

DISASTER-LED OCCUPATIONAL TRANSFORMATION OF THE FISHING COMMUNITY IN COASTAL BANGLADESH

[A Dissertation submitted to the Institute of Bangladesh Studies (IBS),
University of Rajshahi, Bangladesh for the degree of Doctor of Philosophy]

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Session: 2020-2021

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February, 2024

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Certificate

This is to certify that the thesis titled “**Disaster-led Occupational Transformation of the Fishing Community in Coastal Bangladesh**” is an original piece of work accomplished by **Mr Md. Tarik Aziz**, a PhD fellow in Institute of Bangladesh Studies (IBS), for the session 2020-2021, University of Rajshahi, Bangladesh. The findings and views expressed in this thesis are originated from both primary and secondary data and entirely his contribution.

I have gone through the draft thesis thoroughly and found it satisfactory for submission. The thesis is therefore recommended and forwarded to the University of Rajshahi through Institute of Bangladesh Studies (IBS) or necessary formalities leading to its acceptance in partial fulfillment of the requirements for the degree Doctor of Philosophy.

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Declaration

I hereby declare that the thesis titled “**Disaster-led Occupational Transformation of the Fishing Community in Coastal Bangladesh**” has been prepared by me. It is an original work carried out by me taking advices and suggestions from my honorable supervisor. I will take all the responsibilities for all comments, statements and opinions written in the thesis. Two of my research articles related to the issues of this thesis have already been published in order to fulfil the conditions for obtaining the PhD degree.

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Abstract

Coastal communities around the world have become vulnerable in recent years due to climate change. Like other communities, coastal fishing communities in Bangladesh have also become vulnerable due to increase the frequency of climate extreme events. A large number of studies have been conducted on fishing community's occupational transformation worldwide. Most of these studies focus on their vulnerabilities, migration, coping strategies and climate change adaptation. However, little research has considered the disaster-led occupational transformation of coastal fishing communities. Considering the gap, the current study explores disaster-led occupational transformation and its outcomes in the coastal fishing community in Bangladesh. The study finds out possible ways to secure fishermen's livelihoods. Using a mixed methods approach, data were collected from six villages from two districts of coastal Bangladesh through surveys, key informant interviews, and focus group discussions. Findings show that coastal fishers, affected by various disasters have been changing their fishing occupations and transforming into other roles for example, fishing labor, fish business, shop keeper, auto van puller, motorcycle driver, day labor, construction worker, garments worker and small business. The study explores the causes of occupational transformation and finds that various factors, including different types of disasters (e.g., cyclones, storm surges, salinity and riverbank erosion) and other factors (e.g., moneylender's pressure, decreased navigability of rivers and increased prices of fishing equipment) compel them to make this transformation. The changes in occupation create financial and social crises (e.g., income decrease, poverty increase, dropout and breakdown of social networks) and sometimes, occupational transformation secure their livelihood by reducing life threats from disasters and mental stress, increasing income and social networking. Additionally, the study identifies several ways to secure the lives and livelihoods of fishing communities (both regular fishers and transformed fishers), such as providing soft loans, skill development training and social safety nets and excavation of coastal rivers is needed for regular fishers. The study also finds that transformed fishers need support, such as big boats, good nets, life-saving instruments, and easy loans, fair market price. The study argues that due to the changing occupation, some fishermen are well, however some of them face difficulties in the study area. This study suggests that government and non-government initiatives are needed to make their occupation secure, as they are not skilled to perform their current occupation in terms of their ancestral fishing occupation.

Keywords: Disaster, Vulnerabilities, Fishing Community, Occupational Transformation, Coastal Bangladesh.

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Acronyms

ASA Association for Social A

dvancement

ASEAN Agreement on Disaster Management and Emergency Response BCCSAP

Bangladesh Climate Change Strategy and Action Plan BMD Bangladesh

Meteorological Department

BRAC Bangladesh Rural Advancement Committee CBO

Community-Based Organization

CPP Cyclone Preparedness Program

CSS Christian Service Society

DFID Department for International Development DoF

Department of Fisheries

DRR Disaster Risk Reduction

ECOFISHBD Enhanced Coastal Fisheries in Bangladesh Project FGD

Focus Group Discussion

GDP Gross Domestic Product

GO Government Organization

HFA Hyogo Framework for Action

HHS Household Survey

KII Key Informant Interview

LGO Local Government Organization

MCPP Mujib Climate Prosperity Plan

MoDMR Ministry of Disaster Management and Relief NAP

National Adaptation Plan

NGO Non-Governmental Organization

NPDM National Policy on Disaster Management

PSF Pond Sand Filter

SAARC South Asian Association for Regional Cooperation

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SDF Social Development Foundation SDG Sustainable

Development Goal SIM Subscriber Identity Module

SMS Short Message Service

SPSS Statistical Package For The Social Sciences SUS Satkhira

Unnayan Sangstha SWC Storm Warning Center

CHAPTER ONE

INTRODUCTION

The study is designed to explore the present status of fishing community and their occupational transformation in coastal Bangladesh. The introductory chapter starts with a background of the issue that structures the study problem. This chapter also discusses the thematic literature review, research gap, rationale of the study, global, regional and national perspective of the study, key concepts, and theoretical position of the study, study objectives, conceptual framework and scope and limitations of the study.

1. 1 Study Background

Fisheries provide a living for almost half a billion people worldwide. Many people who are dependent on small-scale fishing live in underdeveloped nations, where they are exposed to climate shocks and challenges such as cyclones, droughts, floods, sea-level rise, riverbank erosion, and rainfall changes.¹ Non-climatic pressures on fisheries, such as overfishing, pollution, and habitat loss, are likely to increase. In some areas, these effects have already reached to individuals rely on fishing.² Extreme weather events like cyclones and floods could intensify these effects by disrupting fishing activities and land-based infrastructure.³ Sea-level rise, soil erosion, and temperature and rainfall changes can all cause problems for land-based infrastructure. These consequences may put fisheries dependent livelihoods at risk.⁴

–
¹Joel B Smith et al., "Assessing dangerous climate change through an update of the Intergovernmental Panel on Climate Change (IPCC) "reasons for concern," *Proceedings of the national Academy of Sciences* 106, no. 11 (2009): 4133-4137.

²R. Ian Perry et al., "Interactions between changes in marine ecosystems and human communities," *Marine ecosystems and global change* (2010): 221-252.

³, Lena Westlund, "Disaster response and risk management in the fisheries sector", vol. 479 (Food & Agriculture Org., 2007). p.4

⁴ M. T. Sarch and E. H. Allison, "Fluctuations in Africa's inland fisheries: well-adapted livelihoods, maladapted management" (*paper presented at the Biennial Conference of the International Institute for Fisheries, Economics and Trade (IIFET)*). Oregon State University, Corvallis, OR, 2000).

Despite significant economic progress over the past four decades, Bangladesh is considered one of the most vulnerable countries to the effects of climate change.⁵ Due to climate change, Bangladesh has been facing various climate extreme events like cyclones, storm surges, floods, riverbank erosion.⁶ These natural hazards threaten the lives and livelihoods of coastal fishing communities and create socioeconomic and physical vulnerabilities. Therefore, fisheries has become one of the most vulnerable sectors to climate change in Bangladesh⁷ and this sector directly supports the livelihoods of approximately 7 million fishermen and it provides 4.43 % to GDP and 2.73% of export revenues.^{8, 9}

In coastal Bangladesh, one of the most devastating cyclones and storm-surge-induced floods killed 300,000 people in 1970 (see cyclone track, on Figure-1), Cyclone Gorky, another Category IV¹⁰ storm, struck Bangladesh on April 29, 1991, and killed an estimated 140,000 people.¹¹ On November 15, 2007, Cyclone Sidr made landfall across the southwestern coastal areas of Bangladesh, leaving 3,406 people dead and causing damage of nearly US\$ 1.7 billion.¹²

Many of the people died by the cyclones and storm surges were from fishing communities.¹³ Moreover, coastal areas of Bangladesh and low-lying rivers in tidal regions would be affected by rising sea levels. The expected sea level rise will submerge the livelihood ways (fishing and farming) of coastal communities as well as the natural

ecology –⁵ R. Ian Parry et al., *Climate change 2007-impacts, adaptation and vulnerability: Working group II contribution to the fourth assessment report of the IPCC*, vol. 4 (Cambridge University Press, 2007).

⁶ Peter Sammonds, Mohammad Shamsudduha, and Bayes Ahmed. "Climate change driven disaster risks in Bangladesh and its journey towards resilience." *Journal of the British Academy* 9, no. 8 (2021): 55- 77.

⁷ P.55 E. H. Allison et al., "Vulnerability of national economies to the impacts of climate change on fisheries," *Fish and fisheries* 10, no. 2 (2009): 173-196, p.185

⁸ Yearbook of Fisheries Statistics of Bangladesh. Fisheries Resources Survey System (FRSS), Department of Fisheries, Bangladesh. Volume 33: 124 p. (2017). <http://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page>. Accessed on 25 January 2022.

⁹Ibid. p. 123.

¹⁰ Category IV is the second-highest hurricane classification category on the Saffir–Simpson Hurricane Scale, and storms that are of this intensity maintain maximum sustained winds of 113–136 knots (130–156 mph, 209–251 km/h).

¹¹ Caryn Bern et al., "Risk factors for mortality in the Bangladesh cyclone of 1991," *Bulletin of the World Health Organization* 71, no. 1 (1993):73-78.

¹² Government of Bangladesh (GOB), *Cyclone Sidr in Bangladesh: damage, loss and needs assessment for disaster recovery and reconstruction*. Government of Bangladesh, Dhaka (2008). P.31 ¹³ Ibid. p.30

of coastal zones. People will be compelled to leave their homelands, take refuge in dry regions, and change their ways of earning, resulting in a complete transformation of their way of life.¹⁴ The fishing community of coastal Bangladesh is mainly dependent on fishing from the seas and rivers for their livelihood. Most of the rivers in the coastal areas have lost their navigability due to natural disasters (e.g., flood, riverbank erosion) and human activities (e.g., deforestation, building bridges and creating ghers). Fishing community is becoming vulnerable (e.g., physically, financially and socially) to natural disasters every year.¹⁵ That is why, the river based fishermen have become unemployed gradually.

Many fishermen are not skilled at anything except fishing, and as a result, they become unemployed. Because of the ban imposed by the government (Since 2015), fishermen cannot fish in the sea for almost two months out of a year, and the government's support for the prohibition is also inadequate.¹⁶ As a result of natural disasters and bans imposed on them, the lives of coastal fishermen are gradually becoming more difficult, and they are mostly suffering from financial crisis. Due to the economic crisis the rate of child marriage and dropout have been increasing.¹⁷ Boys, involvement with fishing in their teenage is one of the major causes of dropout in the coastal fishing community. In fact, the teenager boys focus more on earning than acquiring educational qualifications.

The climate-induced vulnerabilities led the fishing community to change their existing occupation. This study intends to explore, how the fishing community change their occupation and what are the possible ways to promote sustainable livelihood of the coastal fishing community.

¹⁴ - Md Golam Mahabub Sarwar, "Impacts of sea level rise on the coastal zone of Bangladesh," *Lund University International Masters Programme in Environmental Science (LUMES) Lund University, Sweden* (2005). See http://static.weadapt.org/placemarks/files/225/golam_sarwar.pdf (2005).

¹⁵ Roy Brouwer et al., "Socioeconomic vulnerability and adaptation to environmental risk: a case study of climate change and flooding in Bangladesh," *Risk Analysis: An International Journal* 27, no. 2 (2007) 313-326.

¹⁶ Joy Bhowmik et al., "Resilience of small-scale marine fishers of Bangladesh against the COVID 19 pandemic and the 65-day fishing ban," *Marine Policy* 134 (2021): 104794. ¹⁷ S Hossain et al., "Socio-economic condition of the fishermen in jelepara under pahartoli of Chittagong district," *J. Sylhet Agricultural University* 1 (2014) 65-72.

1.2 Problem Statement

Fishing community lives in the bank of the river or nearest area of the sea. They manage their livelihood by fishing from river and seas. Almost every member of their family is somehow connected with fish related activities (i.e., catching fish, running boats, weaving nets, repairing boats and nets, drying fish and catching minnow). Many times their fishing activities always hampered by the impact of natural calamities. By dint of their skills and resources, the fishing community should be able to overcome their vulnerabilities, and as citizens, they should get support from the government, NGOs, and their local social capital. Moreover, the fishing community has limited physical and financial capital. Due to the lack of physical and financial capital, local social capital cannot play effective role during their emergency.¹⁸

Different types of natural calamities (e.g., Cyclone and storm surge, riverbank erosion and tidal flooding) affects Bangladesh coast every year. The frequency of cyclone in the Bay of Bengal has been increasing science last decades alarmingly (see cyclone details in table-1), Almost every year at least one cyclone crossed Bangladesh coast and create enormous damage and loss of infrastructure (e.g., roads, culverts, embankments) community services (e.g., water, electricity, education, market and health facility), shelter (e.g., housing, community housing, public shelter center), livelihoods (fishing, agriculture), properties (e.g., land, livestock, and poultry), food, environment, and economy. The cyclone also has many social impacts, for example, unemployment, poverty, inequality, and migration/displacement. Sea level rise may affect land use for homesteads, socio-economic activities, infrastructure, social services, and non-fisheries activities in coastal fishing communities.

Variations in temperature, rainfall, and drought in several parts of the world, can have a severe impact on their non-fisheries assets, such as agriculture production.¹⁹ In fact, most

– ¹⁸ Rabiul Islam and Greg Walkerden, "How do links between households and NGOs promote disaster resilience and recovery?: A case study of linking social networks on the Bangladeshi coast," *Natural hazards* 78, no. 3 (2015): 1707-1727.

¹⁹ Md Masum Billah et al., "Studies on fisheries status and socio-economic condition of fishing community in Bhatiary coastal area Chittagong, Bangladesh." *J. Entomol. Zool. Stud* (2018): 673-679.

of the coastal rivers have lost its navigability, which decreased the fishing opportunities in coastal areas. Due to the increase of climate extreme events, coastal fishing community has been suffering from a lot of difficulties. At present, they cannot manage their livelihood through fishing and they are trying to find out alternative livelihood. Their economic crisis compelled them to take high interest loans from moneylenders and many time they sell fish in advance at low prices for taking loans from them.²⁰ This economic crisis increase dropout and child marriage in the fishing community.²¹ The health aspects of the fishing community are also poor in nature. They live beside riverbank, damp and unhealthy environment always exist in the fishing community. Thus the fishing community is often lagging behind in terms of education and health facilities. The overall situation leading the fishing community in a great danger as they are changing their occupation and migrating other place from their own place for better livelihood. Government and NGOs have taken different types (e.g., mitigation, responsive) of programs to reduce their vulnerabilities.²²

In fact, the fishing community has been facing many challenges due to the climate extreme events, which led them to change their existing occupation. They are migrating to other places for sustainable livelihood and trying to change their occupation in different ways such as fishing to day labor, garments workers, vendors. Therefore, the study investigated how and to what extent occupation is transforming the coastal fishing community in Bangladesh.

²⁰ M. L. Hossain Ali et al., "Access to fisheries resources by the poor fishers for income generation and livelihood and their coping strategies during lean and ban fishing period in Bangladesh." *National Food Policy Capacity Strengthening Programme, Bangladesh Centre for Advanced Studies, Bangladesh* (2010): 1-39.

²¹ Hassan Shafkat Siam et al., "Socio-economic status of fisher community at Nijhum Dwip," *Asian Journal of Medical and Biological Research* 6, no. 2 (2020): 351-358.

²² Marie-Caroline Badjeck, "Vulnerability of coastal fishing communities to climate variability and change: implications for fisheries livelihoods and management in Peru." *PhD Dissertation. Universität Bremen*, 2008.

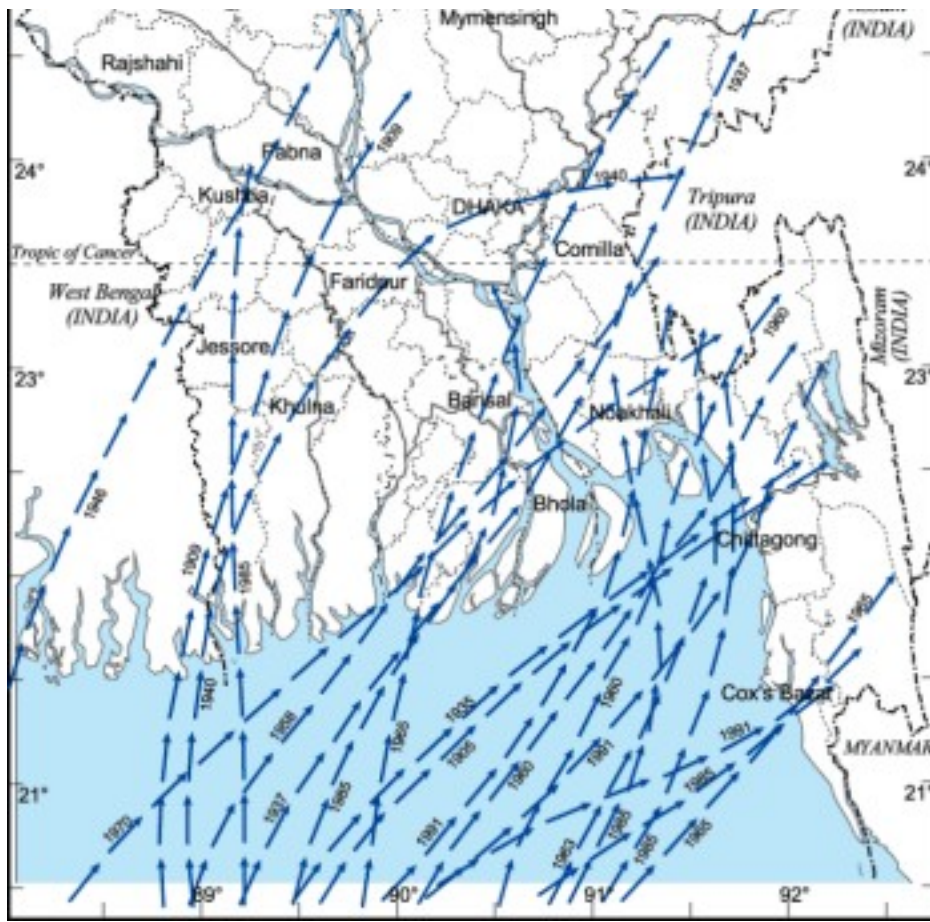


Fig. 1. Cyclone Tracks Modified From Banglapedia

Date	Wind Speed (Max) and Storm Surge	Affected Coastal Areas
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November-12 November, 1970	222 km/h 10.6 m	Bangladesh and West Bengal
April 29, 1991	260, km/h 6.1 m	Chittagong
November 10, 1995	190km/h 3.05 m	Eastern India and Bangladesh
November 15, 2007	260 km/h, 3m	Barisal, Khulna and Dhaka Divison
October, 26 2008	90 km/h, 2-3.m	India and Bangladesh
May 25, 2009	120 km/h 6.1 m	Khulna and Barisal Division and West Bengal
May 4, 2019	213 km/h	Khulna, Rajshahi Dhaka and Eastern India
November 09, 2019	139 km/h	Khulna, Barisal Chittagong division
May20, 2020	241 km/h	Khulna, Rajshahi Dhaka, Rangpur Division
May 23, 2021	139 km/h	Khulna, Rajshahi division
October 25, 2022	83 km/h	Chittagong, Barisal, Dhaka division
May 14, 2023	256 km/h	Chittagong and Myanmar
October 25, 2023	148 km/h	Cox's Bazar
November 17, 2023	102 km/h, 1-2 m	Khulna, Barisal, Sylhet and Dhaka division

Table 1: Cyclones in Bangladesh²³

Cyclone Name

Cyclone 1991,
Cyclone

Deaths of 500,000 people

1970,
Bhola

Deaths of 138,866 people

Damage and Loss

BOB 07 Deaths of 173 people,
fishing boat

Sidr 3,447 people died and 150 boat missing
Rasmi 11 fishermen missing with boat
Aila 4-10 people died, missing 13-1
boats
Fani Deaths of 89 people

Bulbul Deaths of 25 people Amphan Deaths of 16 people

Yaas Deaths of 24 people Sitrang Deaths of 35 people Mocha Deaths of 463 people Hamoon

Deaths of 3 people

Midhili 7 people died, missing more than 20

fishing boats

Cyclones in Bangladesh,

Source: World data. Info and Wikipedia

²³
- <https://www.worlddata.info/asia/bangladesh/cyclones.php>, Accessed on November 17, 2023.

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1.3 Literature Review

Coastal community manage their livelihood by fishing from river and seas. However, the fishing community of Bangladesh has been suffering from different types of vulnerabilities due to lack of assets, information about natural disasters, weak social capital etc. and they are migrating and transforming their occupations for better well-being as their adaptation strategies. Within such a situation, the existing literature highlights the coastal community's vulnerability²⁴ and their livelihood assets²⁵. Besides, a large and growing body of literature has investigated on coastal livelihoods,²⁶ vulnerabilities of fishing community,²⁷ and their coping and adaptation strategies.²⁸ This section focuses the existing literature on fishing community and identifies the study gaps.

1.3.1 Livelihoods of Fishing Communities

People who are directly involved in fishing (such as boat captains and crews) as well as those who work in the fishing industry before and after harvest (for example, gear and boat builders, processors, and main fish sellers). The captains and crews of the boats are known as "fisher folk" (people who fish, especially for a living) or "fishers". People depend on fishing on a full-time, part-time or occasional basis. While for the full-time

group, fisheries are the sole source of their livelihoods, for part-time and occasional groups, fisheries form part of their diversified livelihood strategy.²⁹ Small-scale fisheries are located in

- ²⁴ Michael Jepson and Lisa Lynne Colburn, "Development of social indicators of fishing community vulnerability and resilience in the US Southeast and Northeast regions," (2013):28-32. ²⁵ MS Hossain et al., "Climate change resilience assessment using livelihood assets of coastal fishing community in Nijhum Dwip, Bangladesh." *Pertanika Journal of Science & Technology* 21, no. 2 (2013): 397-422. ²⁶ Venkatesh Salagrama, "Trends in poverty and livelihoods in coastal fishing communities of Orissa State, India" *Food & Agriculture Org., No. 490. 2006.* <https://books.google.com.bd/books> ²⁷ J.E. Cinner et al., "Vulnerability of coastal communities to key impacts of climate change on coral reef fisheries." *Global Environmental Change* 22, no. 1 (2012): 12-20. ²⁸ Apurba Krishna Deb, and C. Emdad Haque, "Multi-dimensional coping and adaptation strategies of small-scale fishing communities of Bangladesh to climate change induced stressors." *International Journal of Climate Change Strategies and Management* 9, no. 4 (2017): 446-468. ²⁹ Sarah Coulthard, "Adapting to environmental change in artisanal fisheries—Insights from a South Indian Lagoon." *Global Environmental Change* 18, no. 3 (2008): 479-489.

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developing countries and support livelihoods of more than 90 percent of the world's capture fishers.³⁰

In Bangladesh, people depend on fishing on a full-time, part-time or occasional basis. While for the full-time group, fisheries are the sole source of their livelihoods, for part time and occasional groups, fisheries form part of their diversified livelihood strategy.³¹ A study found that among the fishing community there were small scale business, agriculture and rickshaw pulling for their livelihood.³² In coastal areas people are engaged in farming, trading of fish, shop keeping, day labor, Arotder, Mohajon, private/govt. jobs etc.³³. A study in India showed, as in many other fisheries, active fishing is limited to men and women openly fishing consider to be taboo. They are engaged with fish seed gathering, marketing, net making and repair, and post-harvest procedures like curing and peeling. Women make up approximately three-quarters of the total employment in the sector, and they dominate all activities except active fishing in terms of numbers.³⁴

1.3.2 Livelihood Assets

The livelihood assets of those who rely on fishing can be divided into five groups such as natural, physical, human, financial and social capital. These capital assets are also known as the "livelihood platform" or "building blocks of livelihood,"³⁵ and they serve as the

foundation for fishery-dependent people's adaptive capabilities.³⁶

³⁰ - FAO Fisheries, "Aquaculture department," The state of world fisheries and aquaculture (2012). ³¹ Md Masum Billah et al., "Studies on fisheries status and socio-economic condition of fishing community in Bhatiary coastal area Chittagong, Bangladesh." *J. Entomol. Zool. Stud* (2018): 673-679. ³² Ibid.

³³ Md Royhanur Islam et al., "Climate Change and Its Impacts: The Case of Coastal Fishing Communities of the Meghna River in South-Central Bangladesh." *International Journal of Marine and Environmental Sciences* 12, no. 10 (2018): 368-376.

³⁴ G. Syda Rao et al., "Demographic and socio-economic changes in the coastal fishing community of India." *Indian Journal of Fisheries* 63, no. 4 (2016): 1-9.

³⁵ UK DFID, "Sustainable livelihoods guidance sheets," *London: DFID 445* (1999). ³⁶ M. C. Badjeck et al., "Impacts of climate variability and change on fishery-based livelihoods." *Marine policy* 34, no. 3 (2010): 375-383.

Table 1.2: Assets of fishery-based livelihoods

Asset types	Components
Natural	Fish, fish habitats, livestock, agriculture, land and water
Human	Educational qualifications, training, fishing skills and ability to work
Social	Relationships between households, neighbors and friends, the relation among organizations and political parties
Physical	Fishing boats, gear, houses, mobile phones and roads
Financial	Cash, savings, loans and Jewelry

Source: Adapted from DFID, 1999.

Natural capital is the natural resources from which benefits flow to fishery-dependent People. These include fisheries resources such as fish stock and aquatic habitats as well as the non-fisheries resources on which they can also be dependent such as agricultural land and freshwater for drinking and agriculture.³⁷ Physical capital includes physical infrastructure and tools or equipment used to support livelihoods. These include fisheries resources such as fish landing centers, gear stores, ice plants, boats, engines, nets, and processing equipment, as well as non-fisheries resources such as roads, dams, houses, schools, markets, hospitals, water supply systems and cyclone shelters (raised concrete structures that protect from wind and flood).³⁸ Fishing communities are often poorly

affected by roads and other infrastructure, and social services. These different types of livelihood assets may be combined creatively and innovatively to create more livelihood opportunities in a particular area.³⁹

³⁷ B. P. Satia, "Promoting the ecosystem approach to fisheries in the context of small-scale fisheries," *Advisory Committee on Fisheries Research. Papers presented at the second session of the Working Party on Small-scale Fisheries: Bangkok, Thailand, 8-21 November 2003* 2 (2004): 99.

³⁸ Philip Townsley, "Review of coastal and marine livelihoods and food security in the Bay of Bengal Large Marine Ecosystem Region," *Bay of Bengal Large Marine Ecosystem Programme; The Innovation Centre, University of Exeter: Exeter, UK* (2004).

³⁹ Ian Scoones, "Sustainable rural livelihoods: a framework for analysis," (1998).

1.3.3 Livelihood Vulnerabilities

Small coastal communities with an older demographic, high unemployment, declining commercial fishing boats, high participation in the marine sector, and limited local sea based or land-based employment opportunities are considered to be especially vulnerable to climate change.⁴⁰ Changes in wind and weather patterns, physical changes to the marine environment, and variations in animal behavior were all mentioned as challenges to small scale fishers' livelihoods in the Gulf of California.⁴¹

Vulnerability of coastal fishing community increases due to the frequency of cyclones.⁴² In fact, last fifteen years, the frequency of cyclones has been increasing. At least one cyclone has crossed the Bangladesh coast since 2007 and creating physical, socioeconomic and human vulnerabilities. The fishermen cannot go to the sea or river when a cyclone is formed. Increase of salinity intrusion, and land-use change all have an impact on household access to livelihood assets. This has a negative impact on social well-being by affecting food and water security.⁴³

A study found that fishermen's income is good but inconsistent; they are highly dependent on marine resources, and the fishing community faces significant challenges as a result of their specific occupational characteristics, such as a lack of capital, a lack of secure employment, a lack of marine resources, weather dependence, and labor shortage.⁴⁴ Therefore, the fishing community of Bangladesh is compelled to live in the coastal area of

- Van Putten et al., "Transformation of coastal communities: where is the marine sector heading?" *The Australasian Journal of Regional Studies*, 20, no. 2 (2014): 286-324.

⁴¹ Timothy H. Frawley et al., "Heterogeneous perceptions of social-ecological change among small scale fishermen in the central Gulf of California: implications for adaptive response." *Frontiers in Marine Science* 6 (2019): 78.

⁴² Tariq Masood Ali Khan, O. P. Singh, and MD Sazedur Rahman. "Recent sea level and sea surface temperature trends along the Bangladesh coast in relation to the frequency of intense cyclones." *Marine Geodesy* 23, no. 2 (2000): 103-116.

⁴³ Masud Iqbal Shameem et al., "Vulnerability of rural livelihoods to multiple stressors: A case study from the southwest coastal region of Bangladesh." *Ocean & Coastal Management* 102 (2014): 79-87. ⁴⁴ Phan Hai et al., "Develop Sustainable Livelihoods for Fishermen in the North Central Region of Vietnam-Case Study for Nghe An Province." *Journal of Agricultural Studies* 8, no. 1 (2020): 227-246.

Bangladesh despite the impacts of natural disasters as they have limited resources for relocating to other areas in search of better opportunities.⁴⁵

1.3.4 Cyclones and Storm Surges

Cyclones and storm surges are among the most significant natural disasters that affect the coastal fishing communities of Bangladesh⁴⁶. The country is located in a region that is prone to tropical cyclones, which are accompanied by heavy rainfall, strong winds, and storm surges. The coastal regions of Bangladesh are particularly vulnerable to these disasters, as they are located at low elevations and are exposed to the sea.⁴⁷ Cyclones and storm surges can cause extensive damage to the fishing boats and equipment used by the coastal fishing communities. The high winds and waves can capsize boats and damage fishing nets, making it difficult for fishermen to catch fish. Storm surges can also inundate the coastal areas, leading to the loss of homes, livelihoods, and even lives. The impact of these disasters is particularly severe on the coastal fishing communities, who are already vulnerable due to poverty and lack of access to resources.⁴⁸

1.3.5 Coastal Flooding

Coastal Flooding are another natural disaster that affects the coastal fishing communities of Bangladesh.⁴⁹ The country is located in the delta of the Ganges, Brahmaputra, and Meghna rivers, which makes it prone to floods during the monsoon season. The floods

⁴⁵ Mohammad Mahmudul Islam, "Living on the margin: the poverty-vulnerability nexus in the small-scale fisheries of Bangladesh." *In Poverty mosaics: Realities and prospects in small-scale fisheries* (2011), Dordrecht: Springer Netherlands: 71-95.

⁴⁶ Md Nazir Hossain, "Analysis of human vulnerability to cyclones and storm surges based on influencing physical and socioeconomic factors: evidences from coastal Bangladesh." *International journal of disaster risk reduction* 13 (2015): 66-75.

⁴⁷ Shitangsu Kumar Paul and Jayant K. Routray, "Household response to cyclone and induced surge in coastal Bangladesh: coping strategies and explanatory variables." *Natural Hazards* 57 (2011): 477-499. ⁴⁸ Muhammad Al-Amin Hoque et al., "Cyclone vulnerability assessment of the western coast of Bangladesh." *Geomatics, Natural Hazards and Risk* 12, no. 1 (2021): 198-221.

⁴⁹ Md Mustafa Saroar, Jayant K. Routray, and Walter Leal Filho, "Livelihood vulnerability and displacement in coastal Bangladesh: Understanding the nexus." *Climate change in the Asia-Pacific region* (2015): 9-31.

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damage homes, roads, and other infrastructure, making it difficult for fishermen to access the sea and sell their catch. The loss of homes and possessions can also lead to displacement and further exacerbate the challenges faced by these communities.⁵⁰

1.3.6 Salinity Intrusion

Salinity intrusion is another disaster that affects the coastal fishing communities of Bangladesh.⁵¹ The intrusion of saltwater into freshwater sources can lead to a loss of access to clean water, which can have significant health impacts on the communities. The increased salinity in the soil can also affect crop yields, further exacerbating the challenges faced by the communities.⁵² Salinity intrusion can also affect fish stocks, making it more difficult for fishermen to catch fish.⁵³

1.3.7 Disaster Impact on Fisherman Livelihoods

The disasters faced by the coastal fishing communities of Bangladesh have a significant impact on their livelihoods. Fishing is the primary source of income for these communities, and the loss of fishing boats, equipment, and fish can have severe economic consequences. Displacement due to floods and storm surges can also lead to the loss of homes and possessions, making it difficult for these communities to rebuild their livelihoods.⁵⁴

The impact of these disasters is particularly severe on vulnerable groups, such as women and children. Women are often engaged in the processing and selling of fish, and

- ⁵⁰ Md Golam Mahabub Sarwar and Aminul Islam, "Multi hazard vulnerabilities of the coastal land of Bangladesh." *Climate change adaptation actions in Bangladesh* (2013): 121-141. ⁵¹ Sebak Kumar Saha, "Cyclone, salinity intrusion and adaptation and coping measures in coastal Bangladesh." *Space and culture, India* 5, no. 1 (2017): 12-24.
- ⁵² Golam Rabbani et al., "Loss and Damage from salinity intrusion in Sathkira District, coastal Bangladesh." *Loss and damage in vulnerable countries initiative, Case Study Report* (2013): 8-10. ⁵³ Md Giasuddin Khan, "Bangladesh coastal and marine fisheries, and environment." *Sustainable Management of Fisheries Resources of the Bay of Bengal. Support to BOBLME Project, Bangladesh Fisheries Research Institute, Bangladesh* (2010): 1-35.
- ⁵⁴ Md Monirul Islam et al., "Vulnerability of fishery-based livelihoods to the impacts of climate variability and change: insights from coastal Bangladesh." *Regional Environmental Change* 14 (2014): 281- 294.

the loss of access to markets due to floods or storms can have a significant impact on their livelihoods.⁵⁵ Children are also affected, as they may be forced to drop out of school to help their families with fishing or other economic activities.⁵⁶

1.3.8 Coping and Adaptation Strategies

Changing ocean conditions, such as acidification, rising sea levels, rising sea surface temperatures, and ice melt, are driving factors for adaptation in marine and coastal fisheries.⁵⁷ In Bangladesh, the coastal fishing community adopted different types of coping strategies during ban and emergency period. They work as day laborers, take a loan from different sources, reduce their expenditure, and catch fish in other sources (e.g., ponds, and canals).⁵⁸

Different strategies have been adopted in different countries for adaptation in the fishing community. Migration is considered an adaptive strategy in respond to climate variability and change to achieve more livelihood assets, higher incomes and better access to water supply, health and educational services, technology and markets.⁵⁹ Diversification of livelihoods, using traditional knowledge, increased access to climatic information, and shifting gender roles in fisheries found in Uganda as adaptation strategies.⁶⁰ However, in

⁵⁵ Priyono Prawito and Gita Mulyasari, "Comparative social vulnerability of fishermen in the coastal area of Bengkulu and Central Java, Indonesia." *Aquaculture, Aquarium, Conservation & Legislation* 14, no. 5 (2021): 3045-3054.

⁵⁶ Bishawjit Mallik, Khan Rubayet Rahaman and Joachim Vogt, "Coastal livelihood and physical infrastructure in Bangladesh after cyclone Aila." *Mitigation and Adaptation Strategies for Global Change* 16 (2011): 629-648.

⁵⁷ Carolina Camargo et al., "Community involvement in management for maintaining coral reef resilience and biodiversity in southern Caribbean marine protected areas." *Biodiversity and Conservation* 18

(2009): 935-956.

⁵⁸ Md Liaquat Ali et al., "Access to fisheries resources by the poor fishers for income generation and livelihood and their coping strategies during lean and ban fishing period in Bangladesh." *National Food Policy Capacity Strengthening Programme, Bangladesh Centre for Advanced Studies, Bangladesh* (2010): 1-39. ⁵⁹ Md Monirul Islam et al., "Migrating to tackle climate variability and change? Insights from coastal fishing communities in Bangladesh." *Climatic Change* 124 (2014): 733-746.

⁶⁰ Laban Musinguzi et al., "Fishers' perceptions of climate change, impacts on their livelihoods and adaptation strategies in environmental change hotspots: A case of Lake Wamala, Uganda." *Environment, Development and Sustainability* 18 (2016): 1255-1273.

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some areas livelihood transforming within and outside the fishing sector.⁶¹ Fishermen use community adaptive responses, such as new technology, collective action, and collaboration.⁶² The government have been taken some strategies for building a sustainable fishing community such as building capacity to inform and train fishermen (e.g.,

workshops, education, and research).⁶³ Some fishing communities are using insurance schemes, increasing social capital to increase community resilience (social cohesion, local fund raising, and maintaining cultural identities) and using different knowledge systems (e.g., indigenous, local knowledge).⁶⁴ Changing the fishing technique (e.g., catch-and release practices, altering trips in time - distance).⁶⁵ Adaptive strategies responding to specific climate impacts and communities are shifting to non-fisheries businesses for more income in Indonesian coastal fisheries.⁶⁶

Another study found that using local organizations to create social influence over the Flood Action Plan is a successful floodplain management strategy in Bangladesh.⁶⁷ Moreover, dependence on a single source of income, insufficient access to aid and financial and natural resources, a lack of skills and knowledge about alternative livelihood options, a lack of strong social protection and social networks, social inequalities, institutional incompetence, and a lack of community leadership and cooperation all harmed fishermen's resilience.⁶⁸

⁶¹ Pius Z. Yanda et al., "Nexus between coastal resources and community livelihoods in a changing climate." *Journal of Coastal Conservation* 23 (2019): 173-183.

⁶² Eranga K. Galappaththi et al., "Climate change and community fisheries in the arctic: a case study from Pangnirtung, Canada." *Journal of environmental management* 250 (2019): 109534. ⁶³ George Freduah, Pedro Fidelman, and Timothy F. Smith, "Adaptive capacity of small-scale coastal fishers to climate and non-climate stressors in the Western region of Ghana." *The Geographical Journal* 185, no. 1 (2019): 96-110.

⁶⁴ Md Monirul Islam et al., "Limits and barriers to adaptation to climate variability and change in

Bangladeshi coastal fishing communities." *Marine Policy* 43 (2014): 208-216.

⁶⁵ Kirsten E. Abernethy et al., "Fuelling the decline in UK fishing communities?" *ICES Journal of Marine Science* 67, no. 5 (2010): 1076-1085.

⁶⁶ Pasita Chaijaroen, "Long-lasting income shocks and adaptations: Evidence from coral bleaching in Indonesia." *Journal of Development Economics* 136 (2019): 119-136.

⁶⁷ Parvin Sultana and Paul Thompson, "Local institutions for floodplain management in Bangladesh and the influence of the Flood Action Plan." *Environmental Hazards* 9, no. 1 (2010): 26-42. ⁶⁸ Joy Bhowmik et al., "Resilience of small-scale marine fishers of Bangladesh against the COVID 19 pandemic and the 65-day fishing ban." *Marine Policy* 134 (2021): 104794.

1.4 Research Gap

Existing literature showed that coastal fishing communities have been suffering from various types of disasters and vulnerabilities. Most of the studies have focused either on a national scale of the vulnerability of fisheries systems⁶⁹ or of agricultural livelihoods.⁷⁰ Many studies often tends to focus on general aspects of disaster impacts and disaster induced vulnerabilities for example, cyclone impacts⁷¹, flood impacts⁷², riverbank erosion impacts⁷⁴, ,⁷⁵ salinity impacts⁷⁷ and vulnerabilities of coastal fishing communities⁷⁸. Additionally, many studies also conducted on disaster impacts on agricultural communities⁷⁹,⁸⁰. Also several studies conducted on migration⁸¹, disaster

⁶⁹ Edward H. Allison et al., "Vulnerability of national economies to the impacts of climate change on fisheries." *Fish and fisheries* 10, no. 2 (2009): 173-196.

⁷⁰ Attila N. Lázár et al, "Agricultural livelihoods in coastal Bangladesh under climate and environmental change—A model framework." *Environmental Science: Processes & Impacts* 17, no. 6 (2015): 1018-1031. ⁷¹ Md Royhanur Islam et al., "Climate Change and Its Impacts: The Case of Coastal Fishing Communities of the Meghna River in South-Central Bangladesh." *International Journal of Marine and Environmental Sciences* 12, no. 10 (2018): 368-376.

⁷² Md Humayain Kabir, and Md Nazmul Hossen. "Impacts of flood and its possible solution in Bangladesh." *Disaster Adv* 12, no. 10 (2019): 48-57.

⁷³ Paul M Thompson and E. Penning-Rowsell. "Socio-economic impacts of floods and flood protection: a Bangladesh case study." *Disasters development and environment*. Wiley, Chichester (1994): 81- 97. ⁷⁴ Abdullah Al Mamun et al., "Assessing riverbank erosion and livelihood resilience using traditional approaches in northern Bangladesh." *Sustainability* 14, no. 4 (2022): 2348. DOI: <https://doi.org/10.3390/su14042348>

⁷⁵ A. T. M. Baki "Socio-economic impacts of Gorai riverbank erosion on people: A case study of Kumarkhali, Kushtia." *PhD diss., BRAC University*, 2014.

⁷⁶ Munshi Khaledur Rahman et al., "Riverbank erosions, coping strategies, and resilience thinking of the Lower-Meghna River Basin community, Bangladesh." *Climate Vulnerability and Resilience in the Global South: Human Adaptations for Sustainable Futures* (2021): 259-278.

⁷⁷ M. H., T. Lund Rahman and I. Bryceson. "Salinity impacts on agro-biodiversity in three coastal, rural villages of Bangladesh." *Ocean & Coastal Management* 54, no. 6 (2011): 455-468. ⁷⁸ Md Monirul Islam, Susannah Sallu, Klaus Hubacek, and Jouni Paavola. "Vulnerability of fishery based livelihoods to the impacts of climate variability and change: insights from coastal Bangladesh." *Regional Environmental Change* 14 (2014): 281-294.

⁷⁹ Nazmul Huq et al., "Climate change impacts in agricultural communities in rural areas of coastal Bangladesh: A tale of many stories." *Sustainability* 7, no. 7 (2015): 8437-8460.

⁸⁰ Afshana Parven et al., "Impacts of disaster and land-use change on food security and adaptation: Evidence from the delta community in Bangladesh." *International Journal of Disaster Risk Reduction* 78 (2022): 103119.

⁸¹ Md Monirul Islam et al., "Migrating to tackle climate variability and change? Insights from coastal fishing communities in Bangladesh." *Climatic Change* 124 (2014): 733-746.

coping strategies,⁸² and climate change adaptation⁸³ in Bangladesh. The study identifies that only a small portion of research has been conducted on livelihood diversification in the world for example, India⁸⁴ Ghana⁸⁵ Colombia⁸⁶ Laos⁸⁷ Kenya⁸⁸ Nigeria⁸⁹ specifically in fishing communities. Beside those studies are available in the context of diversification they have other limitations-

- Among the small number of conducted research studies, the majority are the work of NGOs and INGOs, with only a few being conducted in the field of academia.
- The majority of research has not focused on the disaster-led occupational transformation in the coastal Bangladesh.
- While a large number of studies have been conducted on livelihood diversification in fishing communities across different global regions, the number of studies specifically addressing occupational transformation in Bangladesh remains notably limited.

Considering this gap in the literature, the current research aims to know the existing status of coastal fishermen and explore, how their occupation is transforming due to various climatic shocks and disaster-induced vulnerabilities.

⁸² - Shitansu Kumar Paul and Jayant K. Routray "Household response to cyclone and induced surge in coastal Bangladesh: coping strategies and explanatory variables." *Natural Hazards* 57 (2011): 477-499. ⁸³ M. Salim Uddin et al., "Disasters threaten livelihoods, and people cope, adapt and make transformational changes": Community resilience and livelihoods reconstruction in coastal communities of Bangladesh." *International Journal of Disaster Risk Reduction* 63 (2021): 102444. ⁸⁴ Prateep Kumar Nayak. "Fisher communities in transition: Understanding change from a livelihood perspective in Chilika Lagoon, India." *Maritime Studies* 16 (2017): 1-33. ⁸⁵ A. Gordon and A. Pulis "Livelihood Diversification and fishing communities in Ghana's Western Region" *WorldFish Center. USAID Integrated Coastal and Fisheries Governance Initiative for the Western Region, Ghana* (2010), p.69.

⁸⁶ Jorge Higinio Maldonado et al., "Livelihoods characterization of a small-scale fishing community in the Colombian caribbean." *Marine & Fishery Sciences (MAFIS)* 35, no. 2 (2022): 181-210. ⁸⁷ Sarah M. Martin,

Kai Lorenzen, and Nils Bunnefeld. "Fishing farmers: Fishing, livelihood diversification and poverty in rural Laos." *Human Ecology* 41 (2013): 737-747.

⁸⁸ Edward Olale, and Spencer Henson. "The impact of income diversification among fishing communities in Western Kenya." *Food policy* 43 (2013): 90-99.

⁸⁹ Y. J. Alhassan, S. Umar, A. Gona, and I. S. Jega. "Analysis of livelihood diversification strategies adopted by the fishing communities along shiroro and kainji dams, nigeria." *African Journal of Sustainable Agricultural Development* 4, no. 3 (2023): 26-37.

1.5 Rationale of the Study

1.5.1 Global Perspective

Many global initiatives, such as the Hyogo Framework, Sendai Framework and SDGs have been undertaken to mitigate disaster risk and build resilient communities worldwide. These initiatives are discussed below.

Hyogo Framework for Action (HFA) (2005-2015)⁹⁰

The Hyogo Framework for Action was adopted in 2005. It was a ten-year plan designed to build the resilience of nations and communities to disasters. The framework was endorsed by UN member states during the World Conference on Disaster Reduction held in Hyogo, Japan, hence the name "Hyogo Framework." The framework aimed to promote a more strategic and systematic approach to reducing vulnerabilities to natural hazards. It was a ten-year plan, it concluded in 2015. After the conclusion of the Hyogo Framework, the international community adopted the Sendai Framework for Disaster Risk Reduction in 2015, which outlines a more comprehensive and updated approach to disaster risk reduction.

Sendai Framework for Disaster Risk Reduction (2015-2030)⁹¹

The Sendai Framework for Disaster Risk Reduction (2015-2030) is a global initiative that outlines priorities and actions to reduce disaster risk and build the resilience of communities and nations. In the context of the study, the Sendai Framework could

provide a lens through which the research analyze how the fishing community in coastal

⁹⁰<https://www.preventionweb.net/publication/hyogo-framework-action-2005-2015-building-resilience-nations-and-communities-disasters>. Accessed on 09 May, 2023.

⁹¹<https://www.preventionweb.net/sendai-framework/sendai-framework-for-disaster-risk-reduction>
Accessed on 12 May, 2023.

Bangladesh copes with and adapts to disasters, particularly in terms of occupational changes.

Sustainable Development Goals (SDGs) (2015-2030)⁹²

The Sustainable Development Goals (SDGs) encompass a broad range of global challenges, including poverty, hunger, and climate action. This study may align with several SDGs, such as Goal 1 (No Poverty), Goal 2 (Zero Hunger) and Goal 13 (Climate Action). These goals provide a comprehensive framework for understanding the broader implications of disaster-led occupational transformations on sustainable development.

In summary, these frameworks offer theoretical and conceptual foundations for analysis by providing lenses through which to view the fishing community's response to disasters, the effectiveness of risk reduction measures, potential forced migration issues and the broader context of sustainable development goals.

1.4.2 Regional Perspective

ASEAN Agreement on Disaster Management and Emergency Response (AADMER)- 2010-2015

AADMER is a regional agreement that outlines the commitment of ASEAN⁹³ member states to cooperate in disaster management and emergency response. It emphasizes coordination, information sharing, and capacity building to enhance the region's resilience to disasters. It also work for strengthen the institutional capacity and policy development.

SAARC Framework on DRR (2005)

South Asian Association for Regional Cooperation (SAARC) has a framework for disaster risk reduction that promotes regional cooperation. It highlights the importance of

⁹² <https://sdgs.un.org/goals>. Accessed on 17 May, 2023

⁹³ The Association of Southeast Asian Nations is a political and economic Union of 10 states in Southeast Asia. It was established on 8 August 1967.

information sharing, capacity building, and joint initiatives to reduce the impact of disasters in the South Asian region. It has works for establishing and strengthening the regional disaster management system (e.g., early warning) to reduce risks and to develop response and recovery management at all levels. The other aim of the framework is to exchange information on prevention, preparedness and management of natural disasters.

1.5.3 National Perspective

NPDM 2021-2025 (Ministry of Disaster management and Relief-MoDMR, 2020)

The NPDM 2021-2025 outlines a broad strategy for disaster management with a primary focus on Disaster Risk Reduction (DRR) for sustainable development. The plan was undertaken by MoDMR Bangladesh. The plan integrated with national, regional and international frameworks (e.g., Delta Plan 2100, 8th 5 Year Plan of Government of Bangladesh, Sendai Framework for Disaster Risk Reduction-SFDRR). This five-year plan aims to strengthen the community resilience, reduce vulnerabilities, and enhance preparedness to effectively mitigate the impact of disasters. Also it wants to create an effective response and to 'Build Back Better' by strengthening forecasting and early warning systems, improving emergency response, and enhancing capacity in almost every phase of disaster management, including preparedness, recovery, rehabilitation, and reconstruction.

National Adaptation Plan of Bangladesh (2023-2050)

To mitigate the adverse effects of climate change and encourage sustainable development planning, the Government of Bangladesh has undertaken the National Adaptation Plan (NAP) under the Ministry of Environment, Forest and Climate Change (MoEFCC). The

goal is to climate-resilient development, minimizing climate risks and vulnerabilities. Building on the National Adaptation Programme of Action (NAPA) and the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), the NAP aims to enhance and streamline adaptation efforts. The perspectives of various groups, including local residents,

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women, individuals with diverse gender identities, persons with disabilities, youth, ethnic communities, children, the elderly, vulnerable communities, the private sector, and disadvantaged groups, were prioritized in the development process. The NAP encompasses eight key sectors, with a focus on disaster management, social safety, agriculture, fisheries, livestock, and more. With the primary objective of reducing risks and vulnerabilities to climate change, the NAP envisions the creation of a climate-resilient nation. This involves implementing effective adaptation strategies to strengthen both society and ecosystems while promoting sustainable economic growth.

Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009 (updated in 2022)

The Climate Change Strategy and Action Plan is designed to address the challenges posed by adverse climate change effects and reduce the risks associated with disasters. The plan places a strong emphasis on enhancing community resilience and implementing adaptation strategies. The climate change action plan is structured around six key pillars, with a primary focus on ensuring food security, social protection, and health measures to safeguard the most vulnerable members of society from the impacts of climate change. The strategy involves comprehensive disaster management, aiming to fortify the country's systems for handling the growing frequency and severity of natural disasters. Additionally, the plan includes initiatives to secure existing assets, such as coastal rivers and embankments, through the development of infrastructure. Furthermore, it involves capacity building and institutional strengthening to empower the government and other stakeholders in effectively reducing the impact of climate change.

Bangladesh Delta Plan, 2100

The recently adopted Bangladesh Delta Plan 2100 by the government signifies a commitment to gradual and sustainable development through an adaptive delta management approach. Recognizing climate change as a substantial future challenge, the plan underscores Bangladesh's dedication to reducing greenhouse gas (GHG) emissions and establishes the groundwork for climate adaptation initiatives in the coming decades.

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The plan outlines 52 specific climate change adaptation projects aimed at enhancing the climate resilience of the delta region.

Mujib Climate Prosperity Plan (MCP) 2022-2041

The "Mujib Climate Prosperity Plan" in Bangladesh aims to secure funding, primarily through international collaboration, to execute initiatives in renewable energy and climate resilience. It focuses to reduce vulnerabilities induced by disasters and create a resilient community. It also address both climate change adaptation and mitigation. The preliminary plan outlines various significant initiatives, emphasizing renewable energy, infrastructure for energy storage, modernization of the power grid, and the establishment of a carbon market regime. These efforts aim to future-proof locally-driven adaptation outcomes and bolster Micro, Small, and Medium Enterprises (MSMEs).

National Strategy on Internal Displacement Management 2021

The Ministry of Disaster Management and Relief (MoDMR) has embraced the National Strategy on Internal Displacement Management 2021 with the aim of incorporating the displaced population into the development process, thereby ensuring their inclusion and participation. The long-term vision of the strategy is to enhance the resilience of vulnerable communities in Bangladesh to climate change and disasters by implementing sustainable disaster and climate-induced internal displacement management. The overarching goal of the strategy is to establish a comprehensive and practical rights-based framework that upholds, safeguards, and guarantees the rights of individuals who have been internally displaced due to disasters and climate-related factors (DCIIDs) at various stages of displacement and throughout the pursuit of durable solutions.

National Disaster Management Policy, 2015

The National Disaster Management Policy, 2015, has been developed with the purpose of outlining the national stance on disaster risk reduction and emergency management in Bangladesh. This policy aims to articulate the strategic framework and national principles

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that govern disaster management in the country. Through the sustainable management of catastrophes and internally displaced persons, the policy try to enhance the resilience of Bangladesh's.

As coastal fishing community is consider is a vulnerable community and different global, regional and national framework and policies have focused now about the sustainability of underprivileged community in the world. However, climate extreme events have been increasing significantly in recent times and are affecting all of the coastal communities. Due to climatic shocks, coastal fishing communities are facing a lot of challenges. This study aims to explore the occupational transformation of the coastal fishing community. Moreover, more recent attention has focused (HYOGO Framework, Sendai Framework and SDGs) on the provision of disaster coping strategies, migration, and climate change adaptation and a few research focused on occupational transformation in the fishing community. Considering the current situation of fishing communities in Bangladesh, this study is necessary for several reasons,

- The study is necessary to know the physical, financial, social, and health vulnerabilities of coastal fishing communities.
- The study is also essential to investigate how and to what extent occupation is transforming in the fishing community.
- The study is crucial, as it find out the possible options (e.g., national-level intervention, community-level intervention, coping and adaptation strategies) to promote sustainable livelihood in the fishing community.
- Therefore, the study would contribute to the existing body of literature, knowledge, policy, and further research.

1.6 Understanding Key Concepts

1.6.1 Disaster

According to UNDRR (United Nations Office for Disaster Risk Reduction), a disaster is a serious disruption of the functioning of a community at any scale due to hazardous events. This results in widespread human, material, economic, or environmental losses that exceed the ability of the affected community or society to cope using its own resources. This study refers to the disasters affecting coastal Bangladesh, such as cyclones, storm surges, coastal floods, riverbank erosion, and salinity.

1.6.2 Occupational Transformation

Occupational transformation refers to the changes in the employment patterns, livelihood strategies, and economic activities of individuals and communities in response to external factors such as disasters, socioeconomic shifts, or environmental changes. In the context of the thesis, it refers to the changes within the fishing communities' occupational activities and strategies triggered by the impact of disasters in coastal Bangladesh. This study refers to occupational transformation, which is the process of fishermen transforming from fishing to other occupations.

1.6.3 Fishing Communities

Fishing communities represent the social groups living in coastal areas of Bangladesh whose livelihoods primarily depend on fishing and related activities from rivers and sea. These communities often possess a distinct cultural identity and shared traditional knowledge. The fishing community have been facing different challenges such as

overfishing, habitat degradation, climate change, economic instabilities, and governance issues.

1.7 Study Objectives

The key aim of the study is to explore disaster-led occupational transformation and its outcomes in the coastal fishing community of Bangladesh. The specific aims of the study are,

- a) To identify disaster-induced vulnerabilities in the fishing communities; b) To know in what ways the occupation is transforming in the fishing communities; c) To investigate whether occupational transformation is creating vulnerabilities or securing livelihood; and
- d) To find out the possible ways to promote livelihood security.

1.8 Conceptual Framework

The global climate is changing and the consequences of these climate extreme events have been increasing. Every year, climate extreme events negatively affect the fishing community and due to these the coastal fishing community has been facing different types of vulnerabilities. Also these vulnerabilities creates pressure on their existing fishing occupation. Focusing on capital assets (i.e. human, social, financial, physical and natural) and vulnerability context, and this study was conducted to assess how their occupation is transforming and whether the existing occupational transformation creating vulnerabilities or securing their livelihood. Figure 1 shows the conceptual framework of the study.

Climate Change

Climate Extreme Events

Cyclone and Storm Surges Riverbank Erosion Salinity Coastal/Tidal Flooding

Vulnerabilities of Coastal Fishing Communities

Physical Financial Human/health Social

-Loss of fishing equipment	-Infrastructure - Embankments	-Deaths and injuries -Skill loss/capacity decrease	& social insecurity
-Shelter loss & damage	-Income loss	-Disease	-Breakdown social networks
	-Increase debt	-Unemployment -	-Displacement and migration
	-Loss of livelihoods	Fragile resilience -Food	

Creating Stresses on Exiting Occupation

Occupational Transformation How Transform

and to what extent?

Figure 2: Conceptual framework

Source: Developed by the researcher

1.9 Theoretical Position of the Study

The study has used “Theory of Community Resilience”. The theory emphasize the capacity building for successful adaptation in the face of disturbance, stress, or adversity.

⁹⁴ In addition, the literature also indicates that the ability of social units to mitigate hazards, contain the effects of disasters, and engage in recovery activities can significantly reduce social disruption. This theory provides a comprehensive lens through which to analyze how fishing communities in coastal Bangladesh respond and adapt to disasters, thereby facilitating their occupational transformation. The study shown that a community's capacities, skills, and knowledge play a crucial role in recovering from the impacts of disasters. However, the “Theory of Community Resilience” suggests that communities have the capacity to effectively respond to and recover from external shocks and stressors, such as natural disasters, through a combination of social, economic, and environmental resources and strategies. It emphasizes the importance of adaptive capacities, social networks, and institutional support in enabling communities to tolerate, cope with, and bounce back from disruptive events.

Theory of Community Resilience

In the context of disaster studies and community development, researchers have contributed to the conceptualization of community resilience, particularly in the context of understanding how communities recover from and adapt to the impacts of disasters and other stressors. The theory shown that a community's capacities, skills, and knowledge play a crucial role in recovering from the impacts of disasters.⁹⁵ It also refers to the community's capacities, skills, and knowledge that enable it to participate fully in

recovery from disasters.⁹⁶ Additionally, it defines the ability of individuals and communities to deal with a state of continuous, long-term stress; the capacity to discover unknown inner strengths

⁹⁴ Fran H. Norris et al, "Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness". *American journal of community psychology* (2008), 41, 127-150. ⁹⁵ Eve Coles and Philip Buckle, "Developing community resilience as a foundation for effective disaster recovery" *The Australian Journal of Emergency Management* (2004), 19(4), 6-15. ⁹⁶ Ibid.

and resources to cope effectively; and the measure of adaptation and flexibility.⁹⁷ Community resilience stems from four primary sets of adaptive capacities such as Economic Development, Social Capital, Information and Communication, and Community Competence that collectively form a strategy for disaster preparedness. To enhance collective resilience, communities must address and diminish risks and resource disparities, involve local residents in mitigation efforts, establish organizational connections, reinforce and safeguard social support systems, and plan for unforeseen circumstances. This necessitates flexibility, decision-making skills, and reliance on trusted sources of information in the face of uncertainties.

This theory helps to understand the fishing community's adaptive capacity to analyze how the fishing communities in coastal Bangladesh have developed adaptive capacities, such as diversified livelihood strategies, community-based disaster preparedness activities, and social support networks establishment, to cope with the occupational transformations induced by natural disasters. The theory is essential for exploring the role of social networks in the fishing communities, including community based organizations (CBOs), local leadership, and informal support systems, in facilitating collective action and resource-sharing during and after disasters. The theory also investigate the effectiveness of government policies, institutional frameworks, and external interventions in building the resilience of fishing communities and supporting their existing transformation in the face of disaster-induced challenges.

1.10 Scope and Limitations of the Study

The key focus of this study is to understand the present occupational transformation situation of fishermen in the coastal areas of Bangladesh. This study identifies the disasters faced by the fishing community and the disaster-induced vulnerabilities of the community. The study also explores in what ways fishermen are changing their fishing occupation to other occupations. Also, the study finds out the causes of occupational transformation in the

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- Michael Ganor and Y. U. L. I. Ben-Lavy. "Community resilience: Lessons derived from Gilo under fire." *Journal of Jewish communal service* 79, no. 2/3 (2003): 105-108.

coastal areas. The current study investigates whether occupational transformation is creating vulnerabilities or securing livelihoods in the coastal fishing communities. Finally, the study finds out the possible ways to promote fishermen's livelihood security in the coastal areas of Bangladesh. Additionally, this study identifies further research opportunities in this field. Therefore, there is great scope for the study in the domain of disaster management in Bangladesh.

Still, the study has some limitations. Specifically, it did not encompass all the disaster-prone communities in Bangladesh as part of the study population. The research focused on only two Upazillas and three Unions.

1.11 Thesis Structure

Chapter One of this thesis provides a basic introduction and describes the study problem. The literature review describes previous research related to the current study and identifies the study gap. Additionally, this chapter discusses the rationale of the study, conceptual framework, theoretical position, study objectives, study scopes, and limitations. To address the research aims, finally, this chapter explores the thesis argument, contributions of the thesis, and the thesis structure.

Chapter Two discusses the methodology of the study. Several methods and techniques are used to achieve the key goal of the study. This chapter covers the study approach, study area, sampling and recruitment of research participants, data sources and data collection techniques, data analysis, study coordination schema, and ethical

considerations.

Chapter Three is designed based on the study area profile. This chapter provides a brief description of the geophysical settings of the study area and the profile of the respondents. It includes general background, location, and climate of the study area. The study area maps are included in this section. This chapter also includes the respondents' profile, encompassing education, household types, sources of drinking water, nature of fishing, income and expenditure, and duration of fishing involvement.

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Chapter Four provides a short description of how disasters affect the community (e.g., cyclones, storm surges, tidal floods, riverbank erosion, and sea salinity). This chapter discusses vulnerabilities such as physical, socioeconomic, and health vulnerabilities created by the disaster in the fishing community in the study area.

Chapter Five describes the occupational transformation of coastal fishing communities. This chapter provides a brief explanation of the processes of fishermen's occupational transformation, including fishing to fishing labor, fishing to business, fishing to agriculture, etc. Additionally, this chapter provides the causes of occupational transformation, including the increase of natural disasters, decrease of fish in the rivers, and the loss of navigability in rivers, etc.

Chapter Six is written based on the impacts or outcomes of fishermen's occupational transformation in the study area. It describes positive impacts, including increased income, reduced life threats, increased child education, and decreased dropouts. It also provides a short description of the negative impacts of occupational transformation, including increased poverty, decreased income, and increased dependency on moneylender pressure, etc.

Chapter Seven provides a brief description of the ways of securing fishermen's

livelihoods in coastal Bangladesh. This chapter includes providing soft loans, providing nets and boats, including both fishermen and non-fishermen in social safety nets, ensuring actual prices for the fish, and the excavation of coastal rivers as ways to promote fishermen and non fishermen's livelihoods.

Chapter Eight provides a discussion and conclusion for the thesis. This section answers the central research question and shows how the answers are supported by the findings. It describes how the answers align with the existing body of knowledge and concludes with

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recommendations for further research. Table 1.3 indicates the research aims and response locations in the thesis.

Table 1.3: Research aims and location of answers

Research aim one: To identify disaster induced vulnerabilities in the fishing communities in coastal Bangladesh.

This research aim is addressed in Chapter four.

Chapter Four: Disasters and Vulnerabilities of Fishing Community Research aim

two: To know in what ways occupation is transforming in the fishing community.

This research aim is addressed in Chapter Five.

Chapter Five: Processes and Causes of Occupational Transformation Research

aim three: To investigate whether occupational transformation is creating vulnerabilities or securing livelihoods.

This research question is addressed in Chapter Six.

Chapter Six: Outcomes of occupational Transformation

Research aim four: To find out the possible ways to promote fishing community's livelihood security.

This research question is addressed in Chapter Seven.

Chapter Seven: Possible Ways and Initiatives to Secure Livelihoods of Fishing Communities

1.12 Chapter Summary

This chapter has written the introduction of the study and describes the study problem. Literature review describes previous research related to current study, and identify the study gap. Additionally, the chapter discusses the rationale of the study, conceptual framework, theoretical position, study objectives, study scope, and limitations. In addressing the research aims, the chapter concludes by examining the thesis argument, detailing the contributions of the thesis, and outlining the structure of the thesis.

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CHAPTER TWO METHODOLOGY

The purpose of the study is to investigate how the fishing community in coastal Bangladesh is changing their occupation due to disasters. To fulfill the study's main objective, a number of strategies and methods are employed. The study methodology, study area, recruitment of research participants, and sampling, data sources and collection methods, data analysis strategies, study coordination schema, and ethical issues are discussed in this chapter.

2. Methodology

2.1 Study Approach

The study has followed a mixed methods approach. Both qualitative (e.g., interviews, focus groups) and quantitative (e.g., survey) data have been used in the study. The mixed methods approach is usually used in social and human sciences when the impediments of quantitative and qualitative methods are pertinent to the inquiry. In this research, mixed methods approach has been used for a more robust investigation to know in what ways

occupation is transforming and whether their occupational transformation is creating vulnerabilities or securing livelihood. Mixed method approach is appropriate for this study, because qualitative methods such as interviews, focus groups, and observations helped to capture the experiences, perspectives, and narratives of the fishing community members, demographic and vulnerability-related information and quantitative methods such as surveys have been used to gather statistical data on the extent and nature of the occupational changes. Also qualitative narrative data were collected to investigate the stories and inner causes of the fishing community's occupational transformation.

2.2 Study Types

The research is descriptive and exploratory in nature. The research aimed to describe the phenomenon of occupational transformation in the fishing community in Coastal Bangladesh. It seeks to provide a detailed justification of the changes in their fishing occupations that have occurred as a result of disaster induced vulnerabilities. Also the study aimed to explore and understand the relationship between disasters and the occupational transformation of the fishing community. It tries to find out information, insights, and perspectives from the community members to gain a deeper understanding of the changes they have experienced.

2.3 Study Area

Four villages have been selected from the three Union (Table-2) in Khulna and Satkhira

districts. Khulna and Satkhira are coastal districts and prone to cyclones and storm-surge. These districts were highly affected by the last big cyclones Amphan (2020), Fani (2019) and Aila (2009). The three selected Unions were the most affected Union by cyclone Amphan and especially, Raruli, Jalalpur and Boalia were the worst affected villages in this Union by cyclone Aila. Paikgacha and Tala Upazillas have been selected as the study area because socioeconomic and the nature of vulnerabilities are almost similar in 19 coastal districts of Bangladesh.⁹⁸ Moreover, the fishing community in the study area has been suffering every year from different types of disasters e.g., storm surges and tidal flooding. According to the Department of Fisheries (2022), 95,755 registered fisher cards in Khulna (45977) and Satkhira district (49778). However, there is a limitation between the exact fishers and fishing cards in the study area. The figure does not represent the exact number of fishers. Because some people have fishing cards but do not have any engagement in

⁹⁸ - Khurshed Alam and Md Habibur Rahman, "Women in natural disasters: a case study from southern coastal region of Bangladesh." *International journal of disaster risk reduction* 8 (2014): 68-82.

fishing activities.⁹⁹ Therefore, the study included non-cardholder fishers to investigate better information in the fishing community.

Table 2: Study area profile

SL Villages Unions Upazillas Districts

1. Raruli Raruli Paikgacha Khulna
2. Baka Raruli Paikgacha Khulna
3. Katipara Raruli Paikgacha Khulna
4. Boalia Godaipur Paikgacha Khulna
5. Srimantakati Jalalpur Tala Satkhira
6. Jalalpur Jalalpur Tala Satkhira

2.4 Study Population

Approximately one thousand fishers have been identified based on fisher cards from three

Unions. Besides, some non-card holder fishers have also been included as the study population. The study has used only male fishermen as population because the fishing occupation in the study area is traditionally male-dominated.

Table 2.1: Number of fishing cards

Study areas Number

Jalalpur, Tala, Satkhira 320

Raruli, Paikgacha, Khulna 499

Godaipur, Paikgacha, Khulna 404

Total fisher cards 1223

Source: Upazilla Fisheries officer Paikgacha, Khulna and Tala, Satkhira (January

2022). **2.5 Sampling and Recruitment of Participants**

The study has used a combination of random and purposive sampling. The study villages have been selected purposively and research participants (for the survey, interviews, and

⁹⁹ – Rabiul Islam and Greg Walkerden. "How do links between households and NGOs promote disaster resilience and recovery?: A case study of linking social networks on the Bangladeshi coast." *Natural hazards* 78 (2015): 1707-1727.

focus group) have been selected randomly. Following a statistical formula, $n = \frac{N}{1 + \frac{N}{e^2}}$

¹⁰⁰where, n= Sample size, N= Population and e= Precision level (95%), this study has selected 349 fishing households. Among the 1223 fishing card holders, 275 fishing card have been selected. Also, 26 non-card holders have been selected purposively (some people have fishing cards but do not have any engagement in fishing activities in the study area) from fishers who have no fishing card from the six villages of three Unions of the study areas. The study also used snowball sampling to find fishers who have already transferred their occupation. Following this process, 48 non-fisher households have been identified to get better information about occupational transformation in the study area. Four (4) FGDs (Two from Raruli Union and one from each of the other two Unions) have been conducted. Various occupational groups (e.g., fishermen, businessmen, religious

leaders, day labor and students) were included as the focus group participants. Ten (10) key informant interviews have been conducted including village leaders, Union Parishad Members, school and madrasa teachers, village doctor, imam, NGO leaders to gather qualitative insights and in-depth information.

Various questions were asked to the participants: What are the disaster induced vulnerabilities in the community? What are the existing occupations besides fishing in the community? In what ways their occupation is transforming? What types of vulnerability creates due to disaster at the fishing community? What are the causes/factors of transforming occupation in the fishing community?

2.6 Data Sources and Data Collection Techniques

Data sources of this study were both primary and secondary. Primary data have been collected from fishing households and communities through field surveys, Focus Group Discussions (FGDs), and Key Informant Interviews (KIIs). Semi-structured checklist/Interview guideline has been used to conduct FGDs and KIIs. The study has collected secondary information from various sources e.g., books, journal articles, research reports, thesis works, and government and NGO documents. Note-taking method has been -¹⁰⁰ E. Slovin, "Slovin's Formula for Sampling Technique". [Paper reference 1]," (1960).

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used to collect FGDs and KIIs data from the research participants. The researcher himself and four research assistants were involved to take notes and write down the interviews in the notebooks. Finally, the researcher has accumulated the interview information based on the main themes and aims of the research.

2.6.1 Field Survey

The researcher and four research assistants (university graduates and undergraduates who are experienced with conducting several fieldworks) were directly involved in conducting face-to-face interviews through a semi-structured survey questionnaire with 37 close ended and open-ended questions (see detailed survey questionnaire in Annex-1). About 349 fishers and non-fishers have interviewed through a questionnaire. The questionnaire was pre-tested (5% of the total sample) through mobile phone and face-to-face interviews

and necessary corrections were made before the final survey. A local guide assisted during the fieldwork to introduce the researchers to the fishermen. During interviews with household-heads, the physical settings and the everyday lives of fishermen were observed, which contributed to an overall understanding of the study area. The fishermen were interviewed in their homes and local market at their comfortable time.

2.6.2 Focus Group Discussions

Focus Group Discussions (FGDs) were conducted to obtain more in-depth and diverse data and to understand the present status of occupational transformation in the coastal fishing community. Data saturation (data saturation occurs when new participants or discussions fails to provide significantly new information or insights.¹⁰¹) was reached after conducting four Focus Group Discussions (FGDs) using a thematic semi-structured checklist (see Annex-4). Each focus group consisted of 8 to 10 members. Some basic criteria were followed during group formation, for example, homogeneity, different occupational groups (e.g., fishing, farming and students), age and education to capture diverse perspectives and

¹⁰¹ - Patricia I. Fusch Ph D and Lawrence R. Ness. "Are we there yet? Data saturation in qualitative research." (2015).

experiences related to a specific topic or research objective.¹⁰² FGDs were conducted in the fishermen house and a tea stall near the fishing community, there was an arrangement of refreshments, and a moderator from the fishing community was selected and briefed about the questions and gave a summary to the participants about the aims of the study. Ten questions were set, and the duration of each discussion was 50–60 minutes for each group. The researcher and two research assistants took notes during each discussion.

2.6.3 Key Informant Interviews

Key informant interviews were conducted to get further information from the knowledgeable person. Ten Key Informant Interviews (KIIs) took place with key local leaders including local government, *dadondar* (moneylender), fishing community influential, teachers, and village leaders. Key informant interviews participants were

selected purposively from the study areas. A checklist/Interview guideline was used to conduct the interviews (see Annex-2). These people are the key individuals in the villages and played a direct and indirect role in the fishing community. Therefore, their experience was important to include in the thesis to know the way of occupational transformation and whether their occupational transformation is creating vulnerabilities or securing their livelihood.

2.7 Data Analysis

Several methods and techniques were used to analyze primary data. Qualitative data have been analyzed by coding and grouping to identify key themes of data. Thematic analysis was used to analyze the qualitative data collected from the FGDs and KIIs. Also story telling method (narrative inquiry)¹⁰³ was used to understand the in-depth insights of

–¹⁰² Rabiul Islam and Greg Walkerden. "How do links between households and NGOs promote disaster resilience and recovery?: A case study of linking social networks on the Bangladeshi coast." *Natural hazards* 78 (2015): 1707-1727.

¹⁰³ Narrative inquiry involves collecting and analyzing stories or narratives shared by individuals to gain insights into their experiences, perspectives, and the meanings they attribute to events. It is a qualitative research approach that focuses on the stories people tell to understand the complexities of human experiences.

occupational transformation.¹⁰⁴ The participants' answers were coded. After coding the answers, the themes were constructed and organized the responses based on the key aims of the study.

For analyzing quantitative data descriptive statistics (e.g., frequency distribution) has been used. Statistical Package for Social Sciences (SPSS, version 16) has been used for analyzing quantitative data. For data triangulation, multiple sources of data (e.g., KIIs, FGDs, and Observation) were used. To strengthen the reliability and validity, primary data have been correlated with secondary data.

Data sets	Data sources
-Physical vulnerabilities -Financial vulnerabilities -Social vulnerabilities -Health vulnerabilities	Both primary and secondary e.g., Focus group, key informants, local government staff, and current literature.
-Fishing to day labor - Fishing to fish related work -Fishing to van/auto puller -Fishing to others	Both primary and secondary e.g., Focus group, key informants, local government staff, and current literature.
-Physical vulnerabilities (infrastructure, properties)	Both primary and secondary e.g., Focus group, key informants, local government staff,

2.8 Study Coordination Schema

This study has used a study coordination schema that includes research aims, data sets, data sources, and data collection tools, which is shown in Table-2.2.

Table 2.2: Study coordination schema

Study aims Data collection

HHS,
KIIIs,
FGDs,
meeting
with
LGOs.

To identify
disaster-induced vulnerabilities
in the fishing
communities

To know the
process of
occupational
transformation in fishing
community

To investigate whether
occupational
transformation is

techniques/tools HHS, KIIIs,
FGDs, meeting with LGOs.

HHS, FGDs, KIIIs, meeting
with LGOs.

creating
vulnerabilities or securing
livelihood

To find out
the ways to
promote
livelihood
sustainability

HHS, KIIs,
FGDs,
meeting with
LGOs.

-Financial vulnerabilities (income loss, livelihood loss, unemployment) -Social vulnerabilities (decrease capacity, increase child marriage etc.) -Human vulnerabilities (death and injury, skill loss/capacity decrease, disease)	and current literature.
-National level intervention -Community level intervention (savings, education, skill development etc.,) -Coping strategies (daily labor, catch fish from different sources e.g., pond, canal) -Adaptation strategies (migration, manage alternative livelihoods)	Focus group, key informants, local government staff, and current literature.

2.9 Ethical Considerations

This research has adhered to multiple ethical guidelines. Initially, an informed consent form was utilized in this study, which asks participants for their permission before conducting official interviews, having conversations, or taking pictures. The participants have received a detailed

explanation of the research objectives and a suggested list of questions from the data enumerators. They are free to choose whether or not to participate in this research, according to the data collectors. They were not required to take part, and if they did, they were made aware of their option to back out at any time if the questions felt uncomfortable. Second, the thesis contains a few quotes that the researcher used. The researcher has used the remarks and opinions of the participants as the quotes. The thesis does not contain any mention of any specific names. The data is only accessible to the

researcher and the supervisor of this study. Third, the confidentiality of the respondents' responses was guaranteed.

2.10 Chapter Summary

This chapter has discussed the methodology of the study. The mixed-methods approach has been used for the study. Five disaster prone coastal Unions such as Raruli, Godaipr, Kopilmuni, Candkhali, Union of Paikgacha Upazilla, Khulna district and Jalalpur, Tala Upazilla, Satkhira district have been selected as the study area. This chapter has described the sampling and recruitment of participants. Following a statistical formula, this study has interviewed 349 fishing household. Data sources and data collection techniques (e.g., Field survey, focus group discussion and key informant interviews) have been discussed in this chapter. This study has taken 4 FGDs and 10 KIIs from the study areas. Thematic analysis and SPSS have been used for analyzing qualitative and quantitative data. Finally, this chapter has drawn a study coordination schema (mentioning study objectives, data set, data sources and data collection tools) and described an ethical consideration.

CHAPTER THREE

STUDY AREA AND RESPONDENT'S PROFILE

The geophysical surroundings of the study area and the respondent's profile are briefly described in this chapter. This chapter provides an overview of the study area's history, geography, and climate. This section also includes some maps, such as the investigated Upazilla and Union. This chapter additionally addresses the profile of the respondents includes education, household types, drinking water sources, nature of fishing, income and expenditure, duration of fishing involvement etc.

3.1 General Background of Study Area

3.1.1 Paikgachha Upazilla

The present study has been conducted in two Upazillas (Paikgachha and Tala) of coastal Bangladesh. Paikgachha Upazilla of Khulna district, located in the southwestern region of Bangladesh. Paikgachha Thana was formed on 22 April, 1872 and it was turned into an Upazilla in 1983. The Upazilla has 10 Union Parishads, 171 mouzas and 212 villages. The Upazilla has a total population of 248,112 people, including 127,579 males and 120,533 females. Among the population, 162,248 are Muslims, 84,892 are Hindus, 831 follow Buddhism, and there are 141 individuals of other faiths. Paikgachha is surrounded by several rivers, with the Kobadak, Shibsa, Marichap, and Haria. There are 162 mosques, 55 temples, 3 churches, and a sacred spot for religious worship.

The average literacy rate in the Upazilla is 53.93%, with a literacy rate among females at 37.33%. Paikgachha is home to several educational institutions, including 53 secondary schools, 9 colleges, 170 elementary schools, 4 kindergartens, 4 CSS schools, 3 community schools, and 60 madrasas. Agriculture is the primary source of income for the people, and many also engage in non-agricultural work such as labor, small businesses, fishing, services, construction, and religious activities. The main crops cultivated in the Upazilla include paddy, jute, wheat, pulses, sesame, betel leaf, turmeric, and various

vegetables. Some crops like black gram, sugarcane, mustard, ginger, and kaun are nearly extinct or no longer grown. Primary fruits produced in the region include lemon, coconut, sapodilla, jackfruit, mango, and blackberries.

In terms of infrastructure, there are 50 kilometers of pucca roads, 100 kilometers of semi-pucca roads, 465 kilometers of mud roads, and 15 nautical miles of canals for transportation and communication. The primary exports from the region are fish, coconuts, and jute. Several non-governmental organizations (NGOs), such as SDF, BRAC, ASA, CARITAS, and SUS, are actively involved in various development initiatives.¹⁰⁵

3.1.2 Tala Upazilla

Another area of this study is Tala Upazilla of Satkhira district, located also in the southwestern region of Bangladesh. Tala Thana was formed in 1913 and it was turned into an Upazilla in 1989. The Upazilla has 12 Union Parishads, 151 mouzas and 229 villages. The Upazilla has a total population of 299820 people, including 149389 males and 150431 females. Among the population, 220240 are Muslims, 77231 are Hindus, Christian are 1859 and others 490. Tala is surrounded by several rivers, with the Kobadak, Dalua, Madhabkhali Canal, Dhari Canal and Mathura' Beel are notable. There are 162 mosques, 55 temples, 3 churches, and a sacred spot for religious worship. The average literacy rate in the Upazilla is Average literacy 45.66%; male 51.85%, female 39.08%. Tala is home to several educational institutions, including college 12, secondary school 60, primary school 119, madrasa 21. Main crops are paddy, wheat, jute, mustard, potato, gram, onion, lentil, turmeric and vegetables. Tobacco, linseed, kaun, coriander are the extinct or nearly extinct crops in the Upazilla.

Agriculture is the primary source of income for the people, and many also engage in non-agricultural work such as labor, small businesses, fishing, services, construction, and religious activities. The main crops cultivated in the Upazilla include paddy, jute, wheat, pulses, sesame, betel leaf, turmeric, and various vegetables. Primary fruits produced in the region include Mango, jackfruit, coconut, betel nut, litchi, papaya, plum, guava,

¹⁰⁵ - https://en.banglapedia.org/index.php/Paikgachha_Upazila. Accessed on 15th September, 2023.

banana, and blackberry. In terms of infrastructure, there are pucca road 84.19 km, semi pucca road 31.73 km, mud road 621.15 km. The primary exports from the region are paddy, jute, wheat, potato. Several non-governmental organizations (NGOs), such as SDF, BRAC, ASA and SUS, are actively involved in various development.¹⁰⁶

3.2 Climate of the Study Area

3.2.1 Paikgachha Upazilla

Paikgachha Upazilla is located at an elevation of 4.88 meters (16.01 feet) above sea level, Paikgachha has a Tropical wet and dry or savanna climate. The area is under risk in agricultural prospect due to intensity and frequency of occurrences of salinity, storms, drought, irregular rainfall, high temperature, flash floods, etc.¹⁰⁷ The district's yearly temperature is 29.77°C (85.59°F) and it is 2.03% higher than Bangladesh's averages. Paikgachha typically receives about 63.38 millimeters (2.5 inches) of precipitation and has 115.27 rainy days (31.58% of the time) annually. Like many coastal areas in Bangladesh, Paikgachha Upazilla is prone to tropical cyclones during cyclone seasons (April-May and October-November). These cyclones can bring strong winds, heavy rainfall, and storm surges, posing significant risks and challenges. The monsoon season receives the highest amount of rainfall, with significant precipitation occurring from June to October. Rainfall in this season is caused by the depressions in the study area from the Bay of Bengal, sometimes heavy rainfall lead to waterlogging and flooding in some areas.¹⁰⁸

3.2.2 Tala Upazilla

The climate of Tala Upazilla, is characterized by a tropical monsoon climate. Here are some key features of the climate in this region. Summer (March to June) in Tala Upazilla are hot and humid. During this period, temperatures can rise significantly, often exceeding 30°C (86°F). This season is marked by high humidity levels. Monsoon (June to October)

¹⁰⁶ - https://en.banglapedia.org/index.php/Tala_Upazila, Accessed on 15th September, 2023. ¹⁰⁷ A. H. M. J. Alam and M. Islam, "Impacts of climate change on cropping pattern in coast belt of Bangladesh: study conducted at Paikgachha Upazila of Khulna district." *Bangladesh Journal* 34 (2018): 7-10. ¹⁰⁸ <https://tckctck.org/bangladesh/khulna/paikgachha#t2>, Accessed on 15th September, 2023.

season brings heavy rainfall by the depressions in the study area from the Bay of Bengal to Tala Upazilla. Sometimes it causes waterlogging and flooding in low-lying areas. Temperatures during the monsoon season are relatively cooler, ranging from 25°C to 32°C (77°F to 89.6°F). Tala Upazilla is susceptible to tropical cyclones during cyclone seasons (April-May and October-November). These cyclones can bring strong winds and heavy rainfall, causing significant damage. Winter (November to February) in Tala Upazilla are characterized by cooler and drier weather.

3.3 Area and Location

3.3.1 Paikgachha Upazilla

Paikgachha is an Upazilla located in the Khulna District within the division of Khulna, Bangladesh. The area of Paikgachha Upazilla is 383.87 sq. Km. Paikgachha Upazilla is situated between 22 degree 28 " and 22 degree 43 " north-south longitudes and 89 degree 14 " and 89 degree 28 " east-west longitudes. It shares its borders with the Tala and Dumuria Upazillas to the north, the Koyra Upazilla to the south, and the Batiaghata and Dacope Upazillas to the east. To the west, it is bordered by the Tala and Assasuni Upazillas. Distance of Paikgachha Upazilla from Khulna district town by road is 65 km.¹⁰⁹

3.3.2 Tala Upazilla

Tala is an Upazilla located in the Satkhira District within the division of Khulna, Bangladesh. The area of the Upazilla is 337.24 sq km, located in between 22°32' and 22°50' north latitudes and in between 89°05' and 89°20' east longitudes. It is bounded by Kalaroa, Keshabpur and Dumuria Upazillas on the north, Assasuni Upazilla on the south, Dumuria and Paikgachha Upazillas on the east, Satkhira Sadar Upazilla on the west.¹¹⁰

¹⁰⁹ - <https://paikgachhaa.khulna.gov.bd/en/site/page/6kUn>. Accessed on 15th September 2023. ¹¹⁰ https://en.banglapedia.org/index.php/Tala_Upazila, Accessed on 15th September, 2023.



Fig. 3:

Paikgachha Upazila map, Source: Google map Fig. 4: Tala Upazila map, Source: Google map

3.4 Respondent Profile

3.4.1 Age of Respondents

Data were collected from fishermen of different age groups in the study area. The study found that most of them are 36 and 50 years old, about 46 percent fishermen are belonged to this age group in the study area. Around 27 percent belong to the age group of 51 to 70, while about 21 percent are in the 26 to 35 age range. Fishermen aged 70 to 90 years represent approximately 3 percent of the total respondents (Table-3.1) in the study area. This particular age group provided valuable information on occupational change due to their extensive experience. Having witnessed various events over an extended period, they also provide significant insights into occupational transformation.

Table 3.1: Age of respondent

Age Frequency Percent

15-25	16	4.6
26-35	72	20.6
36-50	159	45.6
51-70	92	26.4
70-90	10	2.9

Total 349 100

Source: Field Survey, 2022.

3.4.2 Amount of Land (Decimal)

Fishermen typically live along the river and have minimal land where they construct their houses. Most fishermen have no other options for building their homes. Analyzing the data the research shows that most of the fishermen (44%) own only 1-5 decimal of the land. About 28 percent of fishermen own less than one decimal of land (Table-3.2). They mostly live on government khas land along the river. There are some fishermen who buy land elsewhere and do vegetable cultivation or some other income generating activities. In the study area, it was found that more than 5 percent of the fishermen own more than 50 decimal of the land and about 3 percent of the fishermen own more than 100 to 150 decimal of the land (Table-3.2). Based on World Bank data from 2009, over half of the rural population in Bangladesh, constituting nearly three-quarters of the country's total population, either lacks land ownership or possesses less than 0.5 acres of land, indicating a significant land crisis in rural areas.

Table 3.2: Amount of land

Amount of land (decimal) Frequency Percent

1< 99	28.4
1-5	154 44.1
6-10	56 16
11-15	7 2
16-20	3 .9
21-30	1 .3
31-50	19 5.4
51-70	2 .6
100-150	8 2.3
Total	349 100

Source: Field Survey, 2022. Average land= 8.08 decimal.

3.4.3 Education

The fishermen educational status is poor in the study areas. The study found that 33.8 percent of the fishermen have primary education, and 31.2 percent of the respondents have completed their secondary education. A large number of respondents were illiterate (29.8%) in the study areas (Table 3.3). Only 0.6 percent of the fishermen were educated up to graduate. According to the 2022 report from the Bangladesh Bureau of Educational

Information and Statistics (BANBEIS), 73.60% of the student population resides in urban areas, while 26.40% resides in rural areas.¹¹¹ The current study supported the national data that education rate of coastal areas is lower than urban areas. Another study also found the low education rate of south west coastal fishermen.^{112, 113}

There are many reasons behind the lower education rate among the fishermen, e.g., economic vulnerability, frequency of disasters, damages of educational institutions (FGD & KII). Due to their lower education rate, many times they cannot cope with the present disaster-induced vulnerabilities. They cannot earn from other income sources except fishing in the river or sea. If they had proper education, they could have managed their livelihood engaging in other occupations, e.g., jobs in formal sectors, teaching and tuition (FGDs & KIIs).

Table 3.3: Educational status

Level of education	Frequency	Percent
Illiterate	104	29.8
Primary	118	33.8
Secondary	109	31.2
Higher Secondary	16	4.6
Graduate	2	0.6
Total	349	100

Source: Field Survey, 2022.

It is found that fishermen who have minimum education are less vulnerable than illiterate fishermen. In some areas, during the time of the ban imposed by the government, some fishermen were engaged in fish markets to earn extra money. They worked as muhuri (accountants) in the fish selling place (macher kata –local fishermen comes here to sell fish) (KII-1). The vulnerable economic conditions and lack willingness of local fishers are also a reason behind their below education rate. One FGD participant (A fisherman said),

¹¹¹ www.banbeis.gov.bd. Accessed on May 20, 2023.

¹¹² Bishawjit Mallick, Bayes Ahmed and Joachim Vogt, "Living with the risks of cyclone disasters in the south-western coastal region of Bangladesh." *Environments* 4, no. 1 (2017): 13. <https://doi.org/10.3390/environments4010013>

¹¹³ Mridula Rani Das et al., "Livelihood assessment of the fishermen community in the south west region of Bangladesh." *Journal of Experimental Biology and Agricultural Sciences* 3, no. 4 (2015): 353-361.

their teens they become engaged in catching fish and Crab to earn money. They have a little willingness to educate their children in terms of earning money, but fishermen who have money try to educate their children (FGD 1).

A study found that coastal people who have lower education sent their children to earning, but higher educated people sent their children to other places to achieve higher education.¹¹⁴

3.4.4 Religion of Fishermen

Most of the respondents of the study areas were Hindu. The study found that 98 percent fishers were Hindu and 2 percent of respondent were Muslim. In the past, fishermen were predominantly Hindu communities of lower caste in Bangladesh, but but currently, a significant number of Muslims have entered the fishing occupation.¹¹⁵ On the contrast, majority in Muslims was observed in another study in the coastal area (Vola) and northern Bangladesh (Mymensingh).¹¹⁶

Table 3.4: Fishermen Religion

Religion Frequency Percent

MIslam 7 2

Hindu 342 98

Total 349 100

Source: Field Survey, 2022.

¹¹⁴ Shitangsu Kumar Paul and Jayant K. Routray, "Household response to cyclone and induced surge in coastal Bangladesh: coping strategies and explanatory variables." *Natural Hazards* 57, no. 2 (2011): 477- 499.¹¹⁵ Zakia Sultana and Bishawjit Mallick, "Adaptation strategies after cyclone in southwest coastal Bangladesh—pro poor policy choices." *American Journal of Rural Development* 3, no. 2 (2015): 24-33. p.29

¹¹⁶ H. Ali et al., "Livelihood status of the fish farmers in some selected areas of Tarakanda upazila of Mymensingh district." *J. Agrofor. Environ* 3, no. 2 (2009): 85-89.

3.4.5 Housing Condition

The housing conditions of the fishing community was not good in the study areas. Most of the fishers' houses were fragile i.e., katca (made of straw and mud) and semi-pucca (Tin shed house with brick wall). Due to their economic vulnerability and as a threat of natural hazards, most of the fishermen did not want to make concrete houses at the high risk of riverbank erosion, cyclone and storm surges and salinity. About 40 percent of houses were katca in the study area and 39 percent of houses were semi-pucca. Besides, more than 20 percent of fisher had concrete houses in the study areas (Table-3.5).

Table 3.5: Housing condition

Household types Frequency Percent

Concrete house 70 20.1

V

Katcha house 141 40.3

a

Mud And Unburnt Brick 2 0.6

l

Tin or Brick (Semi-pucca) 136 39

i

d

Total 349 100



Source: Field Survey, 2022.

Image 2.1: Affected house (Raruli east

Malopara, Paikgacha, Khulna). **Source: Researcher**

Fishermen who have concrete houses, most of them live far away from the bank of the river. However, katcha and semi-pucca houses affected every year by cyclone and tidal surges. One FGD participant (An affected fishers) told,

We cannot build strong houses near the river due to riverbank erosion, salinity and storm surges. Two years ago, I built a pucca house near the bank of Koptakkha River, but some days later it was affected by riverbank erosion (FGD-2).

Another study found most of the fishermen houses is katcha.¹¹⁷ Near the coastal areas fishermen houses were severely damaged or destroyed by cyclone and storm surges¹¹⁸ also

- ¹¹⁷ Mridula Rani Das et al. "Livelihood assessment of the fishermen community in the south west region of Bangladesh." *Journal of Experimental Biology and Agricultural Sciences* 3, no. 4 (2015): 353-361. ¹¹⁸ Bishawjit Mallik, Bayes Ahmed, and Joachim Vogt, "Living with the risks of cyclone disasters in the south-western coastal region of Bangladesh." *Environments* 4, no. 1 (2017): 13. <https://doi.org/10.3390/environments4010013> **49**
coastal community have different types of vulnerabilities e.g., physical, economic, social, health livelihood in the coastal areas of Bangladesh.¹¹⁹

3.4.6 Drinking Water Sources

There was a scarcity of freshwater in the study area. The area was highly affected by salinity. Therefore, the fishing community was highly dependent on supply water. The study found that 82.8 percent respondent used community supply water and 16.6 percent used tube-well water. Only 0.6 percent used PSF (Pond Sand Filter) water for drink (Table

3.6). Because of the high salinity, most of the fishing community in the study area could not drink tube-well water as a primary source (FGD-3). They depend on community supply water to drink and sometimes they used tube-well water for household activities (KII). One FGD participant (fishing household) said,

We can't drink tube-well water for salinity. We often buy supply water and drink it. It takes sixteen taka to buy each twenty liter bottle of water. Our community tried to store rainwater during rainy reason and drink it during water crisis in summer season (FGD-3).

Table 3.6: Water sources

Sources	Frequency	Percent
Tube well	58	16.6
Community/Supply Water	289	82.8
PSF (Pond sand filter)	2	0.6
Total	349	100

Source: Field Survey, 2022.

Rivers of the southwest coastal areas have been suffering from salinity and as a result of climate change the river salinity of the southwest Bangladesh will cause significant changes by 2050.¹²⁰ The GOs and NGOs are trying to disseminate knowledge about

¹¹⁹ - Edris Alam and Andrew E. Collins, "Cyclone disaster vulnerability and response experiences in coastal Bangladesh." *Disasters* 34, no. 4 (2010): 931-954.

¹²⁰ Susmita Dasgupta et al., "River salinity and climate change: evidence from coastal Bangladesh," *World Scientific Reference on Asia and the World Economy* (2015), p.8.

alternative drinking water sources (e.g., rainwater harvesting, using purifying tablets) among the households in the coastal areas.¹²¹

3.4.7 Monthly Income from Fishing

Income of the fishermen in the study area is even lower, the study found that 16 percent of the respondents (The study have a total 349 respondents, among them 125 are existing fisherman) earn between 2690 to 5000 taka (Approximately \$24-\$45, 1\$= 109 BDT, as of December, 2023) per month. About 25 percent fishermen earn from 5100 to 7000 taka. On the other hand around 13 percent fishermen earn 12 to 15 thousand taka per month by fishing. Very few fishermen have an income of more than 15 thousand taka. Only 7 percent fishermen earn between 16,000 to 50,000 taka.

Table 3.7: Present income from fishing per month

Taka Frequency Percent

2600-5000	20	16
5100-7000	31	24.8
7100-9000	15	12
9100-11000	33	26.4
12000-15000	16	12.8
16000-20000	7	5.6
21000-50000	2	1.6
50000 above	1	.8

Total 125 100

Source: Field Survey, 2022. Mean 9968.

Much income is possible for those fishermen who have earning sources from other occupations and have their own boat and nets. Most of the fishermen said that ten to fifteen years ago they used to earn 15000 to 20000 taka per month from fishing, now it has decreased to 5000 to 10000 taka (Table-3.7). By which the fishermen are not able to manage their family very well. A fisherman said,

¹²¹ M.A. Rahman et al., "Drinking Water Supply Options in Arsenic and Salinity Affected Areas of Bangladesh: A Case Study," *Journal of Environmental Science and Natural Resources* 12, no. 1-2 (2019), p.221.

Ten years ago, I used to earn about 15 to 20 thousand taka from fishing, but now it has reduced to about 10 to 12 thousand taka. However, there are not always as sufficient fish in the river as I caught before, due to overfishing and reduction the in fish in the river (FGD-4).

Various studies conducted in coastal areas and found that most of the fishermen income are often affected by various factors (reduction of fish in the river, various types of disasters i.e., cyclones, storm surge) that influences on their income decrease in the study area.¹²²

3.4.8 Monthly Expenditure from Fishing

Expenditure on fisher households in the study area is very high. Studies show that their monthly income and expenses are almost equal. Where the average monthly income is more than 9900 taka and the total expenditure is around 9800 taka per month (Table-3.8).

Table 3.8: Present expenditure from fishing per month

Taka Frequency Percent

2600-5000	23	18.4
5100-7000	22	17.6
7100-9000	24	19.2
9100-11000	23	18.4
12000-15000	21	16.8
16000-20000	9	7.2
21000-50000	3	2.4

Total 125 100

Source: Field Survey, 2022. Mean 9800.

The income earned from fishing and other occupations is spent on the whole family expenses. Most of the fishermen have no savings in the study area. A fisherman lamented, *how can I save my family with the income I earn every month, most of the time I have to borrow money.*

¹²² - Tamanna Kabir, "Assessment of biophysical factors for storm surge hazard and their implications for food security." *PhD thesis, Institute of Water and Flood Management* (2016). P.4.

3.4.9 Duration of Fishing Involvement

Fishing is the primary occupation of the fishermen of the region and they have been catching their fish for a long time. The study found that about 77 percent of fishermen

have been fishing for more than 15 years in the area. About 9 percent fishermen have been fishing for 10 to 15 years, 6.8 percent have been fishing for 5 to 10 years and 7.2 percent have been fishing for 1 to 5 years (Table-3.9). Although many fishermen leave this occupation, there are many who consider fishing as their main in the study area. A fisherman said that *my father used to fish in Shibsa River since 40 years ago and I have also been fishing in this river for 15 years.*

Table 3.9: Duration of fishing involvement

Duration Frequency Percent

1-5 years	9	7.2
5-10 years	8	6.4
10-15 years	12	9.6
Above 15 years	96	76.8

Total 125 100

Source: Field Survey, 2022.

3.4.10 Nature of Fishing Activities

Different types of fishermen are found in the study area who catch fish in the river or sea at different times. Analyzing the data, the research found that most of the fishermen fish in the river with their boats for 6 months. The study showed that about 49 percent of the fishermen (The study have a total 349 respondents, among them 125 are existing fisherman) spend six months fishing in the river, while they engage in other activities such as netting, farming, or driving auto vans (Table 3.10).

There are many fishermen (28%) who go fishing for a month and stay in the river for about seven days twice, total 14 days. About 13 percent of fishermen catch fish daily from nearby rivers, mainly they are earning their livelihood from fishing (Table-3.10).

Table 3.10: Nature of fishing activities

Nature Frequency Percent

Regular fisher 17 13.6
 14 days in a month 35 28
 6 month in a year own boat 61 48.8
 6 month in a year in others boat 11 8.8
 Unable to catch fish now 1 .8

Total 125 100

Source: Field Survey, 2022.

Some fishermen have mentioned that they do not have own boats but catch fish on other boats for about six months, and other times, they work as masons, grocers, or in sweet shops. The research found that one fisherman has been unable to go fishing in the river for last five years due to an injury while repairing the boat. A fisherman who catches fish in the river for 14 days a month said, *They go for fishing on the new moon and full moon, and after fishing, they go to sell the fish in the nearby market daily, remaining idle on other days of the month (FGD-3).*

3.4.11 Occupations Excluding Fishing

Fishermen in this region have other occupations besides fishing. They earn money from different sources. The number of fishermen who are involved in other occupations besides fishing is very low in the study area.

Table 3.11: Other occupations

Other occupation Frequency Percent

Yes 18 14.4

No 107 85.6

Total 125 100

Source: Field Survey, 2022.

Most of the fishermen have chosen fishing as their main sources of income and they have no other occupation. The study found that more than 85 percent fishermen have no other occupation except fishing in the study area. There are some fishermen (14.4%) who have other works (Table-3.11).

3.4.12 Types of Other Occupation Except Fishing

Many fishermen in the study area are engaged in various occupations besides fishing. About 5 percent of fishermen are involved in the gher business in this region, as it is profitable. About 4 percent of fishermen work as construction workers (masons), while two fishermen (1.6%) work as agricultural laborers. More than 1 percent of fishermen buy fish from the fish market and sell it in other markets. Additionally, one fisherman (0.8%) works in a cloth shop alongside fishing in the study area (Table-3.12).

Table 3.12: Types of occupation

Other occupation	Frequency	Percent
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Gher business	6	4.8
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Netting	1	.8
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Construction worker (raj mistri)	5	4
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Agriculture labor	2	1.6
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Auto/van puller	1	.8
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Fish business (buying and selling)	2	1.6
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Cloth Shop	1	.8
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<u>Total other occupations</u>	<u>18</u>	<u>14.4</u>
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<u>No other occupation</u>	<u>107</u>	<u>85.6</u>
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<u>Total</u>	<u>125</u>	<u>100</u>
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Source: Field Survey, 2022.

3.4.13 Monthly Income from Other Occupation

Besides fishing, fishermen also earn from various other sources. Their income from these other occupations usually ranges from 2,500 to 11,000 taka, with an average income of around 5,500 taka. The study found that 7.2 percent of them earn between 3,000 to 5,000 taka, while 3 percent earn between 5,000 to 9,000 taka. Approximately 2.5 percent of fishermen earn between 9,000 and 11,000 taka from other occupations. It should be noted that the majority of those who earn between 9,000 and 11,000 taka are involved in the gher business in the study area (Table-3.13).

Table 3.13: Monthly income from other occupation

Taka Frequency Percent

2500	2	1.6
2600-5000	9	7.2
5100-7000	2	1.6
7100-9000	2	1.6
9100-11000	3	2.4
<u>Total</u>	<u>18</u>	<u>14.4</u>
No other occupation	107	85.6
Total	125	100

Source: Field Survey, 2022. Mean 5555.56

3.4.14 Fishermen with Fishing Card

The Bangladesh government imposes a total of 147 days of bans each year at different stages for improving the fish production. First, a 60-day ban on hilsa reservations in March April, Second phase, 65 days ban¹²³ from May 20 to July 23 and the last one is a 22-day ban on mother hilsa conservation in October.^{124, 125} The government provides support to

the fishers with a fishing identification card (Jele card) during the fishing ban period. **Table 3.13B: Fishing ban and support given by the government**

Time of Fishing ban	80 kg rice each family
Time Area Support provided by government	65 Days May 20 to July 23
60 Days March- April River of Barisal, Chandpur, Bhola, Shariyatpur, Patuakhali, Lakshmipur	22 Days October 12 to November 2
	Sea 86 kg rice in two phases
	River of twenty coastal district 25 kg rice each family

¹²³ - Rumana Sultana et al., "Multilevel resilience of fishing communities of coastal Bangladesh against Covid-19 pandemic and 65-day fishing ban." *Frontiers in Marine Science* 8 (2021): 721838.

¹²⁴ <https://www.thedailystar.net/news/bangladesh/news/govt-imposes-65-day-fishing-ban-3027461>, 20th May 2022. Accessed on 9th October, 2023.

¹²⁵ <https://bangla.thedailystar.net/news/bangladesh/news-455971>. 1st March 2023. Accessed on 12th October, 2023

The study found that 84 percent of respondents have a fishing card in the study area (Table 3.14). The fishermen received different types of support from the government through the card. The Union Parishad enlists the actual fishers for the fishing card. Some fishermen (16%) said that they do not have fishing card even after fishing in sea and river (Table 3.14). They described that when the government requested the enlistment of genuine fishermen, local government members and leaders influenced the process by providing cards to their known people who have no engagement in fishing (FGDs and KIIs, 2022). Another study supported the current data that the enlistment process was not fair in some areas due to nepotism and corruption.¹²⁶ Also a study found that corruption and nepotism of the Union Parishad during distributing the food grain among the fishermen.¹²⁷

Table 3.14: Fishermen have fishing card

Fishing card Frequency Percent

Yes 105 84

No 20 16

Total 125 100

Source: Field Survey, 2022.

3.4.15 Fishermen with Quality Fishing Materials

Fishermen need a lot of equipment to catch fish in the river or sea. Strong boat, sufficient net and ropes, and other things are very important when they fish in river or sea. About 67 percent of the regular fishers in the study area have quality fishing material and around 33 percent of fishermen do not have quality fishing equipment (Table-3.15). The study explores that fishermen who do not have quality fishing material inside have very low income from fishing. Talking to the fishermen, the study also revealed that they are unable to buy good quality fishing material due to their lack of capital and debt burden. They also told that the price of the material has increased a lot since last 10 years.

¹²⁶ Mohammad Mahmudul Islam et al., "Social considerations of large river sanctuaries: A case study from the Hilsa shad fishery in Bangladesh." *Sustainability* 10, no. 4 (2018): 1254, p.8. ¹²⁷ Md Mizanur Rahman et al., "Challenges of artisanal fishermen: a case study from Sonadia Island, Bangladesh." *Knowledge Management, Governance and Sustainable Development: Lessons and Insights from Developing Countries*. India: Routledge. <https://dx.doi.org/10.2139/ssrn.3773504> (2020), p.12.

Table 3.15: Quality fishing materials

Fishing materials Frequency Percent

Yes 84 67.2

No 41 32.8

Total 125 100

Source: Field Survey, 2022.

3.4.16 Types of Fishing Material

Most of the fishermen in the study area have strong boats and enough nets. The study found that 97 percent of fishermen have strong boats, and 97 percent have enough nets to catch fish. At least 83 percent of fishers have sufficient rope (kachi). Additionally, about 54 percent of fishermen now have buoys to survive cyclones and approximately 55 percent have life jackets to keep them afloat in the sea or river in case of danger (cyclones and storm surge). Furthermore, almost 13 percent of fishermen have available manpower for fishing in the sea (Table-3.16).

Table 3.16: Types of material

Quality material Number Percent

Strong boat 78 77.2

Sufficient nets 69 68.3

Rope 82 81.2

Buoy 57 56.4

Life jacket 58 57.4

Radio 2 2

Manpower 14 13.9

Source: Field Survey, 2022. Multiple response, N=125.

Fishermen in this study area have emphasized the importance of strong boats and powerful engines, particularly during storms at sea (FGDs and KIIs). One fisherman shared his experience, saying,

Before Cyclone Ampan in 2020, many of us, including myself, were fishing close to the coast. However, as the wind speed increased, we attempted to

return to the shore. Our strong boat and engine allowed us to do so, but one of the boats behind us experienced engine failure and drifted out to sea. We were able to rescue them and bring them ashore in our boat (FGD-4).

He further emphasized the vital role of strong boats and engines when embarking on sea fishing. A study has also revealed that fishermen with weaker boats are prone to damage from strong winds and storm surges. In some cases, some fishermen do not have proper safety equipment such as life jackets, leading them to rely on alternative measures, such as tying net floats together or using bamboo or drums as makeshift flotation devices.¹²⁸

3.4.17 Facilities in the Fishing Community

Most of the fishing families in the study area enjoy various facilities. Fishermen have access to hospitals, educational institutions, some good roads and other facilities. Around 64 percent of fishing families have access to good healthcare facilities in the study area. More than 74 percent of fishermen believe that there are nearby educational institutions for their children's education. However, the increase in salinity in the South-West region has caused problems with the supply of safe drinking water. About 27 percent of fishermen have access to safe water, while others purchase water and collect rainwater during monsoon. Approximately 71 percent of fishermen think that their community has good roads. About 69 percent of fishermen also told that there are sufficient recreational facilities, such as places of worship, Joggo (religious festival), and games (e.g., Football, Carom, Chase, Cards) in the community (Table-3.17).

One significant observation is the strong social bonding within the fishing community. They support each other in times of danger (FGDs). About 51 percent of fishermen feel that they have a strong social network. Sometimes, fishermen have to borrow money from moneylenders to repair nets, boats, and purchase other fishing

¹²⁸ Md Monirul Islam et al., "Limits and barriers to adaptation to climate variability and change in Bangladeshi coastal fishing communities." *Marine Policy* 43 (2014): 208-216, p.212.
<https://doi.org/10.1016/j.marpol.2013.06.007>

materials. However, there are no institutions in the study area that provide loans on favorable terms. Consequently, fishermen are compelled to borrow from moneylenders at high interest rates.

Table 3.17: Facilities available in the community

Facilities of fishing community

Facilities	Number	Percent
Health facilities available	72	64.3

Educational institution facilities	83	74.1
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Safe drinking water	31	27.7
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Transport facilities	80	71.4
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Recreation facilities	77	68.8
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Strong social network	58	51.8
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Sufficient moneylenders	42	37.5
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Availability of selling fish	15	13.4
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Fish market near to the community 37 33

Source: Field Survey, 2022. Multiple response. N=125

Only 37 percent of fishermen told that they have sufficient moneylenders in their community to borrow money during crisis (Table-3.17). Among the respondents some of them also believe that they do not have adequate places to sell fish near the community. Consequently, they have to sell their fish at lower prices to the moneylenders or middlemen from whom they borrow directly. About 13 percent of respondents believe that they can sell fish at a better price. Furthermore, the fish market in this area is located at a distance from the community. Thirty-three percent of fishermen mentioned having a fish market near their houses, while other fishermen collectively hire a vehicle (locally known as 'nochimon') to transport their fish to the fish market (KII-2). One key informant said,

We have one community clinic in each of the three wards in our Union, where fishermen seek treatment during illness. Each Union has several schools and colleges. People face a safe drinking water crisis here because this area is affected by salinity, and most of the people rely on supply water.

Fishermen perform various rituals every year, such as Durga Puja, Basanti Puja and Naam Joggo. If the place to sell the fish were a little closer, fishermen could easily sell their fish there (KII-6).

3.4.18 Following Warning Signals during Cyclone or Depression

Since fishing is the primary source of income for fishermen in the study areas, they are predominantly engaged in fishing in rivers or seas. While fishing, they often face sea storms and surges. The Government of Bangladesh provides advanced warning signals to help them avoiding damage and losses of these storms and surges and allowing them to return to the coast and protect their lives and property. In the past, the number of deaths due to cyclones and floods was high, but it has now reduced significantly due to following warning signals (KII-5). In the study area, almost all of the fishermen (93.6%) follow warning signals and take steps to protect themselves from cyclones and storm surges. However, sometimes, a small percentage of fishermen (5.6%) do not follow the warning signals and consequently suffer losses (Table-3.18). During discussions with them, it was revealed that they mainly catch fish in the river.

Table 3.18: Follow warning signals

Follow signals Frequency Percent

Yes 117 93.6

No 7 5.6

Total 124 99.2

Unable to fishing now 1 .8

Total 125 100

Source: Field Survey, 2022.

3.4.19 Sources of Warning Signals

Warning signals are issued by the Bangladesh Meteorological Department before a cyclone. Bangladesh government disseminated it to the fishermen in various ways. Most of the fishermen get the cyclone related news through SMS on their mobile phones. They also receive cyclone warnings through other channel. Research shows that around 79 percent fishermen receive warning signal through mobile phones. The Government of

Bangladesh has provided one TeleTalk SIM to each coastal fishermen to send SMS alerts to their mobiles before a cyclone. Also, 49 percent of fishermen receive warning signals through FM radio. About 44 percent of the respondents received information through social media. When fishermen go to sea or river to fish, their family members are the most worried during cyclones. At various times, their family members gave warning signals on the phone. About 64 percent of fishermen families give warning signals to their members through phone calls. Also CPP volunteers, local government, neighbors also warn them before the cyclone hits the coast. Those who fish together, warn the neighboring member of the cyclone. About 29 percent of fishermen get warning signals from online newspapers as well (Table-3.19). One FGD participant said,

I didn't know about cyclones until a day before the last cyclone Amphan. I was warned by a fisherman who lives in the neighboring village and told me to prepare to go back to the coast as soon as possible the day before the cyclone hit. If I didn't come back, I would have suffered a lot (FGD-4).

Table 3.19: Fishermen get warning signals

Get warning signals	Number of response	Percent
Radio	57	48.7
Online newspaper	34	29.1
CPP volunteers	17	14.5
Social media	52	44.4
Local government	46	39.3
Mosque	2	1.7
Family members over phone	75	64.1
Neighbors	27	23.1
SMS via mobile phone	92	78.6

Source: Field Survey, 2022. Multiple response. N=125

Study showed that the weather forecasts and disaster warnings in Bangladesh are prepared by the Bangladesh Meteorological Department (BMD), while the dissemination of cyclone warnings to the coastal area is the responsibility of the CPP. The Storm Warning Center (SWC), which operates as a specialized unit of the BMD, offers meteorological forecasts

and disseminates warnings to seaports, river ports, and the mass people. Additionally, the SWC alerts various user agencies including health administrators, relief and rehabilitation authorities, NGOs, the media, and local administrative personnel. It issues Special Weather Bulletins promptly following the formation of tropical depressions in the Bay of Bengal.^{129 130}

3.5 Chapter Summary

This section has provided a concise overview of the geographical context of the study area and the characteristics of the respondents, including aspects such as education, religion, housing condition, income, and expenditure. The chapter has encompassed a comprehensive understanding of the general background, location, and climate of the study area. Additionally, this chapter has incorporated several maps, including the cyclone

affected area map and the profile of the study Upazilla. Also the chapter has discussed about fishermen basic information such as, fishing types, occupation except fishing, fishing material, fishing card, cyclone warning signal.

¹²⁹ K. Chowdhury, "Cyclone preparedness and management in Bangladesh: Improvement of early warning system and responses in Bangladesh towards total disaster risk management approach" *BPATC, Savar, Dhaka* (2002), pp 115–119.

¹³⁰ Bimal Kanti Paul, "Why relatively fewer people died? The case of Bangladesh's Cyclone Sidr." *Natural Hazards* 50 (2009): 289-304. p.292