Kathi Beri badah and heavy or shivering rains, there are 15 to 20 villages become flooded. These disasters result in the closure of schools and colleges, increased mental stress among children, and rising unemployment rates. Infrastructure and houses are destroyed, livestock perish, agricultural crops are ruined, and shrimp farming is interrupted due to salinity. Fish farming in *sadu pani* (sweet water) cannot be grown due to salinity, shrimp gherms are drowned, resulting in a loss of about 2-3 cores of BDT. On the other hand, Marginalized communities reliant on mangrove forests and rivers

struggle to access resources during disasters, leading to health issues such as diarrhea, dysentery, and skin diseases. Women face irregular periods and uterine problems, while food and water shortages become prominent. There is school-cum cyclone center which is 2 or 3 kilometers far away from one another. Children, pregnant women, adolescent girls, aged and physically disable people are the most affected during disasters. The school has been reopened after 20 to 25 days, and after school opening poor parents can no longer send children to school due to financial hardship. The marginal farmers shift from crop production to shrimp farming, crab collecting and fattening, and oyster collecting etc. The marginal people (Bawali, Mawali, chunnery, wood cutters, riders, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their highly risk professions but also climate change induced natural disasters. The availability of mangrove forest resources product is decreasing now a days. As most of the people near the Sundarbans area depends on mangrove forest, particularly, honey collectors, riders, fishermen, crab collectors and the Golpata collectors, they go to economic hardship. There are recently decreasing the adaptation on forest resource use system and increase the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they are forcibly to change their livelihood opportunities in the quest of alternative livelihoods. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

The construction of CPP, Relief Rehabilitation Ministry and social forestry currently play an important role in disaster risk reduction. Awareness building has been working in this area for a long time since the post-disaster period, making everyone aware by organizing some awareness yard meetings. CPP volunteers alerted the mass people during disasters through miking and brought to the cyclone center immediate before of the disaster as early warning system. CPP volunteers directly assist everyone by working this early warning system. At present, the Prime Minister is doing her diligence to fulfill her father's dream and has urged everyone to come forward so that we can minimize the damage a little. Current government allocated a budget of Tk 1020 crores for reducing the risks of numerous calamities few days back. TCB, VGD, VGF and TR cards have been provided to the fishermen so that they become self-reliant. All of these on-going social safety net programs are being supervised by time watchers. If the government properly monitor and distribute with adequate funds for the sufferings people, the people of southern coastal region will be developed.

KII-8: Teacher & CPP Leader (Shyamnagar, Satkhira)

Abdul Samad, serving as a CPP Leader and Teacher in Shyamnagar, Satkhira, describes the plight of the people living in the south-western coastal belt, who frequently experiences of floods, cyclones, tidal waves, river erosion and salinity. These calamities causing significant economic, social, psychological and cultural hardships. These calamities result in the destruction of houses and educational institutions, loss of livestock, damage to agricultural land, increased unemployment, rising crime rates, and heightened of mental stress. On the other hand, the marginal people who depends on catching fish, collect snail or crab in the rivers and extract resources like honey collection, golpata collection, medicinal plants etc. from mangrove forest, they do not collect the resources from the river and mangrove forests due to natural disasters. There exists a cyclone center one to two kilometers far away from one another. The inside environment of cyclone center is quite moderate. Pregnant and lactating women, children, physically challenged and aged people are worst affected and during this time children are affected by various infectious diseases. Children also faces lack food security. Child mortality rate become increases. Schools and colleges are closed due to not possible to send children to school. Additionally, due to long times of school closures and usage of cyclone center, and poverty or economic uncertainty, the poor cannot afford to buy new books, paper and pens and do not able to send their children to school and therefore children never go to school. Aged and disabled people do not have access to bathroom facilities, adequate water, sanitation and hygiene facilities, transportation barriers. They cannot move from one place to another alone. Women and girls do not feel safe. Feminine issues and their health care services are not available. Due to unavailability of food and nutrition, women need to do enough household work at home. The marginal farmers shift from crop production to shrimp farming, crab collecting and fattening, and oyster collecting etc. The marginal people (Bawali, Mawali, chunnery, wood cutters, riders, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they are forcibly migrated or internally displaced not only for their risky professions but also occurring the climate change induced natural disasters. The availability of mangrove resource products is decreasing now a days. As most of the people near the Sundarbans area are dependent on mangrove forest, their economic condition particularly, honey collectors, riders, forest fisheries, crab collectors and the golpata collectors are recently decreasing the adaptation on forest resource use system and increased their vulnerabilities among the marginal people in the Sundarbans area due to climate change and alternative livelihood

sources. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

Now a days, cyclone center plays a vital role reducing the damages of calamities because of the sufficient creation of cyclone shelter opportunity. As a result of preparedness and early warning system of disaster risk reduction, everyone is aware about natural calamities nowadays and the amount of damage is less occurred compared to previous years except the fishermen and the very poor families. Nowadays, the government is trying to change the fate of people in coastal areas by implementing disaster risk reduction policies. Awareness is given through early warning systems such as Facebook, through interpersonal communication, and radio and television news. Public and private assistance should be provided during the post-disaster period. but recovery efforts from their damaged properties often take more than a year with the capacity of utilizing their own resources. The emergency relief such dry food, water, clothes and ready food is provided so that they can easily grasp and rehabilitate. Everyone needs to be more awareness program and plantation of more trees as well as publicity of the news of disaster should be faster and safer so that the people can reduce the loss and damages.

KII-9: Assistant Livestock Resources Officer, (Shyamnagar, Satkhira)

Alhaj Md. Mahabubul Rashid, aged 53, serves as an Assistant Livestock Resources Officer of Shyamnagar upazila in Satkhira district. He notes that the region faces the recurring challenges of cyclonic disasters such as floods, riverbank erosion, salinity, and tidal surges each year due to dam breakdowns. Cyclonic disasters and heavy rainfall exacerbate these issues, causing significant economic and social hardships for the local people. Marginal people who depend on mangrove forest, they do not collect the resources from the mangrove forest due to natural disasters. Educational institutions are shut down, homes are destroyed, and livestock suffer, with cattle feed wasted and animals are died.

In response, various initiatives are undertaken to aid the affected communities. The black Bengal goat project offers training in rearing, reproduction, and conservation. CGA training, medicine, and financial grants are given so that the community can start all over again. Aftermath of disaster, a mobile veterinary clinic, provided by the government, is tended to injured livestock.

At least seven projects are running under its purview, the veterinary doctor is available alongside addressing different animal health hazards, including infectious diseases like cholera, diarrhea, skin diseases and nutritional deficiencies such as lack of magnesium, zinc and iodine leading to

worms. Furthermore, veterinary public health projects focus on preventing animal-to-human disease transmission, tackling diseases like tuberculosis, rabies, brucellosis, and anthrax.

Disaster Risk Reduction Policy programs, including CPP, Cyclone Center, Social Forestry, and Rainwater Harvesting Tanks, aim to mitigate the impact of disasters. The Cyclone Preparedness Program effectively disseminates warnings and guides communities to safety through miking and aided by volunteers

Currently, the *Asharyan* project is provided for temporary shelter to affected families. Later on, various relief efforts are facilitated in place to assist everyone and especially in the cattle sector, with provisions for supplies, monitoring, vaccinations, and medical care is provided free of charge. Training programs for poultry, cattle, and goats are offered at government-regulated fees, sometimes even free of charge, to aid in recovery efforts. Currently, the *Asharyan* project is provided for temporary shelter to affected families. Later on, various relief efforts are facilitated in place to assist everyone and especially in the cattle sector, with provisions for supplies we provide more supplies and monitoring. For later, vaccinations are provided to injured cattle, cattle feed is provided, medical care is provided free of charge, training is provided to poultry, cattle, and goats at a government-fixed fee, and sometimes these are provided free of charge for recovery damage.

This is imperatives for some proposed solutions include the dams should be constructed and repaired or maintenance the old dams, afforestation should be planted, the Sundarbans should be opened up and preserved, grass cultivation extension projects should be increased, cow fattening projects should be implemented, medicines and vaccines should be provided, training should be provided, these may reduce the number of damages or to mitigate future damages. Sheikh Mujib brought breeding development project of animals in Bangladesh through Queen Elizabeth. PPR diagnosis project in horses and goats should be started, artificial breeding project should be further improved, livestock breeding project should be developed, and extension project should be further advocated, improved, and expanded.

KII-10: Upazila Social Service Officer (USSO) (Shyamnagar, Satkhira)

Hiran Sankar Chatterjee, aged 35, serves as a Upazila Social Service Officer in Shyamnagar of Satkhira district, where annual occurrences of cyclones, floods, riverbank erosion, tidal surges, and salinity pose significant challenges. These natural disasters result in the economic vulnerability of communities, with widespread destruction of homes and crops. When the water surges were

heightened during the Aila, the houses, cows, goats and poultry everything had been washed away in water.

On the other hand, the marginal people who depends on catching fish, collect snail or crab on the rivers and extract resources like honey collection, golpata collection, medicinal plants etc. from mangrove forest, they do not collect the resources from the river and mangrove forest due to natural disasters. Health risks such as diarrhea and dysentery are common due to saltwater intrusion. While cyclone centers serve as crucial shelters, they lack adequate facilities for vulnerable groups such as pregnant women, the elderly, and people with disabilities. Cyclone center environment is more or less good in structurally but are comparatively less well-managed and further needs to be improved. Pregnant and old people need lift to take them to cyclone center but they are not available due to which many times they don't want to come to cyclone center for uncertainty and severe risk.

Children, pregnant women, elderly and disable people are among the most vulnerable during disasters. Elderly people are unable to move during this time. They have food shortages and do not have access to separate toilet facilities. Schools and colleges are closed during this period. As a consequence, dropout of school rate increases, food shortages occur, and people also suffer malnutrition. The marginal people (Bawali, Mawali, Riders, chunnery, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their profession are highly risk but also climate change induced natural disasters. As most of the people near the Sundarbans area depend on mangrove forest, their economic condition, particularly, honey collectors, riders, forest fisheries, crab collectors and the Golpata collectors and are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area due to climate change, they have to change their livelihood opportunities. However, the marginal people try to adapt with their indigenous knowledge regarding to climate change adaptation.

The Cyclone Preparedness Program (CPP) plays a pivotal role in disaster risk reduction, alerting coastal communities through early warning systems and facilitating emergency relief efforts. The community can recover their damaged property very quickly and it takes 6 to 7 months to recover. The Directorate of Social Services provides essential assistance, including free medicines, blood donations during cesarean deliveries, and various social safety net schemes such as widow, old

age, employment, disability, and freedom fighters' allowances. There are *Matri Sadan* (maternity health clinic) in which training is provided, 100 taka honorarium is given for participants on monthly basis, interest free loans are assisted to women and disabled persons, and are provided monthly allowance. Presently Widow Allowance, Old Age Allowance, Employment Allowance, Disability Allowance, Freedom Fighters Allowance has been provided actively for whom to concern to all. The social safety net schemes have been undertaken and extended by the present government that should draw up adequate and abundant. Besides, many more cyclone centers should be constructed and maintained, and more tree plantations should be increased to enhance disaster resilience. The government actively supports social safety net schemes and endeavors to bolster them further to ensure sufficient coverage for those in need.

KII-11: CPP volunteer (Shyamnagar, Satkhira)

Tapas Chandra Dey, aged 55, dedicated volunteer for Cyclone Preparedness Program (CPP), is deeply familiar with the recurring natural calamities plaguing his region. Each year, flood, cyclone and salinity are among the natural disasters that strike and resulting in economic, social and cultural hardships on the local people. Cyclonic disasters exacerbate the collapse of infrastructure, cows and goats die, damages of agricultural crops, collapse of educational institutions and soars of unemployment rate. Children, pregnant women, disabilities and elderly are the most affected during disaster. On the other hand, the marginal people who depends on catching fish, collect snail or crab on the rivers and extract resources like honey collection, golpata collection, medicinal plants etc. from mangrove forest, they do not collect the resources from the river and mangrove forest due to natural disasters. The marginal farmers switch from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal people (Riders, Bawali, Mawali, chunnery, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their risky profession but also climate change induced natural disasters.

Despite these challenges, initiatives like Cyclone Centers, afforestation drives, and cyclone preparedness program (CPP) have emerged as beacons of resilience. The nation's priority is needed to build Bangladesh as a disaster resilient nation. Early warning system and cyclone preparedness program is a new paradigm in disaster management nowadays. Cyclone centers serve as vital shelters during crises through sheltering the people in cyclone centers. Aftermath of emergency or disaster period, adequate amount of relief, medicine, water purification tablets, ready

food, bottled water, rice, oil, pulses, cash money are needed. Additionally, empowering women and marginalized communities with resources like cash assistance, sewing machines and livestock including cows, goats and poultry can facilitate their recovery and enhance their livelihoods so that they can lead their normal and better life. During and aftermath of disasters, when everyone tries hard to cope, the community migrate to others very shortly. Furthermore, swift measures such as ensuring safe drinking water, sanitation facilities, and afforestation efforts are imperative for mitigating disaster risks and fostering resilience. Despite the challenges, the collective efforts of individuals like Tapas Chandra Dey and the implementation of strategic programs offer hope for building a disaster-resilient nation.

KII-12: CPP Leader (Shyamnagar, Satkhira)

Hosne Ara Khatun, aged 27, is a dedicated leader in the Cyclone Preparedness Program (CPP) at Gabura village in Shyamnagar upazila in Satkhira district. Every year cyclone, tidal surges, storms, floods and river bank erosion are occurred. The recurring breach of dams inundates numerous households each year, leading to widespread devastation of houses and infrastructure, closure of educational institutions, and a surge in theft and robbery, unemployment, and acute food problems. Despite the availability of fish in the rivers, fishing is hampered due to the lack of fishing nets and the spread of diseases.

Marginal communities who rely on catching fish, collect snail or crab on the rivers and extract resources from their traditional livelihoods like honey collection, golpata collection, medicinal plants etc. from mangrove forest, they do not collect the resources from the river and mangrove forest due to natural disasters. Therefore, these traditional livelihood leads to health risks like itching, skin diseases, and diarrhea. The structural condition of environment is good where there is a cyclone center.

The elderly, children, pregnant women and the disabled are particularly susceptible or vulnerable during disasters. Schools and colleges are closed for about one or two months. Aged people often die and struggle to move for transportations barriers, lack of toilet facilities, water, sanitation and hygiene, and inadequate of medical health care services. Pregnant women face numerous challenges. Many pregnant women have to be taken to Shyamnagar for treatment. Women face uterus problems, changing from periodical cycle, and the fetus is destroyed due to drinking of excessive salt water.

Infants or children are facing problems of nutritious food like eating of enough milk, eggs, bananas, and vegetables during the disaster. As a result, the mother and child suffer from malnutrition. Marginal people (Riders, Bawali, Mawali, chunnery, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their highly risk profession but also cyclonic disasters. The availability of mangrove resource products is decreasing now a days. As most of the people near the Sundarbans area depend on mangrove forest, they face economic hardship. Particularly, honey collectors, riders, forest fisheries, crab collectors and the golpata collectors are recently decreasing the adaptation on forest resource use system and increased the vulnerabilities among the marginal people in the Sundarbans area, they have to change their livelihood strategies due to cyclonic disasters. However, the marginal people try to adapt with their indigenous knowledge.

CPP exists there for the disaster risk reductions. The hand mike is provided at the local level to raise awareness and to reach news of the community people during disasters, Mask, shoes and candle lights are provided them by the Ministry of Disaster Management and Rehabilitation. All of the CPP volunteers aware of the mass people through miking. Pregnant women and children have to take shelters. Much training should be arranged by the government so that everyone will be aware and how to deal with disasters and the damages can be reduced. During this period the essentials such as dry food, documents, gold, jewelry should be stored and kept in safer place. Government offers financial assistance and introduce social support programs such as widow allowance, old age allowance, VGD, VGF, disability allowance, food in exchange for work for the poor, to mitigate the impact on destitute and marginalized groups of the region.

To enhance resilience, intensified efforts are required, including the establishment of more cyclone centers, afforestation projects, and assistance with relocation during emergencies. More cyclone centers are needed because 3 are destroyed out of what is there. Presently there are 7 cyclone centers in Gabura union. Collaborative and proactive measures are essential to minimize the adverse effects of disasters and safeguard vulnerable communities.

KII-13: Upazila Fisheries Officer (Ashashuni, Satkhira)

Tusar Majumdar, aged 40 years, engaged in Senior Upazila Fisheries Officer of Ashashuni Upazila in Satkhira Sadar. The southern coastal regions have natural calamities in every year, some of which are floods, cyclones, river erosion, salinity and tidal surges. Due to these disasters, the infrastructures collapse, cattle die, agricultural land is damaged, agricultural crops are damaged

and unemployment rates rise. The clean water for drinking water is almost scarce. As a result, various diseases are outbroken. Children, pregnant women, disable and old people are affected due to disasters. The death rate of children increases and different types of communicable diseases like diarrhea, dysentery also increases. Children are not sent to schools, because of the financial insecurity, school used as cyclone centers, sometimes it is not possible to buy new books, notebooks, paper, pens etc. The elder people do not get proper toilet facilities, and they have lack of clean water, sanitation and hygiene facilities. Girls and women don't get proper food and nutrition, can't move alone and don't get proper menstrual hygiene management kit. During disaster, the shrimp cages are flooded with water, resulting in heavy losses for the fishmongers. There is school-cum cyclone center are existing there. There are many cyclone centers inside the environment is satisfactory. The CPP volunteer, Cyclone Center, afforestation and ministry of relief and rehabilitations is currently a historical example of Bangabandhu's disaster risk reduction policy and his daughter PM Sheikh Hasina are working to considering the realization of his dreams by extending the Cyclone Preparedness Program, cyclone shelter and his privileged activities. CPP volunteer has a very good early warning system which makes everyone aware and come to the cyclone center that results in less damage and sometimes there is no damage at all. Everyone is made aware by miking locally. After the cyclone, various arrangements are made by government and private sectors. They are trying to recover them as best they can, it takes more than a year to recover them by providing the dry food, water, puffed rice or *chira*, water bottle, clothes, medicines, rice, oil, vegetables, maize and ready-made food as relief. The current government has been 100% successful in reducing the damage caused by the disaster and getting the people of the region back to their former lives quickly. The plans that the government has undertook at present are quite enough. Besides, by creating afforestation and production of salt tolerant paddy vegetables to further reduce the damage and losses of disasters, sustainable development may be achieved.

KII-14: Sub-Assistant Agricultural Officer (Ashashuni, Satkhira)

Mujibur Rahman, aged 55 years, works as a Sub-Assistant Agricultural Officer in Ashashuni Upazila of Satkhira district. The frequent natural disasters like floods, cyclones, storm surges, river bank erosion, salinity, etc. take a devastating form and are often seen almost. Houses and infrastructure are damaged, agricultural land is damaged, mental health stress and unemployment rate become increases due to cyclonic disasters. The cyclone center is almost one kilometer far

away from one another and its structural condition is good but during disasters the management system is not good at all. Children, adolescent girls and women, pregnant women, elderly and disabled people are more affected by disasters. It is estimated that about 15 to 20 crores BDT loses and damages every year by destroying agricultural and standing crops, and losses of fisheries that occur in this area during disasters. The people of these areas are engaged in agro-crop and fish business oriented. There is observed in scarce of safe drinking water during the disasters period which causes various infectious diseases such as dysentery, jaundice, fever, cold and cough.

Bangabandhu Sheikh Mujibur Rahman played a key role for disaster risk reductions by initiating the cyclone preparedness centre (CPP), CPP volunteers, Ministry of disaster management and relief distribution, afforestation and radio programming centre in coastal areas. These are also historic and milestone examples for the disastrous vulnerable people. The initiatives for disaster risk reductions are currently milestones through the activities of honorable Prime Minister Sheikh Hasina and by implementing them very nicely and smoothly. As a result, the people of the coastal areas have benefited a lot. Social Forestry, CPP, Ministry of Relief and Rehabilitation and Cyclone Centers are working on disaster risk mitigation and rapid rehabilitation by setting up there. We have no Mujib kella here. All types of beri badh here are done through the Water Development Board. Before the disaster, we try to make everyone aware and bring them to the cyclone center through miking. Moreover, media news is disseminated through Facebook. Everyone knows that the news of upcoming disaster comes to everyone's mouth. After the disaster, everyone recovers their damaged property through government and private assistance which takes more than a year to recover. During the emergency response, relief including dry food, water purified tablet, bottles water, clothes, candles, medicine, rice, well vegetables, pulses and also ready-made food is provided through government, NGOs, INGOs and different donor agencies.

The plans taken by current government are not enough. More sustainable plans and directions should be needed. Training should be done. Cyclone centers should be secured. Sluice gates should be made in sufficient quantity. Hospitals with enough doctors are needed at union level for expected mothers. Moreover, tree plantation programs should be done. More cyclone centers should be built and maintain properly so that we can reduce some disaster risks.

KII-15: Secretary of Union Parishad, UDMC Member (Ashashuni, Satkhira)

Khairul Islam, aged 39 and serving as the secretary of Protapnagar union parishad in Ashashuni upazila in Satkhira district, highlights the recurring natural disasters experienced by coastal

communities, including floods, cyclones, riverbank erosion, waterlogging, and tidal surges. These calamities result in widespread destruction of homes, loss of livestock, damage to agricultural lands and crops, increased psychological stress, and rising unemployment rates.

On the other hand, the marginal people who depends on mangrove forest, they do not collect the resources from the mangrove forest due to natural disasters. Aftermath of cyclone *Amphan*, the area was flooded for two years. There exists total six cyclone centers and moderately convenient inside structural condition. The existing cyclone centers here are woefully inadequate. Pregnant women, the elderly, children and physically disabled people are the most affected by disasters. Women and adolescent girls do not get enough menstrual hygiene management kits. They have lack of food and nutrition and have extra work pressure at home for domestic household. The marginal farmers shift from crop production to shrimp farming, crab collection and fattening, and oyster collection etc. The marginal people (Riders, Bawali, Mawali, chunnery, wood cutters, nypa or golpata collectors, and fishermen) of Sundarbans area those who depends on mangrove forest, they also migrated or internally displaced not only for their highly risk profession but also natural disasters. The availability of mangrove resources product is decreasing now a days.

During calamities, the community take shelter in cyclone centre. Adequate amount of relief emergency medicine, ready-made food, water, clothes, candles, etc. is needed to provide during disaster and post-disaster so that they can lead a normal life quickly. Chairman and all ward members including male and female members and other people involved with union parishad related work and as a union disaster council member we warn everyone in advance and give signals through miking and ask everyone to move to safer place. Collaboration between public and private entities is essential for post-disaster recovery, which often takes over a year, many are seen to overcome their losses through their own resources. Medicines, clothes, dry food, water purification tablets are provided as emergencies relief. The Cyclone Preparedness Program (CPP) volunteers play a crucial role in the government's disaster risk reduction initiatives.

Khairul emphasizes that the existing policies of the government should be further improved. Construction and renovation of sustainable *beri badh*, more tree plantations should be done. Everyone should be more aware. Awareness meetings and yard meetings should be organized. Strengthening cyclone centers and enhancing disaster preparedness measures are also crucial for mitigating the impact of future disasters.

KII-16: UDO (Ashashuni, Satkhira)

Mizan Salahuddin is 40 years old and lived in Ashashuni Upazila in Satkhira district. In this area various kinds of like natural disasters floods, cyclones, river bank erosion and salinity happen every year. When these disasters happen, they suffer a lot of economically and socially, their houses are destroyed, their educational institutions are break down and they become mentally depressed. Besides, they fall into health risk. The cyclone center is three or four kilometers far away from one another, the staying environment in the cyclone center is not bad but very few people tend to go to the cyclone center. There is not enough space in the center so the whole family cannot go to the cyclone center together. It is seen that they only leave cows and goats. Pregnant women and disabled persons are the most affected during this period. We basically try to make them aware through miking and bring everyone to the cyclone center. Aftermath of the cyclone, we later recovered everyone and delivered them to their homes and later the local administration gave them rice, pulses, oil and medicines. If one is ill, arrangements are made to take him to the hospital and proper treatment is given. Those who suffer more damages are helped as much as possible with cash, money, and food by public and privately.

Bangabandhu's plans to mitigate the disaster risks that were very ambitious. Then for the region Mujib kella and Mujib badh are used as protectors of life, wealth and property. Bangabandhu's far-reaching plan helps the current Hon'ble Prime Minister's activities disaster risk reduction implementation. The Mujib forts are quite high from the ground, and parallel to the ground of staying cattle those who stay inside in the Mujib fort so that feel safe at that time. After public and private aid, they try to overcome from these loss and damages by their own resources and capacities, often taking more than a year to recover them. Public awareness should be raised to reduce this damage. Training should be done at least twice a year. People should be encouraged to visit cyclone centers. Coastal afforestation should be planted and also the people of the region must work in coordination with the government.

KII-17: Family Welfare Assistant (Protapnagar, Ashashuni, Satkhira)

Mst. Rima Khatun, aged 27 years, worked as Family Welfare Assistant at Protapnagar village in Ashashuni Upazila of Sathkira district. Rima says that the southern coastal belt people face disaster in every year. The disasters that happen are floods, cyclones, tidal waves, river bank erosion and salinity are aggravating for these regions in educational institutions and houses are destroyed, cows, goats die, Agricultural crops and agricultural land are damaged, and unemployment rates

rise and so on. Among the health risks, the southern coastal people are struggling on itching, menstrual irregularities, skin diseases, uterine infections in times of disaster. About 80% of women wear white pangas in petticoats, and sexually transmitted diseases are observed in that time. Disasters that happen negatively or most affected people are children, pregnant women, disabled and old people. We provide the menstrual hygiene kits to adolescent girls. We have also field visitors who provide all types of female medicine needed in every village reproductive woman. At this time, we basically try to supply everyone some common medicine such as gastric, iron tablet, zinc, all aids in the toilet, and chlorhexidine ointment is given to women who have babies so that there is no infection after the baby's umbilical cord is cut. The sufferings of elder and disable people are worst off because they have transportation barriers, lack of adequate shelters, do not have access to toilet facilities, but no access to water, sanitation and hygiene facilities. There is a cyclone center two or three kilometers far away from one another. Cyclone center trial environment is moderate. Bangabandhu's disaster prevention programs are very useful like creating Mujib badh. They are under the Water Development Board and the Water Development Board is building all kinds of dams to prevent water from flowing towards the benefit and cyclone centers where everyone takes shelter during disasters so that damage is reduced. At present, Sheikh Hasina government is building adequate relief, cyclone centers and *beribadh* for the people of the coastal areas from which we are benefiting greatly and they are walking the path shown by Bangabandhu. Miking is done in advance to raise awareness. Many times, calls are made on mobile phones. From 1090 onwards, after the disaster, public and private stakeholders support and save their damaged properties through their own resources and it takes a year to do them. Plantation of trees, construction of Sluicgate, construct *beri badh* (embankment), Adequate number of meetings and yard meetings should be organized for awareness programs. Besides, medical facilities for all should be provided and strengthened.

KII-18: CPP Volunteer (Protapnagar, Ashashuni, Satkhira)

Akhtaruzzaman Gazi, aged 42, lives in Protapnagor union of Ashashuni upazila in Satkhira district, with his family consisting of seven members and a monthly income ranging from 10001 to 15000 taka. He serves as a CPP (Community Preparedness Program) volunteer, tasked with aiding the community during various cyclonic disasters that occur annually, resulting in severe damages. They brought fund collection named chada at every year during disaster. Relief efforts typically

span about a month during the cyclonic disastrous events like Aila. When a natural disaster is forecasted, CPP volunteers mobilize to cyclone shelters, prioritizing tasks such as cleaning and providing primary aid of medicine and saline. At first, they try to provide dry food and pure drinking water. Normally, during the disaster pregnant women, older people and physically disabled people are more vulnerable. That is why, the CPP volunteers' prioritized task is to ensure the safety of pregnant and lactating women, physically disabled people as well as elderly by reaching the cyclone shelters. The necessary materials of them are obtained from CPP volunteers. They give these by collecting money from door to door but the victims do not get these goods on time even if the relief substances come from the government. The CPP volunteers receive gloves and hand mikes from the Union Council, and light and blankets from the Bangladesh Coast Guard. They serve as a crucial link between affected areas and various supporting agencies, coordinating with marine police, fire services, local government, and others.

During disasters, CPP volunteers offer basic medical services, distribute food and water, and organize humanitarian travel and transportation. They utilize verbal and online communication channels to disseminate necessary guidance and information to the community. Providing first aid to the sick and injured is a priority, with tasks ranging from alerts and collecting information to dispatching aid and post-disaster cleanup efforts.

It is imperatives that public awareness campaigns through community meetings. Their role is multifaceted, encompassing both proactive disaster preparedness and reactive assistance during emergencies, ultimately contributing to the safety and resilience of their community in the face of cyclonic disasters.

KII-19: CPP Volunteer (Ashashuni, Satkhira)

Shamsuzzaman, aged 37, lives in Protapnagor union of Ashashuni upazila in Satkhira district. His family member is eight and a monthly family income between 10001 to 15000 BDT. He is a CPP volunteer. In every year, he and his community brace themselves for various disasters such as cyclones, salinity intrusion, tidal surges, and floods. These calamities inflict them on economic, social, and health hardships.

As a CPP volunteer, Shamsuzzaman receives assistance from a variety of organizations and mobilizes aid to assist those affected by disasters. As soon as the trouble is anticipated they do the miking and thoroughly clean the cyclone shelter, as well as ensure the availability of necessary items are provided. Priority is given to the safety of vulnerable groups like the elderly, pregnant

women, and the physically disabled. They distributed the materials at every year by raising the fund collection from door to door and even during Aila. They do not get any kinds of materials from the government even they are not paid. Usually, they get gloves, hand mike, flash light, life jacket from the USAID organizations. When the natural disaster is forecasted, CPP volunteers arrange meeting then and they discuss with mass people as well as they give directions on how to safe and escape from the disasters and cope up with these natural calamities.

Majority of the people are not conscious about their health, and do not get proper and nutritious food during disasters, exacerbating issues like malnutrition, particularly among pregnant women and newborns. The scarcity of menstrual hygiene and sanitation facilities due to saline water further compounds the challenges faced by women, impacting their reproductive health and fertility.

Aftermath of disasters, communities are grappling with property damages, necessitating a lengthy recovery period ranging from 7 to 12 months or even longer. Unfortunately, government support in the form of materials or financial assistance is scant, leaving volunteers like Shamsuzzaman to rely on donations from organizations like USAID for essential supplies such as gloves, flashlights, and life jackets. All if those people are affected by disaster, their damage properties need to recover 7 to 13 month and sometimes more than a year. The government should be implemented policy for motivational awareness campaign as well tree plantation activities.

KII-20: Medicinal plant collector (Protapnagar, Ashashuni, Satkhira)

Abul Bashar, aged 47, resides in the Protapnagor Union of Ashashuni upazila in Satkhira district, where he works as a medicinal plant collector for the past 15 years. His community face bitter experience of natural disasters like cyclones, floods, river erosion, salinity intrusion, resulting in damages of their properties and infrastructures at every year. To cope with the financial strains caused by these disasters, Abul Bashar and the community have to take loans from both Grameen Bank and various NGOs.

Although Abul Bashar sells medicinal plants to the villagers, payment collection poses a challenge, often requiring him to take loans from NGOs to continue his business operations. During the cyclones, the bark of the tree is destroyed, so he cannot prepare medicine for many days. He brings medicinal plants from Khulna and prepared medicine from them.

Due to lack of cyclone center the community utilize the Union Parishad as makeshift cyclone centre during disasters. They face significant risks and challenges on economic, social,

psychological as well as health sectors posing vulnerable during disasters. Due to the limited number of cyclone shelter, majority of these people have to stay at home during disaster resulting faces a lot of damage. The adverse effects of saline water on both human health and the environment exacerbate the community's vulnerabilities, leading to health complications, particularly among pregnant women and children. Especially the pregnant women suffer more at that time of pregnancy. They do not get proper nutritious food and health care facilities. Significant portion of the people in this area are not conscious about sound health and pregnancy related complexity. During disaster, pregnant and lactating women face iron deficiency during reproductive period. Even they can not get menstrual hygiene facilities properly. The remoteness of the Upazila Health Complex further compounds their healthcare challenges, leading to delayed medical assistance and inadequate access to essential medications. Due to excess of drinking saline water their babies are spoiled even they are unable to conceive quickly. During the cyclonic disasters, the community do not get sufficient menstrual hygiene facilities. As a result, women and adolescent girls used napkins instead of sanitary pads resulting in genital wound formation and ovary cancer. Pregnancy related complexity like miscarriage, immature birth and death among the mother and intrauterine growth retardation of children becomes very high due to salinity. The community needs 3 to 6 months sometimes or even more than a year to recover their damaged properties by Government and NGO support as well as capacities from their own resources. The existing policy is not enough for them to reduce the disaster risks. The government should have established the sluice gate, embankment and cyclone shelter. Social protection measures like the Vulnerable Group Feeding (VGF) program provide some relief, but additional support is required to bolster the community's resilience. Implementing public awareness programs can empower the community with knowledge and resources to better prepare for and mitigate the impacts of natural disasters.

KII-21: Health Attendant (Ashashuni, Satkhira)

Alimul Rakib, aged 32, lives in Protapnagor union of Ashashuni upazila in Satkhira district where he works as a health attendant. The community faces recurrent natural disasters in every year like cyclones, floods, salinity intrusion and river bank erosion, resulting in widespread property damages and significant damages of economical, psychological, and health sectors. Pregnant women and physically disable people are one of the most vulnerable during natural disasters.

People don't get clean water. The upazila health complex is a little far away, that is why the community can not adequate health care services as well as they do not get free sufficient medicine. Due to excess of drinking saline water their babies are spoiled even they can be unable to conceive quickly. During the cyclonic disasters, the women, pregnant and lactating women do not get sufficient menstrual hygiene facilities. As a result, they used napkins and clothes instead of sanitary pads resulting in genital wound formation and ovarian cancer. Pregnancy related complexity like miscarriage, immature birth and death among the mother and immature birth and death, and intrauterine growth retardation of children are very high due to salinity, exacerbating child mortality rates and food insecurity. During natural disasters, there are not enough shelter and toilet facilities. They are not aware of health even some people are seen to die without treatment. They eat food three times in a day. Malnutrition is a pressing concern, as the community struggles to procure sufficient food during disasters. Women face additional challenges during menstruation, resorting to unhygienic practices due to the lack of menstrual hygiene kits, increasing their susceptibility to diseases like cancer.

Recovery efforts from property damage often take between 7 to 12 months, sometimes extending beyond a year. Existing policies fall short in addressing the community's needs effectively, necessitating the implementation of comprehensive public awareness campaigns. These campaigns can empower the community with knowledge and resources to mitigate the impact of natural disasters and improve overall resilience.

KII-22: Medicinal plant collector (Ashashuni, Satkhira)

Anisur Rahman, aged 50, resides in the Protapnagor Union of Ashashuni upazila in Satkhira district, where he works as a medicinal plant collector. With 3 to 4 years of experience in collecting medicinal plants, he provides healthcare services to patients, both in his chamber and at their homes. It is higher observed of the patients during the winter. Anisur gathers leaves from various plants and utilizes them by preparing medicines. Most of the medicinal leaf or materials he collects from the Mangrove forests of Sundarbans in Khulna site.

The community faces bitter experience of recurrent natural disasters such as cyclones, floods, river erosion, and salinity intrusion, resulting in damages of their properties and infrastructures at every year. To sustain his livelihood, Anisur like the community have to take loans from the Grameen Bank and NGOs. Villagers buy medicine from him but the community don't pay or often delayed,

leading to financial strains. During cyclones, the destruction of tree barks hampers his ability to prepare medicines for an extended period, exacerbating the challenges he faced during disasters. Due to lack of cyclone centers, the community use union parishad as cyclone center, face negatively economic, social, psychological as well as health vulnerability during disasters. Due to the limited number of cyclone shelter, majority of these people have to stay at home during disaster resulting significant damages and hardship. The Impact of saline water poses health risks on human being and livestock. Children, pregnant and lactating women, aged and physically challenged people suffers a lot during disasters. They do not get proper nutritious food and sufficient health care facilities. Majority of the people in this area are not conscious about their health and pregnancy related complexity. During disasters, pregnant and lactating women face iron deficiency during reproductive period. Even they do not get menstrual hygiene facilities properly. The upazila health complex is a little far away that is why they do not get adequate health care services as well as medication. Due to excess of drinking saline water, their infants and neonatal baby are spoiled even they are unable to conceive. During the cyclonic disasters, they do not get sufficient menstrual hygiene facilities. As a result, they use sanitary napkins instead of sanitary pads resulting in vaginal wound formation, skin diseases and ovarian cancer. Pregnancy related complexity among the mother like miscarriage, immature birth and death, and growth retardation of children are very high due to salinity. The community needs 3 to 6 months sometimes more than a year to recover from their damaged properties by NGO support as well as capacities from their own resources. The existing policy is not enough effective for them to reduce the disaster risks. Anisur highlights the necessity for government intervention by establishing sluice gates and embankments and cyclone shelters to mitigate the impact of disasters. Social protection measures like the Vulnerable Group Feeding (VGF), VGD, food for work, TR, GR, and poor people livelihood program offer some social support, but comprehensive public awareness campaigns are crucial to empowering the community and ensuring their resilience in the face of natural disasters.

KII-23: District Relief and Rehabilitation Officer (DRRO), Khulna

Md Abdul Karim, aged 47 years, worked as District Relief and Rehabilitation Officer (DRRO) in Khulna district. He expresses that the people of the coastal areas have bitter experienced in cyclone, tidal surge, river bank erosion, coastal flood and salinity at every year. These disasters damage the educational institutions, houses and infrastructures, agricultural crops and uprooted trees leading to widespread unemployment of south western coastal people. Pregnant women,

children, physically disabled people and the elderly are more vulnerable during and aftermath of disasters. During disaster, the elderly and disabled do not have access to transportation, toilet facilities, adequate food and water at home and women who are loaded extra domestic household work at home. The coastal people of Khulna region faced food and nutrition deficiencies and lack of access to feminine health issues and health care. Pure drinking water is almost insufficient in Koyra and Dacope due to lack of deep tube well (DTW) or shallow tube well (STW) installments. So, the community need to buy drinking water for 3-4 taka per liter. Usually, they drink rain water and pond sand filter (PSF) water. They use pond water for cooking rice and curry. As a result, they are found to unconscious of their sound health. There exists a cyclone center two or three kilometers away from another, and sometimes the cyclone center exists far away for their density of localities and inhabitants. Everyone is satisfied with the environment in the cyclone center. Among the disaster risk reduction programs that was made by Bangabandhu like the Mujib Kella, Mujib badh, Cyclone Center, community-based forest and the Ministry of relief and Rehabilitation in 1972 which play a vital role right now. Mujib kellas were built mostly in 15-20 feet high and were designed separately for keeping both human and livestock like cows, goats during disasters. Multi-storeyed building like two-three floors have been built so that many people could take shelter here at the same time.

Currently, Prime Minister Sheikh Hasina is trying her level best to realize Bangabandhu's vision regarding disaster risk reduction and early warning system, and is implementing them as well as the existing. He mentions that Mujib kella is needed to be shelter for cattle, goat and human being. Basically, ministry of disaster management and relief distribution department are creating the awareness of people through all the technologies of meteorological forecast then infrared voice recorders (IVRs) and also mobile calls via 1090. They know the information of upcoming disaster preparedness through television, miking, interpersonal communication, and social communication sites like Facebook. Aftermath of the disaster, they try to recover their damaged property through public and private assistance which takes more than a year to recover. Karim shares his opinion that the kind of support is not sufficient to back up of their lives but also needs to some more advancement and they also need to get back their normal livelihood as quickly as possible. He advocates that to reduce the disaster loss and damages, everyone should be aware and cooperate with each other, create afforestation (agro, community forest), organize various awareness meetings and seminars, and increase overall cyclone preparedness programs. Medical facilities

should be provided to all by prioritized. Cyclone centers should be made more secured. Local community people should be empowered and existing government initiatives should be increased if possible.

KII-24: Upazila Social Service Officer (Koyra, Khulna)

Anath Kumar Biswas, works as Upazila Social Service Officer (USSO) in Koyra upazila of Khulna district. He says that cyclone and river erosion is predominantly observed at very alarming and frequent disasters, besides some low-lying areas get flooded during monsoons. Disasters, above all, disrupt the progress and development, disrupting fish production, and crop production or rice cultivation etc. Water borne diseases like diarrhea, cholera etc. is very common during cyclonic disasters. The availability of food and drinking water system is alarming, far away from the area. Cyclone center is fairly good, but not too many people stay there. People in remote areas are most at risk. During and post-disaster period, children face many problems, their education is disrupted, mental development is hindered. Apart from this, due to economic hardship, it becomes quite difficult for many families to afford adequate nutritious food. Elderly have problems in walking, besides there are various diseases related to old age. The incidence of child marriages tends to increase after the disasters. Aftermath of the disaster, the people of this area depend on relief assistance from the government or NGOs. Mujib kella exists in some upazila. Awareness campaigns are facilitated through CPP. Miking, red flag hoisting and workers come to the area to warn about upcoming cyclone. At present, the policy is not sufficient and not sustainable. There is need to adopt sustainable plans with financial support. And these plans should be monitored and executed.

KII-25: Health Assistant (Koyra, Khulna)

Najma Khatun, aged 29 years, works as Health Assistant of Koyra upazila in Khulna district. She says that people in southern coastal areas often face multifaceted challenges of natural disasters e.g., cyclones, river erosion, floods. As a result of the disasters, various social and cultural activities are halted. Diarrhea, dysentery, skin diseases, fever and other water borne problems are noticed. The infrastructure of the cyclone center in this area is fairly good. All of the coastal people are at risk if the magnitude of the disaster is high. However, the impact of disasters on children is highly adverse, various diseases are seen, and education is also hampered. Elderly and physically disable people mainly have mobility problems. During disasters, women and teenage girls have to face

problems in feminine issues, toilet and shower, as there is no separate system. They also face such problems in cyclone centers severely. Bangabandhu institutionalized various disaster measures, which resulted in reducing the losses and damages of coastal population. Pre-disaster miking, hoisting red flags and interpersonal communication and warning are used to move into a safer place in advance. Disaster risk reduction has the support of people at the local level who also work to deal with disasters.

KII-26: CPP Unit Leader (Koyra, Khulna)

Md. Matiur Rahman, aged 34 years old, works as CPP Unit Leader of Koyra Upazila in Khulna district. This coastal area is prone to tidal waves and cyclones. Crops, plants, and houses are destroyed. As a result, their socio-economic condition deteriorates. There is various water borne diseases including dysentery, diarrhea. Cyclone center is fairly good. Women, pregnant and lactating women, elderly and physically disable are the most affected. Children's eating and learning are disrupted. Lack of manpower makes it difficult to transport the disable to the cyclone center. Women face many health risks, especially during pregnancy. CPP, MoDMR, and UDMC formed under the initiative of Bangabandhu, is doing various kinds of work to deal with disasters. Various preventive and remedial measures have been taken by present government. The CPP team members are providing relief and financial support to destitute people and disaster affected people. Various initiatives have been taken to sensitize people about what to do during calamities. There is an early warning system with miking. Many have policies which are sufficient, but people need to be more aware. There must be a paid team to monitor all of this.

KII-27: Ward Disaster Council (WDMC Member) (Koyra, Khulna)

Parimal Mandal involves as ward disaster council member (WDMC) of Koyra Upazila in Khulna district. He opines that the southern coastal people are affected by storms like *sidr*, *Aila*, *Amphan*, *Bulbul* and river erosion. As a result of cyclonic disasters, people's homes have been destroyed. In addition, roads are broken and communication is cut off. Cultural rituals cannot be performed because it takes a long time to recover from economic losses aftermath of a disaster. Crops are destroyed, sources of income including household furniture are also damaged. Necessary medicines are not available. Due to the disasters, there is no electricity and network problems, communication with the outside is cut off. Bangabandhu adopted CPP, MoDMR, VDMC, WDMC etc. There is a relation regarding disaster risk reduce activities between Bangabandhu's

government and present government. However, the present government take many initiatives such as increasing of community awareness, afforestation initiatives, awareness meetings, seminars, and enhanced cyclone preparedness programs, constructed cyclone centers, culverts, polders, embankments and sluiceways etc.

KII-28: Upazila Deputy Team Leader (CPP) (Koyra, Khulna)

Md. Masum Billah, aged 54, works as upazila deputy team leader of CPP of Koyra upazila in Khulna district. Storms and tidal surges occur in these areas, and when there remains a signal, the high tide of river flows or rises. Along with that, the area around the river is flooded. People goes to socio-economic, psychological and health hardship for being adversely affected of river erosion. The community lost their homes. Besides, many people catch fish in the river and depend on it for their livelihood. People's livelihoods are damaged aftermath of disasters. The fish in the enclosure die by mixing with the polluted water outside. In addition, the roads are destroyed, houses were devastated. Disasters also have adverse effects on health. Water-borne diseases, children's pneumonia and skin diseases are seen. Cyclone center is in good condition, these are maintained under the supervision of the school. But some cyclone center is needed. And the old ones are breaking down, need to be repaired. The elderly and children are the most affected due to children's malnutrition and damage of children's education. Elderly people have trouble walking and going to the toilet. Physically challenged people also have same difficulties. Adolescent girls, young adult women, pregnant and breast-feeding women have facing trouble maintaining the privacy and feminine issues when they have to go to cyclone centers during disasters. Bangabandhu undertook various projects, CPP being one of them. Disaster preparedness, forecasting, rehabilitation systems and construction of shelters for coastal people. Miking and hoisting of flags are provided as an early warning system. Union Parishad works at community level and there exists community participation. Mujib's fort is not existed there, it was built only on a high ground, and was intended to be a shelter in times of calamity. Ward disaster council member (WDCM) meets at every month and discussion of disaster risk management is taught there. Besides, various NGOs provide training. Post-disaster damages are generally tried according to their capacity and the government provides relief to the extent of the damage. The current government is working more by taking various projects initiatives. They are working on the ideals of Bangabandhu. The current scheme is adequate, but monitoring is needed.

KII-29: CPP volunteer (Uttar Bedkashi, Koyra, Khulna)

Akash, aged 23, an anonymous resident of Uttar Bedkashi in Koyra, is a student and cyclone preparedness program (CPP) volunteer. Natural calamities threatened the area every year. Despite his efforts, Akash does not receive any support or assistance or grants from the government, nor NGOs. He relies on his family for financial support while engaging in CPP activities.

As a CPP volunteer, Akash plays a pivotal role in alerting the community before striking the disaster through miking and facilitating by doing whatever is necessary for their evacuation, and send the community people to cyclone centers or nearby shelters. They try to help people by providing the essential food items like biscuits, drinking water, muri, chira, molasse, puffed rice or other daily food. After hitting the disasters, Akash and other CPP members prioritize is to cleaning and preparing cyclone centers, motivating people to seek refuge there.

Witnessing the sufferings and loss of many lives due to cyclones or lightning, Akash feels powerless to prevent natural calamities but remains committed to educating and preparing the community for such events. CPP makes sure that the communities receive official cyclone warning signals from the government as soon as possible. After being alerted, CPP helps with providing rapid medical attention, refuge, and rescue. They also actively participate in restoration and recovery efforts post-disaster, continually developing and implementing disaster preparedness plans and strategies.

While CPP does not provide personal aid or relief, they facilitate the distribution of various facilities provided by local leaders to the affected community members during floods. Despite the lack of external support, Akash and his fellow CPP volunteers remain dedicated to serve their community and mitigate the impact of natural disasters to the best of their abilities.

KII-30: Health service provider (Uttar Bedkashi, Koyra, Khulna)

Mamun, aged 52, a medical practitioner serving in the community clinic as well as the upazila health complex at Uttar Bedkashi area of Koyra in Khulna district for the past five years, and highlights how the various natural disasters have instilled resilience and sensitivity among the local people. Despite facing the livelihood challenges, the residents demonstrate resourcefulness and readiness to confront any situation. However, when their means of sustenance are disrupted, they are experienced in significant anxiety, and rely on their own efforts due to the absence of external aid from the NGOs or government agencies.

There are different types of patients in different situations with diverse health concerns, ranging from diarrhea to cardiac issues and heart problems, fever, cold and cough among the elderly. During disastrous events, the community clinic serves as a shelter, yet many individuals prefer to remain in their homes, perceiving that their house is safer place for them despite potential security risks like the fear of theft or robbery.

People in this area do not have such indigenous knowledge to mitigate cyclone risks effectively and they are not very aware and do not know what kind of measures should be taken before or after and during cyclones or disasters. Mamun commends the government initiatives such as dam construction and the Cyclone Preparedness Program (CPP) by making them before the cyclone strikes or raising the red flag in some other way, by emphasizing the significance of early warning systems and proactive measures in safeguarding livelihoods.

Moreover, Mamun emphasizes the importance of government assistance and infrastructure development for community resilience. He believes that providing essential facilities and supports through program like CPP can have a profound and lasting impact on the well-being of the area's residents. He thinks that it will play a far-reaching role.

KII-31: CPP Volunteer (Kalabagi, Sutarkhali, Dacope, Khulna)

Omar Gazi, aged 30, resides at Kalabagi village of Sutarkhali union of Dacope upazila in the Khulna district. His family consists of six members, with a monthly family income ranging 10001 to 15000 taka. He serves as a Cyclone Preparedness Programme (CPP) volunteer, tasked with aiding communities during cyclonic disasters, which are a recurrent challenge in the area.

Every year the community faces itself for various types of cyclonic disasters, often resulting in severe damage. In anticipation, they stockpile essentials, known as "chada," to weather the storms. Relief efforts, typically lasting around a month, are mobilized during calamities such as Aila. CPP volunteers play a pivotal role in disaster response, initially focusing on cleanup operations at cyclone shelters and providing primary aid medicines and saline solutions.

Normally, during the disasters, pregnant women, older people and physically disabled people are more vulnerable. That is why during the disasters, the first prioritized task for evacuation is to bring the pregnant women, physically disabled people as well as elderly to cyclone shelter. The volunteers strive to ensure access to dry food and safe drinking water, often relying on self-funding of community due to delays in government support. The CPP volunteers receive gloves and hand mite from the Union Council and get light and blankets from the Bangladesh coast guard.

CPP volunteers serve as the primary point of contact for coordinating with marine police, fire services, local governments, and other support agencies. They provide basic medical services, distribute food and water supplies and organize humanitarian transportation. Their communication channels, both verbal and online, disseminate crucial guidance and information to affected communities.

During disasters, CPP volunteers administer first aid to the sick and injured people. The first task of CPP volunteer in time of disaster is to provide assistance for the safety and preservation of life. Their responsibilities encompass a wide range of tasks, from issuing alerts, bringing and gathering population, providing the safety and security of community, first aid and dispatching aid to specific areas during emergencies with post-disaster cleanup efforts. They also engage to raise public awareness through the community meetings.

The existing formulating policies is not enough for the community to reduce the disaster risks. Recovery efforts for damaged properties can span 7 to 12 months or longer. While some social protection measures, such as Vulnerable Group Feeding (VGF), are in place, they are insufficient. The government should formulate comprehensive policies and enhance public awareness campaigns to better support CPP volunteers and ensure effective disaster management.

KII-32: CPP volunteer (Nalian, Sutarkhali, Dacope, Khulna)

Golam Rasul Fakir, aged 36, resides at Nalian village of Sutarkhali union of Dacope upazila in the Khulna district. His family, consisting of five members, earns a monthly income ranging from 10,001 to 15,000 taka. He serves as a Cyclone Preparedness Programme (CPP) volunteer, dedicated to aiding communities in the face of recurring natural disasters like cyclones, floods, and river erosion. These calamities inflict significant economic, social, and health-related hardships on the affected population.

CPP volunteers receive assistance from a variety of organizations to aid those impacted by disasters. Their responsibilities begin with preparing and cleaning of cyclone shelters, ensuring essential supplies of food items and non-food items are readily available. Priority is given to physically disabled individuals, pregnant women, and the elderly, who are evacuated to safe shelters promptly. Resources are distributed through fundraising efforts annually, known as "chada," and during specific disaster events like Aila. Despite playing their crucial role, volunteers do not receive financial compensation from the government or any. They often receive little bit equipment such as gloves, hand mikes, flashlights, and life jackets from organizations like USAID.

When the natural disaster is predicted they arrange meeting then they discuss with everyone as well as disseminate the directions on how to safe and cope with natural disaster. They educate residents on preparedness measures and distribute materials to help them weather the storms effectively. Majority of these people are not conscious about health, and do not get proper nutritious food during disaster. Especially the pregnant women do not get sufficient nutritious food at that time which leading to malnutrition among pregnant women and newborn deaths. Additionally, due to cyclonic disasters, women do not get menstrual hygiene and sanitation facilities, further exacerbating health risks.

Recovery efforts for those affected by disasters are prolonged, often lasting 7 to 12 months or more. The government's response is deemed inadequate, requiring the implementation of comprehensive policies focused on motivational awareness campaigns. Such initiatives are crucial for raising awareness about disaster preparedness, health, and nutrition, ultimately enhancing the resilience of vulnerable communities like those at Sutarkhali union.

KII-33: Political Leader, UP Chairman, (Sutarkhali, Dacope, Khulna)

Masum Ali Fakir, aged 68, is a prominent figure residing at Nalian village of Sutarkhali union of Dacope Upazila in the Khulna district, serving as a political leader, specifically as the UP Chairman. He has a large family, consisting of nine family members, enjoys a comfortable monthly income more than 40,000 taka. However, the community have face natural disasters at every year, causing significant economic, social, and psychological distress among the people. The impact of these disasters is profound, with a considerable portion of the population forced to migrate from the village due to cyclonic devastation. Approximately one-fourth of the current people migrates elsewhere this year. During the winter seasons their income is observed very lower, and more income in rainy season. When their income sources are halted, they are mentally depressed as well as frustrated by economically.

Despite the adversities, Masum Ali Fakir and his community receive assistance to those affected by cyclones and floods, collaborating with various organizations and government agencies to provide aid to the affected individuals. A significant number of fishermen in the region, totaling 3725, have fisherman ration card and benefit from those fishing cards. Fisherman receive 55 kilograms of rice and 30 kg of rice respectively in every year from the government. Additionally, governmental support of 10 kilograms of rice during Eid through VGF card. organizations alleviate some of the burdens.

Furthermore, maximum people receive 30 kg of rice by 15-taka kg through the ration card in the name of fair price. The community also get 2 kg of soybean oil, 2 kg of pulses and 5 kg of rice from TCB by 470 taka. In this area, the chairman provides 700 disable card and old age allowance of 200 people as well as of 600 widows' allowance. Despite these efforts, the process of property recovery following disasters often spans over a year, prolonging the community's struggle.

To address these challenges comprehensively, it is imperative for the government to implement policies focusing on public awareness and motivational campaigns. By raising awareness and fostering resilience within the community, these initiatives can empower individuals like Masum Ali Fakir and his constituents to better navigate the adversities posed by natural disasters and build a more resilient future.

KII-34: District Relief and Rehabilitation Officer (DRRO Acting), Barguna

Farhana Yasmin, aged 37 years, works as District Relief and Rehabilitation Officer (DRRO Acting) in Barguna district. She says that every year the coastal communities have bitter experienced in cyclone, tidal surge, river bank erosion, coastal flood and salinity. These disasters aggravating in damages of educational institutions and houses and infrastructures, agricultural crops are destroyed and trees are uprooted. Thus, people are unemployed. Pregnant women, children, disabled and the elderly are more vulnerable during and aftermath of disasters. During disasters, the elderly and disabled do not have access to transportation, toilet facilities, adequate food and water at home and women who work overloaded at home, face food and nutritious deficiencies and lack of access to feminine health care. Pure drinking water is insufficient in Patharghata due to lack of deep tube well (DTW) or shallow tube well (STW) installations. As a result, they have to buy drinking water 3-4 taka per liter. They drink rain water and pond sand filter (PSF) water also. They use pond water for cooking rice and curry. As a result, they are found to unconscious of their sound health. There exists a cyclone center two or three kilometers away from another, and sometimes the cyclone center exists far away from their density of localities and inhabitants. Everyone is satisfied with the environment in the cyclone center. Even, the Mujibkella in Haringhata has been built this year which is situated in Patharghata of Barguna district. Efforts initiated by Bangabandhu Sheikh Mujibur Rahman, including Mujib Kella, Mujib badh, cyclone centers, community-based forests, and the ministry of relief and rehabilitation, continue to play vital roles in disaster risk reduction efforts. Mujib kellas were built mostly in 15-20 feet high and were designed separately for keeping

cows, goats and for human habitation. Two-three floors were built so that many people could take shelter here at the same time.

Honorable Prime Minister Sheikh Hasina is currently trying her best to realize Bangabandhu's dreams regarding disaster risk reduction and early warning system, and is implementing them as well as the existing. She further added that Mujib kella is needed to be repaired and developed. Basically, we are making the awareness of people through all the technologies of meteorological forecast then infrared voice recorder (IVR) and also mobile calls via 1090. And everyone is aware in advance and they know this information through television, miking, interpersonal communication and also social communication sites like Facebook. Aftermath of the disaster, the community try to recover from their damaged property through public and private assistance which takes more than a year to recover. She added that the kind of support is not sufficient to back up of their lives but also needs to some more advancement and also they need to get back their normal livelihood as quickly as possible. To reduce the disaster loss and damages, everyone should be aware and cooperate with each other, create social forestry (agro-based and community forest), organize various awareness meetings and seminars, and increase overall cyclone preparedness programs. Medical facilities should be provided to all. Cyclone centers should be made more secure. Local community people should be empowered and existing government initiatives should be increased if possible.

KII-35: UNO (Patharghata, Barguna)

Sufal Chandra Goldar, aged 40 years, works as UNO of Patharghata Upazila in Barguna district. Cyclone, floods and salinity disaster are occurred in these areas. Economically the people of this area are suffering a lot because of that these disasters bring numerous sufferings like destructions of farmland, loss of livestock, destroyed of houses and educational institutions, the community do not have work for some time and they fall into a lot of psychological depression. During this time, fresh water is very scarce. Sidr and Aila attacked the backbone of the region. Basically, there are few numbers of cyclone centers in upazila parishad those are used as a school cum cyclone centers and the structural condition of the environment of cyclone center is not very good. The pregnant women, the elderly and disabled people face more problems. We alert everyone before the cyclone starts and try to bring everyone to the cyclone center before the situation worsens and they stay there till the weather cools down. The mass people come with their cows, goats and poultry. During the cyclone, we try to help them as much as possible through our volunteers and aftermath of the

cyclone we send back everyone home safely and then start our relief activities. We try to give priority to the most affected people by all kinds of relief both public and private, so that they can get back to lead their normal life as soon as possible. It takes three to four years for them to return to lead their normal life. Here the relief activities are properly distributed so that the actual victims can benefit. If the relief from the government is delayed, the local administration arranges such. Mr. Goldar acknowledges that Hon'ble Prime Minister Sheikh Hasina is currently working on the path shown by Bangabandhu and has been very successful. If Bangabandhu had not started them, these activities would not have been alive today and the people of this region would have suffered more. CPP currently holds many responsibilities and their first task is to make people aware and conduct various workshops on how to minimize the damages. Everyone should be aware of their own place and work to reduce these damages. Strong infrastructure needs to be built, a lot of afforestation needs to be done and everyone needs to be more aware so that we can reduce the loss and damages to some extent.

KII-36: Project Implementation Officer (PIO) (Patharghata, Barguna)

Moksedul Alam, aged 49, works as Upazila Project Implementation Officer (PIO) of Patharghata Upazila in Barguna district. He highlights that cyclone, storm surge, floods and salinity are occurred in these areas every year. There are many times deep tube wells cannot be installed which is very urgent in this coastal area and in that case the pond water is purified and drunk. As a result of these calamities, the people of this region suffer a lot economic and social hardship, they are in economic turmoil, they do not have work, livestock are died, educational institutions are broken, increases of crime and also increasing rate of mental illness. There is a cyclone center where the environment is fairly good. Before starting cyclone, we make everyone aware by miking and try to bring them to the cyclone center. The people of the cyclone center bring cows, buffaloes and poultry. Girls, disable, pregnant women and especially elderly are worst off during the disasters. Mujib Kella and Mujib badh plays an important role in disaster risk reduction. The presence of Mujib kella is about seven to eight kilometers far away from Patharghata to Haringhata union. During times of calamity, people take shelter in this fort along with their cattle and goats. As soon as the calamity is predicted, CPP volunteer and concerned authority inform everyone through miking and interpersonal communication and ask everyone to be aware and next time bring them to the cyclone center.

At present, many steps have been taken by the Sheikh Hasina government to disaster risk reduction. The Mujib fort is repaired only two years ago so that it could be sheltered again. When disaster strikes and aftermath of disasters, relief efforts has been tried to provide everyone with dry food, bottles of water and medicines, various types of NGOs providing relief along with the government. The relief distribution is too scant against the community's demand. Alam stresses the importance of enhancing the early warning system, increasing awareness among residents, undertaking tree pruning initiatives, conducting plantation programs, and strengthening transportation infrastructure to mitigate the impact of disasters more effectively.

KII-37: Civil Society Member (Patharghata, Barguna)

Abul Hussain, aged 50 years, engage in civil society member of Patharghata upazila in Barguna district. He says that cyclone, river bank erosions, salinity and floods occur frequently in this area. Every year, seven to eight families suffer heavy losses and many times their houses has been lost in the river. Many people's agricultural land has been lost in the river. Besides, salinity intrusion is very common. Salt water remains for six months of the year in this area. For this drinking water is a problem here.

Although cyclone centers exist in the area, their infrastructure is outdated and in poor condition, making them unsuitable for habitation during disasters. Hussain emphasizes the urgent need for repairs and the construction of additional cyclone centers with improved facilities, particularly ensuring the safety of women, children, the elderly, and people with disabilities. Women, children, old people and disable people are the most affected during calamities.

Bangabandhu's Mujib kella and Mujib badh played a vital role to the disaster risk reductions. There is a Mujib kella in Haringhata. During calamities, people go there because there is no shelter, so their lives and property are saved. He commends the government's efforts in implementing Bangabandhu's plans and emphasizes the importance of preventive measures such as building embankments, sluice gates, and wide roads are being built in this area so that the sea water cannot enter towards the coast and people become aware in advance to minimize the adverse impact of disasters.

During disasters, Hussain and others warn everyone through miking and facilitate their evacuation to cyclone centers. CPP volunteers and the concerned authority distributes the essential food items such as dry food, biscuits, puffed rice, rice, dal, oil, flour and water bottle and also provide these relief swiftly and fairly to everyone so that everyone returns to their normal life as soon as possible.

Hussain further added that it is possible to reduce the damages of disaster if people should be informed about the upcoming disaster and accordingly should be prepared in advance. Dry food, medicine and necessary things should be supplies at home, to mitigate disaster damage effectively.

KII-38: Medical Doctor (Patharghata, Barguna)

Dr. Md. Mostafizur Rahman a 42-year-old resident medical officer in Patharghata of Barguna district, is married and holds a post-graduate degree. With a family of five members, his monthly income ranges from forty thousand to fifty thousand taka. He emphasizes the vulnerability of pregnant women and disabled individuals are one of the most vulnerable during natural calamities, highlighting the lack of community to access to safe drinking water, which contributes to child mortality and food insecurity.

Dr. Rahman notes that there are not enough shelter and sanitation facilities in the area, leading to lack of awareness about health even some people are deceased to die without treatment. During disasters, people often face malnutrition due to food shortages, and women struggle to using makeshift materials instead of menstrual hygiene kits, exposing themselves to various diseases.

The absence of pure drinking water exacerbates the health risks, with diseases like dysentery becoming prevalent. Despite the challenges posed by cyclonic disasters, Dr. Rahman acknowledges the resilience of the community, attributing their ability to overcome obstacles to their hardworking nature.

KII-39: Senior Staff Nurse (Patharghata, Barguna)

Nazneen, a thirty-year-old senior staff nurse residing in Patharghata, is highly qualified with graduate degrees. She comes from a family of five members with a monthly income ranging from twenty-seven thousand to twenty thousand taka.

The community faced with various types of natural calamities such as cyclones, floods, which occur annually, causing significant mental distress among the residents. Although there is a cyclone shelter located one to two kilometers far away from their homes, it is equipped with adequate facilities. However, outbreaks of various diseases like dengue and malaria are common during these calamities.

Nazneen emphasizes the vulnerability of certain demographics, including children, adolescent girls, and pregnant women, who suffer disproportionately during natural disasters. Health centers play a crucial role in providing medical care, but hospitals often serve as cyclone shelters during

the emergencies. Despite efforts to raise awareness about health of community during calamities, resources such as medication and safe drinking water are often insufficient.

Villagers believe that assistance in natural calamities does not show much awareness about health. In terms of employment, Nazneen earns a modest income ranging from daily income is almost eight hundred to one thousand taka. Village hospital usually has one doctor and five nurses who live there or on site. While there are no reports of unethical behavior, dealing with patients can be emotionally taxing, particularly disease outbreaks like diarrhea and fever, which are prevalent during disasters.

KII-40: Public Health Engineer Officer (Patharghata, Barguna)

Mehedi Hassan, aged 45 years, works as Public Health Engineer Officer of Patharghata upazila in Barguna district. Every year the community experience some kinds of natural disaster in southern coastal regions such as flood, cyclone, tidal surge, salinity and river bank erosion. As a result of these disasters, people face many economic, social and cultural hardship or vulnerability. People's houses are destroyed, cows and goats are died because while the people can go to the cyclone center but cannot bring the animals eg., cows, goats and poultry to the cyclone centers. As a result, leading to increased livestock mortality. During disasters, the community are susceptible to endanger of health hazards. Mehedi notes that there is a cyclone center one kilometer away from his house but the environment there is moderate. Children, pregnant women, and old people face numerous challenges during disasters. Economic insecurities and hardship make their life in deplorable situation like failure to send their children to school and the incidence of infectious diseases in children increases as well as the juvenile delinquency occurs. Elderly people and disable people face multifaceted problems during this calamity due to poor communication system. Women also suffer from many forms of harassment and feel insecure in feminine issues like their menstrual hygiene management kits are found inadequate.

Mehedi highlights the significance of some initiatives such as Mujib Kella, Mujib Badh, and the cyclone preparedness program in reducing disaster risks in coastal areas. These measures prevent cyclones, tidal surges, and brackish water from encroaching on the coast, providing shelter and reducing risks, losses, and damages. The present government has taken many other large-scale initiatives for the people of coastal areas to reduce the risks, losses and damages. Right now, we can see the actual reflection of the exemplary works that Bangabandhu has envisioned his thought. Everyone has trying to make awareness before the cyclone and after the cyclone. The various

government and private assistance were provided so that the mass people could recover their damaged properties and it may take three to six months to recover them in their normal life. The programs taken by the present government for this risk reduction should be more afforestation and the mass people should be focused more on health and hygiene. Cyclone centers should be improved, security should be provided for adolescent girls and women, health awareness should be started from the individual stage, more medicines should be kept in health complexes, repair of polder and embankments should be done for better and awareness should be raised among the mass people, to mitigate the disaster risks.

KII-41: Fisheries Officer (Patharghata, Barguna)

Mohammad Nazrul Islam, aged 59 years, works as Fisheries Officer in Patharghata Upazila in Barguna district. Every year natural disaster such as cyclone, flood, salinity and river bank erosion happen here. These are observed a common thing here due to which the people of this region live in very fragile condition economically, educational institutions are destroyed and houses are also destroyed. There are 30 to 40 cyclone centers in Patharghata upazila. Currently, there are more schools cum cyclone centers established. The number of cyclone centers is more or less sufficient but the structure and maintenance are not quite good compared to the past. There is a delay in entering the cyclone center. As a result, people are reluctant to visit cyclone centers, especially women, the elderly and disabled person.

Nazrul acknowledges Bangabandhu's disaster risk reduction policies and programs such as Mujib kella, Mujib Badh, cyclone center, cyclone preparedness program, and Ministry of Relief and Rehabilitation. At present, Patharghata Upazila is fine from the point of view of beri badh because a few days ago, beri badh was done very nicely so that there is a distance between the sea water and the coast. It can be said that the preparedness program of the cyclone was created by Bangabandhu and these policies of Bangabandhu are a new milestone for the recent times. These efforts, inspired by Bangabandhu's vision, have improved early warning systems, resulting in reduced losses and damages.

Now, the government has undertaken numerous initiatives and projects for coastal communities and is implementing them day by day. As an early warning system, 300 boats have been fitted with devices that are tracking them to alert the communities in advance of a disaster and send the information of calamities to the fisherman so that they can come to the shore as quickly as possible. Aftermath of disaster the mass people suffered a lot of losses which may take three to four years

to recover from the sufferings, damages and miseries. In order to create awareness, various workshops have been organized and seminars of two to three days long have been conducted especially for the fishermen so that they are all aware. They have been provided with dry food, bottles of water, clothes and ready-made food as relief during and the post disaster period. The people of the area should be warned more in advance. Cattle should be moved to safe places during calamities. Houses should be made well-equipped and elevated.

KII-42: Agriculture Extension Officer (Patharghata, Barguna)

Farzana Tasneem, aged 40 years old, works as an Agriculture Extension Officer in Patharghata upazila of Barguna district. Basically, cyclones, tidal wave, river bank erosion and salinity these types of natural disaster happen every year there. Due to these disasters, infrastructure is destroyed, schools and colleges are shut down, cows and goats are died and agricultural land and crops is damaged. Due to the intrusion of salt water, there is a shortage of safe drinking water. Due to drinking salt water and works in shrimp gher, many people have skin problems, allergies and various other skin diseases. The cyclone center is more or less two kilometers far away from one another, the staying environment inside the cyclone center is not very good, people are dissatisfied. There is a need to ensure the safety of women because there is no separate room for expected mothers and pregnant women. As a result, lactating mothers do not want to come here with their babies. People with disabilities are the most affected during disaster and children are also deprived of education due to economic hardship.

Mujib kella, Mujib Badh, cyclone preparedness program and social forestry program are very important in reducing the risk of disasters. Farzana highlights that they mainly inform the community by miking through Red Crescent, CPP Volunteers and also some members of union parishad concerned about the disaster and then everyone becomes aware and come to cyclone center. And post-disaster period, they are provided various kinds of public and private assistance and many of them try to protect their damaged assets with their own financial resources which take them almost four years to recover. Apart from these, the Ministry of Relief and Rehabilitation has taken separate projects to provide coastal areas and enable them to be rehabilitated very quickly in the post-disaster period. At present, the measures taken by the government itself should be increased if there is an opportunity, and the farmers should be aware of disasters so that they can produce crops, bring home the crops if they are in the field, needs to plant more trees and deep seaport so that the work does not hamper during disasters. People should be informed about the

disasters and prepare accordingly by making ablutions and building strong houses, then maybe the damage can be reduced to some extent.

KII-43: Community Health Clinic Attendant (Patharghata, Barguna)

Nasrin Khanam, aged 35 years, involve in community health clinic attendant of Patharghata upazila in Barguna district. Sometimes we faced natural disaster here. Cyclone, flood and river bank erosion occurs here every year. During disaster, destructions of infrastructure, death of cattle, destruction of farmland, damage of educational institution and also short time unemployment are observed. When there is a flood, the water rises up in our house and this has happened many times. Cyclone center is one kilometer away from our house. The environment of cyclone enter is not satisfactory. Pregnant women and people with disabilities are the most affected during disasters. Elder and disabled people have transportation barriers and also lacking of toilet facilities. During this time, children are exposed to various infectious diseases and the child mortality rate increases. Plans and programs for disaster risk reduction made by Sheikh Mujibur Rahman in 1972 are very effective in the present time. The Mujib kella, Mujib badh, cyclone center, social forestry scheme, cyclone preparedness program and Ministry of Relief and Rehabilitations policies provide a huge contributing program in coastal belt so that the damage can be minimize. After the cyclone, we give them medicine for various ailments, especially diarrhea and skin diseases.

However, Khanam feels that the current government is trying strictly maintain to realize the Bangabandhu's vision but they are currently inadequate. She emphasizes that medical care as well as community clinics for pregnant women should be improved, emergency care and special health care should be ensured for them during disasters. The awareness of the mass people at all levels of the country should be enhanced to reduce the disaster risks. Khanam advocates that disaster-resilient houses should be built. Cyclone centers should be built and strengthened. Special arrangements should be made for women and young girls in cyclone center. Additionally, everyone should give focus on disaster warning messages and prepare in advance to mitigate the disaster risks.

KII-44: CPP Volunteer (Patharghata, Barguna)

Shahriar Dipu, aged 35 years, works as an CPP volunteer in Barguna district. Cyclone, floods, storm surges and salinity are frequently occurring natural disasters here in every year. The impacts of these natural disasters are so pathetic e.g., the infrastructure is destroyed, cows and goats are

died, agricultural land is damaged, educational institutions are destroyed. The community don't have work for a certain period of time, crime rate increases and they become psychologically depressed. The community go to cyclone center in upazila parishad and take shelter when such calamities occur. The cyclone center is roughly two kilometers far away from one another. The people are not satisfied with the environment inside the upazila parishad cyclone center. During the natural disasters, children, women, pregnant women, physically disable and elderly are in worst condition. Children are affected in various ways, facing sufficient and nutritious food shortage, malnutrition, susceptibility to various infectious diseases, and increases of child mortality rates. Besides then they cannot go to school because schools are used as cyclone centers. Many times, houses are destroyed and lost. Due to cyclonic disasters and economic uncertainty, disable and elderly people do not have access to toilet facilities and there is lack of water, sanitation and hygiene facilities during disaster. Their sufferings are beyond to description. Adolescent girls do not feel safe and do not get menstrual hygiene management kits. They also face food shortage and malnutrition problem which makes them reluctant during disaster.

Dipu highlights the significance of comprehensive disaster risk reduction policies and programs, such as the cyclone preparedness program, Mujib Kella, Mujib Badh, Beribadh, and sluice gates, in mitigating the impact of disasters. These initiatives have been instrumental in providing shelter and assistance to affected individuals and livestock during cyclones.

Dipu emphasizes the importance of raising awareness among the community people through early warning systems and preparedness programs to minimize risks associated with natural disasters. However, recovery and rehabilitation efforts or set back regular normal activities often take several years, and sometimes delays in government assistance from local administrations and upazila chairman. Dipu advocates for the construction of beri badhs, immediate afforestation initiatives, infrastructure development, and heightened awareness campaigns to mitigate the impact of future disasters.

KII-45: Political leader (Patharghata, Barguna)

Jalil Halder, aged 50 years, engage as political leader in Barguna district. He says that every year the community face one or the other disaster, like as cyclone, flood and salinity. There remains salinity for 6 to 7 months for which we cannot use this water for cooking and drinking. So, the community depend on rainwater and store rainwater. Due to the occurrence of disasters, their houses are destroyed, cows and goats are died and some agricultural crops and land is damaged,

the crime rate is increased, people do not have work at certain times etc. Now there is a shortage of food and clean water. The cyclone center is one kilometer far away from our house. The environment inside the cyclone center is not very good and people go to the cyclone center as soon as the disaster is predicted.

There are some cyclone centers in this area which are very old and they need to be repaired. At present some new cyclone centers has been observed here and the number of cyclone centers should be increased. Children can't go to school because of financial hardships due to cyclonic disasters. During cyclone, pregnant women, disabled and elder people are more at risk which aggravates them as vulnerable.

He shed lights that among the Bangabandhu's cyclone disaster risk reduction plan, we know about CPP. CPP volunteers make common people aware by miking. Our upazila parishad office has a data management system and through radio communication system the community receive all kinds of information and concerned authority try to deal with it as soon as possible aftermath of a disaster. And self-awareness is the biggest way to avoid disaster damage. Through miking, everyone is given advance warning. After the cyclone, public and private relief is provided and individuals try to recover their damaged properties, which take one to one and a half years to do. Sometimes training is arranged. Few days ago, Jalil got a training of 7 to 10 days. He mentions that he received training in 2016 and January 2022. Cooperate with family members and neighbors, and raise awareness among everyone is very essential tool to reduce the disaster risk and disaster management. To mitigate the disaster risks effectively, not only relief assistances are helpful but also everyone should stand others to help the distress people.

KII-46: Teacher (Patharghata, Barguna)

Tahmina Khatun, aged 42, worked as a school teacher nearest Patharghata sadar in Barguna district. Although the flood does not affect their economy much, but she has faced numerous problems apart from economic problems, and her neighbors or other family members have gone through various horrors which she has highlighted. The community faced different kind of cyclonic disasters like cyclone, tidal surge flood and salinity also. All of them faced these cyclonic disasters in every year.

During disasters their school is used as a cyclone center as well as sensitizing students about various natural disasters. As the people of the area face economic hardship, they have to go through a tough time during floods.

Since the community receive very little assistance and their income is not very high, they do not have to struggle much with their own lives. During disasters, the roads and infrastructures are breakdown, as a result of which, in case of various diseases, they cannot get rid of the diseases easily and cannot get good treatment. Hospitals are far away of around two or three kilometers and due to poverty, the community cannot afford to see a good doctor and they do not get sufficient health care facilities.

The south western coastal people observed numerous adverse effects of cyclonic disaster in their household like economic insecurity, food insecurity, lack of shelter, life risk, loss of infrastructure, health risk, lack of pure drinking water, damage of fisheries, damage of kitchen garden and also damage of their crop productivity.

The people of the area do not seem to have received any significant support during the disasters, but sometimes various types of relief are given to them. In addition to providing relief to the people of these areas, long-term assistance should be provided so that the community remain economically viable in the event of cyclones, floods or any disaster of any severity.

KII-47: Principal of No. 1 Bibichini School and College (Betagi, Barguna)

Pradeep Biswas, a 59-year-old Principal at No. 1 Bibichini School and College of Betagi upazila in Barguna district, highlights the numerous disasters like floods, storm surges, cyclones, and salinity that afflict the region. Salinity endures for half the year and non-existent for the remaining six months. Cyclonic disasters adversely effect on crop productivity and causing significant economic losses for marginal farmers. These disasters accelerate the hardship includes increased crime rates, short term or seasonal unemployment, and psychological distress among residents. Access to potable water for cooking and drinking is also compromised due to salinity.

While a cyclone center located two kilometers away, the living environment inside is congenial and very satisfactory but people don't want to come there due to safety concerns. During calamity, child education is interrupted due to financial instability and water remains there for few days in front of their college which makes students reluctant to come to college. Some people in their village deceased during the 2007 *Sidr*. Women, children, old people and disabled people face heightened risks or affected more during the disaster due to inadequate access of toilet facilities, lack of water, sanitation and hygiene (WASH) facilities and inadequate of their menstrual hygiene management kit.

Biswas acknowledges historical initiatives like berri badh and emphasizes the effectiveness of early warning systems introduced since the 1970s. Early warning systems like Mujib kella, Mujib badh and cyclone preparedness programs are very effective since then to at present. Hon'ble Prime Minister Sheikh Hasina is working on the way shown by her prudence and expertise that she has taken large-scale projects to reduce the disaster risks, losses and damages and making everyone to build-up awareness. Currently, the amount of damage is greatly reduced for taken step by the early warning system. The reduction in damage owing to the current government's pre-cyclone preparedness measures and post-cyclone rehabilitation efforts signifies significant progress. With government and non-government assistance, people are also trying to recover their damaged properties on their own capacity, and it takes three to four years to report everything. The current government's early warning system and post-disaster relief and rehabilitation support forces them to return their normal life very quickly. Biswas stresses the importance of heeding early warnings, seeking safety in cyclone shelters, and collective efforts to minimize damages of disasters.

KII-48: Medical Doctor (MBBS) (Betagi, Barguna)

Dr. Mahmud Hasan, a 27-year-old resident medical officer, resides in Betagi Upazila, Barguna district, with fewer than three family members. He holds a postgraduate degree. Dr. Mahmud's monthly income ranges from forty thousand to fifty thousand taka. He observes that pregnant women and disabled individuals are among the most vulnerable during natural disasters, particularly due to the lack of access to pure drinking water, which contributes to child mortality and food insecurity.

During disasters, the community faces challenges such as inadequate shelter and toilet facilities, exacerbating health risks. The community people are not aware of sound health even some people are seen to deceased without treatment. Malnutrition is prevalent, as individuals often struggle to obtain sufficient nutritious food, leading to fatal diseases. Water scarcity, during cyclones and floods, heightens the risk of waterborne diseases such as dysentery.

Women and adolescent girls, in particular, face challenges with menstrual hygiene due to the lack of access to proper menstrual hygiene products. They use different types of cloths and face all fatal diseases like skin diseases and ovarian cancer. Families with children face additional difficulties. Recovery efforts for damaged properties typically span 7-12 months or longer, underscoring the prolonged impact of disasters on the community. The existing policy is not enough for them to reduce the disaster risks. Above all, Dr. Mahmud emphasizes the need for comprehensive policies

and public awareness campaigns to enhance disaster preparedness and mitigate the adverse effects of natural disasters on vulnerable communities.

KII-49: Medicinal plant collector (Betagi, Barguna)

Md. Oiullah, aged 35, who resides in Betagi of Barguna district and earns his livelihood as a medicinal plant collector. He is married with a family of five, possessing only a primary education. His monthly income is a mere fifteen thousand Taka, which he struggles to stretch for his household's needs. Oli Ullah's approach to medicine-making is entirely natural, but he does not use any artificial elements in those medicines.

Oli Ullah has encountered numerous natural disasters, including cyclones, floods, storm surges, riverbank erosion, and salinity issues. While he has occasionally overcome these challenges, these calamities continually jeopardize his means of living. Despite cyclone shelter is situated within two kilometers of his residence, its efficacy remains moderate.

During natural calamities, the foremost concern is the disruption of plant medicine collection. Even if gathering of plant medicine remains feasible, the quality of the medicine often deteriorates, resulting in diminished or halted income. Oli Ullah cultivates some medicines himself, while others are procured from Rajshahi. However, the region is inadequate of communication infrastructure during disasters and complicates the transportation of essential medicines from Rajshahi. If he fails to effectively sell these medicines, the burden of debt becomes overwhelming. Consequently, the inability to selling medicines during such times leads to financial strain or the burden of debt.

Oli Ullah is too much suspicious that their income sometimes becomes totally off during cyclonic disasters. Despite governmental aid and minimal assistance from local leaders, Oli Ullah and his community lack sufficient facilities or relief during and after disasters. This lack of support exacerbates the challenges they face in maintaining their livelihoods amidst adversity.

KII-50: Senior Staff Nurse (Betagi, Barguna)

Nasrin Akther, a senior staff nurse residing in Betagi Sadar in Barguna district, sustains a family of six with a monthly income totaling Tk twenty-five thousand. Over her lifetime, she has encountered various natural calamities, *Sidr* and *Amphan* being the most destructive, though the river bursts have been notably absent from her experiences.

The southern coastal people of this area survive with various natural calamities but they don't have any permanent solution to reduce the risk. Despite the presence of cyclone centers, the people stay remain within their homes during disaster periods, primarily due to concerns regarding their safety. During the cyclonic emergencies, Nasrin and her fellow community members confront heightened health challenges exacerbated by the scarcity of accessible healthcare services. Although healthcare facilities are accessible, transportation constraints impede individuals from seeking necessary medical aid. The insufficiency of transportation infrastructure during crises further exacerbates this predicament. During disasters, the transportation facilities became too much dissatisfied and people can't move here.

Pure drinking water isn't accessible there. During disasters, their health complex is used as a shelter and treats people as best they can. Hospitals are arranged to provide for free medical care as much as possible, but hospitals have some limitations, there is a shortage in pharmaceutical supplies, sometimes doctors are found insufficient from far away during disasters, so many times local people have to rush to get treatment when there are striking significant natural disasters.

KII-51: Political Leader (UP member) (Betagi, Barguna)

Mizanur Rahman is a responsible member of the Union Parishad, in Betagi, has been actively serving in this capacity for the past three years. According to him, the community people of this area faces challenges with waterlogging, aggravated by the proximity of the Bishkhali river, which often inundates the agricultural fields and destroys crops.

During disasters, people are encouraged to go to the cyclone center by miking for several days ago and various flags are drawn as a warning signal. Besides, a team is made by the union parishad to go to door to door so that they can use the union parishad as a shelter. Additionally, the union parishad is trying to provide various types of assistance to everyone while they are in shelters as much as possible and also trying to provide various types of relief items.

In addition to door-to-door support, arrangements are implemented to distribute rice at affordable rates of fair price, with a keen awareness of the need for food security during disasters.

The people of Betagi suffer significant hardships during these calamities, as their livelihoods is halted with the inability of day laborers to work and the destruction of farmers' crops, leading to tremendous impacts on their economic sustenance. Recognizing the vulnerability of these communities, the government has provided permanent financial aid to assist them during such crises.

KII-52: District Relief and Rehabilitation Officer (DRRO), Bhola

Delwar Hussain works as District Relief and Rehabilitation Officer (DRRO) of Bhola district. He emphasizes that this area is prevalent characterized by cyclones, river erosion, and floods, while it is observed a slight issue of salinity. River erosion engenders homelessness, land loss, financial setbacks, joblessness, livestock fatalities, and infrastructure destruction. Fatalities and disease outbreaks are common in disasters. Women and children are particularly affected by disasters, with pregnant mothers having difficulty accessing health care, and children often drop out of school due to financial uncertainty. River erosion exacerbates the displacement of residences, and disrupts the regular education of children. Furthermore, adolescent girls and young adult women are unable to maintain menstrual hygiene, heightening the risk of water borne diseases, skin diseases, and other related illnesses. Cyclones are common, and schools are often used as cyclone center. Furthermore, the poor and disaster-prone people of this area have the lack the technical and vocational skills which is necessary to cope with disasters. Delwar stresses that construction should be elevated to 12 feet to mitigate tidal wave risks, and overall infrastructure development is imperative.

KII-53: Red Crescent Upazila Unit Youth Leader (Charfashion, Bhola)

Tariqul Islam, aged 35, a youth leader of Red Crescent Upazila Unit of Charfashion upazila in Bhola district, highlights Bangabandhu's pivotal role in disaster risk reduction. Through initiatives like Mujibkella, Mujib badh, CPP, and the Ministry of Relief and Rehabilitation, Bangabandhu aimed to minimize the impact of disasters and ensure the safety of coastal residents, particularly during cyclones. Miking, television, social media is used for early warning. Currently, Red Crescent and CPP teams conduct door-to-door awareness campaigns immediate before of the disasters. It usually takes 7-12 months to recover from the damage aftermath of a disaster. In this case, disaster-affected lonely people get some support from NGOs, government and stakeholders. The current government is taking diverse measures to address disasters, providing training programs, repairing existing cyclone shelters and building new cyclone centers. Apart from this, housing projects are being done for the landless and providing emergency post-disaster relief. Besides, some are getting financial support. These works make Bangabandhu's disaster management more dynamic. They are moving forward by using the initiative taken by Bangabandhu. However, some more projects have to be implemented and monitored considering

the situation. Special attention should be given to the protection of coastal areas. The existing embankments should be maintained, made higher and stronger.

KII-54: Medical Assistant (Char Kukri Mukri, Charfashion, Bhola)

Monirul Islam, a medical assistant, sheds light on the recurrent impacts of cyclones on affected communities, which exacerbates the extensive health risks and socio-economic ramifications. Cyclones pose multifaceted challenges, deeply affecting individuals across economic, social, physical, psychological, and cultural dimensions. Economically, these communities bear the brunt as cyclones often result in the destruction of homes, livestock casualties, and loss of valuable documents. Disruption of daily activities ensues, with interrupted work, damaged infrastructure, food shortages, and communication breakdowns due to cut-off power and lack of mobile phone charging facilities. Consequently, forced migration increases, with many individuals shift to urban centers like Dhaka in search of livelihood opportunities.

The aftermath of cyclones disproportionately impacts vulnerable groups such as individuals with disabilities, pregnant women, and children. Children are often observed for helping with household work rather than going to school. Children then develop a tendency to drop out of school. Besides, they do not go to school for unable to buy new books, notebooks, pens, or even many times those schools and colleges are closed for long periods of time for usage of cyclone centers. Limited access to safe drinking water exacerbates health risks, leading to a surge in skin diseases, fever, colds, malaria, diarrhea, and other waterborne ailments. Skin diseases, particularly, afflict individuals of all ages. Access to adequate medical care is often hindered by poverty and lack of education, exacerbating health disparities. Pregnant women face heightened risks due to a lack of access of essential goods and awareness, leading to various complications.

Due to extreme poverty plus lack of education they are not even aware of their health for which the community suffer the most while they arrange various programs as far as they can and invite them to attend those programs through which they can be at least somewhat aware. The planning initiatives taken from the government are trying to do more than enough for this.

In words of Monirul, they have a medical team during disaster or aftermath of disaster for medical assistance. Medical teams are deployed to offer treatment, with initiatives from the government aiming to address health needs comprehensively. Access to calcium tablets, vitamin capsules, and free ultrasounds is provided at free of charge throughout entire pregnancy is facilitated by hospitals supported by the Department of Family Planning. He further notes that they have some trained

nurse, midwives who provide maternal care and counsel of teenagers on health services. In emergency situations, medical personnel visit affected homes to provide treatments. While patients in well-connected areas access hospitals, medical teams extend outreach efforts to poorly-connected regions.

Overall, proactive measures are taken to mitigate the adverse health impacts of cyclones, encompassing medical assistance, community outreach, and government initiatives. Despite challenges, relief efforts are underway to ensure the well-being of affected populations in the aftermath of cyclonic disasters.

KII-55: Ward Member, (WDCM), (Charfashion, Bhola)

Farooq Uddin, a 38-year-old resident of Charfashion upazila in Bhola, highlights the recurring challenges faced by coastal communities due to annual natural calamities such as cyclones, floods, and salinity intrusions. These disasters inflict substantial economic, social, political, and cultural damages, perpetuating a cycle of adversity for the affected population. The efficacy of cyclone centers is deemed moderate, with severe consequences observed during cyclonic events, including livestock fatalities, housing destruction, communication breakdowns, disrupted education for children, and inadequate access to safe drinking water and medical services. Adolescent girls, pregnant women, the elderly, and individuals with disabilities are disproportionately impacted among the vulnerable groups, facing heightened risks and challenges during these crises.

People who are physically disable, do not have proper toilet facilities at home. Girls they do not have access to water, sanitation and hygiene facilities and also faces massive food shortages. Due to cyclones, they face the economic hardship by decreased crop production, disrupted shrimp farming, livestock losses, leading to increases barren land, and reduces yield crops production of wheat, rice and maize. Salinity intrusion further compounds agricultural woes, severely affecting rice production.

The aftermath of cyclones witnesses the diminished community cohesion. Health risks including colds, diarrhea, skin diseases, and malnutrition, proliferate rapidly, with pregnant women facing elevated risks such as hypertension. However, inadequate knowledge hampers the effective decision-making to mitigate these challenges.

The medical center they have there is 2 km far from home and the community were neither satisfied with the treatment they received. Communication channels like miking and television serve as

primary sources of cyclone-related information, but governmental assistance post-cyclone is perceived as insufficient, necessitating increased relief efforts.

Due to cyclones occurred recurrent year the community suffer so much that it takes a year for us to recover from the damaged properties. Also, due to lack of vocational and technological knowledge, the coastal people cannot take any proactive steps to cope with this cyclone. The government should also create more awareness programs and construct adequate embankments dams, sluiceways and sufficient cyclone shelter for the region so that cyclone water cannot flow easily towards the coast. Furthermore, Farooq notes that it is imperative for the urgent need for comprehensive strategies to address the enduring challenges faced by coastal communities.

KII-56: Medical Doctor (Char Kukri Mukri, Charfashion, Bhola)

Mr. Rajib Hossain, a 42-year-old doctor, sheds light on the prevalence of natural disasters like cyclones, tidal surges, floods, and storm surges that regularly afflict in this area. These cyclonic disasters have a profoundly negative impact on our economic situation. Despite the presence of a cyclone shelter located 2 kilometers away, the condition of the shelter is not entirely satisfactory. The community faces disruptions in communication, and their health is jeopardized by the outbreak of various diseases for cyclonic disasters, exacerbated by the scarcity of safe drinking water.

Women, children and pregnant women are particularly vulnerable during such disasters, facing significant challenges that hinder their education and access to proper healthcare. Moreover, the high proportion of uneducated individuals in the area contributes to a lack of awareness and preparedness for upcoming disasters. Women and adolescent girls often struggle with securing shelter and hygiene management kits, while pregnant women may be reluctant to seek treatment at hospitals. The elderly population also faces vulnerabilities in such circumstances.

They suffer the most for economic challenges. Communication and transportation problems are occurred for cyclonic disaster. The community people experience tension and significant losses, including their house, livestock and trees due to disasters. While indigenous practical knowledge is prevalent among the population, television and miking systems serve as crucial tools for disaster awareness of the upcoming natural disaster.

The establishment of more community clinics could greatly benefit the people, providing essential healthcare services during disasters. However, the assistance from NGOs is deemed insufficient, necessitating yearly meetings to disseminate knowledge about natural disasters, create safe

shelters, and advocate for principles of good governance to better address the community's needs arising from these bitter experiences with natural calamities.

KII-57: CPP volunteer (Char Nabinagar, Charfashion, Bhola)

Shajahan Khokon, a 58-year-old volunteer for the Cyclone Preparedness Program (CPP), resides at Charmainka village in Char Nabinagar union of Charfashion upazila in Bhola district and sheds light on the recurring natural disasters such as cyclones, salinity intrusion, tidal surges, and floods that afflict the coastal area annually. The impact of cyclonic disasters is particularly severe, negatively affecting both our economic and social well-being.

The community have a cyclone shelter far away from 2 km distance. The condition of shelter is moderate. CPP volunteers used to advise and aware them to go under cyclone shelter during natural disasters, some of them agree to go while many refusing to go. Consequently, the community faces communication disruptions and health risks, including the outbreak of diseases and loss of livestock, during cyclonic disasters. Natural disaster creates problem of safe water.

Children, aged people, physically challenged people, and pregnant women are disproportionately affected due to cyclonic disaster, encountering challenges like inadequate shelter, school dropouts, and lack of hygiene resources. Additionally, economic hardships are prevalent during these times, compounded by communication and transportation difficulties

The community have vocational knowledge like prevention or mitigation knowledge, reduction of vulnerabilities, strengthening capacities for disaster risk reduction. Additionally, the community have indigenous practical knowledge. Television broadcasts and miking systems play crucial roles in disaster awareness efforts, yet there remains a demand for enhanced technological knowledge and equipment to bolster disaster preparedness and response capabilities.

KII-58: Nurse (Char Kukri Mukri, Charfashion, Bhola)

Sonia Akter, a 38-year-old nurse resides at Char Kukri Mukri union of Charfashion upazila in Bhola district, shared her encounters with cyclones, salinity intrusion, tidal surges, riverbank erosion, floods, and waterlogging that occur frequently throughout the year in their area. She detailed the adverse effects of cyclonic disasters, experiencing economic, social, and psychological aspects. Despite the presence of a cyclone center within a 1-kilometer radius, Sonia expressed dissatisfaction with its usage quality. These calamities disrupted their daily activities, cultural

traditions, rituals, and exacerbated food insecurity, mental health issues, and waterborne illnesses. Natural disaster creates water problem in their region.

Children, adolescent girls, young adult women, pregnant women are the most vulnerable group during cyclonic disasters. Aged people face the multifaceted challenges like lack of shelters, transportation barriers, and lack of toilet facilities. Sonia and her family faced economic hardships due to cyclonic disasters impacting negatively on food production, domestic livestock, and employment opportunity. Furthermore, she faced socio cultural challenges like disruption of social network, disruption of communication and transportation, lack of social cohesion, increase domestic violence, gender-based vulnerability due to cyclonic disaster. Sonia encountered various health hazards during natural disasters, such as fever, cold, bad headache, diarrhea, and skin diseases. She faced scarcity of suitable place for changing proper sanitary materials, suitable place for baby's breastfeeding, and medical treatment. Health care institution is 1 km far away from her region. Their residence conditions are risky and unhygienic, dirty and polluted, and suffocated. Women face lots of problem during cyclonic disasters. Disaster preparedness efforts relied on broadcasting alerts, miking and interpersonal communication. Sonia stressed the inadequacy of current government policies, as they provided minimal aid during natural disasters, underscoring the urgent need for public awareness campaigns to address their challenges.

KII-59: Medical Service Provider (Char Kukri Mukri, Charfashion, Bhola)

A senior staff nurse, Rubina Akter, aged 32 lives at Char Kukri Mukri union of Charfashion upazila in Bhola district, shared insights into the challenges posed by recurring natural disasters such as cyclones, tidal surges, and floods in their region. She doesn't have any bitter experience during disasters. Despite having a cyclone shelter located within a 2-kilometer radius, Rubina notes that its structural condition is not satisfactory, reflecting broader concerns about infrastructure resilience.

Natural disasters affect their social life negatively. People of their community faced hindrance of daily activities, cultural and ritual activities, food insecurity, disruption of prayers and communication, and break out of diseases. Children, pregnant and lactating women, physically challenge people and elderly are more vulnerable group during cyclonic disasters. Children are susceptible to health issues and educational disruptions, while pregnant women face challenges accessing proper care and are at increased risk of miscarriage. Cyclonic disasters leading economic hardship and hampers economic activities. Food productivity is decreasing gradually, seasonal

crops cannot be cultivated due to salinity. Cyclonic disasters disrupt the communication and transportation and affected livelihood. In last 10 years much people migrated from this village due to cyclonic disasters. Government health service institution is away from within 1 km. Fever, cold, bad headache, skin diseases, whooping cough and diarrhea are common diseases during cyclonic disasters. Women faced vulnerability for hardly getting proper treatment, long distance of health care center, lack of opportunity in community decision making, and lack of access to proper care for their unpaid or engaging in informal sectors like domestic household chores.

Awareness efforts, primarily through miking and interpersonal communication, aim to prepare the community for upcoming disasters. Rubina expressed dissatisfaction with existing policies, citing a lack of sufficient support and the need for comprehensive measures such as nursing courses, vocational education, and improved healthcare infrastructure.

Government should take careful planning required like financial assistance, test relief, and essential infrastructure like tube wells and sluice gates to ensure safe drinking water. Additionally, Rubina stressed the importance that public awareness program and preparedness programs should be more enriched to effectively address the challenges posed by natural disasters and safeguard the well-being of the community.

KII-60: ASI of Police (Charfashion, Bhola)

This participant is a resident of Barguna and worked as a sub inspector of police in Charfashion during 4 years. He is 37 years old man and lives in Charfashion. He is a married man and his education qualification is post-graduation.

His family has to five members and his monthly income is twenty thousand to thirty thousand taka. Pregnant women and disable people one of the most vulnerable during natural calamities. According to him people of charfashion faced cyclone, tidal surge, flood and sometimes salinity. He accepted that this different cyclonic occurrence compelled them to feel different mental wellbeing like a sleeping disorder. Cyclonic calamities make unfavorable wellbeing suggestion in coastal zone like a spread of water borne infections, lack of healthy sustenance driving different illnesses, spread of respiratory sickness too feel physical disturbance.

He recognized that cyclonic calamities initiated different social disturbances like disturbance of communication and transportation, hindrance to women's wage and business, increment of household viciousness, disturbance of the implies of business moreover make sex based defenselessness due to need of security.

There is no shortage of drinking water for the people in the area but the tubewell is a little far away and not every house has a tubewell because most of them are low income people and they have to collect water from other houses to collect water from the tube and there is a shortage of drinking water.

Income is cut off during floods as most of the people in this area are poor and they indulge in various petty crimes to support their families. Those who are a little younger are more likely to commit crimes and are more responsible for floods because floods are the only reason for their income to stop and there can be other disasters as well.

The law enforcement forces are trying to warn them as well as help them out from the fund if they need any assistance, and anyone who commits a crime during the flood is looked down upon.

Those who live in the municipality do not have any problems with hospitals or treatment, but those who are a little away from the municipality do not get any medical care at that time because the roads are not good.

KII-60: PIO (Tajumuddin, Bhola)

Md. Salim, a 42-year-old project implementation officer residing in Tajumuddin with a total household of five members, earns a monthly income more than 25000 taka, which is sufficient to cover their expenses. He notes that every year natural calamities such as cyclones and floods occur there which subject them to worst conditions and suffer economic, social, psychological and cultural hardships. There is a cyclone center here near his house within one kilometer. The environment inside the cyclone center is good but not ideal. Cyclones wreak havoc on their homes, livestock, and livelihoods, leading to profound social disruptions, communication breakdowns, school closures, and outbreaks of waterborne and skin diseases. Pregnant women endure inadequate medical care, children face educational disruptions and food shortages, while girls lack menstrual hygiene management kits.

Children face various problems like food insecurity, school closures, drop out of school, their books and educational items get washed away by cyclonic disasters. Adolescent girls and young adult women face lack of menstrual hygiene management kits, pregnant women do not get maternity health facilities and lack of food and nutrition. Aged people and disabled people face transformation barriers, no access of their friendly toilets, sanitation and hygiene facilities. When cyclones hit our houses, economic uncertainty starts, lack of shelter, livestock losses, reduced food

production, and damaged shrimp farms. Cyclones decrease the social cohesion, no one can try to keep in touch with anyone and move from one place to another due to cyclones.

The cyclone center's inadequacies, particularly in providing safety measures for vulnerable groups like adolescent girls, young adult women, pregnant women and lactating women do not have separate rooms, changing clothes, even changing and maintaining menstrual hygiene kits, and breastfeeding facilities, exacerbate post-disaster challenges. Insufficient hospital services further compound their plight, particularly for women who lack adequate facilities and autonomy. Limited vocational and technological knowledge hampers their ability to mitigate cyclonic impacts effectively.

Before striking hit the cyclone, usually we first try to inform the community and bring everyone to safe place in cyclone center. Recovery efforts spanning one to two months and negotiations for assistance lasting three to six months. While government assistance is deemed sufficient, Salim advocates for increased awareness programs by both the government and private sectors to enhance preparedness and post-cyclone recovery efforts. Emphasizing the importance of environmental conservation and improved healthcare infrastructure, he believes these measures can mitigate risks and minimize damage from future cyclones.

KII-61: Upazila Social Service Officer (Tajumuddin, Bhola)

Md. Siddiqur Rahman, aged 35, resides of Tajumuddin upazila in Bhola district, consisting of five members in his household, with a monthly income and expenses of totaling 25,000 taka. He shares his thought that reflects on the annual onslaught of natural disasters including floods, cyclones, riverbank erosion, landslides, and tidal surges, which create a heavy toll on their community, particularly in economic hardships. Cyclones, in particular, wreak havoc by demolishing homes and infrastructure, resulting in significant economic losses.

The cyclone center is situated nearby and the environment inside the cyclone center is quite good. Cyclonic disasters profoundly adverse effects on economic sectors, leading to widespread destruction of homes, loss of livestock, and disruption of communication networks. Socially, the breakdown in communication exacerbates the precarious situation, as crime rates rise and outbreaks of diseases like diarrhea become rampant due to the lack of safe drinking water.

Children, women and pregnant people, physically challenged people and aged people are the most affected by cyclones. Children education are hampered more because of school closure as schools are used as cyclone centers. Adolescent girls face additional challenges related to menstrual

hygiene and security. Furthermore, inadequate facilities of toilets, water, sanitation and hygiene and challenges of mobility for transportation barriers for the elderly, disabled, and pregnant women exacerbate their vulnerability.

Moreover, fever, cold, diarrhea, and malaria increases, rise in fatalities, miscarriages, and birth defects of women are observed due to cyclonic disasters. Agricultural productivity dwindles due to saltwater intrusion, affecting rice, wheat, corn, vegetable crops, and fish farming in enclosures. CPP volunteers and other government officials announce by miking to go to the safer places including cyclone shelters for their preparedness and early warning system. Recovery from the devastation and get back to normal life typically spans one to two months, with government support falling short of meeting the community's needs.

Rahman stresses the importance of government-led awareness programs, public health and hygiene related initiatives, and infrastructure development to mitigate the impact of natural disasters. However, the community's lack of vocational and technological expertise hampers their ability to independently address these challenges, underscoring the need for sustained government intervention and support.

KII-62: Union Parishad Chairman (Keyamullah, Chandpur, Tajumuddin, Bhola)

Shahidullah, aged 47 lives at Keyamullah village and serves as union parishad chairman of Chandpur of Tajumuddin upazila in Bhola district, reflects on the perennial challenges posed by cyclones, tidal surges, and salinity intrusion in the region, which inflict significant hardships encompassing economic, social, and health dimensions. Despite the presence of cyclone shelters within a 500-meter radius and their structural condition is not satisfactory.

Economical hazards they face like destruction of infrastructures, ruining the shelter, death of cattle and destruction of farmland. Natural disasters affect their social life and livelihood negatively. Access to safe drinking water emerges as a pressing concern during cyclonic events, exacerbating health vulnerabilities. Children and old people are more vulnerable group during cyclonic disaster. Children face infectious diseases and also hamper their education during this time. The vulnerability old people face are transportation barriers and lack of shelters.

Cyclonic disasters exacerbate the economic hardships. Food productivity is decreasing gradually, seasonal crops cannot be cultivated, vegetables cannot be grown, and fruit trees cannot be grown due to salinity.

Disruptions in communication and transportation further exacerbate social upheaval, while healthcare access remains inadequate, with government health services often located beyond a 1-kilometer radius. Common ailments such as fever, colds, and diarrhea prevail during cyclonic disasters, underscoring the need for improved medical infrastructure and preventive measures.

Despite community efforts to remain vigilant through miking systems, government support falls short of addressing the multifaceted challenges posed by cyclonic disasters. The burden of recovery largely falls on the affected communities, highlighting the inadequacy of existing policies and the necessity for enhanced funding to bolster livelihood resilience.

Shahidullah advocates for comprehensive planning initiatives, including the installation of tubewell, construction of embankments and polders, adequate cyclone center, and sufficient sluice gates to mitigate the impact of cyclonic disasters. He emphasizes the importance of public awareness and preparedness programs to foster community resilience and address the complex challenges posed by recurrent natural disasters.

KII-63: Upazila Information Service Officer (Tajumuddin, Bhola)

Khadija Begum, aged 29 years, works as Upazila Information Service Officer of Tajumuddin upazila in Bhola district. Cyclones, river erosion and floods are major problems in this area. Besides, there is a slight problem of salinity. As a result of river erosion, people lose their homes and become landless. As a result, they have to migrate and take shelter in the government's land or lease it. A lot has to be spent in uncertainty. Apart from this there is financial loss, loss of employment, death of livestock and as a result people are physically and mentally broken. Children stop learning. Girls are given early marriages, boys work with their fathers or on their own to support the family. When the dam is broken, the house collapses, the furniture is destroyed, rice falls, the foundation of the house is destroyed. Besides, other infrastructures are destroyed. Many people die in disasters. In addition, various diseases spread. Girls cannot maintain menstrual hygiene, so there is a possibility of these related diseases. Apart from this, outbreaks of various water borne diseases including skin diseases are seen. There is a cyclone center within a kilometer or two. Usually, the school is made like a cyclone center. Women and children are more affected by disasters. Pregnant mothers have trouble accessing health care, children drop out of school. Because post-disaster financial uncertainty prevents them from studying. Erosion of rivers leads to displacement of residences and disruption of children's regular education. The poor and disaster-prone people of this area do not have such technical or vocational knowledge to deal with disasters.

They follow traditional coping mechanisms. For example, saving crop seeds, dry food, saving money, cooking stoves made of earth so that when the water rises, they can cook in the loft, keeping the necessary things in the high places of the house and trying to overcome the damage of the disaster in their own way. The present government is extending Bangabandhu's disaster management further. Delta Plan has taken over. Apart from this, various works are being done for Cyclone Centre, Housing and Relief and Rehabilitation. All the projects that are currently there should be made more efficient. In that case, financial disparity should be removed, financial assistance should be arranged for the truly needy, health system should be improved, health care should be ensured for all during the time of disaster, health center should be taken.

KII-64: Marine Fisheries Officer (Tajumuddin, Bhola)

Md. Al Amin, aged 52, works as Marine Fisheries Officer of Tajumuddin upazila in Bhola district. He says that every year, the population of the region is confronted with a variety of disasters such as flooding, cyclone strikes, river erosion, and salinity. These disasters can cause extensive destruction, resulting in the destruction of homes, the loss of crops, the death of livestock, the blocking of roads, the destruction of shops, and the sinking of many boats. These disasters can lead to the loss of employment, a decrease in income, and a rise in economic hardship also. The majority of the population in the region are already impoverished and rely on fishing, agriculture, and hunting for sustenance. Natural disasters have a direct significant adverse impact on the population, thus exacerbating their plight. The current government is taking various measures to deal with disasters, providing training, repairing existing shelters and building new cyclone centers. Apart from this, housing projects are being done for the landless and providing emergency post-disaster relief. The work of installing GSM (Geographical System of Mobile communication) device in fishermen's trawlers is in progress. Community based training should be arranged. Leaflets should be distributed, so that actionable strategies are available from anywhere during disaster. In order to reduce the risk of disaster. Embankment version, navigability of the river should be taken for rain. Necessary steps must be taken to ensure post-disaster yield.

KII-65: Fisheries Extension Officer, Tajumuddin

Md: Amir Hossain, aged 46, works as Fisheries Extension Officer of Tajumuddin Upazila in Bhola district. He says that cyclones, river erosion and floods are major challenges of the community in this area. Besides, there is a slight problem of salinity. As a result of river erosion, people lose

their homes and become landless. The fish in the pond were swept away by the flood. More cyclone centers should be constructed. Dam should be provided in riverside areas. A monitoring committee should be provided in the upazila so that the disaster management project is properly implemented.

KII-66: Sub Assistant Engineer (Tajumuddin, Bhola)

Samarjeet Chandra Gharami, aged 48, works as Sub Assistant Engineer of Tajumuddin upazila in Bhola district. Floods, cyclones, and river bank erosion occur in every year in this area. Severe disaster forces some people to change their profession. Houses are destroyed. The disaster also has various economic consequences. Agricultural production is reduced, agricultural land is destroyed, people lose their job and migrate to cities. There is a cyclone center within a kilometer or two. Usually, the school is made like a cyclone center. The structural condition is good, but in the time of disaster many people have to stay there, so it is tough to maintain hygiene and provide all the opportunities. Women, children, the disable, and the elder people face more challenges during cyclonic disasters. However, economically low-income people suffer the most. Bangabandhu focused on the disaster risk reduction. He established the CPP and MoDMR. He worked on post disaster relief and rehabilitation, including early warning. Current government is working very well. Along with the government, local wealthy individuals should come forward.

KII-67: Health Assistant (Tajumuddin, Bhola)

Abdus Salam, aged 46, lives at Keyamullah village in Chandpur union of Tajumuddin upazila in Bhola district. He has been serving the individuals of this region for around five a long time. Salam sits within the community clinic as well as the upazila wellbeing complex. He and the community faces different kinds of calamities like cyclones, tidal bore, floods, river erosion etc. which leads to many sufferings, destruction of houses, losses of livestock, breakdown of roads and infrastructures, health risks including fever, malaria, diarrhea, headache and many infectious diseases, even unable to afford menstrual hygiene, drinking water scarcity and water, sanitation and hygiene (WASH).

Salam mentions that diverse calamities have made the individuals more hardworking, dedicated, dedicated and touchy. They arrange to confront any circumstance but when business is cut off individuals have no other plan of action. Due to which they are continuously stressed but without offering any assistance from government or NGOs they lift all the difficult hardship by themselves with their possess endeavors.

Amid surges they were discharged as community clinic covers. But individuals need to take off their house since they think that their house is the most secure put for them besides. And a parcel of uncertainty is the fear of robbery or thieves that will cause individuals to take off their homes and go to covers, it's really people.

Individuals in this zone don't have such indigenous knowledge to maintain a strategic distance from surges and they are not very aware and don't know what kind of measures ought to be taken some time recently or after surges amid surges.

Getting safe drinking water is found almost absent for the community during calamities, since tubewells and other safe drinking water sources are distant from their possess. He is exceptionally suspicious around the wellbeing of the villagers and it's nearby individuals.

Distinctive maladies influenced them for their oblivious development amid cyclonic disasters. Concurring to him, the foremost excellent activity of the government is to construct dams and offer assistance the individuals of the region through CPP by miking them some time recently the surge or raising the ruddy hail in some other way, other than the affect on their vocation within the long run, if any offices are given to the individuals of the zone. He considers that it'll play a far-reaching part.

KII-68: Teacher (Tajumuddin, Bhola)

Mr. Nur Nabi, aged 35, highlights the prevalence of cyclones in their area, emphasizing the adverse impact of cyclonic disasters on the local economy. Despite having a cyclone shelter located 1 kilometer away, its condition is only moderate. People of their community face disruption of communication, and their health is susceptible risk for break out diseases due to cyclonic disaster. Natural disaster creates scarcity of safe drinking water. Women, children and pregnant women face multifaced risks due to cyclonic disasters and they are the most vulnerable group during disasters. Women and adolescent girls struggle numerous challenges including lack of secured shelter, drop out from school, lack of hygiene management kit. The elderly population also faces vulnerability during such events.

Economic hardships are widespread, with significant losses incurred in terms of housing, livestock, and trees. Communication and transportation disruptions further exacerbate the situation, leading to heightened tension among community members due to cyclonic disasters.

Despite these challenges, the community member relies on indigenous practical knowledge and modern tools like television, facebook and miking for disaster awareness. However, the support

provided by NGOs seems to inadequate, required more proactive measures such as regular meetings to disseminate information about natural disasters, establish safe shelters, and promote principles of good governance to mitigate the impact of cyclonic disasters.

Appendix 5: Focus Group Discussion (FGD)

FGD 01: Vetkhali, Shyamnagar, Satkhira

| Name | Age | Marital status | Education | Occupation | Family member | Income | Expenditure |
|-------------|------------|-----------------------|------------------|-------------------|----------------------|---------------|--------------------|
| Nitish | 28 | Single | SSC | Crab collector | 5 | 11000 | 10000 |
| Horichandra | 58 | Married | Illiterate | Fisherman | 6 | 11000 | 12000 |
| Rani kar | 45 | Married | Class V | Fisherman | 5 | 6500 | 6000 |
| Nitai | 58 | Married | Illiterate | Golpata collector | 7 | 8000 | 8000 |
| Singran | 40 | Married | SSC | Housewife | 6 | 10000 | 10000 |
| Puja | 40 | Married | Class V | Fisherman | 5 | 5000 | 5000 |
| Nirdash | 62 | Married | Illiterate | Fisherman | 8 | 8000 | 8000 |
| Koushik | 22 | Single | HSC | Student | 4 | 4000 | 5000 |

(Source: Field Survey, 2023)

This focus group discussion has been conducted on the yard of Nitish's house with eight participants including six male and two female respondents of Vetkhali union of Shyamnagar upazila in Satkhira district.

One-third of the participants are illiterate and almost one-third respondents have passed class V, two of the participants have passed SSC examination and rest of one passed HSC examination. Two-third of the respondents are married. Half of the total participants are involved in fishing which is their main livelihood. Some of them are involved in crab collecting and golpata collecting which is almost off during the cyclonic disasters period.

According to all of the participants, cyclonic disasters like cyclone, tidal surge, salinity as well as flood is severe there. Ponds are sunk through cyclone and coastal floods and there is a severe

shortage of drinking water. All of the participants faced different kind of cyclonic disasters like cyclone, tidal surge, flood and salinity in every year.

All of the participants are experienced bitterly. Almost all the of respondents are little bit happy after the construction of the dam. Although the problem of inundation is less, still the daily wage earners or dinars are out of work due to cyclone and coastal flooding and the boatmen are out of business, resulting in no income on top of the regular income due to flooding.

All of the participants point out that they face negatively effect on economically, psychologically and health threats due to cyclonic disasters and one third of the respondents face negatively effect on social, physical and cultural sectors. All of them face negative effects of cyclonic disaster in their household like economic insecurity, food insecurity, lack of shelter, life risk, loss of infrastructure, health risk, lack of pure drinking water, damage of fisheries, damage of kitchen garden and also damage of their crop productivity.

Crab collector notes that in winter season the growth of crab hampered for the cold weather but these three to four months of their income is too much than the other months. Their income is almost off at the time of this season. According to crab collector, during the cyclone and flood the crab farming was disrupted about three or four times and suffered a loss of about three lakh takas due to drowning of crabs.

Fisherman claims that fishing is closed especially during Baisakh and Jaishtha months although hilsa fish is available but Kalbaisakhi storms as well as one after another tides remain in the river. As a consequence, their income is too scant during these two months.

All of them admit that cyclonic disasters and saline water also create health challenges while fishing and other agriculture work. They emphasize that cyclonic disasters are negatively effect on their children's education as the closure of school for the cyclone shelter, loss of books or other accessories and also damages of their infrastructure.

They believe that various cyclonic incidents compelled them to feel various mental pressure, agony and insomnia. Cyclonic disasters create adverse health implication in coastal area like a spread of water borne diseases, malnutrition leading various diseases, spread of respiratory illness also feel physical irritation.

All of them outline that cyclonic disaster induced various social disruptions like disruption of communication and transportation, impediment to women's income and employment, increase of

domestic violence, disruption of the means of livelihood also creates gender-based vulnerability due to lack of security are occurred.

All of them claim that cyclonic disasters negatively affected on their livelihood activities also negatively effect on their social life which create hindrance of daily activities, hindrance of cultural activities, disruption of communication, break out of various diseases, disruption of social network, hindrance to movement of children, disruption of communication, and transportation, impediment to women's income and employment , and damage of educational institution , also increasing rate of mental health issues and spread of water borne and victor borne diseases.

The salinity intrusion promotes the soil infertility that also hamper the ecological balance through disruption of ecosystems, disease of fish may increase, production of carp and sweet water fish will extinct, hindrance of vegetation and plant species and lack of homestead and kitchen garden. Two third of them face occupational challenges like their human labor faces less demand during cyclonic disasters and they also enjoy low wages and salary.

According to them almost six or seven hundred people migrated from this village due to cyclonic disaster which is create their loss of livelihood and also close their income source that's create them migrated to other villages.

They note that everyone is health conscious, but as they have to fight against salinity to survive and also because the source of income is very low, even though they are health conscious, they cannot provide nutritious food. All of the participants mention that pregnant women/breastfeeding women and adolescent girl do not get sufficient nutritional food. Pregnant women face iron deficiency, carry under weigh baby and become risk due to cyclonic disasters.

All participants mention their residence is suffocating, extremely heated, dirty and polluted, and risky and unhygienic respectively. One- third of the participants use bamboo made toilet which is surrounded by jute straw and also corrugated tin. Upazila health complex is far away from their homes and they do not get the desired free medical services from there. Two-third of the participants mention that health care services are not satisfactory.

All of the respondents claim that high rates of diseases, extreme weather or heat related illness and death, water, food and vector borne diseases, mental, nutritional, infectious and other health effects also create adverse health implication of those people are occurred due to cyclonic disasters in this area. All of them affected on fever, cold, headache, diarrhea, whooping cough and skin diseases etc. Pregnant women, Lactating women, neonatal baby, disable, aged and coastal people do not get

proper health care access or services. They claimed that lacking of fresh drinking water is responsible to damage of their health and they also risk on some infectious and communicable diseases. Besides, almost all (7 out of 8) participants claim that sufferings in maternal and fetal complexity, miscarriage, changes in periodical cycle, immature birth and death, intrauterine growth retardation and STD risks are occurred due to cyclonic disasters and excessive brackish water.

All of them have slightly technical knowledge like decision support system about resilience of cyclonic disaster response and risk mitigation. They do not have vocational knowledge about resilience of cyclonic disaster response and risk reduction. Two-third of them have widely and one-third have slightly indigenous practical knowledge like survival mechanism, migration, shifting cyclone center, taking dry food and water, regarding resilience of cyclonic disaster response and risk mitigation.

All of them agree with that they concern about upcoming disasters from Television, Miking and interpersonal communication. They expect from the Government, NGOs and others that they create enough policy to reduce this risk. All participants of FGDs think that embankments, sluice gate and cyclone center should be created, repaired and properly maintained. They think about that awareness should be focused on public health and hygiene issues, public awareness program and preparedness program should be more enriched to reduce the risk.

Two-third of them received vulnerable group feeding and poor people livelihood program and one-third of them mentioned that they received child education stipend, food for work and vulnerable group development for social protection from Govt and NGOs.

All of the participants of FGD emphasized that for implementing the following campaign will reduce risk like motivational and awareness campaign, supply of roof materials, supply of fresh drinking water and water reservoirs, salinity tolerant crop, principles of good governance, reconstructs of coastal tree plantation and vegetables garden activities project can be introduced for vulnerable women.

FGD 02: Boro Kauniya, Protapnagar, Ashashuni, Satkhira

| Name | Age | Marital Status | Occupation | Education | Family Member | Income | Expenditure |
|-------------|-----|----------------|-------------------|------------|---------------|--------|-------------|
| Munsur Sana | 70 | Married | Daylabour | Illiterate | 5 | 5000 | 5000 |
| Tota Bibi | 58 | Married | Landless poor | Class IV | 6 | 4500 | 5000 |
| Rakib | 45 | Married | Golpata collector | Class VIII | 6 | 14000 | 12000 |
| Harun | 57 | Married | Marginal farmer | Class III | 5 | 8000 | 9000 |
| Rafiq | 55 | Married | Boatman | Illiterate | 7 | 12000 | 12000 |
| Rashid | 55 | Married | Golpata collector | Class VI | 8 | 14000 | 15000 |
| Hamid | 62 | Married | Daylabor | Illiterate | 8 | 10000 | 10000 |
| Rijiya | 45 | Married | Crab collector | Illiterate | 8 | 9000 | 10000 |

(Source: Field Survey, 2023)

FGD 02 has been conducted on the yard of Munsur Sana’s house at the Boro Kauniya village of Protapnagar union in Ashashuni upazila in Satkhira district.

All participants of FGD said that they face various kinds of natural or cyclonic disasters in every year in this area such as: cyclone, salinity intrusion, tidal surge, as well as floods. All of the people said that they have bitter experiences during cyclonic disaster period. All respondents said they are more negatively affected by disasters economically, psychologically as well as health and one-third of the people affected socially, culturally as well as physically. They said economic hardship is the first speak. Almost all of those people said that they have cyclone shelter but the condition of cyclone shelter is not very good. Half of the people said that the cyclone shelter is 2 km far away from their home and one-third of the people said that the cyclone shelter is near their home. Half of the total respondents claim that cyclone center is good, one-fourth said that the condition of cyclone center is quite moderate. One-fourth of the respondents can not go there because of unhygienic environment and insufficient security during disasters period. All of the participants argue that cyclonic disasters effect negatively on their livelihood activities and also affect their social life such as: hindrance of daily activities, food shortage, communication break-down, break out of diseases etc., movement of children becomes problematic as well as their educational institutions had been destroyed resulting majority of those children more seriously hamper their learning losses. Half of the total respondents struggle the hindrance of daily activities like wedding

ceremony, and disruption of prayers. Almost all of the participants said that they have face more salinity intrusion during disaster an also said that even after installation of tube wells, saline water is available in this area. All of the respondents claim that children, pregnant women, disable and aged people are more vulnerable whereas two-third mention that adolescent girl and young adult women are more vulnerable during and post- cyclonic disasters. Almost all point out that school used closed as cyclone centre, infrastructure was damaged, lack of food and economic insecurity has been arisen. Almost all of the people argue that due to cyclonic disasters they have severely damaged their own properties as well as they face hindering of network and transportation, impediment to women's income and employment, prevalence of diseases particularly skin diseases, raises of mental health and illness, spread of vector and water borne diseases, lack of toilet facilities an also lack of water sanitation and hygiene facilities, gender vulnerability, disruption of the means of livelihood and consequences of overall migration etc. Almost all of the respondents admit that workers suffer less demand for human labor, low wage and salary particularly women, feel physical irritation and health hazards due to cyclonic disasters and saline water. All of the participants said that women get hardly medical treatment or health care services etc. and also engaged in unpaid domestic chores, child care and rearing of informal sectors which lead them vulnerability or deplorable situation. Almost all of the respondents claim that they face more intensity in summer season (Baishakh-Jaisthya) and least intensity during winter seasons (Poush-Magh). Seasonal crops and fruit trees can not be grown, and nursery, sapling plantation and timber trees and sweet water cultured fish, carp fish, hatcheries and aquaculture are damaged and decreasing due to cyclonic disasters which are claimed by all of the participants. They said that their main livelihood practice is fishing, crab, golpata and honey collecting, as well as agricultural and homestead kitchen garden in where their main income source is closed half of the year.

All of the people of this area can not get proper nutritious food and three-fourth of the participants are not conscious about their health. Due to lack of money, they can not get nutritious food, especially those people more face this situation during disaster period. Almost all of the participants mention that majority of the pregnant/breast feeding women, adolescent girl do not get proper, sufficient and nutritious food during and aftermath of cyclonic disasters. When they can not earn, several times can be mentally depressed. Women face many challenges during disaster especially pregnancy related complexity. They can not get adequate health care facilities

due to the remote of health complex. Pregnant women carry under weight babies due to malnutrition and are at risk due to cyclonic disasters. Even they face iron deficiency during reproductive period. Majority of them do not conceive quickly due to salinity as well as getting lack of menstrual hygiene facilities. Many of the children who remain have high rates of child mortality and lack of sufficient child food, increasing juvenile delinquency among children, as well as lack of food security. As a result of cyclonic disasters, social cohesion with everyone is almost cut off. Half of those people can not get any news through television women becomes job less, and majority of those people said that they are all time economically depressed as well as two-third percent of people are socially and mentally depression after post cyclonic disaster. Half of the people said that they have severely faced and extended various kinds of crime as well as theft, robberies and burglaries are increased at the time of disaster. They further said that during cyclonic disaster their environmental changed are worst all of them various dead animals and the smell of human corpse make the surrounding environment very toxic and very nasty. Three-fourth participants in this area can not get properly enough medicine facilities and maximum times they face shortage of health attendant as well as doctors during the post disaster period. As a result, half of those people in their areas is quite sick, not everyone is properly given the medical treatment facilities at the primary stage of illness people needed. All participants said pregnant women, disable, aged people and children are more vulnerable and they are fall into the worst conditions during cyclones, floods as well as river erosion. Even sometimes, pregnant women give birth inside the cyclone shelter but there are not enough medicine facilities and security to breastfeeding women the baby and also during disaster and post- cyclonic disaster. The adolescent girls can not get sufficient menstrual hygiene kit available. They never get safe drinking water and the help they get is too scant. Medical facilities which has been provided to them from the hospital is almost insignificant and they are almost 8 kilometers apart from their houses. Three-fourth of the participants mention that health care services are not satisfactory at all. They don't have any private clinic from where they can take their medical service for any needed.

All participants mention that their residence is suffocating, almost all note that their habitat is filthy and more than two-third participants mention that their resident is extremely heated, risky and unhygienic and toxic environment respectively. More than two third of the participants use bamboo made toilet which is surrounded by jute straw and almost one third made their toilet by corrugated tin. Almost two third mention that Upazila health complex is 08 km far away from their homes

and they do not get the desired free medical services from there. More than two third of the participants mention that health care services are not satisfactory.

All participants of the FGD claim that high rates of diseases, extreme weather-related diseases, heat related illness and death, water, food and vector borne diseases, mental, nutritional, infectious and other health effects also create adverse health implication of those people are occurred due to cyclonic disasters in this area. All of them suffered on fever, cold, headache, diarrhea, whooping cough and skin diseases etc. Pregnant women, Lactating women, neonatal baby, disable, aged and coastal people do not get proper health care access or services. They claimed that lacking of fresh drinking water is responsible to damage of their health and they also risk on some infectious and communicable diseases. All participants claim that sufferings in maternal and fetal complexity, miscarriage, changes in periodical cycle, immature birth and death, intrauterine growth retardation and STD risks are occurred due to cyclonic disasters and drink and usage of excessive salt water.

Almost one-third of the respondents said that they haven't any technical knowledge for risk reduction during disaster as well as two-third of people also said that they have technical knowledge for risk reduction during cyclonic disaster. Majority (three-fourth) of the people said that they haven't any vocational knowledge to reduce disaster risk during disaster as a result they have face many severely damaged. But all of the respondents said that the indigenous practical knowledge has been implied through migration, own survival mechanism, moving from the higher ground in the time of cyclone and floods, and also practicing by the religious activities as well. All participants said that the early warning system is available and they know the upcoming disaster by miking and interpersonal communication and half of them mentioned through television and facebook. All participants note that they can recover their damage properties after cyclonic disasters through capacities their own resources, two-third of the participants claim that they can recover their damage properties through government support. And half of total respondent response that they get support from NGOs and also some people recover their damage properties by stakeholders support but it can get rarely. Half of the total respondents said that they need 7 to 12 months to recover their damaged properties causing by cyclonic disasters, one-third mention that they need more than a year to recover their damaged properties and only one participant mention that s/he needs 3to 6 months to recover damaged properties causing by cyclonic disasters. Half of the respondents admit that the existing policy is not enough for them, and rest half note that the existing policy need some advancement for them. All of the respondents suggest that they

need to repair and maintain embankments and cyclone center, careful planning should be required for sufficient sluice gate, ensure safe drinking water, ensure medical facilities during and after disaster, menstrual hygiene management (MHM) corner for disadvantaged women, to empower local community, local community to local government, build disaster risk reduction skills, public awareness program particularly focused on public health & hygiene issues, meeting and comprehensive training module and overall preparedness programs should be more enriched. Half of the participants received social assistance from the government or different kinds of non-governmental organizations e.g., child educational stipend and vulnerable group development (VGD) as well as two-third of people mentioned that they have received vulnerable group feeding from the government, and only one-fourth of participants mentioned on grief that they haven't received any kinds of social assistance from the government. Above all, majority of the people said that the government should policy implemented about motivational awareness campaign as well as the current government should be implemented policy about education, computer skills, technological training and basic vocational skill-based training.

FGD 03: Uttar Bedkashi, Koyra, Khulna

| Name | Age | Marital status | Education | Occupation | Family member | Income | Expenditure |
|--------------|-----|----------------|------------|---------------------|---------------|--------|-------------|
| Prakash | 28 | Married | Class V | Marginal farmer | 6 | 13000 | 13000 |
| Aiyub | 25 | Married | SSC | Daylabor/ fisherman | 5 | 18000 | 18000 |
| Kabita munda | 35 | Married | Illiterate | Landless poor | 4 | 7000 | 6000 |
| Monu mia | 62 | Married | Illiterate | Fisherman | 7 | 10000 | 8000 |
| Faruk | 58 | Married | Illiterate | Fisherman | 8 | 12000 | 12000 |
| Nomita | 37 | Married | Illiterate | Daylabor | 8 | 8000 | 7000 |
| Razzak | 27 | Married | SSC | Marginal farmer | 5 | 14000 | 14000 |

(Source: Field Survey, 2023)

This focus group discussion has been conducted at Prakash's house in Uttar Bedkashi union of Koyra upazila in Khulna district with seven respondents including five male and three female. One third of the respondents involved with the occupation of farming, crab collecting and the rest of them are day labour respectively. Half of the total participants are illiterate and more than one-

third passed SSC. Most of their income from the respondent are moderate but the other's income are too much low.

All of the participants experienced various type of cyclonic disasters like cyclone, flood, storm surge and salinity also. Cyclonic disasters create enormous problem on their livelihood. All participants of FGD mention that cyclonic disasters affect negatively on their social life. All of them have been loaned money from NGOs and all have taken loans because of livelihoods destroyed by natural disasters. all of the respondents of FGD claim that they face negatively affected by economically, psychologically and health due to cyclonic disasters. On the other hand, almost one-third of the participants mentioned that they face negatively affected by socially, physically and culturally. All of the participants face economic hazards by destruction of infrastructures, damages of houses, agriculture and agricultural land.

All of the participants claimed about the condition of cyclone center is satisfactory which is 2 km far away from their house. All respondents mentioned that the transportation system became destroy at the time of the disaster period. All of the participants claim that community people faced negatively for food insecurity, the hindrance of daily activities, disruption of communication and break out of diseases due to cyclonic disasters. All participants of FGD mention that cyclonic disasters pose threats negatively by social implications for the disruption of social network, communication and transportation, women's income impediments, damages of educational institutions, mental stress heightened, prevalence of diarrhea, inflicted of water and vector borne diseases, skin diseases, forced migration, disruption of the means of livelihood and almost three-fourth mention of gender-based vulnerability.

About two thirds of people collect rainwater to meet their needs for drinking safe and clean water, while the rest collect water by purifying salt water or using other methods. Most suffer from a lack of safe food and water. Almost half of the houses have tube wells but the salt water comes from the tube wells and they meet their fresh water needs through other means.

All participants claim children, pregnant and lactating women, disable and old people are more vulnerable due to cyclonic disasters whereas six out of seven respondents of FGD claim that adolescent girl and young adult women are more destitute during cyclonic disasters. All of participants are experienced at damages of infrastructure, economic uncertainty, lack of food security, risk of infectious diseases due to disasters. Furthermore, cyclonic disasters impacted adversely on women and adolescent girls in various sectors including lack of secured shelter, drop

out from school, lack of menstrual hygiene management kit, lack of maternity health and health care services, lack of food and nutrition, increases of domestic household works etc. All participants claim that aged people and disable people face vulnerability for lacking of water, sanitation and hygiene facilities. Two-third of disable and aged people mention that they face transportation barriers and lack of toilet facilities due to cyclonic disasters.

According to them they earn more in Ashar-Srabon and Vadro- Ashwin months but their income is comparatively less in Baisakh-Jaistha months. The reason behind their lowest income in this particular season is because of an available of fish and no agriculture productivity and also lack of employment opportunity. Everyone feels that natural calamities are the biggest threats to them as their income is cut off and besides subsistence, they have no source of income for those few months if there is a major natural calamity at that time.

Seasonal crops, vegetables and fruit trees can not be grown, and nursery, sapling plantation and timber trees and sweet water cultured fish, carp fish, hatcheries and aquaculture are damaged and decreasing due to cyclonic disasters which are claimed by all of the participants.

All participants admit that they are not conscious about their health and even do not get proper or nutritious food. Five out of seven participants take 2 meals in a day and only two participants get 03 times meal in a day. Everyone feels that mental health has a huge impact during disasters. Almost all of them face lack of healthcare facilities, sanitation and pure drinking water due to cyclonic disasters. Pregnant or lactating women do not get sufficient and nutritious food and also face iron deficiency during reproductive period. Pregnant women, lactating women and baby carry underweight.

The upazila health complex and community health clinic is about ten kilometers and about four to five kilometers far away from their house respectively and none of them have ever received free medical care and free medicine there.

All participants explain about their condition of residence including toxic and suffocating environment; two third mention risky and unhygienic and almost half of the participants of FGD claim that their habitat is dirty and polluted environment and dusty and nasty. One-third participants use bamboo made latrine surrounded by plastics, bamboo made toilet surrounded by jute straw and bamboo made toilet surrounded by corrugated tin.

All participants of FGD also claimed the adverse health implications of them due to cyclonic disasters in coastal area like high rates of diseases, heat related illness and deaths, water and food

borne diseases, mental, nutritional, infectious, and other health effects also inflicted them. Only one-third mention that they suffer air pollution related health effects diseases. They also faced the health hazards during disasters like damage of health facilities, lack of free medical services, risk of infectious communicable diseases and also lack of fresh drinking water. All participants agree about that cyclonic disaster-prone areas coastal people and pregnant or lactating women don't get proper health care services.

Besides, all participants explained that women faced vulnerability for hardly getting preferential treatment, social exclusion due to lack of empowerment and women roles in domestic houses, child care and rearing like informal sector which is also unpaid. Also, two-third participants explained that women faced vulnerability that healthcare center is far from the home. Almost all participants mention women face social restriction and barriers in getting access to health care services, and women faces lack of opportunity in community decision making process due to domination of males; one-third noted that women face patriarchal attitude in the context, and women are unable to play role in voluntary services due to restriction of social movement.

They don't know about any technical and vocational knowledge about resilience of cyclonic disaster response and risk reduction. Besides, all participants claim that they have widely and slightly indigenous practical knowledge about resilience of cyclonic disaster response and risk reduction by maintaining own survival mechanism, internally displaced, shifting cyclone center and practicing religious activities etc.

The local leaders and CPP volunteers aware them upcoming disasters by miking; all participants know the upcoming disasters by television, and interpersonal communication.

Almost half (three out of seven) of the participants of FGD get child education stipend, vulnerable group development, vulnerable group feeding, and rest of them has the Jelle card who get 60 kg rice when fishing is off.

All participants of FGD recommended the following coping strategies like embroidery, tailoring and knitting project can be initiated, motivational and awareness campaign, education, computer skills and vocational skills and technological training should be introduced, supply of roof materials, supply of pure water, reconstructs of coastal embankments, dams, and polder, and tree plantation and vegetable garden activities should also be increased. More than half of the participants of FGD claim that salinity tolerant crops should be introduced.

FGD 04: Kalabagi, Sutarkhali, Dacope, Khulna

| Name | Age | Marital Status | Education | Occupation | Family Member | Income | Expenditure |
|--------------------|------------|-----------------------|------------------|-------------------|----------------------|---------------|--------------------|
| Krishnopodo Mondal | 67 | Married | Illiterate | Marginal Farmer | 9 | 20000 | 18000 |
| Nirod Mondal | 48 | Married | Illiterate | Fisherman | 5 | 10000 | 10000 |
| Lotika Mondal | 35 | Married | Class V | Crab collector | 4 | 6000 | 8000 |
| Niranando Mondal | 34 | Married | Class V | Marginal Farmer | 6 | 15000 | 15000 |
| Surjo Mondal | 54 | Married | Illiterate | Golpata collector | 5 | 14000 | 15000 |
| Binod | 38 | Married | Class V | Fisher man | 6 | 12000 | 12000 |
| Nirmol | 58 | Married | Illiterate | Mowal | 6 | 15000 | 15000 |
| Bishwanath Mondal | 32 | Married | Class III | Landless poor | 5 | 10000 | 10000 |
| Avoychoron | 70 | Married | Illiterate | Fisherman | 5 | 8000 | 10000 |

(Source: Field Survey, 2023)

FGD 04 has been conducted at the yard of Krishnopodo Mondal’s house at Kalabagi village of Sutarkhali union of Dacope upazila in Khulna district. All of them have faced bitter experiences some natural disasters in their areas such as cyclones, tidal surge, floods, salinity, river erosion at every year. As a result of those natural disaster, they live in worst conditions and according to them, they suffer from most severely affected economically, psychologically as well as health. Half of them said that economic crisis is the most important challenges after cyclonic disaster. At that time of cyclone, they take secure shelter near their home due lack of sufficient space and insecurity majority of those people can not go cyclone shelter although it situated neat at their houses. The environment of the cyclone shelter is very bad. As a result, they faced several kinds of water related vector bone diseases especially the children are more severely affected among those diseases. Half of those people have faced economic hazards during disaster period like destruction of infrastructure, death if cattle and few people said that more severely affected their farmlands. As a result, majority of those people fall into the worst conditions during disaster. Some people said that the environment inside is not good at all. Majority of the people said that economically they suffer the most because during this time their houses are heavily damaged, agricultural land is damaged, cows and goats die, schools and colleges are destroyed. Cyclone is

seen to have a negative impact on their livelihood and hence their social life is also affected. All of the community people are affected by the cyclone, then those who are day laborers and most of them work at others destitute and also said that maximum people have no work during disaster. They do not have any social events, there is shortage of food, they cannot offer their religious prayers because then there are no houses to offer prayers. Communication system breaks down and prevalence of various diseases increases. Due to the cyclonic disasters, there is social damage because there is no contact with anyone, children have mobility problems, communication systems are broken, roads are broken, people are out of work, unemployment and educational institutions are broken. In addition, diarrhea increases, crime rates increase, mental depression, various water-borne diseases increase, skin diseases and migration of many people from rural to urban areas, along with greater gender discrimination. As a result of occurring cyclone, problems on water, sanitation and hygiene as well as lack of safe drinking water become evident and water from ponds, rivers and canals is wasted and women are the most affected because they have double work pressure at home, do not get adequate medical facilities. The most affected group during this time as well as girls, children, old women and men, disabled and later women are also in poor condition. Half of the participants said that the child mortality rate increases, children are deprived of food, various types of juvenile delinquency are organized and various infectious diseases affect them. Almost everyone said that children are affected in various ways during this time because schools are closed, schools are used as cyclone centers for a long time and people take shelter in cyclone centers until they can build houses. Many times, schools are broken due to economic uncertainty, parents cannot send them to school with new books, notebooks and pens and due to lack of money they go to work in the paddy and brick fields with their father and brother and the girls who stay help their mother near home. Thus, the rate of student dropout also increases. In their areas women are also said that they can not be secured in cyclone centers and at home and those girls who stay do not have the opportunity to go to school, they do not get enough hygiene management kits in their menstrual hygiene period at home and in cyclone centers, they do not get maternity health facilities, pregnant women who stay. And women suffer the most. They are old and disabled, they are in worse condition because in many cyclone centers they don't have toilet facilities, they don't have enough food, they can't go there easily, they don't have water sanitation and hygiene facilities in many more cyclone center. According to them, cyclones affect their economic activities because they do not have work, they stay at home for long periods, their moods become irritable and family

problems arise. And during cyclones their production of crops like paddy, wheat, corn, garlic, which are seasonal crops are reduced, vegetable production is reduced, not enough trees are born in nursery. Fish farming is affected due to salt water and they are said to be the most affected by cyclones. They are basically poor people. Most of their jobs are farming and fishing, selling fish and working in other people's houses. Majority of those people worked at 15 to 20 days in a month and two- third portion of participants said that they are doing work at 20-25 days in a month. Few people said that their daily income is 200-250 and half of those people said that their daily income 150-200 taka. outside of that they don't get work and our income is like 300 to 400 taka but post cyclone time When they don't have this job, unemployment occurs and they spend their days in more poverty. And in the aftermath of a cyclone, there are various environmental changes like increasing of waterlogging, salinity, river erosion, soil erosion, and a nasty smelly environment. As a result of the cyclone, illiteracy rate increases because people can no longer educate their children, Two- third of the participants said that they are not basically conscious about their health but in their area, they basically don't get enough hospital facilities for which they can't get treatment. The outbreak of diseases during post cyclone is so intense in all the hospitals that they can not afford their expenses adequately. Pregnant women stay in cyclone centers or aftermath of disasters they face many difficulties, and in many cyclone centers they don't have lactating or breast feeding rooms to feed their babies because of insecurity. They often don't want to go to the cyclone center and not going to the cyclone center leads to various problems. And post-disaster or during disaster women who are reproductive do not get sufficient nutrition food due to which they become physically weak and often hypertension. Those who are adolescent girls do not get enough nutritional food at this time, so they face various physical complications. Moreover, many cyclone centers do not have any portable water supply and do not have adequate hygiene and sanitation facilities. Half of those people said that they can not proper sanitation facilities during disaster; they have used bamboo made latrine that surrounded by plastics, most of them are in open areas and bamboo made latrine surrounded by jute straw which are not hygienic and cause various physical complications. Two third of the participants can get properly medical facilities that provided by upazila health complex but majority of the people said that in this area they can not get properly medical services from union health complex as well as upazila health complex, and almost all of their houses remain within 5 km from the hospital. The medical facilities they provide during disasters are not enough. As a result, they are not satisfied. The marginal people of the coast

face various problems due to the cyclonic disasters. They are mentally frustrated by various diseases. As women suffer the most especially pregnant and disabled women cannot struggle with cyclone. Due to lack of technical knowledge and every year this loss has become their daily routine. When disaster upcoming they get news by miking as well as television and also few people said that they knew upcoming disaster by social networking site two- third of people know about upcoming disaster by interpersonal communication. The coastal people go to the safe place and many people do not want to go cyclone center because home, cows, goats, poultry keeping. Half of the people said they recover their damage properties capacities from their own resources, and maximum people further said that they recover their damage properties by various kinds of non-governmental organizations and few people said that they can be stakeholders support as well as two third portion said that they can not any government support during after disaster. Sometimes it takes more than a year, and then another cyclone comes again and they are experienced with the same sufferings, damages and that's how life goes on for their coastal people. As a result, the scenarios and plans taken by the government for the people of this region are not enough and also majority of those people said that they have received social protection from the government and nongovernment organizations, half of the people get social protection like vulnerable group development and two- third portion of participants said they have received social protection food for work and further said that few people can not get any social protection from the government after cyclonic disaster. The present government should be ensured and implemented policy for them like motivational awareness campaign, supply of roof materials as well as tree plantation and vegetable gardening practices.

FGD 05: Charlathimara, Horinghata, Patharghata, Barguna

| Name | Age | Marital Status | Education | Occupation | Family member | Income | Expenditure |
|---------------|------------|-----------------------|------------------|-----------------------|----------------------|---------------|--------------------|
| Abul Hosen | 42 | Married | Illiterate | Fisherman/ Grocery | 6 | 20000 | 18000 |
| Parvin | 38 | Married | Illiterate | Fisherman | 5 | 10000 | 12000 |
| Altaf Hossain | 60 | Married | Illiterate | Fisherman | 8 | 20000 | 20000 |
| Hossain | 22 | Married | Class V | Fisherman | 4 | 16000 | 12000 |
| Khairul | 24 | Single | Graduate | Student | 3 | 4000 | 8000 |
| Yousuf Ali | 70 | Married | Illiterate | Marginal farmer | 4 | 6000 | 6000 |

(Source: Field Survey, 2023)

This focus group discussion has been conducted at Abul Hosen’s grocery at Charlathimara village of Horinghata union of Patharghata upazila in Barguna district with six respondents including five male respondents and one female respondent.

One respondent is shopkeeper, marginal farmer and student and half of the total participants of FGD who are also involved in fishing.

All of the participants faced various natural or cyclonic disasters including cyclone, tidal surge, flood and salinity etc. These are the cyclonic disasters following to them. Cyclone and tidal surges are very common.

All of the participants mention that due to the cyclonic/natural disasters, they live in miserable conditions. They suffer from most severely affected economically, psychologically as well as health. Half of them said that economic crisis is the most important challenges after cyclonic disaster. All of the participants are disappointed about the condition of cyclone centre during disaster but the centre is not so far from their house. One-third of the respondents mention that the cyclone centre is 5 km far away from their house. Half of the respondents of FGD are satisfied about the structural condition of cyclone center and rest half of the respondent feels moderate.

All respondents mention that cyclonic disasters destroy their infrastructures and their farmland. Two third mention the ruining of the shelter, and one third noted their death of cattle and also impacted on economic hazards during natural disasters.

All of the respondents admit that hindrance of daily activities, disruption of communication, food insecurity, breakout of diseases etc. are occurred negatively on their community during cyclonic disasters and rest of them think that hindrance of culture activities like wedding ceremony and rituals are hampered during the natural disasters.

They observed salinity intrusion in the three or four months of the year. All of them believed that cyclonic disasters create the problem of safe drinking water because of the salinity. The tubewells are not installed because of salinity intrusion and they rely on rain water and pond sand filter (PSF) to meet their needs. Also some NGOs set up PSF to provide safe drinking water for the people. But all of them upset about that the PSF is far from their house and they struggle very much difficulties for collecting this water.

The health care center is not so far from their area but they don't get any free medical care from these. Also, they claimed that at the time of disasters they don't get any help from the upazila health complex because the doctor do not come in the health complex because of this weather.

All participants mention that children, adolescent girls, young adult women, pregnant women, disable and aged people are more vulnerable due to cyclonic disasters. All participants claim that children, women and adolescent girls suffered economic uncertainty and lack of secured shelter, lack of food and nutrition, lack of menstrual hygiene management system, lack of health care services during the disaster period. Three fourth mention that women and adolescent girls faced mobility problem and collect sanitary materials etc. All of the participants of FGD note that aged people or disable face vulnerability on water, sanitation and hygiene problems and toilet facilities. Tow third mention that aged people or disable face vulnerability on transportation barriers and lack of shelters etc.

All participants of FGD faced occupational hazards and challenges during disaster like workers suffer due to cyclonic disasters and less demand for human labor, feel physical irritation and hazards due to saline water in the paddy fields, low wages and salary also women are discriminated in terms of wage and work environment. They also faced health hazards due to cyclonic disasters and saline water while fishing and other agriculture works.

Three fourth of them earn more money in Paush-Magh and Falgun-Chaitra whether it is occurred cyclonic disasters or not and Baishakh- Jaistha and Ashar- Srabon are their lowest income month because of unavailable of fish, low agriculture productivity and lower vegetation.

All participants think that cyclonic disasters seriously affected on seasonal crops and fruit trees and almost all of them affected vegetables cultivating during cyclonic disasters.

Cyclone, flood or other natural calamities are big curse for them as their livelihood as well as their lives are threatened as those involved in the occupation of fishermen go to fish in rivers or seas.

Cyclonic/ natural disasters greatly affect their mental health and mental illness of lower income family. One-third is aware of sound health and nutritious food but nutritious food is not possible for them as they do not have the income required to meet nutritious food. All of the participants mention that they do not get proper and nutritious food. Two third of the participants claim that they take 02 meals in a day and one third mention that they take 03 meals in a day. All of the participants mention that pregnant women, lactating women and adolescent girls do not get proper and nutritious food; pregnant women face iron deficiency and carry underweight baby; and pregnant women are at risk during cyclonic disasters. Furthermore, two third of the participants of FGD mention that they have drinking water, sanitation and hygiene.

All of the participants habitat condition is filthy, dusty and nasty, risky and unhygienic, and dirty and polluted environment as well during cyclonic disasters. One fourth has pucca latrine and two third of the participants has bamboo made toilet surrounded by corrugated tin. One-fourth, one-sixth and half of the participants of FGD claim that their health service institution is 02, 05 and 08 km far away respectively from their home. Two third mention that they do not get free medical services and are not satisfied also.

They face adverse health implications during cyclonic disasters in coastal area like heat related illness, extreme weather events, high rates of diseases, water and food borne diseases and vector borne diseases also mental nutritional, infectious and other health effects inflicted them during cyclonic disaster whereas half of the participants mention air pollution related diseases.

All of the participants face the health risks of fever, cold, headache, diarrhea, whooping cough and skin diseases etc. All of them faced risk of infections communicable disease and lacking of fresh drinking water and pure drinking water and also damages of their health facilities.

All participants claim that cyclonic disasters induced salinity create maternal and fetal complexity, changes in periodical cycle, premature birth and death, intrauterine growth retardation and

sufferings in STDs due to usage of periodic time and miscarriage rate are more in their coastal region than other areas.

All of them acknowledged that women face vulnerability mostly during the natural disasters like hardly getting preferential treatment, health care center is too far, facing lack of opportunity in community decision making process due to domination of males, and they face social restriction and barriers in getting access to health care services, also they are unable to play role in voluntary services due to restriction of social movement.

Two third of them have not any technical and vocational knowledge about resilience of cyclonic disaster response and risk reduction but rest of them has applied some technical knowledge to cope with this disaster and mitigate the risk.

All participants of FGD have indigenous practical knowledge including community behaviour towards disaster, own survival mechanism of victim, internal displacement/migration and moving higher ground in the time of flood/ shifting cyclone center during cyclonic disasters.

All participants know the early warning system of upcoming disasters by miking and interpersonal communication. All participants mention they recover from damage properties due to disasters through government support and their own capacities. Two third of the participants need seven to twelve months to recover the damages properties and setback in regular life activities. On the other hand, one-third mention that they need 3 to 6 months to recover their damaged properties and setback in regular life activities. They also emphasized that government need some advancement to recover the damage and also reduce their risk.

One third of the participant's family of FGD received some social protection from govt like child education stipend and poor people livelihood program respectively; all participants received vulnerable group feeding and half of the (3 out of 6 respondents) participants received vulnerable group development and food for work.

All participants of FGD recommend various coping strategies with disasters like salinity tolerant crop variety needs to be introduced, motivational and awareness campaign, supply of rain water and roof materials, education, computer skills, basic vocational skills and technological training, reconstruct of coastal embankment, dam and polder, and also tree plantation and vegetable gardening activities.

FGD 06: Betagu Bazar, Betagi, Barguna

| Name | Age | Education | Occupation | Family Member | Income | Expenditure |
|---|-----|------------------|-----------------|---------------|--------|-------------|
| Abdus Sattar (Ward 1, Betagi) | 63 | Illiterate | Sanitary maker | 9 | 20000 | 20000 |
| Rasel Howlader (Ward 1, Betagi) | 28 | Primary | Daylabour | 6 | 15000 | 15000 |
| Shahidul (South Phultola) | 42 | Class VIII | Daylabor | 4 | 15000 | 15000 |
| Jhantu (Ward 1, Betagi) | 40 | Illiterate | Auto Driver | 5 | 12000 | 12000 |
| Asad (Ward 1, Betagi) | 18 | Higher Secondary | CPP Volunteer | 9 | 15000 | 15000 |
| Ashok Karmokar (Ward 6, Betagi, IDP from Jolabari, Swarupkathi) | 42 | Secondary | Jewellery maker | 4 | 20000 | 25000 |

(Source: Field Survey, 2023)

FGD 06 has been conducted at the shop of Betagi upazila of Barguna district. All of the participants of FGD argued that every year they have face different kinds of natural disasters like cyclone, tidal surge, salinity intrusion, floods as well as river erosion. Two-third of the participants said that they have faced cyclonic disasters every year but one-third participants said that they have faced disasters sometimes. All respondents of FGD said that they have faced bitter experience during disaster period. Half of the people said that they are more severely affected economically during disaster period. All participants said cyclonic disasters impacted on economically and also psychologically especially health and one- third percent people said they have faced bitter experiences on socially, physically and culturally. All of the people said the cyclone shelter exists their areas. Cyclone center is situated at near distance from their houses, two-third mention that cyclone center exists within 1 km and one- third of FGD participants said that cyclone center is situated within 2 km. All of the respondents said the structural conditions of cyclone shelter is satisfactory but they can not go there during disaster due to lack of security and unhygienic environment. Due to the cyclonic disasters all of the participants are severely affected different kinds of diseases especially for the lacking of pure drinking water, and children are negatively affected water and vector bone diseases like dysentery, diarrhea fever, and cold. All participants of FGD said that women, pregnant women, breastfeeding women, children, aged and disabled

persons are more vulnerable and two-third participants claim that adolescent girl and young adult women are more vulnerable during disaster. All participants said that due to cyclonic disaster effects their children's institutions and school was closed, damages of infrastructure, and economic uncertainty are also observed. All of the participants mention that the aged and disable people face vulnerability regarding lack of shelters, transport barriers, lack of water, sanitation and hygiene facilities during disaster. Due to disaster all participants are unemployed at least 2 to 3 months, face challenges of occupational hazards, lower wages, as well as health hazards due to cyclonic disaster, and also two-third face challenges of physical irritation and hazard due to saline water in the paddy fields. Half of those people said that their main livelihood practice day-laborer, and two-third participants of FGD mentioned agriculture and fishing. But one-third respondents said their main livelihood practice is homestead kitchen garden and seasonal work. They said that they are working in a month 20-25 days but two- third of participants said they work 15-20 days in a month. Their daily income is more than 300-taka, half of the people of FGD mention that maximum people's income 200-250 taka in daily, and few people daily income is 150-200 taka. They said that seasonal worker earn more money during summer (Baishakh – Jaistha) said half if the people an also two- third participants said they have earn more money during rainy season and furthermore few people said winter seasons they have earn more money when intensity of salinity. Their income is lowest during the rainy season but majority of those people said that lowest income is found during autumn. Few people said lowest income is found during late- autumn.

Half of the people said that they have found lowest income in a particular season low agricultural productivity as well as lack of employment opportunities, two- third of the people said lower vegetation main cause their lowest income during disaster and few people said they do not know about the issues. All participants face many challenges of social disruption during disaster such as disruption of social network as well as communication and transport, much more disruption of the means of livelihood and migrated from their areas in every year due to cyclone, river erosion, tidal surge etc. Almost all participants notified 400-500 people have migrated in a year, and also one-third respondents said 700-800 people have migrated in every year. All participants face negatively affected their own properties as a result, they are severely damaged economically, mentally depression as well as socially. Almost all said that they are not conscious about health and they do not get proper, nutritious and sufficient food,

Three fourth of the people can get proper nutrition food in their area, two- third percent of people said that they take meal in a day 3 but some people can get meal in a day 2. At the time of disaster pregnant women face iron deficiency during reproductive period. Even they can not menstrual hygiene facilities properly way. The Upazila Health complex a is little far away that is why they can not adequate health care Service as well as they do not get sufficient medicine. Due to excess saline water their babies are spoiled even they can be unable to conceive quickly. During the cyclonic disasters, they can not get sufficient menstrual hygiene facilities. As a result, they used wool instead of pads resulting in wound formation and cancer. Pregnancy related complexity among the mother and children are very high due to salinity like miscarriage, immature birth, intrauterine growth retardation. Majority of people said that they haven't any technical knowledge about resilience of cyclonic disaster, but two-third portion participants have technical knowledge during disaster response and risk reduction. They further said that few people don't know about the term technical knowledge. Two- third of the participants said that they have vocational skills based knowledge during disaster response and risk reduction like: reduction of vulnerabilities as well as cope with hazards, but half of the people said they have not any vocational knowledge during disaster response and risk reduction. They (half of the participants) said that they have indigenous practical knowledge but some people can not know that about the issues. They have indigenous practical knowledge has been known and implied such as community behavior towards disaster as well as moving higher ground in the time of floods, but majority of those people in this area religious activities. According to them early warning system is available during disaster, half of those people said that they know that the upcoming disaster by television and miking, and some people said that they know upcoming disaster by interpersonal communication, but few people further said that they know upcoming disaster by social networking sites. They recover their damage properties half of the people by government and nongovernmental organizations. Few people said that they recover their damage properties capacities from their own resources, and also said that some people recover by their stakeholders support. They said that half of the people need to recover their damage properties after disaster more than a year, and two- third percent of people need to recover their damage properties 7 to 12 months and few people furthermore said that need to recover their damage properties 3 to 6 months. They said that majority of those people said the existing policy is not enough for them, an also said that two- third percent of people need some advancement and few people further said that, the existing policy is enough for them. They said

the government should be ensure to reduce their problem, the majority of people said the government should be ensure to reduce need to build disaster risk reduction skills and more sustainable community risk management system is needed for them, and two- third percent of people said that need to link local community to local government and few people furthermore said that they don't know about this problem to mitigate. They said that majority of those people received social protection from the different kinds of non-governmental organizations and the government. Half of those people said that they can not any social protection from the government. But two- third of participants said that they have received children education stipend facilities as well as vulnerable group feeding, and also said few people have received food for work from the government. The government should be ensured more policy implemented for them they said, like motivational awareness campaign as well as a central aquifer can be set to collect and preserve rain water.

FGD 07: Char Kukri Mukri Bazar, Charfashion, Bhola

| Name | Age | Marital Status | Education | Occupation | Family member | Income | Expenditure |
|-------------------|-----|----------------|------------|-----------------|---------------|--------|-------------|
| Farid Mazumder | 40 | Married | SSC | Business | 4 | 20000 | 25000 |
| Sajahan Khokon | 58 | Married | SSC | Agriculture | 7 | 25000 | 25000 |
| Delowar Hossen | 45 | Married | Class VIII | Honey Collector | 5 | 20000 | 20000 |
| Motalab Choukidar | 48 | Married | Class V | Village police | 7 | 15000 | 14000 |
| Ratan Munsii | 50 | Married | Illiterate | Fisherman | 6 | 12000 | 10000 |
| Mijan Howlader | 55 | Married | Illiterate | Landless poor | 7 | 8000 | 8000 |
| Tipu Mondol | 39 | Married | Illiterate | Fisherman | 4 | 12000 | 12000 |

(Source: Field Survey, 2023)

FGD 07 has been conducted on the shop of Farid Majumder at Char Kukri Mukri Bazar of Charfashion upazila in Bhola district. All of the respondents among seven express that various natural disasters such as floods, tidal waves, cyclones and river bank erosion hit there at every

year. They all have faced these calamities in their life and still face every year. Cyclones are more common here. All of the participants said cyclones increase salinity and waterlogging. All of them face bad situation or bitter experiences due to the cyclonic disasters. All of them said that cyclonic disasters affect negatively by economically, psychologically and health. One-fourth mention that due to the cyclonic disasters, they are very sick physically and suffers adverse vulnerability by socially and culturally. All of them said they have cyclone center in the vicinity of their house within 2 kilometers. But most of them said that the environment inside the cyclone center is not good and they are not satisfied with the cyclone center. All of the respondents mentioned that the houses and buildings of their homesteads are destroyed, agricultural land is damaged and three-fourth mentioned that cows and goats are died due to cyclonic disasters. Thus, they are economically damaged. They said that the effect of the cyclone has a negative impact on their livelihood and social life every year. Almost all of the participants said that apart from the economy, they suffered socially as a result of the cyclone. During this time, their daily activities were hampered, food shortages are occurred, communication are break down, movement of children becomes problematic, educational institutions are closed resulting in drop out, human diseases are increase, skin diseases and water borne diseases are increased, and unemployment are increased and migration are occurred, but two-fifths respond that social events such as weddings and religious functions cannot practicing, crime rates are increased, and three fourth express that vector borne diseases, and gender discrimination are widely observed. Cyclonic disasters like cyclone, tidal surge and flood cause problems of water, sanitation and hygiene. Among them, the lack of safe drinking water takes a prominent form. All participants mention that women, pregnant women, adolescent girl, children, disable and elder people experience in worst situation during cyclone. Almost all of them claim that women lose their jobs and take enough work pressure at home and they don't get enough medical facilities and hospitals are too far away from home to get treatment. many times this time women lose their life.

Many of the children who remain have high rates of child mortality and lack of adequate child food, increasing juvenile delinquency among children as well as risk of infectious communicable diseases. During this period children's education is affected the most because schools are closed used as cyclone centers and sometimes educational institutions collapse due to cyclones, parents cannot send their children to school because of financial uncertainty. Women and girls also face insecure for their safety. Moreover, many houses are collapsed and they take shelter in cyclone

centers or relative or neighbor's houses and the dropout rate of female child increases rapidly. All of the participants said that during cyclonic disasters the elderly and disabled people are in the worst condition because they cannot move from one place to another for transportation barriers, lack of secured shelters, roads and toilet facilities and water, sanitation and hygiene etc. According to them, cyclones occur in the months of Baisakh and Jaishtha and least in Poush and Magh. Cyclones create economic insecurity, food shortages, lack of safe drinking water, life risk, health complexity, decrease of crop production and kitchens garden, damage of fish farming, destroyed of houses, deceased of cows and goats. In addition, they migrate from one city to another in search of work and live there for a long time. Due to the cyclonic disasters, they are the most affected economically and it is seen that many times they have no work for one to two months or more, and even the wages and allowances of women are reduced. Their food production decreases for decreasing fertile land, fish farming suffers, domestic animals and poultry die, forest sector is destroyed. During disaster, their production of seasonal crops such as wheat, corn, pepper, onion, garlic, cucumber, and pepper decreases, and then the production of various types of nursery, crops also decrease. All of the participants who are here mainly engaged in agriculture and fishing industry. They noted that they have 15 to 20 days of work and the rest of the days have to be unemployed. That is roughly 300-400 taka as our daily wage to support family becomes very difficult. Almost all of the participants claim that due to the cyclonic disasters, social network and communication contact with everyone is cut off, transportation is also disrupted, women's earning sources are almost absent, everyone is depressed, cohesion with people decreases, increased of crime and theft. All of the participants are aware of their health except poverty and lack of knowledge. They do not get enough medical facilities and during the post-disaster period when everyone is quite sick, not everyone is properly given the treatment they need. Due to different types of diseases, they can no longer get enough treatment. All of the participants said that pregnant or lactating women are in the worst condition during cyclones as many times pregnant women give birth inside the cyclone center but there are not enough medical facilities and security to breastfeed the baby. Adolescent girls do not get adequate ministerial hygiene kit there. During cyclone or post cyclone they never get pure drinking water. The assistance they get is not enough for them and the medical facilities provided to them from hospital are almost three kilometers apart from their houses. The health care services of hospitals are not satisfactory at all. They don't have any private clinic from where they can take their services for emergency need. Fever, cold, cold cough,

diarrhea and different types of skin diseases occur continually. Moreover, they are the most affected because of coastal prone area and having no technical, vocational and technological knowledge. All of the participants express their opinion that they have indigenous practical knowledge about resilience/coping mechanism of cyclonic disaster response and risk reduction. These indigenous knowledges are implied by community behavior towards disaster, own survival mechanism, migration and shifting cyclone center or moving higher ground in the time of cyclonic disasters. All of the participants mention that there exist early warning system and they know the upcoming disasters by miking through CPP volunteers, television, and interpersonal communication. They recover the damage properties from the cyclonic disasters with the help of government support services and own resources. Regarding setback in regular activities half of the respondents mention that they need 7 to 12 months, one-fourth participants need 3 to 6 months and one-seventh participants need more than a year to recover from the damage properties. Almost two-third of the participants admit that the exiting policy should need some advancement. All of the FGD participants suggest that they need to build, repair and maintain the embankment, cyclone center, and sufficient sluice gate, ensure safe drinking water, ensure medical facilities during and after disaster, menstrual hygiene management (MHM) corner for disadvantaged women, to empower local community, local community to local government, build disaster risk reduction skills, public awareness program particularly focused on public health & hygiene issues, meeting and comprehensive training module and overall preparedness programs should be more enriched. Almost half of the participants received social assistance from the government or non-governmental organizations e.g., child educational stipend and vulnerable group development (VGD) as well as more than half of participants mentioned that they have received vulnerable group feeding from the government, and almost one-third of participants claim that they haven't received any kinds of social assistance from the government. Above all, the significant portion of the participants said that the government should policy implemented about motivational awareness campaign as well as the current government should be implemented policy about education, computer skills, technological training and basic vocational skill-based training. They said that if the government creates more and more afforestation and that will be coastal afforestation, in addition, sufficient amount of trees should be planted, roads should be made higher. We should arrange various technical trainings, should organize various awareness programs. Then it will be possible to reduce the amount of damage to some extent.

FGD 08: Kazikandi, Tajumuddin, Bhola

| Name | Age | Marital Status | Education | Occupation | Family member | Income | Expenditure |
|---------------|-----|----------------|------------|-------------|---------------|--------|-------------|
| Rafikul Islam | 45 | Married | Class V | Agriculture | 4 | 12000 | 12000 |
| Abu Taher | 47 | Married | Illiterate | Day labour | 6 | 10000 | 10000 |
| Md. Firoj | 38 | Married | Illiterate | Day labour | 5 | 10000 | 10000 |
| Nurnabi | 70 | Married | Illiterate | Agriculture | 7 | 10000 | 10000 |
| Abul Hashem | 45 | Married | Illiterate | Day labour | 6 | 10000 | 10000 |
| Iqbal Hossen | 42 | Married | HSC | Business | 4 | 25000 | 25000 |

(Source: Field Survey, 2023)

FGD, with 06 participants, has been conducted at the yard of Rafikul’s house in the village of Kazikandi of Tajumuddin upazila in Bhola district. All of the participants respond that some natural calamities eg., cyclones, floods, salinity, river erosion strike Kazikandi every year. Among them, cyclones are prominent that hit every year. As a result of these calamities, they live in dire conditions. All the participants of FGD respond that they suffer the most economically, psychologically and health risk of chances. One-third mention that cyclonic disasters affect them by socially and culturally and one-sixth respond on physically injured/illness. When there strikes cyclone, they take shelter in the cyclone center. One-third participants said that there is cyclone center within 500 meters which is next to their house and two-third mention that cyclone center exists approximately 01 km far away from their home. Two-third participants said that the environment inside is not good at all. All of the participants admit that they suffer most economically because of their houses are heavily damaged, agricultural land is damaged and schools and colleges are destroyed, and one-third reported that cows and goats are deceased. All participants mention that cyclonic disasters have negative impacted on their livelihood and hence their social life is also affected. All of the participants in this community are affected by the cyclones. Those who are day laborers and rickshaw pullers have no work, they cannot attend any socio-cultural events like wedding, funerals etc. All participants admit that there is shortage of food, break-down of communication system and also break out of various diseases, children have mobility problems, roads and infrastructures are broken, people are out of work, increases of unemployment and educational institutions are collapsed. In addition, two-third or more than that confess that it is observed that increases of crime rates, mental depression, diarrhea, various water-borne and vector borne diseases, skin diseases and internally displaced along with greater gender

discrimination. All respondents note that problems on water, sanitation and hygiene as well as lack of safe drinking water become evident. Women are the most affected because they have double burden of work pressure at home and do not get adequate medical care facilities. The most affected group during this time are noticed in adolescent girls, children, old, disabled and young adult women. All participants mention that the child mortality rates are increased, children are deprived of food security, and various infectious diseases etc. Almost everyone said that children are affected in various ways during this time because schools are closed, schools are used as cyclone centers for long time and coastal people take shelter in cyclone centers. Due to disasters, sometimes schools are broken, observing economic uncertainty, parents cannot send them to school with new books, notebooks and pens and sometimes children have to go to work in the brickfields or catching fish or day labour with their father and brother for poverty. Thus, the rate of dropout student also increases. All of the FGD participants notes that women, pregnant women and adolescent girls do not feel safe in cyclone centers, do not get enough hygiene management kits in their menstrual period, do not get maternity health facilities, having enough work pressure at home. Besides, children, old and disabled people become more vulnerable or in worse condition because of lacking toilet facilities, enough food, water, sanitation and hygiene (WASH) facilities and can't move easily for lack of transportation during and aftermath of cyclonic disasters.

All participants note that there are more cyclones in these areas during the month of Baisakh, which causes a lot of damage to their households. According to them, cyclones affect their economic activities because they do not have work, they stay at home for long periods, their moods become irritable and family problems arise. All respondents of FGD mention that during cyclonic disasters their production of crops like paddy, wheat, corn, garlic, which are seasonal crops are reduced, vegetable production is reduced, and not enough trees are born in nursery. Fish farming is adversely affected by cyclonic disasters. Most of the people are basically poor. By selling fish and working as day labor in other people's houses, they earn money like 300 to 400 taka but post cyclone time they don't have job which leads to unemployment and more poverty. Aftermath of cyclone, illiteracy rate increases because people can no longer educate their children and migrate for their livelihood; there occurs various environmental changes increasing waterlogging, salinity, river erosion, soil erosion, and a nasty smelly environment. All participants mention that basically they are not conscious about their health, even don't get enough medical facilities.

The outbreak of diseases during post cyclone is so much that all the hospitals that are there can't help us adequately. Pregnant women, breast feeding or adolescent girls face many difficulties and they do not get proper food, nutrition or sufficient food during disasters. Even they don't have breast feeding rooms to feed their babies in the cyclone center. Aftermath of disaster or during disaster, reproductive women do not get enough nutrient food due to which they become physically weak and often hypertense and pre-eclampsia. Women, pregnant women and adolescent girls do not get enough nutritional food, portable water and adequate hygiene and sanitation facilities. Most of the toilets are in open areas and fenced around by jute straw, bamboo which are not hygienic and cause various physical complications. The facilities provided by the family planning centers, union health complex and upazila health complex. Union health complex are not good enough for us and almost all of them are far away from 1 km or 2 km from their house. Those who are marginal people of the coast face various problems due to the cyclonic disasters. They are mentally frustrated by various diseases. As women suffer the most especially pregnant and disabled women cannot struggle with cyclone. Due to their lack of technical knowledge and every year loss of infrastructure has become our daily routine.

Except we who are we never try to take any initiative on our own to reduce the damage because we don't know much and we can never deal with these natural calamities. Before upcoming the disasters, they get news by miking and move to a safe place. Official miking is done by various organizations. Many times, they hear it on the news and know through Facebook. Then they go to the safer place and many people do not want to go cyclone shelter because home, cows, goats, poultry keeping. It takes them three to six months to recover from the damages caused by cyclone, sometimes it takes more than a year. Then another cyclone comes again and we get the same damages and that's how life goes on for our coastal people. As a result, the things and plans are taken by the government for the people of this region are not enough, the government should increase more plans and maintain them, and if the assistance provided by the government is not enough for them, then they should increase the assistances and also to reduce cyclone damages, the government should build dams, construct wide roads, organize different types of meetings, organize different awareness programs so that everyone should be aware. Everyone should work from all places. Besides, more social and community coastal forests should be built and trees should be planted. Everyone should be more conscious and do not do any work that harms the environment. Everyone should be more vocationally and technologically enriched.

Appendix 6: List of Tables

Table 1: Socio-economic Indicators of People’s Republic of Bangladesh in 2022 and 2016

| Indicators | 2022 | 2016 |
|---|---|--------------------------|
| Total Area (in Sq. Kilometre) | 1,47,570 | |
| Total Population (in thousands) | 169.8M | 160.8M |
| Density (Per Sq. km) | 1151 (1119) | 1090 |
| Annual population growth (%) | 1.2% | 1.4% |
| Average Household size | 4.26 | 4.06 |
| Labor force participation rate (Male & Female) | 61.0 (79.7 & 42.7)/ 61.72 (81.33 & 42.49) | 58.5 (81.9 & 35.6) |
| Unemployment rate | 3.6 | 4.2 |
| Incidence of Poverty [Upper & Lower poverty line] (Headcount rate) | 18.7 & 5.6 | 26.5 (24.3) & 9.2 (12.9) |
| Literacy Rate (Male & Female) | 74.0 (75.8 & 72.6) | 65.6 (67.8 & 63.4) |
| Migration per Household | 10.47% | 11.22% |
| Life Expectancy at Birth (Years) | 72 | |
| Dependency Ratio | 52.30 (52.63) | 59.20 |
| Income per capita & per household (per month in Tk.) | 7614 & 32422 | 3940 & 15988 |
| Expenditure per household (per month in Tk.) | 31500 | 15715 |
| Per Capita Daily Calorie Intake (in k. cal) | 2393.0 | 2210.4 |
| Mauzas Damaged/Affected by Natural Disasters during the Last Five Years (Flood) | 152 (42.22%) | 436 (27.17%) |
| Mauzas Damaged/Affected by Natural Disasters during the Last Five Years (Cyclone/Tornado/hailstorm) | 94 (26.11%) | 237 (14.77%) |
| Mauzas Damaged/Affected by Natural Disasters during the Last Five Years (Storm/Tidal Surge) | 82 (22.78%) | - |
| Mauzas Damaged/Affected by Natural Disasters during the Last Five Years (Salinity) | 16 (4.44%) | - |
| Getting Benefit (Household and Program Beneficiaries) from Social Security Programs by Locality | 37.6 & 50.0 | 27.8 & 28.7 |
| Food for work | 61.25 | 35.7 |
| Food for Education | 9.12 | 17.76 |
| Vulnerable group feeding | 79.2 | 54.39 |
| Vulnerable group development | 79.77 | 52.02 |

| | | |
|---|-------|-------|
| Govt. old age pension scheme | 77.78 | 52.90 |
| Farmers' Co-operative Society (KSS, BRDB) | 26.21 | 16.76 |
| Bittahin samabay samity (BSS) | 3.7 | 6.60 |
| Particular bank credit for livestock/ fishery | 14.25 | 3.99 |
| Adult education | 3.42 | 2.31 |
| TCB | 2.85 | |
| Widow Allowance | 3.99 | |
| Disability Allowance | 3.99 | |
| Other government programmes | 39.6 | 24.05 |

(Source: Key Indicators for Asia and the Pacific 2023 by ADB 2023; HIES 2022 by BBS 2023; BDRS 2022 by NIPORT 2023; UNESCO 2017. 10)

Table 2: Health indicators target and achieved

| Indicators | Year (Achieved) | | | | | Target | SDG Target |
|---|-----------------|-----------|-----------|-----------|------|--------|------------|
| | 1993 | 2001 | 2004 | 2014 | 2022 | 2022 | 2030 |
| <5 years Mortality Rate per 1000 live birth | 133 | 94 | 88 | 46 | 31 | 34 | 25 |
| Infant Mortality Rate | 87 | 66 | 65 | 38 | 25 | 31 | |
| Neonatal Mortality Rate | 52 | 42 | 41 | 28 | 20 | 18 | 12 |
| Nutritional Status | | | | | | | |
| Stunting (Height-for-age) | | | | 31 | 24 | | |
| Underweight (Weight-for-age) | | | | 22 | 22 | | |
| Wasting (Weight-for-height) | | | | 8 | 11 | | |
| Maternal Mortality Rate | BBS | 1986: 648 | 1990 :478 | 2015 :181 | | 121 | 70 |
| | UN | | 1990 :569 | 176 | | 121 | 70 |
| Total Fertility Rate (15-49 years) | 3.4 | | 3.0 | 2.3 | 2.3 | 2.0 | |
| Adolescent Fertility Rate (15-19 yrs) | 33 | | 33 | 31 | 24 | 2.5 | |
| Proportion of Birth attendant by skilled health Personnel (100000) | | | 15.6 | 42.1 | | 65 | |
| Contraceptive Prevalence Rate | 44.6 | | 58.1 | 62.4 | 64 | 75 | |
| Contraceptive Prevalence Rate (modern methods) among married adolescent | 19.6 | | 34.1 | 46.7 | 54.7 | 60 | |

(Source: Bangladesh, Key Indicators | ADB Data Library | Asian Development Bank; HIES 2022, GoB 2017, IHME 2017)

Appendix 3: Some Photograph of Different Field Areas



Figure 1: Data collectors in a frame of Mirgaon, Shyamnagar, Satkhira



Figure 2: Mirgaon Govt. primary school used as cyclone center, Shyamnagar, Satkhira



Figure 3: Collecting data from crab collector at Boro Vetkhali, Shyamnagar, Satkhira



Figure 4: Shrimp gher at Boro Vetkhali in Shyamnagar, Satkhira



Figure 5 & 6: Housing condition in Mirgaon, Shyamnagar, Satkhira

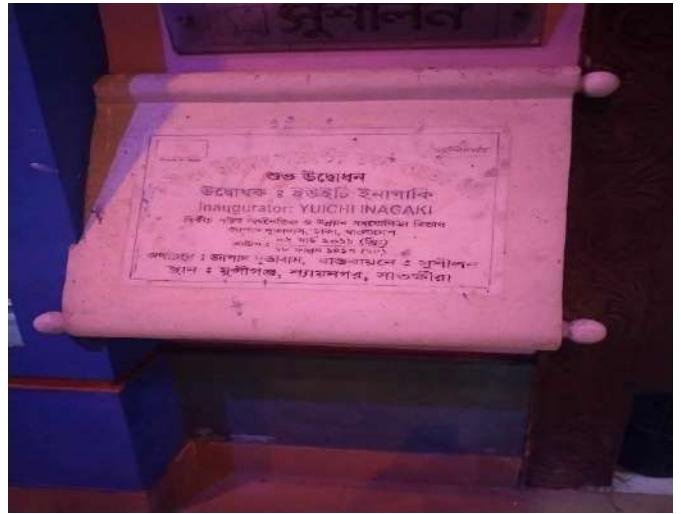


Fig 7: Homestead/kitchen garden in shyamnagar Fig 8: Inauguration of cyclone shelter in Munshiganj, Shyamnagar, Satkhira



Figure 9: River channel near sundarban area of shyamnagar Figure 10: Cyclone center in Shyamnagar



Fig 11: Housing condition at Tengrakhali, Shyamnagar Fig 12: Shrimp gher & Mud-built road Boro vetkhali, Shyamnagar



Figure 13 & 14: Housing condition at Tengrakhali village of Shymnagar in Satkhira



Figure 15 & 16: Housing condition at Tengrakhali village of Shymnagar in Satkhira



Figure 17 & 18: FGD at Tengrakhali village of Shymnagar in Satkhira



Fig 19: Sanitation system at Tengrakhali, Shyamnagar, Satkhira



Fig 20: Mirgaon village cooperative society in Shyamnagar, Satkhira



Fig 21: Housing condition at Tengrakhali, Shymnagar



Fig 22: Sundarban High school used as cyclone shelter, Munshiganj, Shyamnagar, Satkhira



Fig 23: 88 no. Chunkuri gov. primary school cum cyclone shelter, Munshiganj, Shyamnagar



Fig 24: Protecting and saving tigers project shelter, & modern stoves user, Munshiganj, Shyamnagar



Fig 25: Collecting data from Tengrakhali, Shyamnagar



Fig 26: Housing and sanitation at Tengrakhali, Shyamnagar



Fig 27: Housing at Mirgaon adjacent (100 feet far) Sundarban



Fig 28: Housing at Mirgaon of Shyamnagar, Shyamnagar



Fig 29: Low height house & woman collecting drinking water at Tengrakhali village from almost half km far



Fig 30: Sanitation system at Tengrakhali village, Shyamnagar



Fig 31: Data Collection from Boro Vetkhali, Shyamnagar, Satkhira



Fig 32: Case study from Boro Vetkhali, Shyamnagar



Figure 33: Map of Chakbara, Gabura, Shyamnagar



Figure 34: Forecasting billboard in Gabura, Shyamnagar



Figure 35: School cum cyclone centre in Gabura, Shyamnagar



Figure 36: Cyclone centre in Ashashuni



Figure 37: Data collectors in a frame of Protapnagar, Ashashuni, Satkhira



Fig 38: Collecting data from Protapnagar Union Health Complex, Ashashuni, Satkhira



Fig 39: Kurikahunia community clinic, Ashashuni, Satkhira



Fig 40: United Academy Protapnagar school cum cyclone center, Ashashuni, Shyamnagar



Figure 41: FGD at Protapnagar in Ashashuni



Figure 42: Data Collectors went to Ashashuni, Satkhira



Fig 43: Homestead/ kitchen garden at Protapnagar Ashashuni, Satkhira



Fig 44: Destruction of Housing by cyclone at Protapnagar, Ashashuni, Satkhira



Fig 45: Weak housing condition at Kurikahunai, Ashashuni



Fig 46: At United academy of Protapnagar, Ashashuni, Satkhira



Figure 47: /Salinity intrusion/ Waterlogging at Protapnagar, Ashashuni, Satkhira



Fig 48: KII from Union Agricultural Officer, Ashashuni, Satkhira



Figure 6: Breakdown of house at Protapnagar Ashashuni Satkhira



Fig 50: Housing and toilet condition at Protapnagar, of Ashashuni, Satkhira



Figure 51: Data collection in Uttar Bedkashi, Koyra, Khulna



Figure 52: Data collection in Uttar Bedkashi, Koyra, Khulna



Fig 53: Data collectors in a frame at Kathkata village Uttar Bedkashi, Koyra, Khulna



Fig 54: 03 no Koyra govt. primary school cum- cyclone center, Koyra, Khulna



Fig 55: Climate Resilient Scheme of Local Govt. Initiative on Climate Change (Logic) Project at 06 no Koyra, Khulna



Fig 56: Inauguration of Rain water Harvest for drinking water at Logic project



Fig 57: 04 no Koyra Launch ghat Bazar, Khulna



Fig 58: Collecting data from CPP volunteers, Koyra, Khulna



Fig 59: 03 no Koyra govt. primary school cum cyclone center, Bedkashi, Koyra, Khulna



Fig 60: Borobari high school used as cyclone center, Koyra, Khulna



Fig 61: Borobari high school, Bedkashi, Koyra



Fig 62: Koyra Madinabad govt. high school used as cyclone center, Koyra, Khulna



Fig 63: Collecting data from crab collector, Koyra, Khulna



Fig: Waterlogging/ salinity intrusion in Koyra, Khulna



Fig 65 & 66: Housing condition of Patharkhali, Uttar Bedkashi, Koyra, Khulna



Fig 67 & 68: Madinabad model & Bedkashi Borobari govt primary school used as cyclone center, Koyra



Figure 69 & 70: Koyra Madinabad Darussalam Mahila Dakhil Madrasa cum cyclone center in Koyra, Khulna



Fig 71: Data collectors in a frame of Sutarkhali Purbapara govt. primary school cum cyclone center, Dacope, Khulna



Fig72: Hanging latrine at Kalabagi, Sutarkhali, Dacope, Khulna



Fig 73: Kamarkhola union parishad complex, Dacope, Khulna



Fig 74: Housing condition at Kalabagi, Sutarkhali, Dacope



Fig 75: Sutarkhali Purbapara govt. primary school cum cyclone center, Dacope, Khulna



Fig76: Hanging latrine at Nalian village, Sutarkhali, Dacope



Fig 77: 06 no Kamarkhali govt. primary school used as



Fig 78: Kalabagi-Sutarkhali govt. primary school cyclone center, used as cyclone center, Dacope, Khulna



Fig 79: Salinity water intrudes through the water channel



Fig 80: Housing condition at Nalian, Sutarkhali, Dacope



Fig 81: Cyclone center in Sutarkhali, Dacope



Fig 82: Sutarkhali 2 no govt primary school cum cyclone center, Dacope



Fig 83: Nalian govt primary school, Sutarkhali, Dacope



Fig 84: Kalabagi-Sutarkhali primary school cum cyclone center



Fig 85: collecting case study from elderly at Kalabagi, Dacope



Fig 86: Housing made by golpata at Kalabagi, Dacope



Fig 87: Storage from rain water and safe drinking water & pathways to elicit project at Nalian, Sutarkhali, Dacope, Khulna



Fig 88: Disaster Map of for extremely poor people Sutarkhali, Dacope, Khulna



Fig 89: Housing condition at Nalian, Dacope, Khulna



Fig 90: Processing of rain water storage funded by HEED Bangladesh NGO, Kalabagi, Dacope, Khulna



Fig 91: Hanging latrine and river channel at Kalabagi, Sutarkhali, Dacope, Khulna



Figure 92: Habitat/ housing condition at Kalabagi village of Sutarkhali union, Dacope, Khulna



Fig 93 & 94: Housing & sanitation condition of Nalian beriband, Sutarkhali, Dacope, Khulna



Fig 95: Hanging latrine at Nalian beriband, Sutarkhali, Dacope, Khulna



Fig 96: Housing & sanitation condition of Nalian beriband, Sutarkhali, Dacope, Khulna



Figure 97: Data collectors in a frame of Harinbaria Mujibkella, Haringhata, Patharghata, Barguna



Figure 98: Researcher visits Mujibkella in Harinbaria, Haringhata, Patharghata, Barguna



Fig 99: Harinbaria Mujibkella in Haringhata, Patharghata, Barguna



Fig 100: Data collectors collect data from Harinbaria, Haringhata, Patharghata, Barguna



Fig 101: Researcher collects KII data from PIO, Patharghata, Barguna Fig 102: Collecting FGD data from Harinbaria, Haringhata, Patharghata, Barguna



Fig 103: Data collectors collect KII data from Patharghata, Barguna Fig 104: Data collector visit Pond sand filter (PSF) Patharghata, Barguna



Fig 105: Data collectors went Patharghata Upaila Parishad Complex, Fig 106: Housing condition in Patharghata, Barguna



Fig 107: Drinking water storage in safety tank in Patharghata



Fig 108: Drinking water storage from PSF in Patharghata



Fig 109: Housing condition in Patharghata, Barguna



Fig 110: Drinking water collect far away in Patharghata, Barguna



Fig 111: Collect data from respondents of Gohorpur, Patharghata, Barguna



Fig 112: collects data from respondents of Charlathimara, Patharghata, Barguna



Fig 113: Breakdown of roads and infrastructure on the way to go Kharakanda, Patharghata, Barguna



Fig 114: Katcha and mud-built road and saline water in agricultural field of *Soto Patharghata*, Barguna



Fig 115: collects data from female respondents of Charlathimara, Patharghata, Barguna



Fig 116: collects data from bede community of Patharghata sadar, Barguna



Fig 117: Data collectors visit Bibichini, Betagi, Barguna



Fig 118: Housing condition in Bibichini, Betagi, Barguna



Fig 119: Housing condition in Jhopkhali, Uttar Betagi, Barguna



Fig 120: Housing condition in Jhopkhali, Betagi, Barguna



Fig 121: Housing condition in Jhopkhali, Uttar Betagi, Barguna



Fig 122: Housing condition in Jhopkhali, Uttar Betagi, Barguna



Fig 123: Waterlogging condition in Jhopkhali, Uttar Betagi, Barguna



Fig 124: Housing condition in Jhopkhali, Uttar Betagi



Fig 125: Sanitation in Gabua, Dokkhin Betagi, Barguna



Fig 126: House destroyed after cyclone at Gabua, Dokkhin Betagi, Barguna



Fig 127: Coastal forest development center cum rest house at Char Kukri Mukri, Charfashion, Bhola



Fig 128: Promoting agricultural commercialization and enterprise (PACE) project, Char Kukri Mukri, Bhola



Fig 129: Inauguration of Char Kukri Mukri Embankment Project, Charfashion, Bhola



Fig 130: Inauguration of bridge at ward no 02 & 06, Char Kukri Mukri. Charfashion, Bhola



Fig 131: Data collectors in a frame at Char Kukri Mukri Fig 132: collects data from crab collector, char kukri mukri, Bhola Speed boat ghat, Bhola



Fig 133: Researcher in Char Kukri Mukri, Bhola Fig 134: Filthy environment & poor housing condition, Char Kukri Mukri, Bhola



Fig 135: Waterlogging scenarios after cyclone at Char Kukri Mukri Fig 136: Sanitation system at Kukri Mukri, Bhola



Figure 137: Collecting FGD data in Char Kukri Mukri, Bhola Fig 138: collecting FGD in Char Kukri Mukri, Bhola



Fig 139: Data collectors in a frame at Betua ghat Charfashion, Bhola Fig 140: collecting KII data from Charfashion, Bhola



Fig 141: collects data from Charmainka, Charfashion, Bhola



Fig 142: Data collector collects case study from Charfaruki, Charfashion, Bhola



Fig 143: Data collector collects data from boatman at Charfaruki in Dokkhin Char Aicha, Charfashion, Bhola



Fig 144: Dokkhin Char Aicha in Charfashion, Bhola



Fig 145: Cyclone center funded by German Redcross from Charfashion, Bhola



Fig 146: Housing condition in Dokkhin Char Aicha, Charfashion, Bhola



Fig 147: Data collector collect data from Ayeshabag, Charfashion, Bhola



Fig 148: Data collector collect data from Ayeshabag, Charfashion, Bhola



Fig 149: Data collectors in a frame of Tajumuddin, Bhola



Fig 150: FGD data collection from Kazikandi, Tajumuddin, Bhola



Fig 151: Aralia community clinic at Tajumuddin, Bhola



Fig 152: CHCP, Delivery & Store room at Aralia community clinic at Tajumuddin, Bhola



Fig 153: Data collectors at Hajikandi, Tajumuddin, Bhola



Fig 154: Data collectors at Vasarpara, Tajumuddin, Bhola



Fig 155: Data collector visits in Dattapara Mujibkella, Tajumuddin, Bhola



Fig 156: Data collector collect FGD data from Kazikandi, Tajumuddin, Bhola



Fig 157: collect KII data from USSO, Tajumuddin, Bhola



Fig 158: Boatman House in Hajikandi, Tajumuddin, Bhola



Fig 159: Cyclone center in Keyamullah, Tajumuddin, Bhola



Fig 160: Cyclone center in Keyamullah, Tajumuddin, Bhola



Fig 161: Cyclone center in Uttar Araliya, Tajumuddin, Bhola



Fig 162: Cyclone center in 22 no Araliya govt. primary school, Tajumuddin, Bhola



Fig 163: Cyclone center in West Chandpur, Tajumuddin, Bhola



Fig 164: collects KI data from PIO, Tajumuddin, Bhola



Fig 165: Collecting data from adolescent girl at Keyamullah, Tajumuddin, Bhola



Fig 166: 29 no Aralia govt. primary school used as cyclone center during disasters, Tajumuddin, Bhola



Fig 167: Collecting data from disabled child at Kazikandi, Tajumuddin, Bhola



Fig 168: Fragile housing at Arpangashia, Tajumuddin, Bhola



Fig 169: Poor housing at Arpangashia, Tajumuddin, Bhola



Fig 170: School cum cyclone center at Tajumuddin, Bhola



ইনস্টিটিউট অব ডিজাস্টার ম্যানেজমেন্ট অ্যান্ড ভালনারেবিলিটি স্টাডিজ (আইডিএমভিএস)

ঢাকা বিশ্ববিদ্যালয়, ঢাকা-১০০০, বাংলাদেশ


ফোন: আইপি পিএবিএক্স: ৮৮-০৯৬৬৬৯১১৪৬৩/৪৭২৭

প্রথম সেমিনার রিপোর্ট

গত ০২ এপ্রিল, ২০২২ তারিখে ইনস্টিটিউট অব ডিজাস্টার ম্যানেজমেন্ট অ্যান্ড ভালনারেবিলিটি স্টাডিজের পিএইচ.ডি গবেষক মোঃ সাদেকুর রহমান কর্তৃক (রেজিস্ট্রেশন নং-১১৫ শিক্ষাবর্ষঃ ২০২০-২০২১ যোগদানঃ ১০/০৬/২০২১) “Exploring the Effects of Cyclonic Disasters on Socio-Economic, Public Health and Health Care System in South West Coastal Bangladesh” শিরোনামের উপর প্রথম সেমিনার উপস্থাপিত হয়। ইনস্টিটিউটের একাডেমিক কমিটি কর্তৃক তা অনুমোদিত হয়।

এ বিষয়ে প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য ইনস্টিটিউটের একাডেমিক কমিটি সুপারিশ করেছেন।

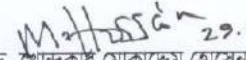
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29.05.2024
(মোহাম্মদ মনিরুজ্জামান খান, পিএইচ ডি)

পরিচালক

ইনস্টিটিউট অব ডিজাস্টার ম্যানেজমেন্ট
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ঢাকা বিশ্ববিদ্যালয়

মোহাম্মদ মনিরুজ্জামান খান, পিএইচ ডি
পরিচালক
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29.05.2024
(অধ্যাপক ড. খন্দকার মোকাদ্দেম হোসেন)

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ঢাকা বিশ্ববিদ্যালয়

ড. খন্দকার মোকাদ্দেম হোসেন
অধ্যাপক ও প্রতিষ্ঠাতা পরিচালক
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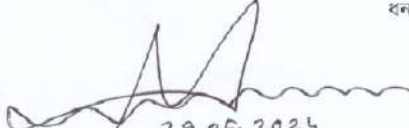
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দ্বিতীয় সেমিনার রিপোর্ট

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ধন্যবাদান্তে,


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on Socio-Economic, Public Health and Health Care System

in South West Coastal Bangladesh

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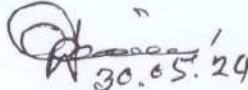
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