

**Wetland-community resilience to flash flood hazards
(*Bonna*) in Sunamganj district, Bangladesh**

By

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Abstract

The purpose of this thesis research was to understand the recovery and resilience of wetland-community to flash flood disasters and its associated risks in the north-eastern part of Bangladesh. I conducted my study using a case study approach following an interdisciplinary research paradigm. It was found that wetland-community is extremely vulnerable to flash flood hazards - both in biophysical and social terms. However, they possess certain coping thresholds, and are resilient to disaster losses. The adaptive capacity of the local communities has been severely curbed by a number of socio-ecological, economic, and political factors, leading to natural resource degradation, marginalization and exclusion of the poor from common pool resources by powerful groups. Response capacities of local institutions were severely constrained by their limited relative autonomy. For building resilience, i) effective management and access of the poor to natural resources, and ii) enhancing autonomy of local institutions are required.

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DEDICATION

This thesis is dedicated to my late father

Mahfuz-Ul-Islam Choudhury

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Acronyms

ASD: Assistance for Slum Dwellers

BBS: Bangladesh Bureau of Statistics

BNP Bangladesh Nationalist Party

BDT: Bangladeshi Taka

BRAC: Bangladesh Rural Advancement Committee

BRRI: Bangladesh Rice Research Institute

BWDB: Bangladesh Water Development Board

CARE: Cooperative for Assistance and Relief Everywhere

CBRMP: Community-Based Resource Management Project

CDMP: Comprehensive Disaster Management Plan

CNRS: Centre for Natural Resources Studies

DC: Deputy Commissioner

DDMC District Disaster Management Committee

FGD: Focus Group Discussion

GO: Government Organization

IFAD: Fund for Agricultural Development

INGO: International Non-Government Organization

IPCC: Intergovernmental Panel on Climate Change

JESIS: *Jointa Sinnomul Songsta*

LGD: Local Government Department

LGED: Local Government Engineering Department

MDG: Millennium Development Goal

NGO: Non-Government Organization

PIO: Project Implementation Officer

PRA: Participatory Rural Appraisal

PRSP-Bangladesh

SFA: SAARC Framework for Action

SES: Social-Ecological System

SOD: Standing Order on Disaster

UDMC: Union Disaster Management Committee

UNDP: United Nations Development Program me

UNFCCC: United Nations Framework Convention on Climate Change

UNISDR: United Nations Office for Disaster Risk Reduction

UP: Union Parishad

UzDMC: Upazila Disaster Management Committee

VARD: Voluntary Association of Rural Development

VDC: Village Development Committee

Glossary

Adaptability: Adaptability is the capacity of actors in a system to influence resilience. In a social-ecological system, this amounts to the capacity of humans to manage resilience (Walker et al. 2004).

Bazar: Bazar is local village market, typically weekly market

Bonna: Abnormal flooding which is beyond the coping capacity of people

Borsha: Normal flooding or seasonal inundation of floodplains

Flash floods: Flash flood is defined as the rapid occurrence with no early warning and time to prepare. Typically, they are caused by the heavy downstream of run-off of water within a limited place and short period of time (Collier, 2007; BWDB, 2014)

Haor: *Haor* is a low lying, bowl shaped flood plain, [originated from the tectonic depression, (Rabby et al.2011)], between the natural levees of a river subject to monsoon flooding every year, are mostly found in the eastern region of the country, known collectively as *Haor* basin.

Human agency: Human agency means the capacity of individuals to act independently and to make their own free choices (Brown & Westaway, 2011)

Institutions: The set of rules actually used (the working rules or rule-in-use) by a set of individuals and potentially affecting others (Ostrom 1992).

Jalmohal: Fishery-estate that lease out by government for revenue collection

Loss and damage: Loss is partially damaged asset, and damage is completely damaged asset incurred by disasters (e.g., flash flood).

Natural disasters: Perturbations or disturbances to social-ecological systems

Resilience: Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks (Walker et al. 2004).

Self-organization: For ecology, self-organization is defined in evolutionary terms, and self-organization of human institutional patterns establishes the arena for future sustainable opportunity (Resilience Alliance, 2015)

Social-Ecological System (SES): Social-Ecological Systems (SESs) are complex and integrated with powerful reciprocal feedbacks with multiple thresholds and stable states, at different scales (e.g., regional or global) (Folke, 2006).

Transformability: Capacity of people to create a fundamentally new social–ecological system when ecological, political, social, or economic conditions make the existing system untenable (Folke, 2006).

Union Parishad (UP): The lowest administrative unit in Bangladesh.

UNO: Chief executive of *Upazila* administration appointed by the government

Upazila: Immediate senior level administration to UP.

Vulnerability: Vulnerability of a system is defined in terms of potential of loss and/or damage of property or life when exposed to a natural hazard (Cutter et al., 2000, Mitchell, 1989).

Chapter One

Introduction

1. 1 Background and context

Flooding is a recurrent phenomenon in Bangladesh and it is one of the major natural hazards that the people of Bangladesh must confront regularly. Flooding usually affects almost 20.5% of the area of Bangladesh (Paul & Routray, 2010). Abnormal flooding also occurs in Bangladesh periodically. Abnormal flooding causes destruction of houses, sources of livelihoods, properties, and lives, which is called *bonna* in the local term. However, flooding is not always considered to be a hazard. Normal flooding is considered to be a blessing as it replenishes the floodplain soil by providing the necessary nutrients. Local people use the term *borsha* to refer to normal flooding (Haque, 1993, p.368).

Bangladesh is a riverine country and one of the largest deltas in the world. 80% area of Bangladesh is riverine floodplain (Brammer, 1990). Its climate contains sub-tropical monsoon with average annual precipitation of 2,300 mm. The annual precipitation pattern is geographically asymmetrical; for example, annual precipitation is over 5,000 mm in the eastern region and around 1,200 mm in the western part of the country. Three mighty rivers, namely the Ganges, the Brahmaputra and the Meghna along with more than two hundred small and medium size rivers carry a huge volume of rain water during monsoon season every year (BWDB, 2009). The land on the eastern part of Brahmaputra is low-lying compared to the land of the western part. The eastern part consists of the major floodplains of the Ganges, the Brahmaputra and the Meghna, which are typically large depression formed

during, the process of delta building particularly in greater Mymensingh and Sylhet districts¹. As a consequence, these low lying areas are seasonally flooded every year (BWDB, 2009).

There are three types of abnormal floods or *bonna* in the floodplain area, such as *monsoon* or *river floods*, *rainwater floods*, and *flash floods*. These types of floods affect different regions, though overlap. Another type of flooding is called *coastal* or *storm-surge flooding*, which is associated with tropical cyclones in the Bay of Bengal. *Monsoon* or *river flooding* is caused by monsoon rainfall (particularly in the Himalayas) and by major rivers. This type of flooding particularly affects active river floodplains in the north-western part of Bangladesh. *Rainwater flooding* is caused by heavy rainfall (particularly within Bangladesh) and drainage congestions. This type of flooding is most prevalent in the north-western and the south-western part of the country. *Flash flooding* is caused by overflowing of hilly rivers. It rises and falls rapidly, typically within a few hours or days, and most prevalent in the north-eastern and the south-eastern part of the country (National Plan for Disaster Management, 2010; Brammer, 1990). It is important here to highlight that present research primarily concentrates in the north-eastern regions of Bangladesh where the flash floods are common.

The north-eastern part of Bangladesh is most prone to flash flood hazards because these regions are low-lying and located at the foot-hills of Meghalaya mountain chain. This low-laying part consists of a bowl shaped depression containing many wetland areas, locally known as *haor*² (wetland). The district of Sunamganj, also located in the north-eastern part of

¹ Greater *Sylhet* district includes the districts of *Sylhet*, *Sunamganj*, *Habiganj*, and *Moulivibazar*

² “The *haors*, *baors*, *beels* and *jheels* are of fluvial origin and are commonly identified as freshwater wetlands ... *Haor* is a low lying, bowl shaped flood plain, [originated from the tectonic depression, (Rabby et al.2011)], between the natural levees of a river subject to monsoon flooding every year, are mostly found in the eastern region of the country, known collectively as *Haor* basin covering an area of approximately 24,500 km². *Beels* are large

the country, has a unique physiography as it contains 95 *haors*. Communities living in the *haor* area in Sunamganj district rely upon a single crop in a year. Peasants here cultivate rice (i.e., *boro*³) once in a year but contribute significantly to the national production of rice. However, abnormal flash floods and early floods often cause significant volume of crop loss in this region. *Boro* crop is extremely vulnerable to irregular extreme early flash flooding. It is found that the percentage of damage is higher when there is an early flooding. For example, a report published by CNRS (2009) shows that percentage of damage is higher in March (75%) and April (70%-90%) compared to May (15%-40%).

The wetland-community⁴ is not only vulnerable to early flooding, but is also vulnerable to extreme monsoon and post-monsoon flash floods. Unlike early floods, monsoon and post-monsoon floods damage homestead property and also water infrastructure and sanitation facilities. These facilitate water borne diseases during post-disaster period. A report published by Local Consultative Groups (LCG) Bangladesh in 2012 indicates that around 318,000 people were affected by the 2012 flood directly or indirectly. Abnormal monsoon

surface waterbodies that accumulate surface runoff water through internal drainage channels; these depressions are mostly topographic lows produced by erosions and are seen all over Bangladesh ... *Beels* are small saucer-like depressions of a marshy character. Many of the *beels* dry up in the winter but during the rains expand into broad and shallow sheets of water, which may be described as fresh water lagoons ... *Baors* are oxbow lakes, formed by dead arms of rivers, are situated in the moribund delta of the Ganges in western part of the country. In Bangladesh, oxbow lakes are quite visible in the older floodplains. Locally, the feature is also known as *beel*, *baor*, and *jheel*. Usually, oxbow lakes are deeply flooded during the monsoon, either through local rainfall and runoff water or by river flood. During the monsoon season oxbow lakes act as local water reservoirs, and help to control the local flood level. In some areas, these lakes serve as valuable sources of irrigation during the dry season” (Chakraborty,2005, p.1)

³ *Boro* rice is usually known as winter rice. The cultivation period normally starts from November, and rice typically matures before the arrival of monsoon.

⁴ In this thesis, wetland-community and wetland-social-ecological system is used interchangeably

and post-monsoon floods are also serious threats to people and their resources living in wetland areas.

Flooding has been part of the lives of people of Bangladesh society. The data in Table 1.1 show the major flood events in Bangladesh from 1954 to 2007. It reveals that there has been at least one major flood event in every decade during the last six decades. In each of the cases, at least 25% of the area of Bangladesh was affected by floods; the only exception was the 1984 flood. However, communities have learned to live with extreme flood events and have adjusted their livelihood accordingly. For example, peasants have adjusted their crop cultivation practices, especially rice varieties that suit local micro-environment (Brammer, 1990). But in recent times, their historical adaptation process with floods have been challenged due to the unpredictable and unexpected nature of extreme events (e.g., floods), and other human induced stresses like marginalization and exclusion of poor fishers and peasants from livelihood options.

Table 1.1: Major flood events in Bangladesh during 1954-2007

Year	Percentage of total area affected
1954	25
1955	34
1956	24
1962	25
1963	29
1968	25
1970	28
1971	24
1974	35
1984	19
1987	38
1988	52
1998	68
2004	38
2007	42

Source: (Dewan, Nishigaki & Komatsu, 2003; Younus, 2010)

Historically, people in Bangladesh society recovered from natural disasters through strong socially embedded institutions, like kin and family ties, primarily because of the absence of strong formal institutions (Zaman, 1989; Mutton & Haque, 2004). Family and kinship ties along with *samaj* (village society or community) and *rayet* (lineage) provided the basic security and support to community people (Feldman & McCarthy, 1983). Kinship ties, family bonding, strong social network and relationship among people living in a *samaj* created a moral obligation to assist one another during crisis period like natural disasters in the form of financial aid and shelter (Mutton & Haque, 2004).

In recent times, the traditional-historical recovery strategies from natural hazards (e.g., floods) have been undermined or replaced by several factors. For example, Feldman and McCarthy (1983) found that family ties and kin ties are gradually weakening in Bangladesh since male and female members are now forced to migrate, seasonally or permanently, for work. In areas of disaster response and recovery in Bangladesh, formal institutions have become more prominent than ever before and they have overtaken the role of socially embedded institutions. Strong government bodies are now being established for efficient and effective disaster response and recovery (please see Comprehensive Disaster Management Plan-CDMP Phase I (2004-2009) and II (2010-2014) for details). Along with government initiatives, NGOs are also playing a decisive role in strengthening community capacity to respond during and after disasters.

For wetland-communities, recovery from flash flood disasters not only depends upon recovery incentives provided by various GO and NGO organizations (horizontal and vertical), but also depend on equitable access to natural resources bases. This is because natural resources are the main sources of livelihood for wetland-communities. Wetland resources; therefore, are very critical for the community people both in terms of sources of income and sources of recovery from flash flood disasters. The poor suffer from

marginalization, and exclusion due to asymmetrical social power structure, and because of resource depletion due to anthropogenic and environmental disturbances (Rahman & Begum, 2010). Therefore, appropriate resource management, and access of poor to natural resources are critical in shaping community people's ability to respond to flash flood disasters. Given this context, I endeavor to examine the wetland-community resilience and recovery process to flash flood disasters in the north-eastern region of Bangladesh.

1.2 Research problem and justification

I personally have observed the severity of chronic poverty and environmental disaster in many parts of Bangladesh during my travel as a development worker and for my voluntary activities with development organizations. I am from the north-eastern part of the country, where flash flood is most prevalent. I witnessed the natural calamities (e.g., flash flood, cyclone) that affect people's livelihood and their normal course of life. I observed that people were living in extreme poverty and in some cases were bound to migrate to other places due to the loss of property and sources of income. Recovery from disasters was largely constrained by the availability of financial resources. Migrating to other places often poses additional problem for improvised people, especially for securing livelihood options due to their lack of technical and communication skills.

The adverse impact of natural hazards (e.g., flooding, storm, coastal cyclone, hail storm) on society has heightened my interest in understanding these adverse natural events. During my university years as an undergraduate student, I understood that natural hazards, especially abnormal floods and cyclones are unavoidable for the people of Bangladesh because of its geographical location and climatic conditions. I noticed that the adverse impacts of these natural events have been magnified by several natural and anthropogenic processes, such as increased intensity and frequency of natural events, increasing pressure on

natural resources due to excessive population growth, and absence of strong institutions to manage the consequences of natural disasters. Since my childhood, I heard that the government of Bangladesh recognized the size and growth rate of population as one of the major problems. The current population of Bangladesh is around 160 million, which is projected to reach 170 million in 2020. Additionally, the pressure of socio-economic globalization has increasingly weakened the traditional institutions (e.g., community bonding), which historically helped community people to cope with adverse natural events.

Given the context presented to above; I found that literature on disaster studies has proposed several prescriptions on how to manage and cope with natural adversity. Some authors argue that development activity should not be initiated or planned in areas which are 'susceptible' to hazardous events (Paton & Johnson, 2006). They consider disaster as the *problem of development*, while other view disaster as the *problem for development* (Mochizuki, Mechler, Hochrainer-Stigler, Keating & Williges, 2014). Regardless of the fact that whether disaster is the problem for/of development, many areas susceptible to hazard activity have been occupied by human population and in most of the cases, the rehabilitation of these human populations to less susceptible area is virtually impossible. For example, many communities like wetland-communities in Bangladesh have opted to live with natural hazards. Given this situation, to live with natural hazards essentially requires the building of the adaptive capacity of human communities because natural hazards have the potential to become disasters in the absence of appropriate adaptive capacity.

In the environmental change literature, resilience thinking offers valuable insights of how to proactively manage disaster risk, and how societies can make best use of pre and post disaster opportunities to enhance adaptive capacity in the long run. Resilience envisages a system's perspective. From a system's perspective, Gunderson (2010) describes natural disaster as the "perturbations or disturbances to a human community system" (p.1). The

concept of resilience was developed by C. S. Buzz Holling (1973), and currently applied to integrated social-ecological system. In the context of natural disaster resilience, this means the ability of a system to "absorb disturbances and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks" (Walker, Holling, Carpenter, & Kinzig, 2004, p.1).

As highlighted above, a wetland-community is prone to flash flood hazards and also often marginalized and excluded from access to natural resources creating livelihood instability. How the wetland-community adapts with flash flood hazards and move forward are yet to be fully explored. Here I approached the issue of flash flood hazards by drawing insights from resilience thinking and seek to understand wetland-community recovery and resilience to flash flood and its associated risks.

1.3 Purpose and objectives of the research

The purpose of my proposed research was to examine the wetland-community disaster recovery processes (i.e., in terms of shocks) and resilience to flash flood disasters. In order to achieve this purpose, the objectives of this research were:

1. To examine the economic losses and recovery processes at household and community levels from flash flood disasters.
2. To examine the resilience of wetland-social-ecological system to flash flood disaster, with a focus on multi-level interfaces (individual, community and ecosystem).
3. To assess the dynamics of multi-level participation by institutions in flash flood disaster management and recovery policy process.

1.4 Research significance

My research is an effort to offer a synthesis of both natural resources management and natural hazards literature by broadly drawing insights from social-ecological system thinking

and disaster resilience. In doing so, my research addresses some of the important research gaps in existing literature, such as the role of human agency in environmental change; the role of power and politics in understanding social-ecological system dynamics; and, how institutions, horizontal and vertical play decisive role in community self-organization process. Overall, my thesis research attempts to understand the transformational change of resources dependent communities in the context of extreme environmental variability.

A number of studies have been carried out to date in the context of wetland-community in Bangladesh, especially in the context of natural resources management. However, limited efforts have been given to understand the resilience of wetland-community focusing on marginalization, exclusion from common pool resources and frequent resources loss due to natural disasters, specifically in the context of flash floods.

1.5 Organization of thesis

This thesis is organized six chapters.

The first chapter provides a general overview of the thesis by explaining the research context and problem, research purpose and objectives, overview of the study area, research methods, research significance and limitations, and lastly organization of this thesis.

The second chapter provides a detailed description of study area and methodology. It first explains the philosophical approaches that are adopted for this research; second, it explains the strategy of inquiry (i.e. use of Case Study approach); and third, an explanation and justification of case study selection are given; fourth, in research scoping section the criteria and selection of study villages and explanation of household survey are elaborated; fifth, it offers a detailed explanation of the use of

data collection procedure i.e. use of PRA tools; sixth, the sources of secondary data; and the data recording and analysis techniques are explained.

The third chapter focuses on wetland-community vulnerability, disaster loss recovery strategies and the role of human agency to unpack the response strategies of community people to flash flood hazards. This chapter addresses the first objective (i.e. the economic losses and recovery processes at household and community levels from flash flood disasters) and part of second objective of my thesis.

The fourth chapter analyses social-ecological system dynamics. It focuses the underlying mechanisms that create vulnerability to flash flood hazards and the factors that build or erode resilience, with a special focus on institutional regimes of resources management and community power dynamics. This chapter addresses the second objective of my thesis (i.e. the resilience of wetland-social-ecological system to flash flood disaster).

The fifth chapter focuses on the multilevel institutional interface in the disaster response and recovery phase, which is the third objective of my research. Here special emphasis is placed on the role of community-based organization for disaster response and, and the role of horizontal and vertical institutions in disaster response and recovery.

The last chapter provides an overall synthesis of the findings of this research and policy implication for disaster prone wetland-community.

Chapter Two

Methodology

2.1 Introduction

This chapter describes study area and methodology used to address the research objectives. First, this chapter explains the philosophical approaches behind the overall research process. Second, it offers a description of strategy of inquiry and rationale for using the case study approach. Third, a description of the study area is provided. Fourth, this chapter outlines research scoping in terms of criteria of selecting study villages and use of survey method. Fifth, it offers an explanation of different PRA tools that were being applied to collect data. Sixth, a description of secondary data sources; and finally, an outline of data recording and analysis procedure are also provided. The duration of my fieldwork was from August 1 through December 30, 2014.

2.2 Philosophical approaches

Broadly, I used a qualitative research paradigm for conducting this research. Qualitative research aims to interpret the meanings of the action in natural settings, and offers the holistic picture of the issue at hand (Marshall & Rossman, 2010). Qualitative research is best suited for exploratory research, where variables are unknown and the focus is on the context, and the research aims for “detailed” and “complex” understanding of the issue (Creswell, 2007). Wetland-community resilience to flash flood hazards, especially in the context of Bangladesh, still remains unexplored. Therefore, qualitative research paradigm suits better for this research than others.

Research is always guided by philosophical positions/worldviews/paradigmatic positions. Guba defines worldview as “a basic set of beliefs that guide action” (Guba, 1990, quoted in Creswell 2009, p. 6). Creswell (2009, p.6) defines paradigm or worldview as “a

general orientation about the world and the nature of research that a researcher holds”. Creswell (2007) identifies broadly four types of worldviews that guide qualitative research, namely postpositivism, social constructivism, advocacy/participatory, and pragmatism.

To understand wetland-community disaster recovery processes (i.e., in terms of shocks) and resilience to flash flood-hazards, my research takes a participatory approach, rather than postpositivist and constructionist approach. The participatory approach is also called as the ‘community-based approach’ to research (Minkler, 2005). This approach holds that the goal of research is to change the lives of participants and also “the institutions in which they live and work” (Creswell, 2007, p.21). From the point of view of this approach, the voices of the marginalized people are of paramount importance. This is an emancipatory approach where the goal is to unshackle people from oppressive-hegemonic power structures. As the purpose of my research is to understand disaster recovery processes and resilience to flash flood-hazards, this approach was helpful in understanding the drivers that shape recovery and also how asymmetrical power structures shapes community resilience. By contrast, postpositivism takes a reductionist and deterministic approach, and thus has limited application for understanding multidimensional issues, like power and domination. As a result, this approach does not fit with the focus of understanding the voice of marginalized and disadvantaged people. Social constructivism as a worldview can overcome some of the limitations of postpositivism, as it seeks to understand the complexity of an issue, but does not go far enough for advocating for actions that can change the lives of marginalized people (Creswell, 2007).

Taking a participatory approach, my research applied data collection techniques using PRA tools. However, to address the purpose of the research fruitfully, a pragmatic approach was also applied to study the problem. To this end, data collection techniques from PRA tools were supplement with household surveys in order to develop a better understanding of the

issues. The household survey helped understanding the socio-demographic profile, income and wealth status, loss and damage due to past big flash flood events. I also collected secondary documents from GO and NGO organizations, such as government gazette, data on water level and discharge, GO and NGO documents on disaster (e.g., SOD, Action Plan) and also other documents to address my research objectives.

2.3 Strategy of inquiry: Use of Case Study approach

Five strategies of inquiry within qualitative research paradigm are documented by Creswell (2009), namely ethnography, grounded theory, case study, phenomenological research, and narrative research. For creating an in-depth understanding of disaster recovery processes of wetland-community, I applied case study research design for my research (Yin, 2014). Creswell (2007) defines case studies as research that "...involves the study of an issue explored through one or more cases within a bounded system" (p.73). Temporal and spatial are the two basic dimensions of bounded system, *viz.* space and time bounded system. Creswell also uses "bounded system" and "case" interchangeably. The "bounded system" or the "case" is the unit of analysis in case study oriented research. Yin (2014) highlights that case study research is more appropriate for answering "why" and "how" questions and for providing "in-depth" understanding of the process, rather than what questions. Moreover, case study research is most applicable where the phenomenon under investigation cannot be distinguished from its context.

For my research, I applied "the single instrumental", "descriptive" case study approach with exploratory elements (Creswell, 2007; Yin, 2014), whereby the focus is more on the issue (i.e., resilience to flood hazards), rather than the case itself. As a descriptive framework, resilience thinking holistically describes the disaster recovery processes of a community - treating community as an integrated SES. Resilience thinking as a framework is

still at its formative stage and provides the opportunity for refinement and space for debate. Resilience is forward-looking and is measured through surrogates rather than indicators (Berkes & Seixas, 2005). Moreover, there have been nominal attempts to explain the wetland-community resilience to flooding disaster; therefore, this case study is a newer attempt to explore these processes (Moyer, 2012).

Compared to case study approach, other approaches, such as ethnography, grounded theory, phenomenological research, and narrative research have either limited application or do not fit with my research problem. For example, narrative research best applies when the aim is to capture the detailed stories of life experience of an individual or group of individuals; phenomenological research suits problems where the goal is to understand the shared experience of people on a phenomenon; grounded theory best applies when there is no available theory to explain a process; ethnographic approach is applied when research interest involves understanding the beliefs, languages, and behaviors of a particular cultural group. Thus these approaches can only partially address the purpose, objective and problem of my study. As discussed above, the case study approach can more fruitfully address the issues highlighted above.

2.4 Study area

The area of Bishwambarpur Upzilla (sub-district of Sunamganj district) is 248.63 sq. km with 220.63 sq. km land area and 28.0 sq.km riverine areas (BBS, 2011). It is located in between 25°01' and 25°11' north latitudes and in between 91°12' and 91°24' east longitudes, bounded by Meghalaya State of India on the north, Sunamganj Sadar and Jamalganj Upazilas on the south, Sunamganj Sadar upazila on the east, Tahirpur and Jamalganj upazilas on the west (Banglapedia, 2012). Bishwambarpur Upzilla has 5 Unions, 61 Mauzas, and 184 villages.

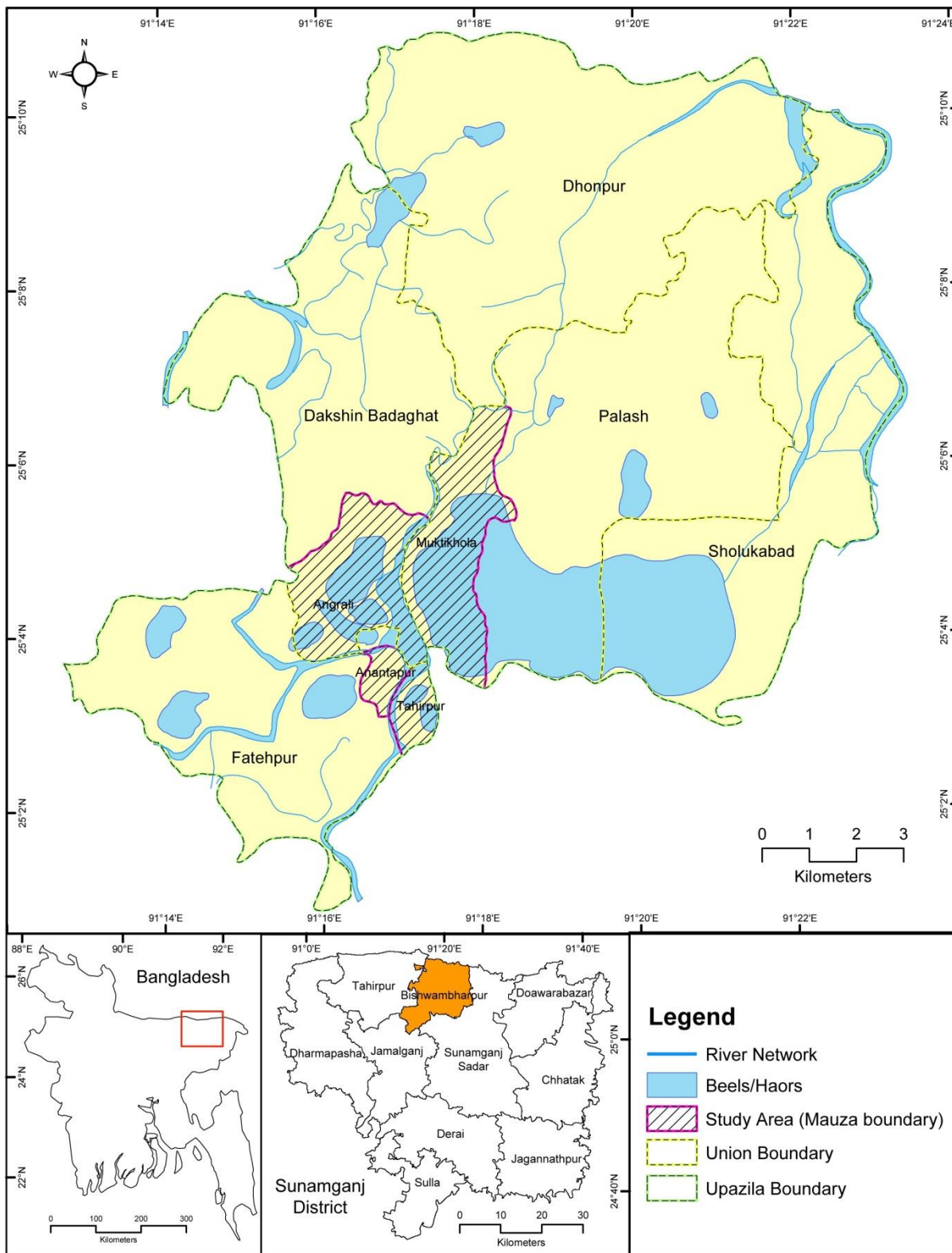
At Sunamganj district, Bishwambarpur Upazila, being a foothills community, is one of the most severely affected areas of flooding in the present years. There are four big *haors* in Bishwambarpur Upazila, namely *Karcharia haor*, *Sonir haor*, *Angrulir haor*, and *Halir haor*. Fotehpur is one of the unions of Bishwambarpur Upazila, located in the deep *haor* area, which covers *Karcharia haor*, *Angrulir haor*, and *Halir haor* areas. *Karcharia haor* is the biggest *haor* in Bishwambarpur Upzilla. Due to its geographical location people living in Fotehpur Union depend on the *haor* ecosystem services for their livelihood. My study therefore selects an area under Fotehpur union as the study area (Map 2.1) to understand the temporal variability of flash flood and resources dependency with a special focus on *Karcharia haor*.

The population of Bishwambarpur Upzilla is increasing. The data in Table 2.1 show the increasing trend of population density in Bishwambarpur Upzilla over the last 40 years. It indicates the increasing pressure on land and other natural resources for livelihood and on carrying capacity.

Table 2.1: Population growth and density of Bishwambarpur Upzilla, 1981-2011

Year	Population ('000)	density/ sq. km
1981	76	306
1991	106	426
2001	126	507
2011	156	627

Source: (BBS, 2011)



Map 2.1: Study area, Bishwambarpur Upazila of Sunamganj district

2.5 Research scope

The aim of qualitative research is to obtain an in-depth understanding of an issue. It provides depth as opposed to breath of understanding. I tried to choose those villages that meet the criteria for selection towards attaining my research objectives. Fotehpur union of Bishwambarpur Upazila has an area of 46.89 square km. This union consists of nine wards, 43 villages with 5,974 households and a total population of 28,390. The scoping of my research in terms of selection of study villages was determined following a reconnaissance visit so that I could identify specific issues of flash flood hazards and relationships with local resources with local communities.

2.5.1 Criteria and selection of study villages

As part of limiting the scoping of my research and selecting study villages, I was involved with a series of consultation forums with different stakeholders, such as local NGO staffs working with disaster and livelihood, local Union Parishad (UP) chairman and members, and community people, and government representatives like a Project Implementation Officer (PIO). I came to know that almost all the villages are prone to flash floods, either early flash flooding or monsoon flash flooding or both. Since I was focusing on the *Kacharia haor* as the source of livelihood and factor of hazards, my next step was to identify those villages where people's livelihood (e.g., crop cultivation and fishing) largely depend on the *Kacharia haor*. I was looking for selecting those villages that will be representative of a wetland-community in terms of livelihood options and occupational diversity, as well as other factors that can potentially influence community resilience, such as migration, remittance.

The data in Table 2.2 shows the temporal variability of flash flood in different wards. Based on the criteria mentioned above, I selected *Jirak Tahirpur*, *Katakhali* village from

ward 4; and *Bishwambarpur, Raipur, and Bahadarpur* village from ward 6. I conducted household survey in these five villages. I carried out participatory research in four villages, namely *Jirak Tahirpur, Bishwambarpur, Raipur, and Bahadarpur*.

Table 2.2: Temporal variability of flash flood in different wards, Fotehpur Union

Temporal dimension of flash flood	Severity	Ward number
Early flash flood	High	2,4
	Medium	2,4
Monsoon flash flood	High	4,5,6,7
	Medium	1,2,3,4,5,6,7,8,9

Sources: Field survey data, 2014

The following section discusses the methods that I have applied for my field study. The methods were applied with research objectives (Section 1.3) in mind. Table 2.3 offers my research objectives with corresponding methods (i.e., the methods I used to accomplish the research objectives, and rationale behind the use of specific methods).

Objectives	Methods	Rationale
1. To examine the economic losses and recovery processes at household and community levels from flash flood disasters.	1. Household survey	To understand the types and magnitude of financial loss and damage at household level
	2. Semi-structured interview	To understand the loss and damage recovery process at household level
	3. Focus Group Discussion (FGD)	To understand community collective effort in disaster loss recovery
2. To examine the resilience of wetland-social-ecological system to flash flood disaster, with a focus on multi-level interfaces (individual, community and ecosystem).	1. Oral history	I applied the oral history method for a specific purpose, which was to unpack human agency dynamics and learning aspects. Oral history method helped me understand the specific experiences of individuals – how individuals coped with the large flash flood, what he/she learned from that event, and how this learning contributed to the subsequent adaptation process
	2. Key informants interview	To understand community people's problem with local power dynamics, such as peasants' and fishers' struggle with powerful groups
	3. Transect walk and direct observation	This method was helpful in identifying community people's problem with flash flooding, such as identifying problems with embankment in the most vulnerable part of their villages
	4. Focus Group Discussion (FGD)	FGDs with peasants were helpful in understanding their problems with crop cultivation practices, the problem they face with early flash flood hazards, and asymmetrical power structure. FGDs with fishers were helpful in understanding fishers problem due to marginalization
	5. Seasonal calendar	To understand seasonal constraints and opportunities
	6. Participatory mapping	To prepare a scratch map of the <i>Karcharia haor</i> and a map that includes the <i>haor</i> and surrounding area. This scratch map was helpful for identifying different patterns of agricultural lands, water bodies, and embankments within the <i>haor</i> . Overall, the two maps that were produced help explain ecological aspect of resilience
3. To assess the dynamics of multi-level participation by institutions in flash flood disaster management and recovery policy process.	1. Focus Group Discussion (FGD)	To understand the role of volunteers (both male and female) in disaster recovery and response processes
	2. Participant observation	To understand how the UDMC as a team functions, and how NGOs play facilitating role

2.5.2 Conducting household survey

Even though my investigation has applied predominantly a qualitative research approach, I have also supplemented it with some quantitative design (i.e., a sample survey). I conducted a purposive household sample survey for mainly two reasons; first, to get a snapshot of the socio-demographic and livelihood characteristics of the community people, and second, to estimate the magnitude and types of loss and damage due to past big flash flood events. Before conducting my survey, I carried out pilot testing of my survey questionnaire for refinement. As part of pilot survey, I conducted six interviews in two villages, and then I have finalized my survey questionnaire (attached in **Annex 1**). I conducted a household survey of 109 households in five villages. Table 2.4 shows the numbers of households surveyed from each village.

Table 2.4: Numbers of households surveyed from each of the selected villages

S/L #	Name of the villages	Number of households surveyed
01	Bishwambarpur	34
02	Raipur	13
03	Bahadarpur	18
04	Jirak Tahirpur	29
05	Katakhali	15
Total		109

2.6 Data Collection Procedure: Use of PRA tools

My research relied heavily upon the spontaneous participation of community people so that the problems they face with flash floods and other natural and human induced hazards could be better understood. Through the participatory process, people develop a sense of ownership with the research, which helps to trace out the underlying mechanism behind the problem under investigation. Participatory approaches are bottom-up with a special focus on empowering the local community, and using local knowledge (Chambers, 1994). This

inspired me to carry out my field research using a participatory framework. Towards this end, I applied data collection techniques from participatory rural appraisal (PRA) tools, including time lines and local histories, semi-structured interview (SSI), transect walks and direct observation, Focus Group Discussions (FGD), seasonal calendars, participant observation, key informant interviews, participatory mapping, and the oral history method (Pretty & Vodouhê , 1997).

2.6.1 Interview methods

a. Semi-structured interviews

Semi-structured interviews are typically “content focused” and involve a guided questionnaire. As it is content focused, researchers develop a guided questionnaire that relates directly research questions. In other words, researchers deal with an area that addresses the research question (Dunn, 2005). Semi-structured interviews are ordered around certain questions; however, the questionnaire is only a guide. It offers flexibility and is more adaptive to the situation and changing circumstances. Focusing on disaster loss recovery process, I conducted 109 semi-structured interviews at the household level (Table 2.5). I conducted semi-structured interviews along with my household surveys. First I estimated loss and damage with my survey questionnaire. Following this, I conducted semi-structured interviews with guided questions (listed in Table 2.5) to understand the loss and damage recovery process.

Table 2.5: Semi-structured interviews at household level

Respondents	Number of semi-structured interview	Focused area	Guided questions	Length of interviews
Household head	109	Disaster loss recovery at household level	<ul style="list-style-type: none"> - What are the immediate sources of finance? - How do you recover from asset losses? - How do social networks and relationships help you get immediate sources of finance and asset loss recovery? 	20 to 45 minutes

b. Oral history

The oral history method provides a “voice” or “picture” of the past from the words and memories of the respondent. It is “a collaborative process of narrative building” where the researcher and interviewee spend a longer period of time together (Liamputtong, 2009, p. 113). The emphasis is on the experience of individuals – how individuals cope with society (Marshall & Rossman, 2010). Often, life history and oral history methods are used interchangeably; however, there is a subtle difference between life history and oral history methods in terms of scope and emphasis. For the life history method, the focus is on the entire life span of the interviewee, and the scope is much broader. For oral history, the focus is on the specific past event where the scope is much narrower (Liamputtong, 2009). Criteria for selecting the respondent depend on the time, willingness of the respondent and relationship with the respondent. Prior to conducting the interview, researcher should build rapport with the interviewee (Hagemaster, 1992). Oral history method follows an unstructured interview setting; however, this is not always the case. Semi-structured interview techniques can be used in the oral history method with a guided questionnaire.

For my research, I applied the oral history method for specific purposes, that is, to unpack human agency dynamics and learning aspects. This method helped to partly address my first and second objectives. Oral history methods helped understand the specific experiences of individuals – how individuals coped with the large flash floods, what he/she learned from that event, and how this learning contributed to the subsequent adaptation process. I conducted five oral history interviews. Interview length ranged from 1 hour 15 minutes to 1 hour 23 minutes. Household surveys were used for estimating loss and damage and semi-structured interview helped me to recruit participants for oral history. I selected those participants who were willing to share their experience. I conducted interviews at interviewee's convenient time and place.

c. Key informant interviews

Key informant means the “individual who shares information” who are vital to understanding culture (Gilchrist & Williams, 1999, p. 73). Key informants differ from other informants because of their relationship with researchers, and their position in the socio-cultural setting. Perspectives from key informants add deeper insights into the research by working as a “translator both literally and figuratively” (Gilchrist & Williams, 1999, p.74). Selection of key informants depends on the topic or the type of information being sought and relationship with the researchers.

At the beginning of my fieldwork, I decided to recruit a guide from the community so that he/she could work as a gate-keeper. During the process of research, whenever I had difficulty in understanding any issue the guide made it clear to me (i.e., he worked as a translator for me). I conducted five key informant interviews at the later part of fieldwork because by that time I developed a good rapport with community people. I also knew who could answer my questions. For example, I conducted a key informant interview with an

individual who was nominated by NGO as the President of Village Development Committee (VDC), and he is also a peasant. As an active individual of the community, he knew community people's problems with flash floods, especially peasants' struggle with powerful groups. Thus, key informant interviews in my research were very helpful in understanding local power dynamics, and how a network among powerful people operates in the study area.

2.6.2 Group methods

a. Timelines and local histories

The first task in participatory research or any form of qualitative research is to build rapport with community people. Rapport building is crucial to ensure the effective participation of community people. Through participation community people build a sense of ownerships in the overall research process. For building rapport, local historical analysis through informal chatting with community people is found to be a good "ice breaker" (Pretty & Vodouhê, 1997, p.74). Local historical analysis includes crop histories, population changes, and changes in ecosystem services among others.

At the beginning of my research, I visited the study villages and shared the purpose of my visit. I shared my research purposes and objectives with the community people and explained how my research *may* potentially benefit them in the long run. After the initial discussion, I had informal chatting with community people from one hour to one and half hours. Because of this chatting, community people felt that they could make important contributions to the research. The informal chatting also helped me to get an overview of fishing and crop cultivation practices, changing social relationships, and the problem that participant currently face due to lease-holders. These overviews helped me to focus on specific issues while I was conducting semi-structured interviews or Focus Group Discussions (FGDs).

b. Transect walks and direct observation

A transect walk is basically a systematic walk with a key informant. Here researchers walk “through the areas of interest, observing, asking, listening, looking, and seeking problems and solutions” (Pretty & Vodouhê , 1997, p.73). It is a method through which outsiders discover the local practices, such as use of plants, variety of crops.

Transect walks accompanied by direct observation were very helpful for me to identify community people’s problem with flash flood hazards, which I carried out both within the village and within *haor* area. However, because of the timing of my fieldwork during the monsoon, this method had limited applications. When I started my fieldwork it was still a wet season. Therefore, some of the problems participants faced within the *haor* were only possible to observe partially at the end of my fieldwork (December). However, while doing transect walks and direct observation within *haor*, key informants identified problems with embankment, and loss of species diversity. While doing transect walk and direct observation within the villages, people identified the locations of their villages that are most vulnerable to flooding.

c. Focus Group Discussion (FGD)

In qualitative research, focus group interviews are used to gain understanding of a particular issue from the perspective of the group’s participants through the description and understanding of perceptions, interpretations and beliefs. Focus Group Discussion (FGD) involves 6 to 10 participants from same socio-economic and cultural backgrounds who have a similar experience or concern (Liamputtong, 2009). FGD is more relevant when researchers want to capture group dynamics, voice of the oppressed or marginalized ones (Liamputtong, 2009). However, some issues may not be discussed in a group setting because even a so-

called homogeneous group like women is often divided in different lines, such as class, race, and ethnicity.

Before conducting FGDs with communities, I spent good amount of time visiting community for household surveys, semi-structured interviews, and informal chatting, which helped me to earn a sense of trust. Prior to conducting a FGD, I was aware of few factors that could affect the result, such as age and gender of the participants, place for conducting FGD, number of participants and recruitment process. First, taking societal cultural norms into account I avoided a mix of male participants with female participants. Second, in the rural social structure of Bangladesh, younger people do not speak-up in front of their elders; therefore, I tried to keep participants within a similar age range, such as 40/45 to 50/55. Third, I conducted the FGDs within the villages in places where participants felt comfortable. Fourth, numbers of participants were six to eight for all FGDs. I made an appointment with them prior to conducting a FGD. While I was conducting FGDs, I found that not everybody speaks-up, even within a small group. I then had to engage them in the discussion by asking whether they have anything to add. At the end of the each FGD, I offered snacks to FGD participants.

Data in Table 2.6 show the number of FGDs I conducted. FGDs with peasants were helpful in understanding their problems with crop cultivation practices, the problem they face with early flash flood hazards, and asymmetrical power structure. FGDs with fishers were helpful in understanding fishers' problem due to marginalization, FGDs with different occupational groups on disaster helped understanding community collective efforts in disaster loss recovery. FGDs with male and female volunteers were helpful in understanding the role of male and female volunteers in disaster response and recovery phase, and what problem volunteers face during disaster response and recovery phase.

Table 2.6: Group composition, number of FGDs, place and duration of FGDs

S/L #	Number of participants	Occupational backgrounds	Focused area (guided questions are attached in Annex 2)	Number of FGDs	Length of FGDs	Date of FGDS	Place of FGDs
01	6	All were peasants	Cultivation	1	1 hour 40 minutes	September 8, 2014	Bishwambarpur village
02	8	All were peasants	Cultivation	1	1hour 30 minutes	October 1, 2014	Jirak Tahirpur village
03	8	All were fishers	Fishing	1	1 hour and 15 minutes	September 2, 2014	Bahadarpur village
04	8	All were fishers	Fishing	1	40 minutes to one	October 15, 2014	Raipur village
05	7	Participants include fishers, farmers, day laborers	Disaster	1	41 minutes	September 3, 2014	Bahadarpur village
06	6	Participants include fishers, farmers, day laborers	Disaster	1	50 minutes	October 15, 2014	Jirak Tahirpur village
07	7	Participants include fishers, farmers, day laborers	Disaster	1	55 minutes	October 22, 2014	Bishwambarpur village
08	5	Male volunteers of the UDMC	Disaster	1	55 minutes	September 24, 2014	Fotehpur UP center
09	5	Female volunteers of the UDMC	Disaster	1	35 minutes	September 24, 2014	Fotehpur UP center
Total				9			

d. Seasonal calendars

In research, a seasonal calendar is used to elucidate seasonal constraints and opportunities. It is typically represented schematically on a yearly duration on a month by month basis. Seasonal calendars can be used to illustrate crops in different seasons as well as to illustrate natural hazards in different seasons (Pretty & Vodouhê, 1997).

Through community participatory process, I prepared three seasonal calendars, namely a resources or livelihood calendar, a natural hazards calendar, and a cross-sectional hazards-resources calendar. In the resources or livelihood and in natural hazards calendars the horizontal column represents 12 months (both Bengali and Gregorian), and the vertical calendar represents resources or livelihood and natural hazards respectively. In the cross-sectional hazards-resources calendar, the horizontal column represents natural hazards and vertical column represents resources or livelihood options. The resources or livelihood calendar was very helpful in identifying constraints and opportunities of earning throughout the year, the natural hazards calendar was helpful in understanding the expected and unexpected behavior of weather, and the cross-sectional hazards-resources calendar was helpful in understanding the connection of livelihood activities with natural hazards (i.e., which livelihood options have adversely been affected by specific type of natural hazards). This helped me to apply an all hazards approach toward livelihoods. For convenience, I initially prepared these calendars in one village and then went to other three villages to get their inputs. After getting inputs from all villages, I finalized the calendars.

e. Participant observation

Participant observation involves “getting close to people and making them feel comfortable enough with [one’s] presence so that [one] can observe and record information about their lives” (Bernard, 2006, p.342). Participant observation fits best when researchers

are interested to understand “how the activities and interactions of a setting give meaning to certain behaviors or beliefs” (Bogdewic, 1999, p.48). It is a very effective way to collect data in an unobtrusive manner. It usually involves fieldwork, but not vice versa.

During the first month of fieldwork, I stayed in Sunamganj Upazila and travelled every day to Bishwambarpur Upazila for my fieldwork. It was time and energy consuming, so I decided to stay close to community so that I could save my time, and could also closely observe the daily lives of community people. During the last four months, I stayed close to the community. I would have my meals in a local village restaurant, visited the local market, and attended public gatherings like village sports. People would usually come to the village market to have a cup of tea and spend time gossiping. Such venues provided me the opportunities to involve myself in informal chatting with people and to know their social lives. I jotted down my field observations on a notebook. These activities helped me to get deeper insights into the lives of people. I also attended two monthly Union Disaster Management Committee (UDMC) meetings to understand how the UDMC functions as a team, and how NGOs play a facilitating role to make the UDMC functioning.

f. Participatory mapping

Participatory mapping involves constructing maps on the ground or on a piece of paper with pen, pencil, chalk, and other locally found materials. Typically, one of the participants takes the lead and as the map takes shape other people give their inputs. Mapping can take different forms, such as social mapping, resources mapping, and forest mapping (Pretty & Vodouhê, 1997). I applied this technique to prepare a scratch map of the *Karcharia haor* and a map that includes *haor* and surrounding areas. This scratch map was helpful identifying different patterns of agricultural lands, water bodies, and embankments within

haor. Overall, the two maps produced helped to explain wetland-social-ecological system resilience to flash flood disasters.

2.7 Secondary Data Sources:

Secondary documents were collected from multiple sources, such as from NGOs, government agencies, Fotehpur UP office, and civil society organizations. NGO documents were collected from local offices of national and regional NGOs (VARD, ASD, JESIS), and UNDP local project office on Governance. Government documents were collected from multiple government organizations, such as Upazila fishery and agricultural offices, Upazila Nirbahi Officer (UNO), and Water Development Board-Bangladesh (regional office and central office).

NGO documents included the UDMC meeting minutes, a disaster action plan, documents on ongoing projects on disaster, and the Union Parishad Act, 2009. Government documents, such as the gazette of the Ministry of Fisheries and Livestock, the government ordinance for leasing water bodies, the government documents on wetland from Upazila fishery office; *haor* maps, water level and discharge of two rivers (from 1997 to present), and annual budget for repairing embankment from water development board, information on agricultural land on different *haors* from Upazila agricultural office. Documents from local the UP office include a yearly budget of last five years. Documents from the civil society organization (Bishwambarpur Upazila Press club) include photos on recent flood. I also interviewed UP chairman, members, PIO, UNO, Upazila agricultural and fishery officer, and NGO staffs to reflect on policy and guidelines, such as Standing Orders on Disaster (SOD).

2.8 Techniques for data recording and data analysis

All the interviews were recorded with an audio voice recorder. Interviews were recorded with the informed consent of the interviewees. All the interviews with the community people were conducted in local dialects, and interviews with GO-NGO officials were conducted both in mainstream Bengali language and also in local dialects depending on the interviewees. Images were taken by digital camera to supplement textual interpretations. These images included people, places, and documents. Images of people were taken with informed consent.

The goal of qualitative research is to offer an interpretation by researchers. To this end, interviews were first transcribed verbatim. Data were then deductively coded to trace out underlying themes running through the texts. Data were also inductively coded based on *a priori* themes, such as marginalization. Thus, themes emerged from the text, and *a priori* themes help coded the text. I followed a paper based rather than a computer assisted data coding process.

After tracing out the themes from the texts and fitting texts within the *a priori* themes, analysis was carried out using the technique of “thick” description (Stake, 2010, p.49). An interpretation of the themes and texts becomes “thick” when it relates to existing literature. Since the goal of qualitative or interpretive research is to provide a “thick” description, interpretation would be “rich” rather than “thick” without any connection with existing literature. I therefore attempted to relate the themes with existing literature on community resilience, natural disaster, and commons to compare and contrast with existing knowledge. Thus, my data analysis technique broadly follows a deductive approach.

Data collected from household survey were coded and analyzed using SPSS software. Household survey data were predominantly descriptive in nature, which helped position the

qualitative research finding within the socio-economic context of wetland-community of Bangladesh.

2.9 Conclusion

To conclude, my thesis research follows a qualitative research paradigm following a case study approach based on a participatory approach. For better understanding of the issue, the participatory scheme is also supplemented by a pragmatic approach. Based on the methods explained above, I have conducted my thesis research for a period of five months (August to December, 2014).

Chapter Three

Vulnerability, recovery from flash flood disasters and the role of human agency: The case of a wetland-community



Plate 3.1: Biophysical exposure

3.1 Introduction

This chapter relates to the first objective and part of the second objective of my thesis (i.e., the economic loss and recovery strategies at two different scales, namely at the household and community levels; and resilience or response strategies of individuals and community toward flash flood hazards respectively). To address these objectives, I focus on wetland-community vulnerability to flash flood hazards, loss and damage due to big flash flood events, recovery strategies, and the role of human agency. In this chapter, first, the current state of knowledge on extreme environmental events, vulnerability, disaster recovery, resilience to natural disasters, and the notion of human agency in environmental change

literature is reviewed. Second, I define community and delineate the boundary of community for operational purposes, and provide an overview of the study villages and socio-demographic profile of villagers that helps to contextualize the vulnerability of community people. Third, I contextualize flash floods in the context of vulnerability and in terms of temporal variability and differential impact, loss and damage due to past big flash flood events, and highlights that community people's survival strategies against flash flood disaster as a "life long struggle" (this narrative is a qualitative elaboration of community vulnerability to flash flood). Fourth, recovery strategies from economic loss and damage at the household and community levels are elaborated. Finally, I expand the *living with floods* narrative by unpacking agency dynamics, which elaborates community people's response to flash flood hazards.

3.2 Vulnerability to extreme environmental events, floods disaster recovery and community resilience

Extreme events are described in different ways. For example, IPCC (2012, p.40) defines extreme events (e.g., weather or climate) as "the initial and consequent physical phenomena including some (e.g., flooding) that may have human components to causation other than that related to climate". Others define in terms of some criteria, such as severe, rare, extreme, intense, and high-impact events (Stephenson, 2008; Beniston et al., 2007). IPCC defines the outcome of events on human and physical system as "impact". The impact of extreme weather events on human or ecosystem can be devastating and the extreme impacts of weather events on human or ecosystem are viewed as "disasters" (IPCC, 2012, p. 237).

Disasters or the impacts of extreme weather or climate events are largely determined by vulnerability. Vulnerability has been a matter of discussion in various disciplines, *inter*

alia, disaster management, sociology, development studies, sustainability science, and climate change impacts and adaptation. However, three common themes that run across theoretical stances are exposures, sensitivity, and adaptive capacity (Adger, 2006). These three key components are also defined in a varied ways, often without consensus. Exposure means “the degree, duration, and/or extent in which the system is in contact with, or subject to, the perturbation” (Gallopín, 2006, p.296). From this definition, exposure is a precondition to judge whether a system is vulnerable or not, unless a system is exposed to a perturbation, it cannot be said vulnerability. Sensitivity means the degree of direct and indirect impact of shocks and stresses on a system. Both direct and indirect impact can cause loss and damage to a system. Vulnerability of a system thus can be defined in terms of potential of loss and/or damage of property or life when exposed to a natural hazard (Cutter, Mitchell & Scott, 2000; Mitchell, 1989).

Scholars in the natural disaster field are typically concerned with vulnerability and risk analysis. They are either concerned with biophysical or social vulnerability. Later on, scholars attempted to combine social and geophysical vulnerability within other concepts, such as “environmental vulnerability” (Boruff & Cutter, 2007), “vulnerability of people and places” (Cutter et al., 2000), and “vulnerability and place” (Colten, 2006). Whether vulnerability of social system or biophysical system or both, attempt to understand vulnerability has always concerned with the weakness of the system rather than strength (Berkes, 2007). In recent years, natural disaster scholarship has witnessed a paradigm shift: from weakness to strength (i.e., building resilience of communities in the face of natural disasters). If vulnerability is understood in terms of potential of loss and/or damage then resilience can be understood as the capacity to recover from loss and/or damage and to move forward despite losses and damage. Based on this definition, in this chapter, I try to elaborate

the recovery process from losses and/or damage at household and community levels, and how individuals and community adapt with flash flood hazards.

To address the first objective (i.e., economic loss and recovery process) of my thesis, I draw insights from the above discussion and examine the vulnerability of the wetland community in terms of economic loss and damage (both direct and indirect loss) due to flash flood disasters (discussed in Section 3.5), resilience of wetland-communities to flash flood disasters in terms of coping mechanism and recovery strategies at both household and community levels (discussed in Section 3.6).

3.3 Human agency, response to flash flood hazards, and community resilience

Conceptually, adaptive capacity links resilience to vulnerability. A resilient system is said to be more adaptive; and in other words, a vulnerable system is less adaptive to shocks (e.g., flash floods). However, vulnerability does not necessarily mean less resilient (Aker & Mallick, 2013). Adaptive capacity or adaptability is mainly a social function of social-ecological system, meaning “the capacity of actors in a system to influence resilience” (Walker, Holing, Carpenter & Kinzig, 2004, p. 3; Folke et al., 2010, p.3). Folke et al., (2010) argue that adaptability is one of the prerequisite for SES resilience. Brown and Westaway (2011) view adaptive capacity as a latent characteristic that must be activated for successful adaptation. It is seen as an attribute of a system at multiple scales (e.g., individual, community). Drawing on the *integrated approach of community resilience*, here I endeavor to understand the role of human agency in community resilience. The *integrated approach of community resilience* provides valuable insights of how human agency plays a crucial role in coping and adaptation with flash flood-hazards both at individual and community levels, because this approach helps to understand adaptive capacity at multiple scales (e.g., individual, community) considering agency as the key factor (Berkes & Ross, 2013). I argue

that agency is the key in understanding adaptive capacity at both levels. The process through which social aspects or human factors influence aspects of resilience requires more attention is hinted to in numerous studies, and yet to be fully explored. Moreover, in the environmental change literature, human agency still remains the “black box” (Brown & Westaway, 2011, p. 326). In this chapter, I explore the aspects of community resilience by unfolding the process through which human beings as a group or individuals adapt to natural disasters by focusing on the role of human agency.

Agency is predominantly conceptualized at the level of the individual. Agency is generally defined as the “capacity of individuals to act independently and to make their own free choices” (Brown & Westaway, 2011, p.322). To understand agency dynamics at individual level, I draw insights from Pierre Bourdieu’s theory of *habitus*, and Anthony Giddens’ idea of agency. A *habitus* is a system of ‘durable, transposable dispositions’ and these dispositions embody quite specific ‘generative schemes’. These schemes of the *habitus* operate below the level of consciousness. The *habitus* involves a non-discursive form of practical knowledge that gives a practical sense of what to do and how to do. By virtue of the *habitus*, people get a practical sense of the social structure through which they unreflectively and routinely orient themselves to each other. *Habitus* is spontaneity without consciousness (Lopez & Scott, 2002; Swartz, 1997). In Giddens’ (1984) view, most individuals' actions are the result of routine activity rather than 'conscious strategy'. Giddens emphasizes the variation resulting from the exercise of agency, the structural constrain within which agents operate, and the intended and unintended consequences of individual actions (Cleaver, 2007). *Habitus* provides practical knowledge of action- the unintended and unacknowledged consequence of action (Guzman, 2009; Swartz, 1997). Giddens (1984) highlights three types of consciousness (*structure of signification*), namely *discursive* (*those actions and belief that agent are able to bring into discursive scrutiny*), *practical* (the taken-for-granted everyday

practice that are part and parcel of every day practice and rarely subject to scrutiny) and *unconscious*. In this research, I examined whether individuals' response to flash flood hazards is a manifestation of *habitus* (e.g., unconscious action) or not (e.g., discursive or practical consciousness). How individuals orient themselves to flash flood hazard in terms of coping, adapting, and transformative sense is the pertinent issue here.

Disaster response and recovery depends, in part, on the ability to act collectively. A community's ability to act or respond collectively in the face of disaster is known as "community capacity", "collective efficacy" (Mancini, Bowen & Martin, 2005, p.574-575) or "collective agency" (Newman & Dale, 2005). Collective agency is more than the sum of individuals' agency (Bandura, 2000). In resilience thinking or social-ecological system thinking, adaptability or adaptive capacity is a social component, which is similar to the idea of collective agency (Berkes & Ross, 2013)

The community resilience concept is best applied to a place-based community (Berkes & Ross, 2013). Place-based community as a collective unit has a "historical intimacy" with its land. Berkes and Ross (2013) identify several factors that help place-based community to foster resilience and to respond to shocks and stresses. These factors are: "people-place connections; values and beliefs; knowledge, skills and learning; social network; engaged governance (including collaborative institutions); a diverse and innovative economy; community infrastructure; leadership; and positive outlook, including readiness to accept change"" these strengths are drawn into combined influence through agency and self-organizing" (P.14-15). However, communities are not always a homogeneous unit (Coffé, & Geys, 2006; Trawick & Howsen, 2006; Aldrich, 2011). Even place-based communities are divided into different lines like race, ethnicity, and interest. Often differential connection of community members with different organization and powerful groups may result in differential outcomes; in this regard, Aldrich's (2011) finding in the case

of tsunami affected people in the Southeast India is worth citing. Therefore, it would be interesting to explore the factors that hinder community people to act collectively in the face of natural adversity.

I draw insights from the above discussion to examine part of the second objective (i.e., resilience and response strategies of individuals and human community toward flash flood hazards). In this regard, Section 3.7 elaborates resilience and response strategies of individuals and community toward flash flood hazards by unpacking agency dynamics at both levels.

3.4 The wetland-community

3.4.1 Defining and delineating the boundary of community

The goal of this section is to provide a working definition of “community” and to set a boundary of community for the operational purpose of this research. Broadly, my research draws insights from two scholarships, namely social-ecological system resilience scholarship and natural hazards/disaster resilience scholarship. Defining and setting an operational boundary of community is important from both conceptual and methodological points of view. Conceptually, it is important because often within social-ecological system resilience and natural hazards/disaster resilience scholarship, community holds different meanings, with misleading interpretations. “Community level” offers the space for the opportunity for convergence between these two disciplinary streams. Methodologically, it is important because defining and setting a boundary helps to focus on a delineated area for in-depth understanding. To define and to set boundary of community, it is important to understand first how community is defined within the two stated streams, and second how community is defined in broader terms in other streams. Insights from these streams would help to formulate a working definition of community as we all setting an operational boundary.

First, let us look at how community is defined in other literature, such as community development, community psychology, and sociology; apart from the social-ecological system resilience and natural hazards/disaster resilience literature. Sociologists such as, MacIver and Page (1981) define community on the basis of two criteria, namely i) locality or geography, and ii) community sentiment. Community means an area of living. Heller (1989) argues that the factor that holds community together is not locality, but is rather a common interest around which social relationships develop. He goes further identifying community as collective political power. Power resides within a community of like-minded people, who come together to reduce structural and other barriers that prevent community from transforming. In similar vein, Bhattacharyya (1995) identifies two interconnected characteristics of community, such as solidarity and agency. In summary, community can be defined as a group of people living in a delineated area having some characteristics in common, such as sources of livelihood, and risk. Community is also a space for collective action.

The term community frequently appears in the social-ecological system resilience literature, often in combination with other words, such as “Arctic community” (Berkes & Jolly, 2001), “human community” (Gunderson, 2010), “fishing communities” (Blythe, 2015), and “resilient communities” (Broderstad & Eythórsson, 2014). Noticeably, authors rarely define what community means within these contexts. Berkes and Ross (2013, p.9) opine that “scholars tend to look for social-ecological systems, rather than communities” (i.e., within social-ecological system resilience literature, community is conceptualized as an integrated social-ecological system). Social-ecological systems and communities are used synonymously and interchangeably. Adger (2000) argues that social resilience is linked to ecological resilience in terms of ecosystem services and livelihood activities. Therefore, a resources dependent human system can be treated as integrated social-ecological systems or

communities. For example, small scale fishing communities are integrated social-ecological systems. Berkes and Ross (2013) argue that resilience best applies to resources-dependent place-based communities.

In natural hazard/disaster resilience scholarship community is defined in various ways. Norris, Stevens, Pfefferbaum, Wyche and Pfefferbaum (2008, p. 128) define community as “an entity that has geographic boundaries and shared fate”, Cutter et al. (2008, p.599) defines community as “...the totality of social system interacting within a defined geographic space such as a neighborhood, census tract, city or country”. Under the CDMP project, the Ministry of Food and Disaster - Bangladesh (2009) defines community in the context of disaster as a group of people living in a delineated area that are affected by specific disaster or at risk of specific hazard. Under National Plan for Disaster Management Bangladesh - (2010-2015), the lowest geographical unit of intervention is Union Parishad. One common theme that appears from these definitions is the concept of space or place (i.e., a human system residing within a geographical space). Space or geography has a clear connection with natural hazards or disaster (Zhou, Wan, & Jia, 2010). The potential impact and nature of hazards are place specific; that is why disaster resilience is also context specific.

In conceptualizing and defining community, there appears to be a strong point of convergence between social-ecological system resilience scholarship and natural hazards/disaster resilience scholarship. One common theme that appears in both of these scholarships is the idea of “place”. Definition and conceptualization of community within these two scholarships are linked through “place”. Place is also a common theme in other literature as well, such as sociology, and community development. Drawing insights from the literature, I define “wetland-community” (in broader term) as a resources-dependent place-based community having some specific attributes, such as i) people living in the wetland area

who rely on wetland ecosystem services for their livelihood; therefore, wetland-community can be treated as an integrated social-ecological system; ii) the potential impact of hazards have some spatial expression (i.e., some of the hazards the community faces is specific to that place). For example, wetland-community living in the Meghalaya mountain chain is prone to some specific natural hazards, like flash floods; iii) because of resources dependency and nature of the natural hazards, place relates to resilience and vulnerability (both social and physical); and iv) community is a space for collective action. Here, the question that remains is how and where to set boundary of community for operational purpose.

Based on the broad definition and the specific attributes, I set the operational boundary of community shown in Figure 3.1. Here the livelihoods of people depend on the *Karcharia haor*; people living in this delineated area have common sources of livelihood and risk. This area is under the jurisdiction of Fotepur Union Parishad in terms of disaster management. These people live close to the embankment that protects *haor* from early flash flood. This embankment is the space for collective action for community people, because when the embankment breaches then they collectively try to stop the breaching to save the crops (*boro*). Therefore, the villages within the area (shown in Figure 3.1) are considered as community for operational purpose of this research.

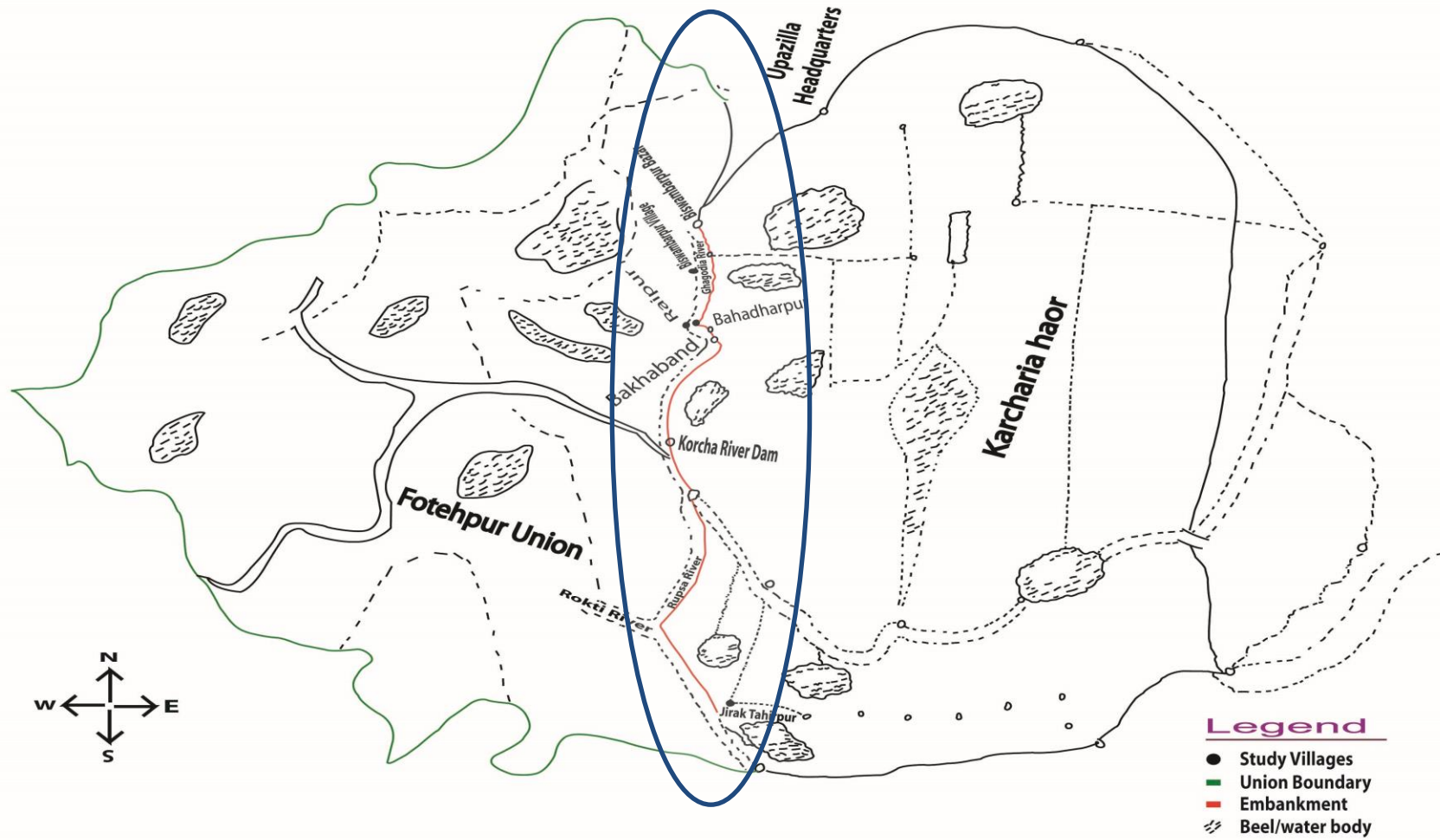


Figure 3.1: Boundary of the study community

3.4.2 Profile of study villages and villagers

a. Description of Fotehpur Union and selected villages

Fotehpur Union consists of nine wards and 43 villages. Its total area is 39.56 square kilometer with a total population of 28,390. The total numbers of people per household are 5.974. The literacy rate is 32%. 65% of households are at risk of various hazards, including flash floods. This union has a history of natural disasters; for example, this union was affected by monsoon flash flood disasters in 1988, 1998, and 2007; and by early flash flood disasters in 1994, 2004. Apart from flash flood, it was also affected by a hail storm in 2011 and by a drought in 2008. The hail storm in 2011 completely damaged the *boro* crops, and the drought severely affected production of *boro* crops. This union has seven primary schools and three high schools that are often used a flood shelter (Plate 3.2). Apart from primary and high schools, people also use UP center as a flood shelter.



Plate 3.2: Image of a multipurpose flood shelter

For my study, I have carried out household surveys in five villages and participatory research in four villages. As I have mentioned in Section 2.5.1, the selection of study villages followed some specific criteria: i) the connection of villages with the *Karcharia haor* in terms of livelihoods (e.g., crop cultivation and fishing), ii) their degree of vulnerability to flash flood hazards, iii) occupational diversity, iv) influence of remittance and migration, and v) religion . The villages I selected, based on these criteria, were *Jirak Tahirpur*, *Katakhali*, *Bishwambarpur*, *Raipur*, and *Bahadarpur*.

The village *Jirak Tahirpur* is located at the end of the embankment with a travel distance of six to seven kilometers from Bishwambarpur Upazila Headquarters. This village has a population of diverse occupational groups, but most of the people make their living on crop cultivation on the *Karcharia haor*. Other occupational groups include fishers, day laborers, and self-employed people. One key characteristic of this village that distinguishes it from other villages is that a large proportion of the population is from Hindu religion and their primary source of livelihood is crop cultivation. They are basically a cultivating caste. They have surnames, such as *Sarkar* and *Talukdar*.

Katakhali village has slightly mixture of people of different occupational groups, but a large part of the population makes their living on fishing. This village has three different characteristics that distinguish it from other villages. First, there is in-flow of foreign remittance into this village; second, the majority of the fishers are Muslims and they are locally called *Maimol*; and third, a good portion of male population seasonally migrates for work. There is an informal system in this village through which people in a group seasonally go to other places for work; this system is locally called *Sordari* system. Here *Sardar* means leader. They form a group, which is typically led by a leader.

Bishwambarpur village is close to Bishwambarpur Upazila Headquarters, and Bishwambarpur bazar. The majority of the populations of this village are Muslims with a mixture of different occupational groups. A good part of the population relies on crop cultivation. The majority of the peasants are Muslims and they do crop cultivation mostly on the *Karcharia haor*. One key attribute that differentiates this village from other villages is that it is in close proximity with Bishwambarpur Upazila Headquarters, and Bishwambarpur bazar. Because of close proximity with Bishwambarpur bazar, a good portion of population of this village work as day laborer. They work at Bishwambarpur bazar area for works that require manual labor.

Raipur and Bahadarpur villages hold very similar characteristics, but different from other villages. Most of the people are from Hindu religion and fishing is the main source of livelihood. Fishing includes catching and selling fish, fish business, and dry fish business. Fishing is their inherited occupation (i.e., they belong to a fishing caste). They heavily rely on the *Karcharia haor* for their livelihood, but due to leasing system and changing pattern of social relationship, they often are excluded from accessing the resources.



Plates 3.3: The above images show the biophysical exposure and sensitivity of community people to flash flood hazards.

b. Socio-economic characteristics of the respondents

1. Sources of income and occupational distribution

As the wetland-community is a resources dependent community, two main earning sources are agriculture and fishing. Out of 109 household surveyed, agriculture is the main source of earning of 47 households (43.1%), and fishing is the main source of earning of 31 households (28.4%). Thus 71.6 % households' main earning source is either agriculture or fishing. Fish business (buying and selling) is the main occupation of 6.4% households. 3.7% household heads' main occupation is working as a boatman. 22.0 % households reported agriculture as their secondary sources of earning, and 17.4 % households reported fishing as the secondary source of earning. Fish business and day labor is the secondary source of earning of 11.9% and 19.3 % households respectively. It is evident from the data that fishing and agriculture are main sources of livelihood of the community people (Figure 3.2 and 3.3).

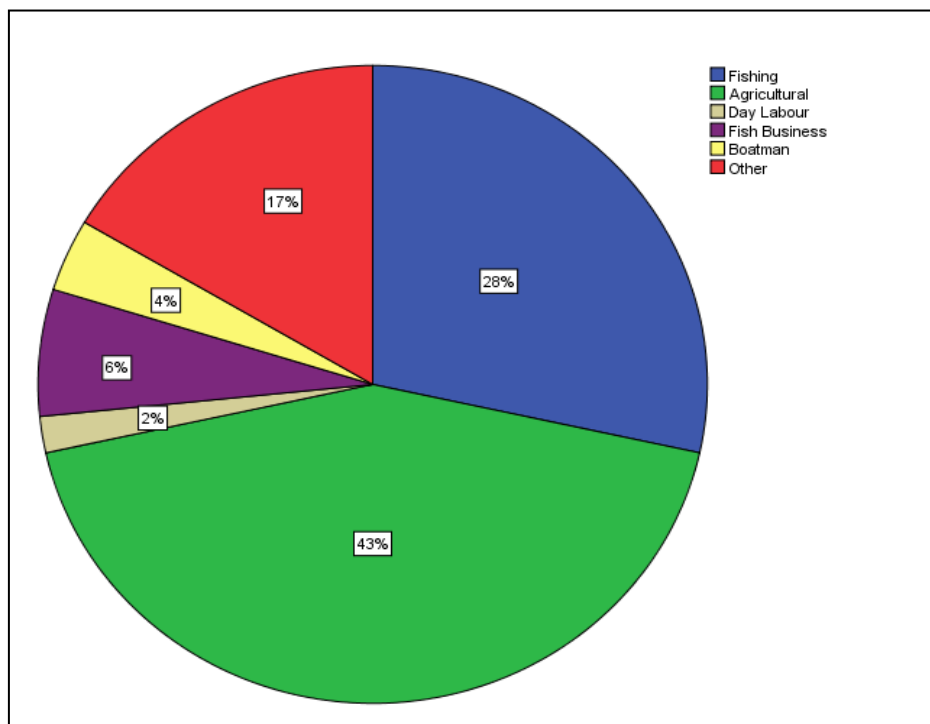


Figure 3.2: Main occupation of households (n=109) in Fotehpur Union, field survey data

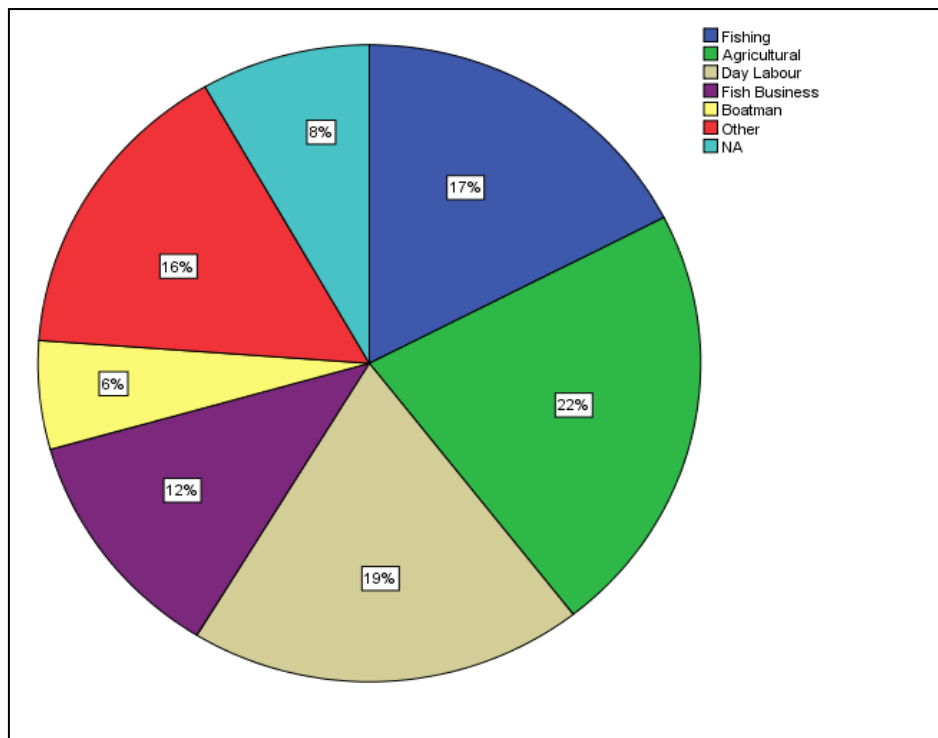


Figure 3.3: Secondary occupation of the respondents (n=109) in Fotehpur Union, field survey data 2014

2. Land ownerships, income and wealth status

On the basis of agricultural land ownership, I divided peasants into five categories. The majority of the households I surveyed have no agricultural lands. 37.6% of the respondents are small and marginal peasants, only 7.2% and 1.8% of the respondents are medium and large peasants respectively (Table 3.1). As mentioned above, 43.12% households' main income source is agriculture. The majority of the households relying on agriculture are small and marginal peasants.

Table 3.1: Agricultural land ownerships (n=109)

Categories of peasants	Amount of land (hectares)	Percentage of households
Landless	0	53.2
Marginal	0.2	11.0
Small	0.2-0.6	26.6
Medium	0.6-2.2	7.2
Rich	2.2>	1.8
Total		100

Source: Field survey data, 2014

According to the World Bank (2015) definition, if an individual has a daily income less than US \$ 1.25 then he/she belongs to below poverty level. It is evident from Table 3.2 that 6.4% of households have daily incomes less than US \$ 1.25. Almost half (49.5%) of the households have daily incomes less than US \$ 2.5. The data in Table 3.3 reveal that 24.8 % of households have no property, they either live on *khash* land or they live on a land that is owned by others. 47.7 % of the household has property which worth of less than US \$ 323 (25,000 BDT).

Table 3.2: Average daily income of households (n=109)

Income (US \$ ⁵)	Frequency	Percentage	Cumulative percentage
<1.25	7	6.4	6.4
1.25-2.5	47	43.1	49.5
2.5-3.75	25	22.9	72.5
3.75-5.0	13	11.9	84.4
5.0-6.25	5	4.6	89.0
6.25-7.5	5	4.6	93.6
7.5-8.75	2	1.8	95.4
8.75>	5	4.6	100

Source: Field survey data, 2014

⁵ 1 US \$ = 77.39 BDT on 18/06/2015

Table 3.3: Amount of moveable and non-moveable property (in US \$)

Amount	Frequency	Percentage	Cumulative percentage
0	27	24.8	24.8
<323	52	47.7	72.5
323-646	18	16.5	89.0
646-969	3	2.8	91.7
969-1292	5	4.6	96.3
1292-1615	2	1.8	98.2
1615>	2	1.8	100

Source: Field survey data, 2014

3. Demographic profile

In terms of formal year of education, it is evident (Table 3.4) that 48.6% of the household head has no formal education. A total of 84.4% household head has education below the primary level. In terms of earning members and size of the household, 60 % household has a single earning member (Table 3.5). Among the single earning member, 80% of the household heads are required to support more than four up to ten household members.

Table 3.4: Formal years of schooling

Years of schooling	Frequency	Percentage	Cumulative percentage
No schooling	53	48.6	48.6
1-5	39	35.8	84.4
6-10	17	15.6	100
Total	109	100	

Source: Field survey data, 2014

Table 3.5: Cross tabulation between number of earning members and total number of household members (n=109)

Number of earning members	Total number of household members							Total	
	2-4	4-6	6-8	8-10	10-12	12-14			
1	13	36	15	1	0	0	65	100 %	60 %
	20.0%	55.4%	23.1 %	1.5 %	0 %	0 %	100 %		
2	7	10	3	2	1	1	24	100 %	22%
	29.2 %	41.7 %	12.5 %	8.3 %	4.2 %	4.2%	100 %		
3	0	2	4	5	3	2	16	100 %	14%
	0 %	12.5 %	25%	31.2%	18.8%	12.5%	100 %		
4 or more	0	0	2	1	1	0	4	100 %	4 %
	0%	0%	50%	25%	25%	0%	100 %		
Total	20	48	24	9	5	3	109	100 %	
	18.3%	44.0%	22.0%	8.3%	4.6%	2.8%	100 %		

Source: Field survey data, 2014

3.5 Community vulnerability to flash flood hazards

3.5.1 Temporal (inter-annual and seasonal) variability and differential impact: Climate change and increased risk

Flash floods are generally characterized by “rapid occurrence” with no early warning and time to prepare. Typically, they are caused by the heavy downstream of run-off of water within a limited place and short period of time (Collier, 2007, p.3; BWDB, 2014). However, the causes of flash floods are many and they vary in terms of geographical region. In most cases flash floods are caused by “...thunderstorm activity, slow-moving or stationary cyclones, both tropical and extra-tropical, and intense monsoon rainfall” (Smith & Ward, 1998, p.125). For example, flash flood in Nepal is caused by mountain glacier induced by earthquake (Vuichard & Zimmermann, 1986), in France and in Bangladesh it was caused by

heavy rainfall (Delrieu et al., 2005; BWDB, 2014). Apart from natural causes, flash floods may be triggered by anthropogenic causes. For example, Gentry and Lopez-Parodi (1980) documents that flooding has increased in the upper Amazon area due to increased deforestation, which results in increased run-off. Global evidence also suggests that increased deforestation and associated landscape changes amplify flood risk and severity in developing countries (Bradshaw, Sodhi, Peh, & Brook, 2007). Van et al., (2009) highlight that population density can alone explain up to 83% variation in flood occurrence.

Flash flood often causes loss of human lives and damage to properties. For examples, flash floods in the Gard area in the Cévennes–Vivarais region in France killed 20 people and damaged property of US \$1 billion (Delrieu et al., 2005); in Fort Collins, Colorado, U.S.A in 1997 a flash flood caused US \$100 million and damaged 1500 homes. These two examples from developed countries illustrate very high vulnerability of economic assets; however, in these countries, rapid disaster management and response system, along with rigorous recovery mechanisms could minimize social vulnerability. The impacts of flash floods are more severe on the marginalized, vulnerable communities of the developing world. For example, flash floods in Vietnam, Nepal or the north-east part of Bangladesh not only damage property but also adversely affect the livelihoods of a sizeable population.

The intensity and variability of flash flood is often found to be linked with climate change. It is often found that hydrological changes, such as changes in the frequency and intensity of precipitation pattern are often linked to global warming. For example, it is found that an increase in 2°C temperature can increase 10% intensity of precipitation. Precipitation patterns are largely determined by the temperatures in adjacent mountainous regions. As a consequence, communities, especially foot-hills communities around the world are more frequently affected by flash floods in recent times than ever before, especially because of the change in precipitation pattern due to global climate change (Allamano, Claps, & Laio,

2009). Wetland-communities in Bangladesh are situated in the foot-hills of Meghalaya mountain chain. Annual precipitation pattern in the Indian state of Meghalaya has increased over the past hundred years but the numbers of rainy days have decreased (Jain & Kumar, 2012); therefore, wetland-communities in Bangladesh are now at more risk of flash flood hazards than ever before.

Apart from the increased intensity of precipitation, there is also an inter-annual and seasonal shift in precipitation patterns due to climate change, which makes flash flooding

Box 3.1: Danger level and water level

This danger level (8.25 mPWD) is for Surma River (station SW269, located in *Sunamganj Sadar* Upazila of *Sunamganj* district). Map 3.1 shows the location of water measurement point (SW269). Danger level at a river location is defined as "the level above which it is likely that the flood may cause damage to nearby crops and homesteads" (FFWC, 2015). Danger level is annual average flood level in a river where there is no embankment. For a river having embankment, danger level is slightly below the design flood level of embankment. Water levels are referred to Public Works Datum (PWD) by Bangladesh Water Development Board (BWDB). "...PWD is a horizontal datum believed originally to have zero at a determined Mean Sea Level (MSL) at Calcutta. PWD is located approx. 1.5 ft below the MSL established in India under the British Rule and brought to Bangladesh during the Great Trigonometric Survey" (FFWC, 2015).

highly variable in terms of temporality (Bronstert, 2003). Flash floods in wetland areas in Bangladesh have temporal variability. Flash floods can be divided into three temporal phases, such as early flash flood (April to May), monsoon flash flood (June to August), and post-monsoon flash flood (August to November). Often there is no differentiation made between monsoon flood and monsoon flash flood. For example, National Plan for Disaster Management (2010-2015) of Bangladesh differentiates different types of floods. It documents that flash flood occurs during April to May and September to November, and monsoon flood occurs during June to September. But flash flood can also occur in monsoon period because of the localized precipitation pattern.

Temporal variability of flash flood and the difference between normal (*Borsha*) and abnormal (*Bonna*) flooding can be explained by the following figures (3.4, 3.5, 3.6, and 3.7).

In 2004 (Figure 3.4) flash flood occurred in pre-monsoon (early flood), monsoon and post-monsoon period. In 2011 (Figure 3.5) is a typical example of *Borsha*, where the water level did not cross the danger level (8.25mPWD, box 3.1 defines danger and water level). Figure 3.6 is a case of monsoon flooding (*Bonna*), and figure 3.7 is a case of post-monsoon flooding (*Bonna*) because in both cases flood water went above danger level (8.25mPWD). *Borsha* becomes *Bonna* (abnormal flooding) during monsoon and post-monsoon period when water level goes above danger level. However, this relationship between water level and flooding does not hold for pre-monsoon or early flooding. Early flash flood becomes disastrous when water inundates *boro* crops; in this case water level may or may not go above danger level. Here early arrival of monsoon (April-May in Figure 3.4) or *Borsha* inundates the *haor* and causes crops loss.

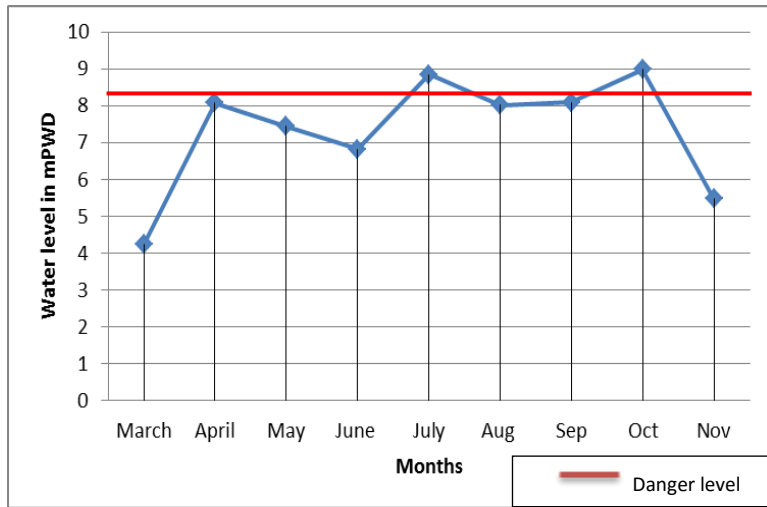


Figure 3.4: Water level of Surma River in 2004

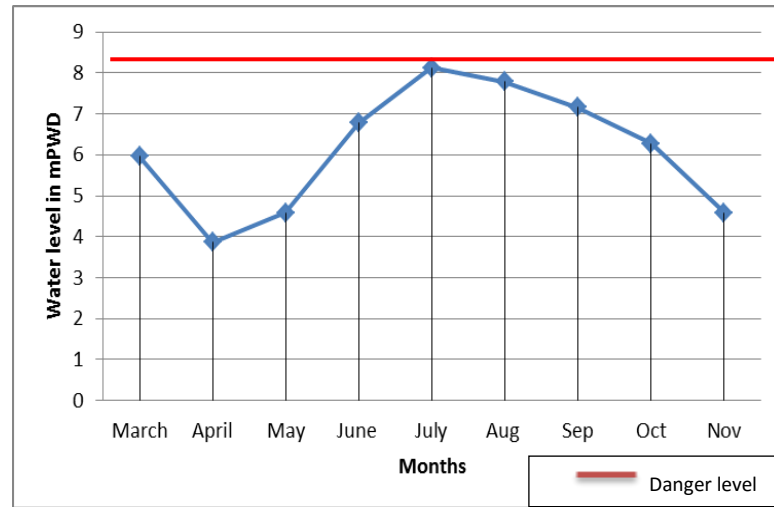


Figure 3.5: Water level of Surma River in 2011

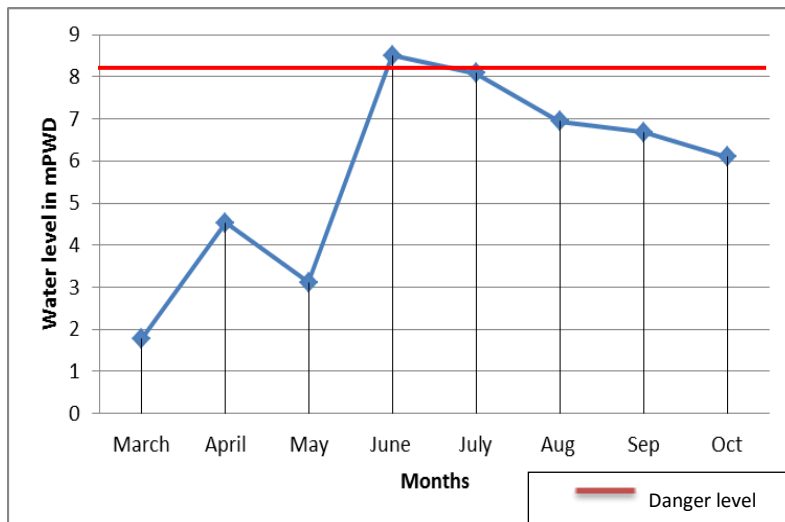


Figure 3.6: Water level of Surma River in 2006

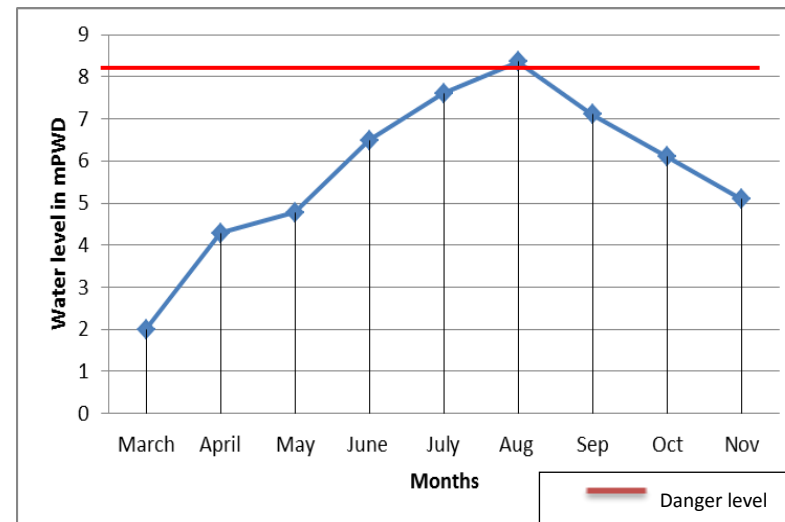


Figure 3.7: Water level of Surma River in 2009

Data Source: North-Eastern Measurement Division, Water Development Board, Bangladesh, 2014

The temporal variability of flash flood has differential impact on community people. One of causes of differential impact of temporal variability of flash flood is due to the spatial distribution of a community. Due to the spatial dimension, the nature of ecosystem and ecosystem services tend to vary. Because of spatial distribution of community, the nature of agricultural land and crop cultivation practices vary. For example, Fotepur Union has a unique geographical location; it located in the deep *haor* (see study area map 2.1). Because of its geographical location most of the lands are low and very low (Table 3.6). Therefore, they can produce a *boro* or *IRRI* crop once in a year (dry season). They are unable to grow paddy during wet season because all the agricultural lands get inundated. Other unions in Bishwambarpur Upazila have high, medium-high, and medium-low land where people can produce crops two or three times a year.

Table 3.6: Classification of land and amount in Bishwambarpur Upazila

Land type	Characteristics	Amount (Hectares)
High land	Not inundated by normal monsoon flooding	2,770
Medium high land	Flood level of 10 cm of water during normal monsoon flooding (<i>borsha</i>)	5,190
Medium low land	Flood level of 90-180 cm of water during normal monsoon flooding (<i>borsha</i>)	3,820
Low land	Flood level of 180-275 cm of water during normal monsoon flooding (<i>borsha</i>)	5,175
Very low land	Flood level of more than 275 cm of water during normal monsoon flooding (<i>borsha</i>)	545

Source: Bishwambarpur Upazila Agricultural office 2014

This temporal variability of flash flooding has differential impact on social-ecological systems, and specifically on social structure in terms of loss and damage. A localized example of differential losses due to temporal variability of flash flood is shown in Table 3.7. Usually early flash flooding (typically early April) causes *boro* or *IRRI* crop loss, because the

haor becomes inundated; monsoon flash flood (typically June to August) causes homestead loss, temporary displacement and damage of seasonal vegetables; and post-monsoon flash flood (typically August to September) causes homestead loss, temporary displacement and damage of winter vegetables.

Table 3.7: Seasonal variability of flash flood and differential losses of crops

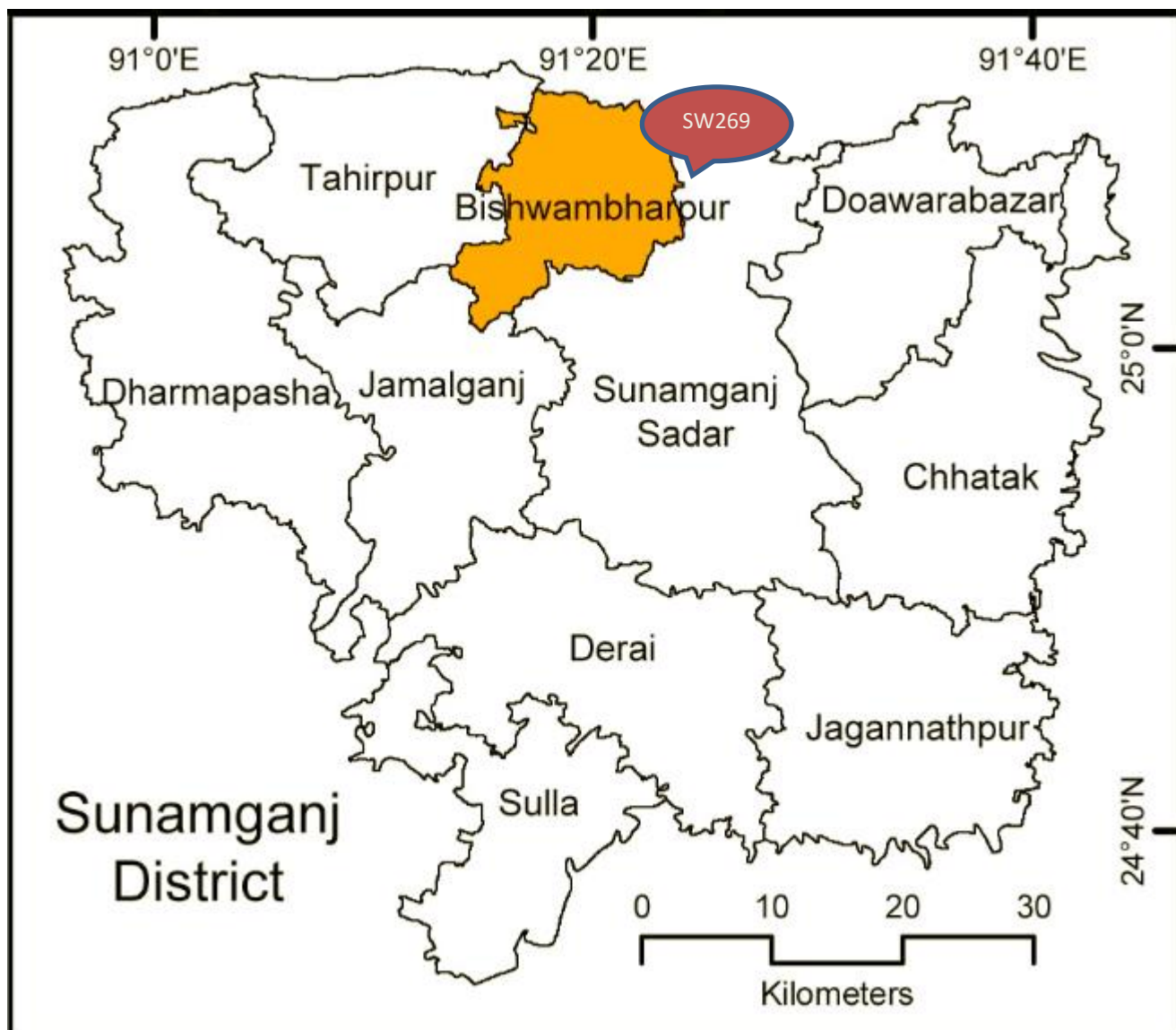
Crops	Flooding by months											
	April- May (Early Flash flood)	May- June	June- July	July- Aug	Aug- Sep	Sep- Oct	Oct- Nov	Nov- Dec	Dec- Jan	Jan- Feb	Feb- March	March- April
		Monsoon flash flood			Post-monsoon flash flood							
Boro/Irri crops												
Vegetable												

Source: Field survey data, 2014

Temporal variability of flash flooding has differential impact on *haor* ecosystem and ecosystem services. Flash floods play a dual role in shaping ecosystem services and affecting ecosystem as a whole. Early, monsoon, and post-monsoon flash floods often create positive impacts in terms of fish production. For example, if water comes early and stays for longer period of time, it increases fish production. Monsoon and post-monsoon flash floods bring fish from other water bodies, such as nearby ponds, rivers, and *beels*. Due to geographical location of the *Karcharia* and other *haors* in downstream location, monsoon and post-monsoon flash floods bring silt rather than coarse sandy sediment that makes agricultural land fertile. Moreover, people collect a substantial amount of fuel wood during monsoon that comes with flood water from upstream area. Sedimentation is a big problem for peasants in the upstream region. Because of sedimentation, peasants in the upstream regions are often unable to grow paddy. However, siltation has negative impacts on *haor* ecosystem in the long run, as such siltation gradually reduces the water carrying capacity of water bodies (*beels*) inside the *haor* and adjacent rivers. These increase the risk of early flash floods to affect

boro/IRRI crops, and create other additional problems during dry season, such as lack of water for domestic use, breaching transportation and communication (e.g., boating).

In sum, the temporal variability of flash flood has both positive and negative impacts on wetland-communities. Flash floods are (whether early, monsoon, post-monsoon) always appear to be beneficial for fish production. However, early flash flood is a hazard for paddy production and post-monsoon flash flood is a hazard for vegetable production. Monsoon and post-monsoon flash floods cause damage to homesteads. Siltation is beneficial in the short-term as it helps to increase paddy production, but deleterious in the long run because it reduces water carrying capacity that increases the risk of flash flood in general and early flash flood in particular.



Map: 3.1: Location of water measurement point (Station ID-SW269) at Sunamganj district

3.5.2 Loss and/or damage due to past big flash flood disasters

Loss and damage is a relatively new concept in the climate change literature. Loss and damage refers to the adverse impact on human systems. It may result directly from climate change because climate change results in extreme weather events, such as flash floods and slow onset events like drought. It may also result from a change in the ecological system such as biodiversity loss. To address loss and damage, it is necessary to understand the kinds

of events and processes that results from climate change in general and extreme weather events in particular.

Defining loss and damage still remains a contested area. There is no agreed definition of loss and damage, even under the UNFCCC. Often, these two terms are used interchangeably and sometimes are used as one composite idea to denote a phenomenon (e.g., adverse effect of climate change). However, the Cancun Agreement sets a boundary when it relates loss and damage with impact of extreme weather events and slow onset events. Loss and damage were defined both in broader sense and also in narrower sense. In broader sense, it is defined as the “...negative effects of climate variability and climate change that people were unable to cope with or adapt to” (Warner & Geest, 2013, p.369) The Damage and Loss Assessment (DaLa) methodology defines damage as “the monetary value of partially destroyed assets, assuming that assets will be replaced in the same condition – in quantity and quality – as before the disaster”, and defines loss as “...changes in the flow of goods and services that will not be forthcoming until the destroyed assets are rebuilt, over the time span that elapses from the occurrence of the disaster to the end of the recovery period” (Surminski, Lopez, Birkmann, & Welle, 2012, p.9).

Few key issues that appear from these two definitions are: first, damage relates to immediate and short term impact and loss relates to long term impact due to the inability to recover from damage (i.e., there is a temporal dimension in understanding loss and damage); and second, damage is measured through monetary value (i.e., quantifiable). Loss may not be quantifiable, may have intangible value. Loss is also differentiated as direct and indirect. Direct and indirect losses relate to the direct and indirect impacts of extreme weather events respectively, direct losses result from direct impact of an event, such as floods and indirect losses results from direct losses. Example of direct loss is crop loss also referred to as direct damage (Bradshaw, 2003, p.9), and example of indirect loss is loss of income due to crop

loss. It is easier to identify loss and damage for shocks, but more complicated to identify for stress due to the complexity with temporal issues.

I define damage in operational terms, as partially destroyed assets and loss in terms of completely destroyed assets incurred by the direct impact of flash flood – measured in monetary value. My focus is on past big flash flood events, specifically monsoon or post-monsoon flash floods that damage houses and property. I tried to estimate loss and/or damage at household level. Losses and/or damages are estimated at current market value.

I surveyed 109 households and found that direct losses and/or damages are to crops, livestock, property (e.g. housing), and fuel/fodder (Table 3.8). 11% of the total household surveyed has loss and/or damage of crops that is worth US \$ 257.04 or more (Table 3.8). The largest amount of crop loss is US \$ 1929.77. 46.8 % households experienced some degree of crop damage. These crops were stored inside their houses while flood water damaged them. Likewise the 2007 flood also damaged partially or completely other assets, such as houses, fuel, fodder, livestock, and also causing health problem that causes monetary losses. In terms of total damages and/or losses, 56% of the total households surveyed faced damages and/or losses at least US \$ 25.71 or more. The largest amount of total loss and/or damage by a household was US \$ 3110.14. Overall 95.4% of households suffered from different types of damages.

Table 3.8: Damage and /or loss due to 2007 flood, Fotehpur Union

Items	Percentage of households	Amount (US \$ ⁶)	Highest level of damage and/or losses by a household	Percentage of loss and damage at household level
Crops	11	257.04 or more	1929.77	46.8 % households with some degree of crop damage
Monetary loss due to health problem	26.6	25.71 or more	642.59	48.6 % households with some degree of monetary loss due to health problem
Property (housing)	46.8	128.39 or more	1362.29	85.3 % households with some degree of property damage
Livestock (e.g., ducks, chickens, cow)	22.9	128.39 or more	1285.18	35.8 % households with some degree of livestock damage
Fuel for domestic use	46.8	12.86 or more	257.03	67.9 % households with some degree of fuel damage
Fodder	19.3	12.86 or more	385.55	20.2 % households with some degree of fodder damage
Total damages and/or losses	56	25.71 or more	3110.14	95.4 % households suffered from some degree of damage

Source: Field survey data, 2014

Prior to the 2007 event, the community people also experienced a big early flash flood event in 2004 that severely damaged the *boro* crops in the field. A total of 53.2 % of the total household surveyed had lost 75% to 100% of their crops, and 61.5% household had some degree of loss and/or damage. Out of 61.5% of the households, 51.37% household lost all (100 %) crops (Table 3.9). Here, 38.5 % of households did not yield crops in 2004, or they are either fishers or of other occupational groups. Apart from the early flash flood, community people also experienced a hail storm in 2011 that severely damaged crops. In

⁶ 1 US \$ = 77.81 BDT on 05/03/2015

2014, they also experienced flash floods in post-monsoon period (discussed in Chapter five in detail).

Table 3.9: Degree of loss and/or damage of *boro* crops in 2004 early flash flood, Fotehpur Union

Percentage of loss and/or damage	Frequency	Percentage	Cumulative percentage
25-50	7	6.4	6.4
50-75	2	1.8	8.3
75-100	58	53.2*	61.5
Non peasants (Not applicable)	42	38.5	100
Total	109	100	
* 51.37 % household lost almost 100 % crops in 2004 early flash floods			

Source: Field survey data, 2014

3.5.3 Survival against flash flood disasters: A lifelong struggle

The above discussion illustrates that the direct impact of flash flood during early monsoon, monsoon, and post-monsoon period had damaged assets (either homestead or crops, or both) completely or partially. These losses and/or damage were a severe setback for the community in terms of normal functioning of their daily lives, such as fulfilling the basic needs of household members, and dropout of children from schools. These losses and/or damages have long term cascading adverse effect, such as further loss of assets, falling into a vicious cycle of money lending, micro credit, leading to an eventual poverty trap. Because of the frequent natural disasters, community people experience additional asset loss before they fully recover from past disaster losses, which exacerbates their vulnerability further. These indirect impacts create a downward mobility in the socio-economic domain. In the following paragraphs, I attempt to illustrate the

Box 3.2: Vicious cycle of money lending and micro credit

Mohammed Rahim, age 60, lives in Bishwambarpur village. His family consists of six members, but he is the only earning member of his family. He does not possess any agricultural land and lives on *khash* land. He primarily lives on fishing, but sometimes does fish business. In the 2007 flood, he lost fish that was worth 20,000 BDT, which he brought for his business. He brought the fish for business taking a loan from a *mohajan*. Apart from the fish he brought for business, he also lost a boat that was worth 12,000 BDT. After flood, his family members suffered from diarrhea, and other diseases that caused him to spend another three thousand taka. In an effort to recover from losses he took loan from multiple sources. He states:

Just after flood, I was in a position to commit suicide. I lost my sources of income (boat, fish), I lost my house, my children were starving.... I bought loan from five different sources. These are Sun Crest, ASA, Grameen Bank, Prodokkep, and Bazar Somete. First, I took loan from two sources. To pay the installment of the loans, I could not feed my children. To pay the installments of these loans, I took loan from another source. To pay the installments of three loans, I took loan from another source. I paid the installments of the first three loans from the fourth one....I did not have enough income to pay the installment or to feed my family members. I was suffering from acute poverty that is why I took loan from another source...After five years I was able to repay the entire loans. My wife helped me a lot to repay the loans. She worked at a construction factory.

indirect effects of flash floods or the consequence of asset loss and/or damage.

The direct losses and/or damages due to the flash flood disasters create a vicious cycle of assets loss (e.g., indirect effect). For example, monsoon flash flood damages property, such as houses. To rebuild their houses they often sell other property, like cows, tress, agricultural or non-agricultural land (i.e., they lose one type of asset to recover from other types of asset loss). In most of the cases, it becomes impossible for them to regain the lost or sold property. This is because before they fully recover from previous loss they suffer from another loss.

Efforts to recover from asset loss create another vicious cycle, namely the vicious cycle of money lending and micro credit. Once the houses are damaged and crops are lost, community people borrow loans from *mohajans*⁷ and also micro credit institutes (e.g., ASA, BRAC, Grameen Bank, and Sun Crest) to rebuild houses. They borrow loans for mainly three reasons: first, to rebuild their houses; second, to feed family members just after disasters; and third, to repay loan taken from other sources. The affected families sometimes borrow loans from microcredit institute to repay the *mohajans*, or vice versa. Thus, they fall into a trap of a vicious loan cycle from which it becomes extremely difficult for them to come out. Moreover, this vicious cycle of money lending is also connected with the vicious cycle of asset loss. For instance, sometimes they sell property to pay the loan or when they have nothing to sell; they are bound to take loans to rebuild houses or to pay loans to others. Sometimes they borrow loans from *mohajans* to grow crops, and when they lose the crops due to early flash floods they have no other option but to sell property (e.g., cow, land) to pay

⁷ *Mohajan* is the person who lends money with high interest. The word "Mahajan" is derived from two Sanskrit words: Maha and Jan. *Maha* means great, and *Jan* means respectful people or individuals. The word Mahajan has become a common generic job title used to describe people involved in money lending. *Mohajoni* system is the informal money lending system.

the loans. Thus their balance sheets always remain negative and their vulnerability is multiplied. A case study of how loss and/or damage can drag people into the vicious cycle of money lending, and micro credit is presented in Box 3.2 to illustrate the dynamics with details.

Households in the community fall into the vicious cycle of asset loss and money lending and microcredit due to income instability. Income instability is both nature-induced and human induced (e.g., marginalization discussed in Chapter four), and income instability can be defined as the product of limited income opportunity, heavy reliance on *boro* crops, and effect of multiple natural hazards. The Resources/Livelihood activity calendar of wetland-community people is shown in Table 3.10. As mentioned earlier, fishing and crop cultivation are the two main sources livelihood of community people. Fishers can only catch fish for six months, and not everybody has the opportunity to go for share-fishing, or do fish business, like dry fish or buying and selling fish, as fish business is more capital intensive. Those who have some capital can do fish business throughout the year and dry fish business during dry season. Peasants heavily rely on *boro* crops and they are prone to crops loss due to flash flooding. The community people mentioned that part of dry season, specifically February to middle of April, is a lean period for them. This is because during that time there are limited opportunities for fishers to catch fish and peasants almost exhaust their stored crops. Not everybody can do or do works like as a porter to loading and unloading goods from cargo boat in the Bishwambarpur bazar - or work in sand and stone quarries. Income stability is also the result of the adverse effect of multiple natural hazards that threaten their livelihood activities. Flash floods, especially during monsoon and post-monsoon period threaten the livelihood activities of fishers and of day laborers (e.g., boatmen, goods carrying, work at sand and stone quarries). Apart from flash floods strong waves, over rain, fog, nor'wester are also hazards for livelihood activities of daily laborers and fishers (Table 3.11).

Because of the income instability, people often need to take loan from *mohajans*. Some people prefer borrowing from *mohajans* rather than micro credit institutes. This is because if they take micro credit it becomes difficult for them to pay weekly installments due to limited income opportunity, whereas they pay *mohajans* at the end of the year. To repay back to *mohajans*, they heavily rely on *boro* crops. If the crops are lost they are bound to sell property to pay loan.

The vicious cycle of asset loss and money lending and income instability create another vicious cycle which can be called a poverty cycle. To recover from asset loss, or pay the installments of micro credit and *mohajans*, or due to income instability, people often struggle to have three meals a day, and they reduce nutritious food intake so that they can save money to pay installments. This is even doubly stressful for female headed households. Thus community people are faced with a continuous struggle with flash flood hazards, and their associated social, economic and political features.

Table 3.10: Resources/ Livelihood activities calendar of Fotehpur Union

		Months												
		Gregorian calendar	April-May	May-June	June-July	July-Aug	Aug-Sep	Sep-Oct	Oct-Nov	Nov- Dec	Dec- Jan	Jan-Feb	Feb-March	March-April
		Bengali calendar	Boishakh	Jyoishtho	Asharh	Srabon	Bhadro	Ashvin	Kartik	Ogrohayon	Poush	Magh	Falgun	Choitro
Resources/ Livelihood activities	Agriculture	Paddy												
		Vegetable												
	Fishing	Catching												
		Business												
		Share fishing												
		Dry fish												
	Day labor	Agriculture												
		Boatman												
		Sand and stone quarries												
		Soil digging												
		Goods carrying												
	Seasonal migration													
	Small business													

Source: Field survey data, 2014

Table 3.11: Cross-sectional calendar on hazards and livelihood activities of Fotehpur Union

		Hazards																	
		Early flash flood	Monsoon and post-monsoon flash flood	Hail storm	Over rain	Wave or wave erosion	Drought	Nor'wester	Water logging	Fog	Pest								
Livelihood activities	Activities related to crop cultivation	Preparing land for seedbed																	
		Planting																	
		Nurturing																	
		Harvesting																	
	Vegetables																		
	Fishing practices	Catching																	
		Business																	
		Dry fish																	
	Day labor	Agriculture																	
		Boatman																	
		Sand and stone quarries																	
		Soil digging																	
		Goods carrying																	

Source: Field survey data, 2014

3.6 Recovery strategies from flash flood disasters: household level and community level

Loss and/or damage occur at two different scales: the household level, and the community level. Loss and/or damage recovery means regaining partially or completely the damaged assets after a disaster, either in physical term or in economic term in a form as it was in the pre-disaster phase. The following section deals with disaster loss recovery strategies at household and community levels.

3.6.1 Strategies taken at household level

Due to assets loss and/or damage, households take different strategies to recover from assets loss and/or damage or to rebuild the damaged assets, like houses. Household strategies can be divided into two parts: i) strategies taken by household head alone, and ii) strategies taken by household members collectively. Strategies taken by household head alone include seasonally migrating, working for extended period of time locally and doing laborious work, and activating social network and relationships. The later helps accessing resources from within community and outside community to recover from disaster losses. Examples of

Box 3.3: The case of Sattar Mia and his family

Sattar Mia, age 56, lives in Jirak Tahirpur village. His family is consists of nine members. He along with his two sons, earn for his family. Agriculture is the main source of earning for his family. He lost his *boro* crop completely in 2004 due to early flash flood. In 2007 due to monsoon flash flood, his house was severely damaged. It took 100,000 taka to rebuild the house. His fuel sources and foddors were destroyed; and after the flood, his family members suffered from diseases as well. He had to spend BDT 4,000 to cure his family members. He stated his disaster loss strategies as follows:

I mortgage my land to mohajans to take some loans so that I can rebuild my house. I mortgage one acres of land out of my two acres of land...It takes three to four years to fill up the deficit of one year...My sons worked at stone and sand quarries. We save some portion of our income to pay the loan, but we also had to sell two cows. In our area, people can do to work like soil digging during November-December. My two sons did some risky job like soil digging. They also worked as agricultural labor. Thus, we worked very hard to recover from our losses over multiple years.

strategies that are taken by household members collectively include reducing household expenditures, changing food habit, and earning by non-earning members of family.

Household heads adopt a number of coping mechanisms and long-term strategies to recover from disaster losses. One of the major factors that helps in recovering from immediate losses is by activating a social network and relationships. Networks and relationships with community members help raise household income. Analysis of social networks and relationships draws insights from social capital literature (Coleman, 1990; Putnam, 1996; Portes, 1998). Natural disaster research streams highlight the role of social networks and relationships in post-disaster recovery (Chen, Liu, & Chan, 2006; Brouwer, Akter, Brander & Haque, 2007; Adger, 2003; Ahamed, 2013). I found that social networks and relationships helped to get relief, to get a job when the job crisis is acute in the post-disaster period, and to do a business without much or no capital. Moreover, social networks and relationships help to obtain informal credit.

Another coping and adaptive strategy is seasonally migrating to other distant places for income. As I have mentioned earlier, and as evident from the resources/livelihoods calendar, February to mid-April is a lean period (Table 3.10), when there is limited income opportunity for community members. At that time, household heads migrate to other places for work. They go to other places to work at sand and stone quarries. Not only during the lean period but also during other times of the year, people migrate to other places to raise income, especially after a disaster when they are in desperate need of money to rebuild their houses or to pay installments to micro credit institutes or to *mohajans* or face a crisis to get a job in the community. In *Katakhal* village, there is an informal system called *Sordari*. Under this system, group leader contacts job providers and then he takes a group of people for work outside the community. Through this system, community people go outside for seasonal work.

Another strategy taken by household heads is working for extended period of time and doing laborious and risky work. These strategies are taken by different occupational groups within the community. For example, to raise income, a day labor works for extended period of time in a day and more days in a month. A peasant typically does not do work like soil digging or goods and commodities carrying, but they do these laborious and risky work to raise income and recover from losses and damages due to early, monsoon and post-monsoon flash floods. Some details of the household level strategies are given in Box 3.3.

Apart from strategies taken by household head alone, households also take some strategies collectively to recover from losses. Once the crops are lost or houses are damaged, people tend to take loans from *mohajans* with interest or mortgage their land to *mohajans* to take loan or take loans from micro credit institutes to rebuild houses to pay loans to others. To pay the installments, household members take a number of strategies, including the reduction of household expenditures, such as changing food habit, and earning by non-earning members of the family especially women and children. They save income of one member to pay installments and use income of other member for household expenditures. I also found that sometimes all household members seasonally migrate to other places for work. After working for five to six months, they return with some savings so that they can pay installments to *mohajans* or to buy a net for fishing or do cultivation of crops.

3.6.2 *Strategies taken at community level*

Community collective assets are also being damaged by monsoon and post-monsoon flash floods; these assets include mosque, temple, bamboo-bridge, and tube wells. Community people take collective initiatives to rebuild or reconstruct the damaged assets. Initiatives taken by community members can be divided into two parts: i) internal resources mobilization, and ii) seeking external assistances. The immediate response comes from

community people to rebuild the damaged property. They raise internal fund and those who are unable to contribute financially contribute by providing physical labor. This is how they try to rebuild the damaged common assets. Sometimes when their internal resources are not good enough to rebuild the assets, they seek for external assistance. Another reason for seeking external assistance is related to the characteristics of common property. For example, community people collectively use the school but they do not own it; rather it is owned by the government or the public; therefore, they need external (government) assistance or interference for the reconstruction of these types of property. In seeking external assistance community leadership plays a significant role.

3.7 Living with flash floods hazard: Understanding the role of human agency

Various authors have used the *living with floods* narrative to describe the role of human dimension in coping and adapting to flood hazards (Shaw, 1989; Cuny, 1991; Zaman, 1993, Wong & Zhao, 2001). Broadly, *living* indicates preparedness and loss reduction (Wong and Zhao, 2001). In different flooding contexts, *living* holds different meaning, for example *living* means controlling in the context of tidal and season floods, coexisting in the context of seasonal floods, and responding in the context of flash floods (Middlemis-Brown, ND). Seasonal floods and flash floods are prevalent in the wetland areas of Bangladesh; therefore, people coexist with seasonal floods and respond to flash floods hazard. Here, I try to understand human response to flash flood hazard, and attempt to expand the *living with floods* narrative by unpacking agency dynamics. In disaster management literature, response typically relates to one temporal dimension (i.e., onset of disaster), but here I relate response to pre-disaster, onset of disaster, and post-disaster phases because understanding agency requires understanding behaviors of actors in all phases. Since social actors have the potential to shape resilience (i.e., adaptive capacity), understanding the behavior and the action of

social actors are very critical in response to shocks (e.g., flash flood), especially to understand what factors facilitate and constraint their response capacity (Bristow & Healy, 2014).

In the environmental change literature, human response or resilience strategies have been categorized in three ways: i) proactive or anticipatory, ii) reactive, and iii) transformative (Gallopín, 2006; Brown & Westaway, 2011; Bristow & Healy, 2014). Proactive or anticipatory holds similar meaning to adaptation, and reactive holds similar meaning to coping. Agency is understood within these three broad response categories. Three interrelated factors that shape the reactive, proactive, and transformative response to flash flood hazard are subjective (e.g., skills, norms, values, belief system), objective (e.g., financial capital and other resources), and relational (e.g., social network and relationships) factors (Armitage, Béné, Charles, Johnson & Allison, 2012; Brown & Westaway, 2011). These three factors are enabling and/or constraining factors of agency exercise. Agency is understood here at two levels: individual, and community levels.

a. Understanding individuals' response to flash flood hazard:

Individuals reactively orient themselves toward flash flood hazard in the study area. Their reactive action to or coping with flash flood hazard is facilitated and/or constrained by subjective, objective, and relational factors. Coping also relates to immediate loss reduction. Subjective aspects of reactive response or coping can best be understood using the concept of *habitus*. As mentioned earlier, *habitus* is spontaneity with consciousness. For example, coping strategies have been inculcated through *living* with flash floods for generation. They hold the values that floods are part of their lives; through their struggle with flash floods, they have developed the skill required to cope with flash floods. Their reactive response or coping strategies has become part of their lives or *habitus*. This aspect of *habitus* helps them to cope with flash flood hazard. Presence or absence of objective factors facilitate and constrain their

coping strategies respectively. For example, they initially react to flash flood hazard by staying at home, unless the water level goes beyond their coping capacity. They stay at home by climbing on bamboo roof, and cook with moveable burner, locally called *cholti*. However, assets holding sometimes restrict them from leaving the house; they are unwilling to leave their houses even when flood water reaches knee level. But if they cannot avail bamboo to make a roof or if the flood water rises beyond their coping level, they leave their houses consciously. This consciousness can be labeled as *practical consciousness*. This aspect of agency exercise is facilitated by social networks and relationships (e.g., relational factor). Relational factors help them consciously exercise their agency or to cope with flash flood hazard. For example, when they are unable to stay home, then they take shelter to neighbor's house, which is typically at upper land or go to a relative's house, or to a flood shelter. Neighbors help them with boat to move to a safer place along with their moveable valuable assets; they also help them cook food at the time of flooding. Depending on the flood condition, social network, and moving ability, people decide whether to go to a neighbor's house or to a relative house (which is not affected by flood), or to a flood shelter. People reactively orient themselves to cope with flash flood hazards applying their *practical consciousness*, and thus they are able to reduce loss or damage as coping relates to immediate loss reduction.

Reactive action is also related to coping mechanism to address loss and/or damage. Due to the loss and/or damage, individuals react to the losses by taking several measures to recover from loss and/or damage. For example, to recover from property damage (e.g., house), caused by monsoon and post-monsoon flash flood, individuals sell property. These include cows, paddy, agricultural land, and mortgage their land to *Mohajans* to take loans. Early flash flood threatens community people's food security because they heavily rely on successful harvest of *boro* crops. To secure food for family members, they typically sell cow

or other property to buy paddy when the price is low. They think that if they have rice at home, then they do not have to worry about food for the entire year (*practical consciousness*). These strategies taken by individuals has unintended negative consequences in the long run, such as falling into vicious cycles like property loss, money lending and micro credit, and facing perpetual poverty. This unintended consequence further perpetuates their vulnerability.

In their efforts to recover from losses, agents face multiple problems. One of those problems that hinder individuals to exercise their agency is the “middle class value”⁸. Middle class people are typically (at least in my study area) small peasants, small businessmen, and self-employed people like carpenters. People with lower class status are day laborer; people with upper class status are typically rich peasants and big businessmen (e.g., rice and fertilizer dealers). People with lower class status have liberty to do work like day labor; upper class people have enough money to recover themselves. Middle class people or at least people who think that they belong to middle class are in double jeopardy; they do not have enough property that can help them to recover quickly from flood loss nor they can do work like day laboring. Middle class value holds them back. Therefore, a clear linkage between social class and disaster recovery is found here.

Another constraining factor is the burden of loans. As mentioned earlier, in an effort to recover from loss, people take on loans. Loans are therefore a constraining factor in agency

⁸ Historically, middle class emerged in the Indian sub-continent (especially in Bengal) during British colonial period. The impetus behind the growth of middle class in Bengal was the English education. Unlike Europe, middle class in Bengal was an educated class, whereas in Europe it was a business class (Mishra, 1961; Ghosh, 2000). In contemporary literature, middle class is conceptualized in varied ways, such as middle class as an income group, and as a consumer class (Kharas, 2010; Jodhka & Prakash, 2011). But beyond consumption and income, middle class in present day Bangladesh context largely remains a salaried-professional class. Middle class holds certain values that shape their attitude toward disaster recovery activities.

exercise. For example, to quickly recover from losses, individuals cannot take any proactive measures, like doing a business. They think that they already have some burden of loan, so if they fail in business, it would be a double burden for them. This reflects that *habitus* orients action in terms of anticipated consequences. This strategic self-refrainment of not taking any proactive measure to recover from losses quickly is part of *discursive consciousness*. Financial burden constrains the economic aspect of agency exercise. Respondent Oshini Kumar Bormon during oral history interview stated:

I took loan for loss recovery and still I am paying the installments. When I have burden of loan, then I do not feel confident in doing any business...because I know I have loan elsewhere, and if I fail in my business then I will fall more behind...

People also proactively orient themselves toward adapting with flash flood hazard. Their proactive action or adaptation to flash flood hazard is facilitated and/or constrained by subjective, objective, and relational factors. Based on past experience, individual can anticipate future events, and take some proactive measures. Proactive measures are related to preparedness. Community members prepare themselves for monsoon and post-monsoon flash flood. For example, every year they prepare for flash floods by elevating their houses from land. They repair the base of their houses during November to December and further elevate the land during January to March (just before early flash flood) (Plate 3.4-B). They take paddy to a rice mill during dry season because it becomes difficult for them during flooding to find a functioning rice mill. In addition, they store rice in their house for coping with crisis period. As part of preparedness, natural resource availability helps them to take proactive measures. For example, they build their houses with bamboo and with other natural resources, locally called *chilla bon* (Plate 3.4-A). Using *chilla bon* for constructing houses makes the house strong, but due to resources degradation (discussed in Chapter four), it is

currently hard to find *chilla bon* locally that is why people bring it from other places to make houses stronger.

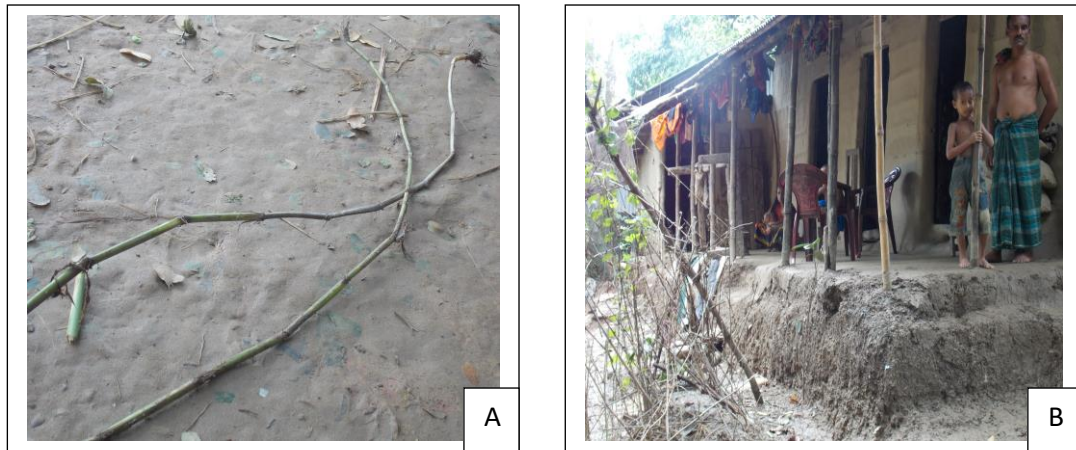


Plate 3.4: (A) Image of *chilla bon*, (B) house constructed on elevated land, damaged by flood

Apart from reactive and proactive measures, individuals often “...transform their behavior strategically over the longer-term by developing technology and innovation...” (Bristow & Healy, 2014, p.929). Transformation relates to future loss reduction. Transformative change partly comes from experiential learning against their continuous struggle with natural disasters. From the past learning, individuals now make houses with stronger structures, and from elevated land. Keeping water level of past years of floods in mind, they elevate their houses more than the water level of the past few years.

Individuals have also transformed their behaviors, such as they are trying to do other jobs apart from what they have skills to do or what they have learned for generations. For example, in Raipur and Bahadarpur village, most of the people belong to a fishing caste. Fishing is their inherited occupation. Due to shrinking income opportunities, some individuals have engaged themselves with other jobs, like working with NGOs or some people are willing to work as day laborer. Peasants like Sattar Mia of Jirak Tahirpur village mentioned that he along with his sons work for additional income by soil digging, and work for extended period of time for loss recovery.

b. Understanding community response to flash flood hazard:

Disaster means distress... We face our disaster by ourselves... (Jirak Tahirpur village during FGD)

Community people reactively respond to flash flood hazard. Their reactive collective responses to flash flood hazards are usually to save community assets, and responses to save community infrastructure provide space for collective action. They collectively respond when they feel a common threat to their assets. In case of early flash flood hazards, they reactively respond to early flash flood hazard to save *boro* crops. For example, when the flood water breaches the embankment that protects *boro* crops from flood water, the community people collectively do earth work or place mud to stop the breaching. Community people thus collectively respond to early flash flood hazards to save collective assets (e.g., *boro* crops). Community collective assets, such as mosque, temple, and tube well are also often damaged by monsoon and post-monsoon flash flood. However, their reactive responses to monsoon and post-monsoon flash floods are limited to individual assets (i.e., to save own household assets, rather than community assets). In this case, they take more proactive measures to save community assets from monsoon and post-monsoon flash flood.



Plate 3.5: Temple (left) and crematorium (right) are built on high concrete pillars.

However, community people's proactive action towards flash flood hazards is shaped by the level of solidarity, and common identity. For example, people living in Raipur and Bahadarpur villages predominantly belong to a fishing caste. They hold a similar identity in terms of religion (i.e., Hindu) and occupation (i.e., fishers). This homogeneous identity helps these villagers to take some proactive measures to save their collective property, such as temple, tube well, and crematorium. They have collectively built a ring dyke to save their assets, and built the temple and crematorium on high concrete pillars so that flood water does not damage it (see Plate 3.5 above). They move the tube well near the temple during flooding period. By contrast in Bishwambarpur village, people are divided in multiple lines such as, religion, and occupation. A good portion of the population of this village has emigrated from other districts, and there is always an inherent tension between local people (i.e., *Sylheti*⁹) and people coming from other districts (i.e., *non-Sylheti*). Villagers of Bishwambarpur village argued that the in-flow of new immigrants have created an additional stress on natural resources. However, whether these new immigrants have added new skills that shaped the adaptability of the community is beyond the scope of this research. People of this village see proactive action or preparedness in personal term, rather than in collective term.

Because of collective efforts of community people and leadership, they were able to bring few transformative changes within community, especially to tackle the early flash flood hazards. Community people identified risky water points through which flood water enters into the *haor* and inundates *boro* crops. Because of their efforts Water Development Board and LGD constructed a switch gate (*Muktikhola Mollikpur Switch Gate*), which is now

⁹ *Sylheti* term is used by local people and outsiders to mention people who have attachment with greater Sylhet region (Sylhet, Sunamgonj, Moulvibazar, and Habiganj) for generation, they are *Sylheti* by born and can speak *Sylheti* local dialects. *Non-Sylheti* people are differentiated from *Sylheti* people by these characteristics.

looked after by community people. After constructing the switch gate, *haor* is now less at risk of inundation. Community people control the water level according to their needs.

3.8 Conclusion

This chapter depicts the vulnerability of wetland-community to flash flood hazards. Community vulnerability to flash flood hazards was proven by 2004 early flash flood and monsoon flash flood in 2007. Types of loss and damage vary according to the temporal variability of flash floods. Early flash flood causes predominantly crop loss and monsoon and post-monsoon flash flood causes homestead loss. Community people's survival against flash flood hazard is a life long struggle. In their effort to recover from losses, they even fall into the vicious cycle of money lending, and poverty trap. However, community people take number of measures to recover from loss and damage at the household and community levels. Responses (e.g., proactive, reactive and transformative) to flash flood hazards at individual and community levels are constrained and facilitated by subjective, objective, relational factors.

This chapter mainly focused on wetland-community vulnerability to flash flood hazards, their disaster recovery process, and role of human agency at response strategy. The following chapter (Chapter 4) will focus on the wetland social-ecological system dynamics, specifically the underlying mechanisms that create vulnerability, drivers of change and/or the factors that build or erode resilience.

Chapter Four

Wetland-Social-Ecological System Dynamics



Plate 4.1: A view of the *Karcharia haor* from north-west side

4.1 Introduction

This chapter focuses on part of the second objective of my thesis: to examine the resilience of wetland-social-ecological system to flash flood disaster. Here I focused on analyzing wetland-social-ecological system dynamics, specifically the factors that build and erode resilience to flash flood hazards (i.e., the underlying mechanisms that create vulnerability to flash flood hazards, and drivers of change within wetland-social-ecological systems), specifically how power structure shapes the transformational quality of wetland-SES and community response capacity to flash flood hazard. Looking at these factors, first I draw insights from literature on resilience thinking discourse, social-ecological system and power. Second, I explore how resilience of wetland-SES is shaped by both social and ecological factors. Third, I present an overview of wetland social structure (power and politics), and

fourth I examine how poor fishers are included or excluded from common pool resources due to current institutional regimes and the existing power structure. Fifth, the struggle of peasants against multiple players of power structures and their problem with loss recovery is explored. Finally, households' strategies for livelihood diversification are examined.

4.2 Resilience thinking discourse and social-ecological system

Berkes and Folke's seminal work – *Linking Social and Ecological Systems: Management Practices and Social Mechanisms for Building Resilience* (1998) – first systematically identified the fact that the “...delineation between social and ecological systems is artificial and arbitrary” (Folke, 2006, p.261-262). Social-Ecological Systems (SESs) are integrated with powerful reciprocal feedbacks with multiple thresholds and stable states, at different scales (e.g., regional or global). Resilience thinking has emerged as an overarching framework to navigate SES. Resilience, adaptability and, transformability are the three interrelated components within resilience thinking discourse (Walker et al., 2004; Gunderson et al., 2006; Folke et. al., 2010). Walker et al., (2004, p.1) define resilience as “the capacity of a system to absorb disturbances and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks”, while adaptability refers to “...the capacity of actors in the system to influence resilience (in an SES, essentially to manage it)”..., and transformability refers to the “...capacity to create a fundamentally new system when ecological, economic, or social structures make the existing system untenable...”. Thus, resilience, adaptability, and transformability have become the corner stones for understanding the dynamics of SES.

Various authors (Berkes & Seixas, 2005; Nayak, 2014) have attempted to examine the dynamics of SES empirically. Berkes and Seixas (2005), for example, have applied the SES framework in a lagoon system. They have selected the lagoon system because: i) “lagoon

systems tend to be human-dominated and are used intensively. [Lagoons] are geographically bounded and readily identifiable as integrated systems of human and nature” (p.967). They argued that lagoons are social–ecological systems (SES), where human activity is an integral part of lagoon ecology; ii) “[M]any processes in lagoon SES, such as hydrology and resource use, follow annual cycles” (p.967); and 3) “[L]agoons are often subject to shocks and directional change, as in depletion-and-recovery cycles, making a good fit with resilience thinking” (p.967-968).

These criteria mentioned above fit well with wetland-SES in Bangladesh. The wetland ecosystem is a floodplain ecosystem. A floodplain is a kind of ecosystem that is seasonally inundated and dried (Bayley, 1995); it is also called a “flood-pulse” ecosystem (Junk, Bayley & Sparks, 1989; Bayley, 1995). The hydrological effects on the biota qualitatively changes in the key components of ecosystem, such as plants, nutrients, detritus, and brings sediments (Bayley, 1995). Flood water dissolves the mineralized nutrients, brings sediments. Therefore, seasonal flooding for the floodplain ecosystem is not a disturbance, rather opens the “windows of ecological opportunity” and renews the system (Tockner, Pusch, Borchardt & Lorang, 2010). Due to seasonal flooding, services from flood pulse ecosystem varies temporally. Wetland ecosystem services are thus entirely shaped by the annual flood cycle. The human system, dependent on this ecosystem, adjusts their livelihoods strategies with temporally changing ecosystem services. In Bangladesh, for instance, wetland-community temporarily adjusts their livelihood strategy with changing ecosystem services. Fishing is their main source of livelihood during wet season and cultivation is the main source of livelihood during dry season.

Since the wetland ecosystem is “human-dominated” and intensively used for fishing and crop cultivation, “resources use and hydrology” in the wetland varies seasonally (i.e., fishing in the wet season and crop cultivation in the dry season). The wetland is also a flood

pulse ecosystem, which temporally rotates between wet season and dry season. Human activity is an integral part of the wetland ecology. Therefore, the wetland-community in Bangladesh can be treated as an integrated SES, and fits well with resilience thinking.

I define resilience of integrated wetland-social-ecological system as the capacity to absorb persistent disturbances (e.g., flash flood), and to remain within the given structure and function (Berkes & Seixas, 2005; Adger et al., 2005). Part of the capacity of integrated wetland-social-ecological system to absorb disturbances depends on the regenerative capacity of wetland ecosystem, as human system depends on the ecosystem services for their livelihoods. In this regard, Gunderson (2000) argues that proper maintenance and restoration of the ecosystem resilience is crucial. He mentions that three “strategies” can enhance ecological resilience, such as: i) “increasing the buffer capacity of the system”, ii) “managing for processes at multiple scales”, and iii) “nurturing sources of renewal”. Several factors are identified by various authors that enhance the resilience of ecosystem through the above mentioned “strategies”. These factors are the role of traditional-ecological knowledge, social institutions, social learning, belief systems, social capital, and the integration of traditional-ecological knowledge with scientific knowledge (Gunderson, 2000; Moller, Berkes, Lyver & Kislalioglu, 2004).

Drawing insights from above discussion (Section 4.2), I address part of my second objective (i.e., resilience of wetland-social-ecological system to flash flood disasters). To this end, I posit that i) ecosystem is linked to social system by institutions in terms of resources dependency. How current institutional practices of resources use shape ecological resilience is the critical question, which I explored in Section 4.2.1, and ii) Resilience of wetland-social-ecological system to flash flood disasters partly depends on the resilience of wetland ecosystem to flash flood disaster, which I discuss in Section in 4.2.2.

4.2.1 Natural resources degradation and the erosion of wetland-social-ecological system resilience

Several social and institutional factors are responsible for the degradation of wetland resources and erosion of wetland-social-ecological resilience. These factors are the wetland resources management policies of government, unsustainable institutional practices of resources extraction (e.g., fishing and crop cultivation), and social processes like marginalization, rapid technological and market integration. These factors are responsible for the degradation of wetland resources, and consequently erode resilience of wetland-social-ecological system. Here more emphasis is given to two main wetland resources, namely flooded forest or swamp forest and fishery resources, which I have elaborated below.

(1) Government policy for wetland resources management:

In Bangladesh, wetland resources fall under the management policy of land and forest ministries. These two ministries are responsible for the conservation, restoration and maintenance of two major components of wetland resources, namely forest resources and fishery resources. Forest and fishery resources are critical components of wetland ecosystems. Conservation and restoration of these two resources are critical in maintaining resilience of wetland-social-ecological systems. Government policies and actions are largely responsible for the destruction of these two main wetland resources, and consequently eroding wetland-social-ecological resilience. Below, I discussed the degradation of forest resources and then about fishery resources due to government policy and action.

First, forest management policy in Bangladesh has undergone a process of transformation from the period of *Mughals* to present period. During the periods of *Mughals* and British colonial power, the forest was a source of revenue collection. But there has been a shift in forest management policy during post-independent Bangladesh period from revenue

collection and management and monitoring of reserve forest to conservation and restoration. However, problems of conservation and restoration of forest have arisen at the local level due to lack of coordination between agencies for land and forest ministries. At the local level, the Deputy Commissioner deals with land issues, and leases out forest for revenue, which eventually causes the destruction of forest (Biswas & Choudhury, 2007).

Forests in the wetland area of Bangladesh are typically flooded forest or “swamp forest” locally called *Hijol-Koroch Bak*¹⁰. Most commonly found tree species are locally called *Hijol* (*Barringtonia acutangula*), and *Koroch* (*Pongamia pinnata*). In Bishwambarpur Upazila, there were naturally grown 12 swamp forests; all were in Fotehpur Union. A study conducted by CNRS (2013) on the current state of swamp forests in wetland areas of Sunamganj district found that in Bishwambarpur Upazila, there were around 42,670 *Hijol* and *Koroch* trees in 12 forests at the initial period whereas currently there are only 2,336 *Hijol* and *Koroch* trees. Largely due to government leasing policy, swamp forests are at the brink of extinction (see Plates 4.2). Out of 12 swamp forests seven swamp forests were leased out in different periods.

The role of swamp forest in maintaining wetland-social-ecological resilience is very critical. Local fishers reported that swamp forests are natural sanctuaries for fish species, and other species, like birds. Branches of trees from swamp forest, usually branches of *Hijol* (*Barringtonia acutangula*) are used in water bodies (*beel*) to increase fish production. Local fishers also reported that due to degradation of swamp forest, other fish species have also declined considerably. Swamp forests also help community people from wave erosion during monsoon flooding. People having *Hijol* and *Koroch* trees in front of their house are more

¹⁰ *Bak* means garden or forest

protected from wave erosion than others. It is also documented that swamp forest around water bodies inside *haor* reduces siltation (Khan, 2012).

Second, fishery resources (*Jalmohals*) are leased out through an open bidding policy where the main goal is revenue collection (discussed elaborately in Section 4.5.1). To maximize profit, lease holders use destructive ways of fishing. Khan (2012) documents the fact that short term (one to three years) leasing policy is one of the causes of destructive fishing practices. Long term leasing policy does not change the scenario. *Jalmohals* above 8.09 hectares (20 acres) are leased out under *development scheme*. Under this scheme, *Jalmohals* are leased out for six years and lease holders are supposed to fish in every three years. However, in practice, they do fishing three times in a year. They catch fish with net; they remove all water to catch fish; they use fertilizer or salt to bring all fishes from under the mud. Another cause of the destructive fishing is the inability of local government officials (e.g., fishery) to enforce rules and regulations. Local fishers blame the government official for playing dual roles (i.e., they enforce rule on local fishers, but not on lease holders).

(2) *Pressure of increased population, and market and technological integration*

Other causes of the degradation of natural resources like swamp forest, fishery, and other species is the combined pressure of increased population growth, and market and technological integration. Due to increased pressure of population growth and density on natural resources, community people are degrading swamp forests, using unsustainable fishing and crop cultivation practices, which significantly erode wetland-social-ecological resilience. Population pressure results in increased pressure on forest for fuel woods, and encroachment of forest land for production purposes, including extension of agriculture and housing. The Table 2.1 (Chapter two) shows the increasing trend of population density in

Bishwambarpur Upzilla over the last 40 years. It indicates the increasing pressure on natural resources for livelihood and exceeding carrying capacity in the locality.

Community people are responding to the increased demand of market for natural resource products (e.g., fishery, wood), and also to increased pressure of population growth by integrating advance technology to exploit natural resources. Due to the increasing demand of market and pressure of population growth, there is an increased pressure on agricultural land for enhancing production and on fishery resources. Peasants and fishers use various unsustainable techniques for fishing and cultivation. For example, peasants are using various chemical fertilizer and pesticides, which are deleterious for ecosystem when used disproportionately (plate 4.4). Peasants mentioned that they use pesticides in agricultural land to control weeds and other unwanted vegetation. As a result preciously found species like tamarisk tree (*Tamarica indica*), *chamuro bon*, *chaila bon*, *vat*, lotus (*Nelumbo nucifera*) have decreased considerably. Previously, community people used to rely on locally found species like *vat*, lotus (*Nelumbo nucifera*) to prepare meals during lean period, but now their availability has decreased. Fishers use a water pump to dry out the water bodies to catch fish. Demand for fish and fish by product like dry fish is high in local and national markets (plate 4.3); therefore, fishers often dry out water to catch fish. Fishers also mentioned that, due to their marginalization from large water bodies, they are bound to catch fish of all types and sizes. Local fishers were asked about the diversity and richness of fish species. They mentioned that the diversity and richness of fish species have declined considerably. Fishers also point that now it takes relatively much longer period of time to catch the same amount of fish they used to catch earlier. They said that some fish species are rare these days, while they were abundant earlier. Fishers' knowledge on the decline of diversity and richness of fish species is captured in Table 4.1. Here I have listed some of the commonly found fish species

in *haor* area. It is apparent that some fish species are critically endangered and some are vulnerable.

Table 4.1: Degradation of fish species

Status	Species name
Critically endangered or near extinct ¹¹	Indian Mottled Eel (<i>Anguilla bengalensis</i>), Mahseer (<i>Tor tor</i>), Gangetic latia (<i>Crossocheilus latius</i>), Gongota Loach (<i>Somileptes gongota</i>), Pungas (<i>Pangasius pangasius</i>),
Vulnerable ¹²	Zebra Danio (<i>Brachydanio rerio</i>), Catla (<i>Catla catla</i>), Bengal Loach (<i>Botia daria</i>), Walking Catfish (<i>Clarias batrachus</i>), Freshwater Shark (<i>Wallago attu</i>), Butter Catfish (<i>Ompok bimaculatus</i>)
Not threatened ¹³	Cuchia (<i>Monopterusuchia</i>), Ocellated Pufferfish (<i>Tetraodon cutcutia</i>), Freshwater garfish (<i>Xenentodon cancila</i>), Blue Panchax (<i>Aplocheilus panchax</i>),

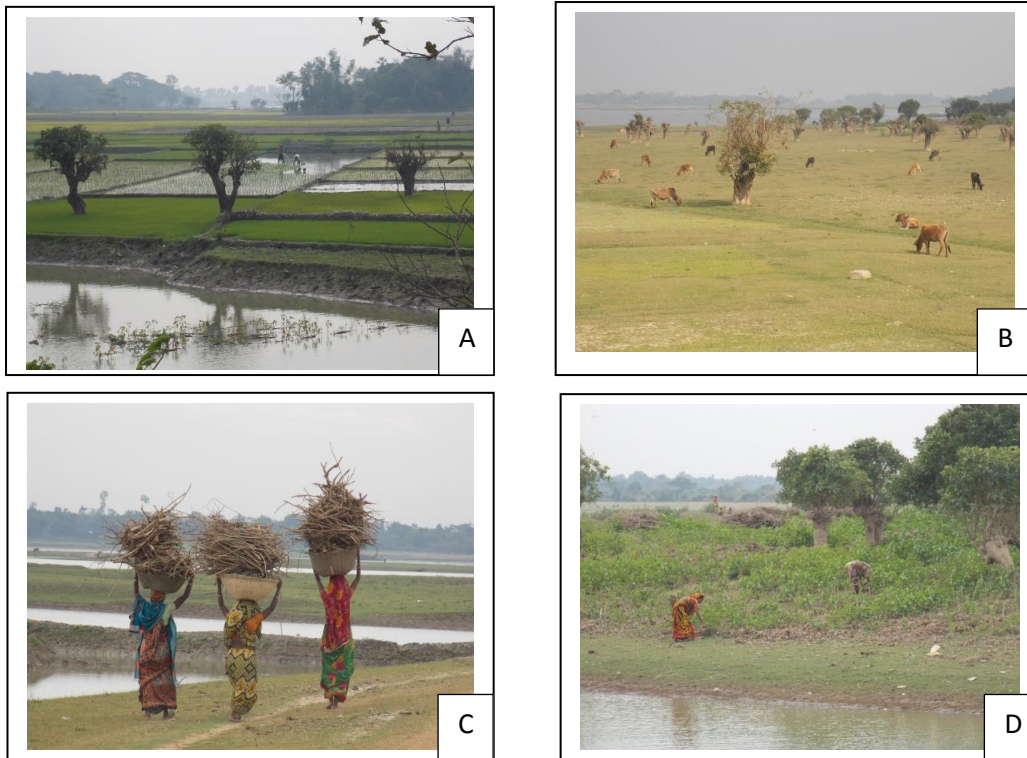
Source: Field survey data, 2014

Current fishing and crop cultivation practices of community people are affecting ecosystem structure and function adversely. Crop cultivation patterns and fishing practices are associated with the food web, and plant ecology. Peasants use various types of chemical fertilizers to increase production and insecticides for pest (invasive species) control, these over-used chemicals are considered as hazards for ecosystem. Through the food web, these toxins may result in bioaccumulation. Fishing practices are also associated with the food web. Current fishing practices are environmentally unsustainable because fishers tend to fish down the food web.

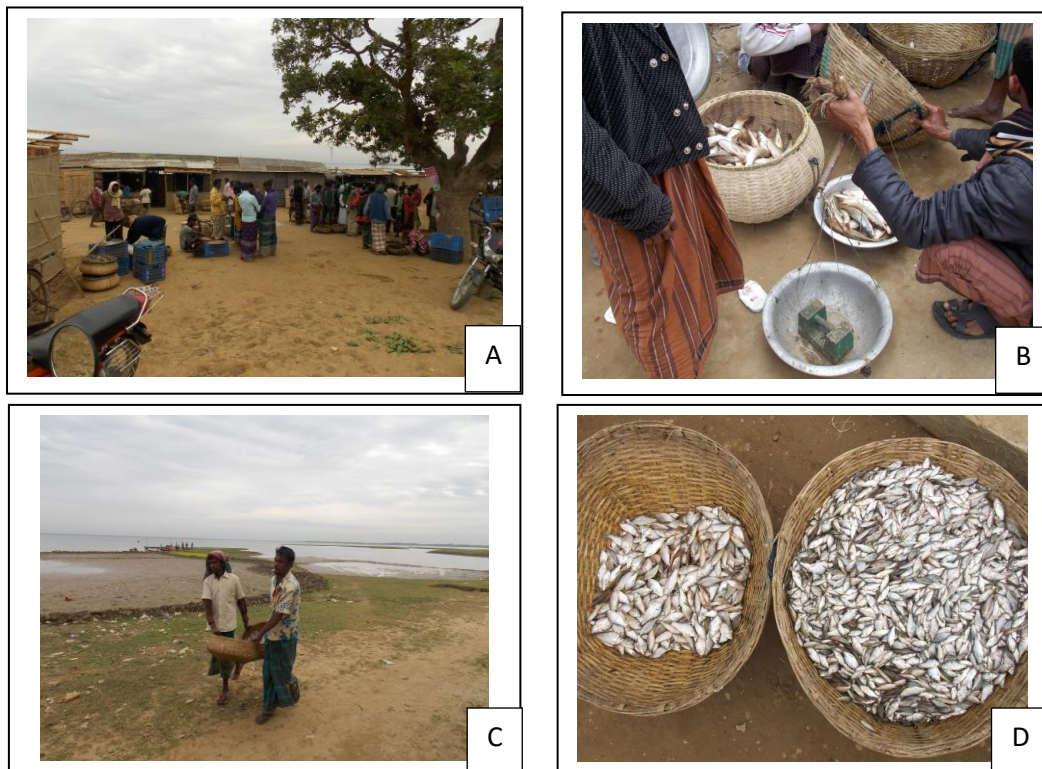
¹¹ Fish species are put on this status which fishers do not or rarely notice.

¹² According to fishers' knowledge, these fish species are comparatively less available

¹³ According to fishers' knowledge, these species are available but declined in number.



Plates 4.2: (A) swamp forest are converted into agricultural land, (B) swamp forest are converted into grazing field, (C and D) women collecting and carrying fire woods from forest.



Plates 4.3: (A and B) seasonal local fish market (local people called it *gach tola bazar*); fish businessman buy fish from here and sell regionally and nationally. (C) Fishers bringing fish from *haor* to market, (D) Some fishes brought in market for sell.



Plates 4.4: (A) A bottle of pesticide to control weeds. (B) Water is taken off from water body by diesel pump. (C) Population density in a village, (D) Fishers catch fishes of all sizes and types for living.

4.2.2 Flash floods and wetland ecosystem

The ecological perspective views natural disaster as a 'disturbance' to ecological systems (Turner, 2010). Scholarship on disturbance offers an insight on the pattern and processes of change in ecosystem structure and function. Drawing on the insights from landscape and ecosystem ecology, disturbance studies seek to understand spatial distribution and temporal effects of disturbance (e.g., flooding). The effect of flooding is often spatially homogeneous but temporally heterogeneous. Spatially, it makes land fertile across the community when the sediments consist of silt. Flash floods are hazardous for the short-term as they destroy the crops; long-term effect could be both beneficial (increases the production as it renews the ecosystem) as well as harmful.

Flash flooding is hazardous for ecosystem in the long term because flood water carries a huge volume of sediment that reduces the carrying capacity of water bodies (*beels*) inside the *haors* and also of rivers adjacent to the *haors*. Figure 4.1 shows the water bodies (*beels*) inside the *Karcharia haor*. These water bodies (*beels*) have lost their water carrying capacity over the time due to sedimentation. As a result, they cannot function as an effective reservoir for flood or rain water; consequently the *boro* crops get inundated. During drought, the peasants suffer from lack of water for irrigation. As these *beels* have lost their water carrying capacity it becomes easier for lease holders to drain out the water to catch fish. The dotted lines inside *haor* are embankments inside the *haor*, locally called *jungle*. These embankments are an integral part of cultivation. For example, these help peasants to store water for irrigation; these also help to control water inside *haor*. During harvesting period, peasants carry their crops over these embankments, as peasants revealed that each of these embankments is connected with villages. However, due to lack of maintenances, peasants are not getting full benefits out of these embankments. In this regard, plate 4.5 shows an image of a damaged embankment (*Jungle*) inside the *haor*. Peasants mentioned that these embankment inside the *haor* need to be repaired and additional embankments should be made for irrigation purposes, and communication and transportation. They also argue that if these embankments are repaired then they would be able to carry crops home quickly if an early flash flood strikes.

In the context of flash floods, two elements are highlighted in Figure 4.2. First, the water carrying capacity of rivers adjacent to the *haor*, and second, how spatial dimension of crop cultivation practice is related with flash flood. The rivers adjacent to the *haor* have also lost their water carrying capacity due to sedimentation. Community elder people have reported that these rivers have lost their water carrying capacity over the time. As a result when the flood water arrives, it easily overflows and enters into the *haor* destroying the *boro*

crops. It is also evident that the north side of *Karcharia haor* is high land (Figure 4.2). Crop cultivation practices of peasants of these areas adversely affect peasants of the *Karcharia haor*. For example, peasants of the *Karcharia haor* mentioned that previously peasants of these high land areas were used to produce crops on sandy silt, which helped absorb rain water. Now, they cultivate on mud and provide irrigation by deep tube well, as result rain water is not absorbed as much as it was before and flows to downstream area (*haor*). Peasants mentioned that this water coming down from the upstream area because of newer crop cultivation practices that make the run-off faster and thus increase the risk of inundation.

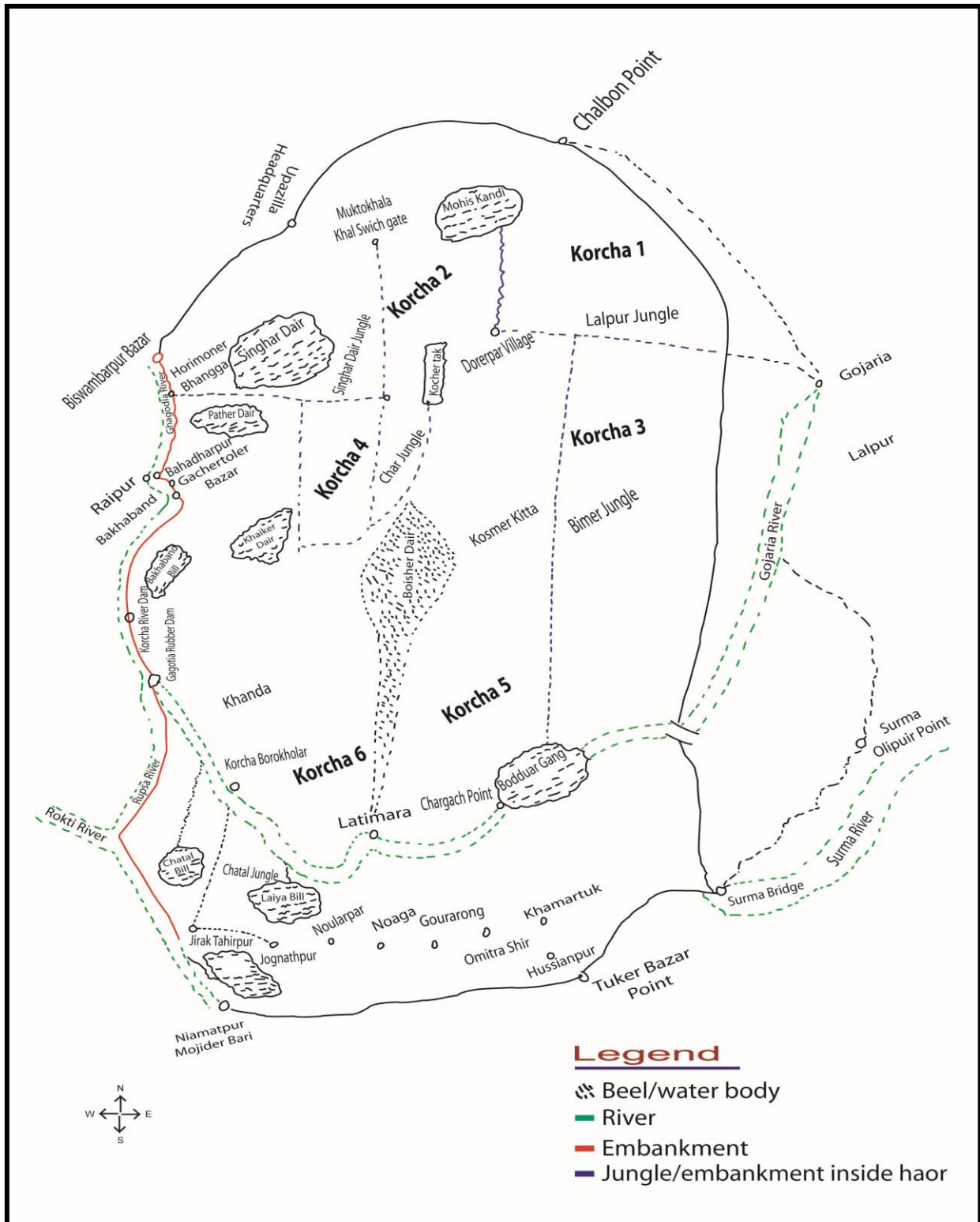


Figure 4.1: The *Karcharia haor* (a scratch map prepared by community people, digitalized using Adobe Photoshop)

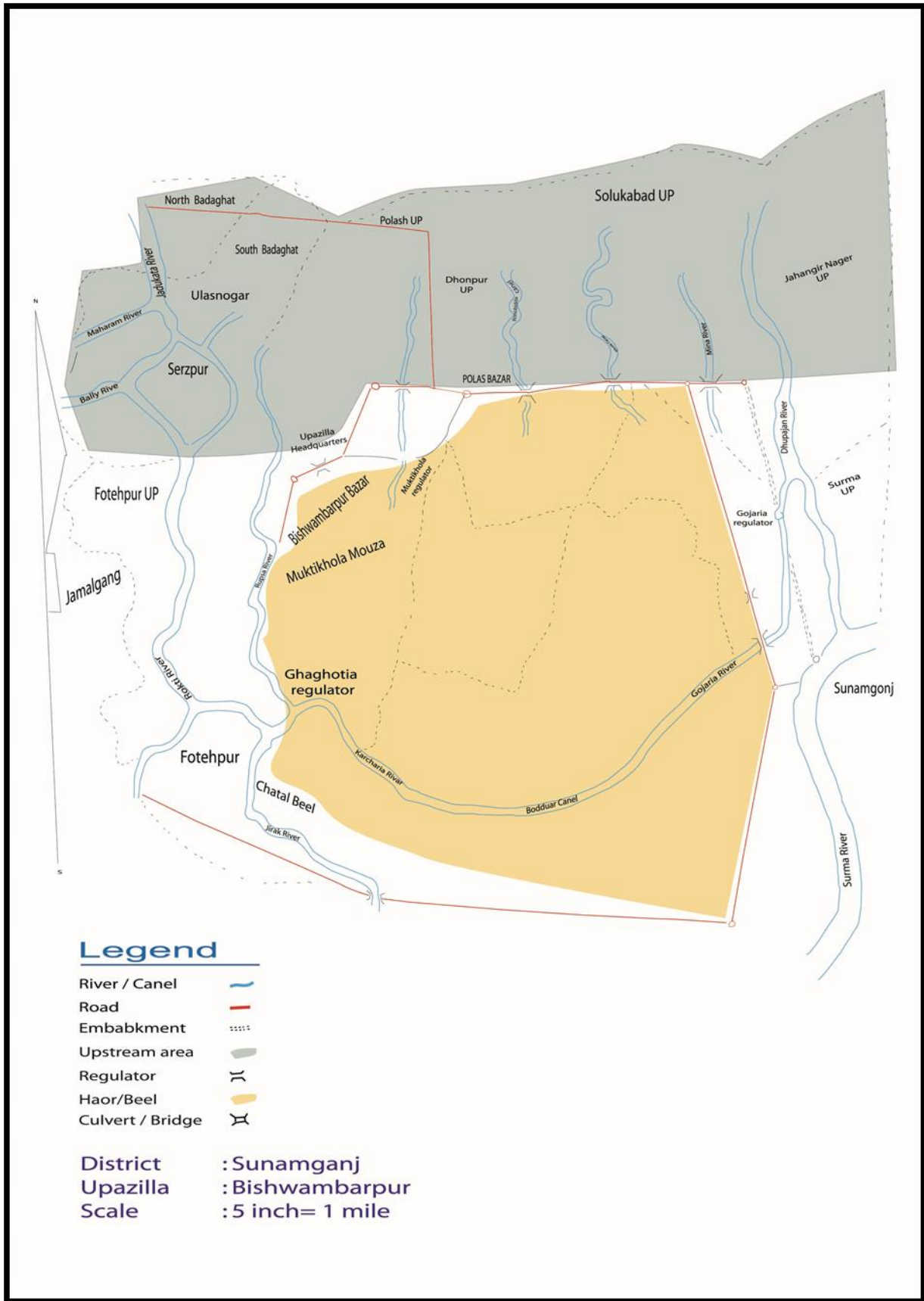


Figure 4.2: The *Karcharia haor* and surrounding areas (a scratch map prepared by community people, digitalized using Adobe Photoshop)



Plate 4.5: Image of a partially damaged embankment inside the *haor*

4.3 Power dynamics and social-ecological system resilience

Within resilience thinking discourse, transformability is identified as one of the preconditions for SES resilience (Folke et. al., 2010). I posit that resilience and transformability are mutually inclusive. Transformability enhances resilience, and maintaining resilience of a SES is necessary for successful transformation (i.e., if a SES loses its resilience then transformation is unlikely). Against this backdrop, it is necessary to understand the factors that facilitate or hinder transformation and thus build or erode resilience. Scholars of resilience field acknowledge that transformational change does not only involve change in “state variables”, but also change in aspects of social, economic and political dimensions including political and power relations and institutional arrangements (Brown, 2014). Thus, power and politics is not an attribute of a social system alone, rather it is an attribute of integrated social-ecological system. However, in social-ecological system resilience studies, the attribute of social system especially the role power and politics still remains understudied (Nayak, Armitage, & Andrachuk, 2015; Brown, 2014; Fabinyi, Evans, & Foale, 2014; Pelling & Manuel-Navarrete, 2011). Power and politics has the potential to block or facilitate transformation (i.e., building or eroding resilience). Questions also remain

(O'Brien, 2012; Nayak et al., 2015): transformation for whom, by whom, and for whom? Answering these questions require serious and close attention to power.

I posit that power is central to understanding the resilience of SES. Adaptability along with transformability are preconditions for SES resilience (Folke et al., 2010). Already I have argued in Chapter three that agency is central to understanding adaptability or adaptive capacity. Exercise of agency is tied to power relations (Cleaver, 2007), and as alluded above, power also shapes transformability. Therefore, understanding power is of utmost importance to understand the resilience of SES.

Several authors argue (Cannon & Müller-Mahn, 2010) that since resilience and its basic principles (e.g., adaptive cycles, self-organization) have emerged from natural sciences (e.g., ecology), the attributes of social systems (e.g., power) that shape the dynamics of social-ecological systems are not adequately captured. Consequently, these lead to some normative questions like “who defines resilience, and for whom?” Focusing on power dynamics would help to address these normative questions.

In social sciences literature, power is interpreted in different ways (Van Dijik, 1989). It is difficult to find a single lens of understanding power and its implication in environmental change and natural resources management literature. Drawing insights from existing theories and perspectives on power, such as “in the power of power” (Jentoft, 2007), structuration theory¹⁴ (Giddens, 1984), power cube (Njaya, Donda, & Bene, 2011), I summarize two basic properties of power that are relevant for the discussions of this chapter:

¹⁴ Power is also understood from agent centered view and structural view (Nayak et al., 2015), but Giddens structuration theory combines both perspectives i.e. structure and action. Structuration theory posits that power is the outcome between the interaction of actors' agency and social structure. Realist (Raik, Wilson, & Decker, 2008) view of power holds similar meaning to Giddens' structuration theory.

1. Power operates through the social relationships between groups, between individuals, and manifested through social interaction in the form of domination and subordination. Sources of social power may reside within community and may come from outside the community (Jentoft, 2007; Njaya et al., 2011). In the wetland-community context, social relationships of power and politics are necessary to understand marginalization, exclusion from common pool resources (e.g., water, fishery), and distributional inequalities of varied social and ecological outcomes (Nayak et al., 2015).

2. Power operates on the basis of various resources, such as authoritative resources (command and control over people), and allocative resources (command and control over goods and services) (Giddens, 1984). Power in the form of “power to” or “power over” (Olsson, Galaz & Boonstra, 2014. P.4) depends on the control over allocative and authoritative resources. Institutions (both formal and informal) hold power and control both authoritative and allocative resources. The wetland-community in Bangladesh is a resources-dependent place-based community. Livelihood of the community people depends on the resources provided by the wetland ecosystem. For natural resources-dependent wetland-community, political economy of resource use requires special attention because livelihood stability is the measure of resilience (Berkes et al., 2003). Here the key questions are: i) Do current institutional regimes create marginalization, exclusion, and livelihood instability given the community power structure? And ii) If livelihood stability is threatened, what are the strategies taken by households to raise income? (Adger, 2000) (Discussed in Section 4.7).

To address the part of second objective (i.e., resilience of wetland-social-ecological system to flash flood disasters), I draw insights from above discussion and examined in the

following sections (4.4 to 4.6) how power as an attribute of a wetland-social-ecological system shapes resilience of wetland-social-ecological system to flash flood disasters.

4.4 An overview of social structure of wetland-community: Power and politics

In the following, I attempt to make an overview of the nature of social structure of wetland-community, specifically the nature of power structure and politics. Here, I emphasized the elements and sources of power and nature of politics. I aimed to frame the wetland-community social structure using the conceptual framework of socio-political power explained earlier.

The sources of power that shape the wetland-community can be divided into two broad categories: i) internal sources of power, and ii) external sources of power. Power from these sources creates control and command over people (i.e., authoritative resources), and control and command over resources (i.e., allocative resources). Elements of internal sources of power (i.e., elements that reside within community) are control over means of production, social status, social position and control over cooperative society, control over resource management institutes, connection with Union office and Upazila, and political dynamics. Elements of external sources of power - that shape wetland-community dynamics - are connections with political leaders, with GO and NGO officials, and with lease holders and with businessman. Studies on the rural social structure of Bangladesh also highlight the role of internal and external elements of power. For example, the study conducted by Chowdhury (2003), Khan (2003) document that power structure of rural community is shaped both by internal and external elements.

Internal elements of power that shape community power dynamics are also connected with the livelihood practices of community people, such as control over means of production (e.g., agricultural land, agricultural inputs, fishing net). The livelihood of community people

largely depends on fishing and cultivation of crops. Those who control the agricultural means of production shape power, for example, ownership of land, control over agricultural inputs like fertilizer, pesticides, seeds, and water pumping and irrigation machines. Landless and marginal peasants work on the agricultural land of rich peasants, and borrow land to grow paddy. Fertilizer, pesticides, seeds are often controlled by government authorized dealers. Often the government-authorized dealers are local community members. Peasants largely rely on machines for irrigation and watering the land, but do not own the machines. Control over water bodies for fishing, and fishing elements such as nets, boats shape power structure.

Connection with the Union office and Upazilla is also the sources of power. Bishwambarpur Upazila Headquarters and Thana (police office) are at close proximity. Upazila Headquarters has many government offices that provide various government services to people, such as agricultural office, fishery office, UNO office, cooperative office, land office, and livestock. Connection with various government offices and with police station (*thana*) is also internal sources of power. Connection with GO and NGO officials is tied with the various distributional inequalities. For example, water bodies less than 8.09 hectares or 20 acres are typically lease out from Upazila office; therefore, those who have good connection with the Upazila office can avail these water bodies or *beels*. For peasants, getting various agricultural inputs and fair price of rice is largely shaped by GO and NGO connections. Union office also offers various social services to people, such as providing birth certificates. Thus, connection with various service provider government offices turned out to be an important factor that shapes power. Moreover, position in various profit, non-profit organization also work as a source of power. For example, being President of *Bishwambarpur bazar somite* (association of businessmen) a person can exert influence considerably in decision making process within community.

Studies conducted in the rural social structure of Bangladesh highlight the function of *encapsulation* process that links local politics with national politics. Local politics cannot be treated in isolated manner, rather as a part of larger political process. Because of *encapsulation* process, local political leaders and external political leaders exert considerable influence upon the socio-economic process of community. For instances, Fotehpur Union Parishad Chairman is the President of Bishwambarpur Upazila Committee of Awami League (current ruling party); Chairman of Bishwambarpur Upazila is the president of Bishwambarpur Upazila Committee of BNP (previous ruling party). Because of their political affiliation they exert considerable influence, especially when their political party runs the government.

Political affiliation of people's representatives often creates factionalism, patron-client relationships or vertical class alignment. Political culture of Bangladesh is often confrontational (Khan, Islam & Haque, 1996), which promotes factionalism among community people because people's representatives often create followers, which in turn promotes patron-client relationships or vertical class alignment. Community people often invoke patron-client relationships because during crisis period (e.g., post-disaster situation) they turn to powerful patron (like local political leaders) for help. Also during post-disaster period, relief distribution is controlled by these patrons.

In the following sections, I discuss how power, in its multifaceted form, creates marginalization and exclusion from common pool resources, and distributional inequalities of varied social and ecological outcomes.

4.5 'Fishing is power': Marginalization from common pool resources

How local resources users have been marginalized and excluded from customary rights of resources access under the current institutional regimes are highlighted here. The

formal institutional regime operates within the existing power structure of the wetland-community. Local resources users (e.g., fishers) are excluded not only by shortsighted leasing policy but also exasperate by unequal power structure, which operates in multiple layers within the community. Local poor resource users are excluded at multiple levels, first, because of the formal institutional structure of resources management, fishers are excluded from big water bodies, and second because of the social-ecological network (e.g., fishers' association) is excluded from accessing and using the small and medium sized water bodies.

4.5.1 Jalmohal leasing policy and violation of customary rights

Four to five hundred people from this village and from Notun Ati (part of Bishwambarpur village) went to UNO. UNO asked whether we are fishers or not, we replied affirmative. He also asked whether we have card, we also replied affirmative, and also said that we have not received the card yet. We said we are fishers only by signboard. We asked him that if we are fishers then do we have the right to get the Sonua Bonua group fisheries. UNO replied yes, we asked him (UNO) to investigate whether we are live near to haor; if we live close to haor then we said give back our rights.... Later on we discovered that Oezkhali Somitee took the haor. We also asked him to allow us to catch fish on our own land; we consulted with fishery officer regarding this matter, but did not get any positive result. This is how we are living; we are deprived of our own rights (Oshini Bormon, a fisher from Bahadurpur village)

In Bangladesh, institutional regimes have changed over the period of time with the change in political regimes. Each political regime has redefined the access, distribution, and use of natural resources. Based on different political regimes, institutional regimes for natural resource management can be divided into four broad categories: i) pre-colonial period, ii) colonial period, iii) pre-independent Bangladesh, and iv) post-independent Bangladesh

(Khan, 2012). Natural resources have been a source of revenue collection since the pre-colonial period. During pre-colonial period or the period of *Mughols*, there was no specific formal institutional policy for resources management. Resources management and exploitation were carried away under the informal system of customary rights. During colonial period (1757-1947), British colonial government introduced the Permanent Settlement Act of 1793. Under this act, a parasitic-middle class called *Jamindars* was introduced as a revenue collector. The goal of *Jamindars* was to maximize revenue for British government and for themselves, not resources conservation or establishing rights to access resources. Under this act, the practice of customary rights was subject to the regular payment of tax. During post-independent (1947-1971) Bangladesh, *Jamindari* system was abolished by East Bengal State Acquisition and Tenancy Act of 1950. During post-independent Bangladesh, institutional regimes for natural resources management have changed its form, but remained same in terms of content. The formal institutional goal still remains revenue maximization, rather than rights to access or resources conservation. *Jalmohals* leasing policy in Bangladesh has gone through a number minor to substantial changes from 1973 through 2009. Currently *Jalmohals* are leased out according to *Government Jalmohals Leasing Policy of 2009*, which is discussed below in brief.

Water bodies are controlled by the land ministry under the *Government Jalmohals Leasing Policy of 2009*. This policy categorizes water bodies as open sources and closed sources. Close sources are *haor*, *beel*, *jeel*, pond, small water bodies, and open water bodies are river and canal. The objectives of leasing the government owned close and open water bodies are: i) to lease out the *khash* (government owned) water bodies to actual fishers on priority basis, ii) to increase government revenue, iii) to increase and conserve fishery resources along with other biodiversity. This policy also outlines the eligibility criteria for water body settlements. These criteria are: i) actual fishers will get the settlement of

government owned water bodies. It defines actual fishers as those whose livelihood depends on open sources. ii) Actual fishers can participate in bidding process; fishers have to form a cooperative that has to be registered with Social Welfare Department or Cooperative Department. iii) Priority is given to youth (18-35) fishers associations to lease out closed water bodies up to 20 acres. iv) To get the settlement of water bodies more than 8.09 hectares or 20 acres, only fishers living close to water bodies can apply (but fishers' association has to be registered).

Government leases out close water bodies more than 8.09 hectares or 20 acres under development scheme. Under development scheme, water bodies will be lease out to actual fishers' association for three years from the Ministries of Land. Fishers' associations have to deposit 20% of the total lease money, which will be adjusted with lease money during the last year. In every three-year period, lease money increases by 5% compared to previous year's lease money. One fishers' association can get only two water bodies more than 8.09 hectares or 20 acres under development scheme.

The *Karcharia haor* covers area of Sunamganj Sadar Upazila and Bishwambarpur Upazila of the Sunamganj district. Gourararang Union of Sunamganj Sadar Upazila, and Sholukabad, Polah, and Fotehpur Union of Bishwambarpur Upazila covers areas of the *Karcharia haor*. Gross area of this *haor* is 5,513 hectares (13622.92 acres) (Younus, 2010). This *haor* has agricultural land of 3700 hectares (9142.90 acres). Government own *khash* water bodies cover area of 41.40 hectares (102.29 acres).

Government leases out *khash* water bodies inside the *Karcharia haor* (*Sonua Bonua Prokashito*¹⁵) under development scheme. Total area of leased out water body is 41.40

¹⁵ *Sonua Bonua Prokashito* applies to a combination of number of *beels* or small water bodies. *Prokashito* is a Bengali word means manifested. *Sonua Bonua* term is used to name

hectares (102.29 acres). *Sonua Bonua Prokashito Karcharia haor* is leased out by the Ministry of Land to the Mitali Fishery Cooperative Society Limited (Oezkhali village, Sunamganj Sadar Upazila, District Sunamganj) for six years (from 2011-12 to 2016-17). The payment for leasing-in for first four years is US \$17,469.95 (1352, 000 BDT); and for the next two years the payment will increase by 25 % of the first four years. Payment of the *Karcharia haor* increases by 5% of the total leasing-in money of previous scheme.

The discussion so far has focused on the changes of leasing policy over time and elaboration of current leasing policy, and the process through which the *Karcharia haor* is leased out to the so-called fishers' association. Now I will shed light on how poor fishers are being included or excluded from their customary rights of fishing and source of livelihood by the existing leasing policy and prevailing power structure.

The current leasing system follows an open bidding system; according to leasing policy priority will be given to association of fishers living close to water bodies. Leases are given to the highest bidders¹⁶. This process impedes poor fishers to compete with financially capable, especially non-fishing groups. As mentioned above, the payment for leasing-in for *Karcharia haor* is 1352,000 BDT (US \$ 17469.95)¹⁷. For a poor vulnerable community who are living their lives in vicious cycles of money lending, poverty, and asset loss, it is almost impossible for them to arrange that such high amount money. Moreover, as per government policy, fishers living close to water bodies have the rights to get to the water bodies. The

small water bodies in combination inside *Karcharia haor*. In legal document the term *Sonua Bonua Prokashito Karcharia haor* is used

¹⁶ Under *Permanent Settlement Act* of 1793, highest bidding policy was the fundamental principle followed by British Colonial ruler in Bengal. The basic motive of highest bidding policy was to increase the revenue collection (Habib, 1975).

¹⁷ 1 US \$ = 77.39 BDT on 18/06/2015

Karcharia haor is surrounded by Sunamganj Sadar Upazila and Bishwambarpur Upazila. Therefore, association formed by fishers living these two Upazilas is supposed to get the water bodies. However, as mentioned above *Sonua Bonua Prokashito Karcharia haor* was leased out to the Mitali Fishery Cooperative Society Limited from Sunamganj Sadar.

Jal Jar Jola Tar (those who have the net for fishing should be the owner of waterbody) policy of government is in theory, but in practice control by the lease holders of the entire *haor*. As noted above, the gross area of *Karcharia haor* is 5,513 hectares (13622.92 acres), and agricultural land inside the *haor* is 3,700 hectares (9142.90 acres). Most of these lands are owned by community people. The government leases out *khash* water bodies, which cover an area of only 41.40 hectares (102.29 acres). During monsoon period, the entire *haor* gets inundated; and at this time, it is impossible to demarcate privately owned land from *khash* water bodies. Even though lease holders pay lease money only for 41.40 hectares (102.29 acres) they control the entire *haor*. Fishers cannot fish on their own land or at *vasan pani*¹⁸ during the monsoon period. There is a common saying in the *haor* area that *fish follows water, lease holder follows fish*. Lease holders thus become “water lords” during the monsoon period. Lease holders expand their control over *haor* areas as far as water goes, and lease holders are so powerful that poor fishers cannot challenge them. Clause 26 of Section 7 of *Jalmohal Leasing Policy of 2009* clearly states that *when during monsoon lease out water bodies and surrounding water bodies become one water body, at that time lease holders right for fishing is only limited to the delineated lease out areas*.

Political dynamics (local, regional, and national), political connection, and leasing policy are all interconnected. In most of the cases, lease holders are from the ruling political party, as the current lease holder is. Typically lease holder changes with the change in ruling

¹⁸ The word *vasan pani* is used by local fishers to indicate water over the land inside *haor*

party. Therefore, lease holders try to generate maximum profit out of the water bodies. Because of the *encapsulation* process, local political leaders are connected with lease holders and often work for lease holders. Poor fishers are thus not only excluded by the current policy but also by the existing power structure. Poor fishers expressed their powerlessness in saying that:

Previously we could fish from Boishakh (April-May) to Kartik (October-November), now it is forbidden for 12 months. They are wealthy, what can we do? They take our nets, file court cases against us; even the officers (police, fishery) listen to them.

4.5.2 Social-ecological network and marginalization process

The term social-ecological network is typically used in the literature on natural resources management (e.g., co-management) (Marin & Berkes, 2010) as well as social-ecological system resilience (Janssen et al., 2006; Gunderson, Carpenter, Folke, Olsson & Peterson, 2006). Networks are made of nodes and links that can be applied to represent a given system in terms of its localized components, (i.e., nodes or vertices), and the relations between those components, (i.e., links or edges) (Janssen et al., 2006). Within social-ecological networks, social components can be individuals, groups or institutions and ecological component can be habitats in landscape or food web. Social nodes are connected with ecological nodes through human activity and resource dependency. To represent a social-ecological system as network, it is important to decide what attributes researcher is interested studying or translating into network. Examples of attributes of social-ecological system are power, trust, and management information (Janssen et al., 2006).

I define a social-ecological network as network between groups and individuals that is applied in the process of resource exploitation or access. Here, dependency on the natural resources in terms of livelihood or income connects people within certain network. These

networks are often close and rigid in character, which typically includes some people and excludes others (i.e., social-ecological network here is understood from inclusion-exclusion point of view and in relation to access to resources). The key factor that shapes a social-ecological network is socio-political power. Close or open networks and connections among people are often connected with ecosystem services and have direct implication for social-ecological resilience. I am interested here in explaining how a social-ecological network operates under a prevailing power structure and institutional regimes and as a result creates marginalization and exclusion. The social-ecological network and resulting exclusion operates in three aspects: i) connection between lease holder and local fishers, ii) connection among Upazila administration, local powerful group, and fishers, and iii) connection among fishers under Community-Based Resource Management Project (CBRMP). These three aspects of social-ecological network and resulting exclusion are discussed below.

- 1) Under current institutional practices, large (more than 8.09 hectares or 20 acres) *khash* water bodies (*Jalmohal*) are leased out on the basis of open bidding policy. As mentioned above, this practice excludes poor fishers because of their lack of financial and other capacities. For example, a poor fishers' inability to form a strong association that can generate sufficient funds to compete in open bidding policy is one of the major hindrances for them to bid for wetlands. This consequently provides the opportunity to non-fishing powerful businessman and politicians to capture the fishery resources. As the lease holders are from non-fishing groups, they require local fishers for fishing during dry season and look after the *Jalmohal* during wet season so that no one can catch fish (Plate 4.6). However, lease-holders do not include everybody for fishing or to look after *Jalmohal*. Rather, they typically involve those fishers who are to some extent influential within their community so that they can suppress the voice of the majority of the fishers.

As a result of this selective inclusion of fishers by lease holders, the majority of the fishers remain excluded from accessing wetland resources.

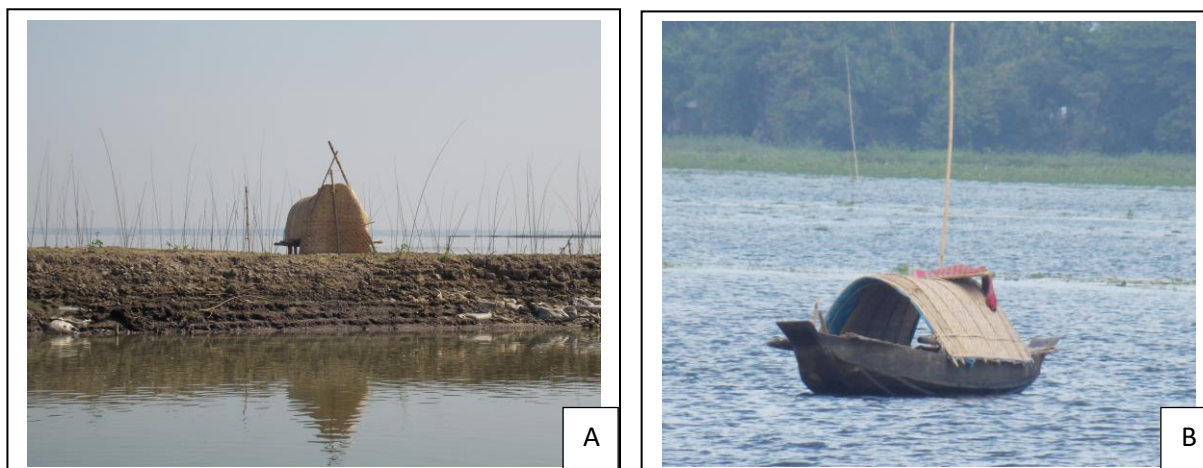


Plate 4.6: (A) a tent where watchman (fisher) stays at night to look after the *Jalmohal*, (B) a boat of watchman used for patrolling at day time.

Apart from using fishers' skill for fishing, another reason for involving local fishers by the lease holders for fishing is to use the local ecological knowledge so that they can get maximum profit out the *Jalmohal*. Here fishers' ecological knowledge is used by lease holders for resources exploitation rather than for conservation. In wetland areas, local fishers understand fish behavioral ecology very well and they know how each fish species behave according to water density and temperature. For example, they said the one-stripe spiny ell (*Macroglyphus aral*) fish goes under mud during hot and humid weather. Fishers also understand the liking and disliking of fish species (i.e., what environment fish likes and does not like), what measures can keep the fish inside the *Jalmohal* rather than migrating elsewhere (Plate 4.7). Thus, fishers' knowledge is exploited by the lease holders to get maximum profit out the *Jalmohal*.



Plates 4.7: (A) local fishers are involved in fishing for lease holders, (B) the use of local ecological knowledge. Here they use water hyacinth (*Eichhornia crassipes*) and bamboo to make a sort of sanctuary for fishes so that they stay there. These are made not to increase fish production, rather to draw fishes in that delineated area that allows easy fishing during dry season. These are a kind of fish trap.

2) The second form of social-ecological connection that excludes poor fishers from their fishing rights is the connection of local powerful touts, typically of non-fishing groups, with the Upazila *Jalmohal* Management Committee. Under current institutional practice, *Jalmohal* is less than 8.09 hectares or 20 acres and less than 1.21 hectares or 3 acres are leased out from Upazila office and Union Parishad respectively. Local powerful fishing and non-fishing groups having connection with Upazila administration and Union Parishad office typically succeed in leasing-in these *Jalmohals*, and then sometimes lease them out to local fishers at a higher rate. **Annex-3** offers data on the total number of *Jalmohals* (less than 8.09 hectares or 20 acres) leased out by Bishwambarpur Upazila committee.

It is evident from the **Annex-3** that those who have strong relationship with Upazila *Jalmohal* Management Committee are able to get *Jalmohal* frequently. For example, Romzan Ali (President of *Jagoron Jubo and Jubo Mohila Corporate Society Limited*, Boshontopur, Bishwambarpur) appeared eight times on the above list. *Jagoron Jubo and Jubo Mohila*

Corporate Society Limited holds more than two *Jalmohals* in one lease period. It holds three *Jalmohals* in one lease period (i.e., from 2008-09 to 2010-11, serial number 6, 8, 20 on the list), even though the Clause four of Section six of *Jalmohal Leasing Policy, 2009* clearly states that no one corporate society can get more than two *Jalmohals* at a time. Moreover, local touts form one or more corporate society by themselves to get *Jalmohals*; they often lease out *Jalmohals* to local fishers at a higher rate. Thus local powerful fishing, non-fishing groups with their connection with Upazila *Jalmohal* Management Committee are able to set controls over *Jalmohals* less than 8.09 hectares or 20 acres, which consequently exclude majority of the poor fishers from their fishing rights.

- 3) The third form of social-ecological connection that includes some and excludes others is the Community Based Resources Management Project (CBRMP). The CBRMP project was implemented by the Local Government Engineering Department (LGED) funded by International Fund for Agricultural Development (IFAD). It is a 12 years long project starting from January 2003 and ending in June 2014 (Plate 4.8). One of the major components of this project was the fisheries development. Under this component, this project aimed to provide poor fishers some access to *Jalmohals*, and to ensure community based resource management with the aim of developing fish habitat and to enhance production (LGED-CBRMP, 2013). Within Bishwambarpur Upazila, CBRMP project has access to 23 *Jalmohals*, the smallest one is 0.59 hectares or 1.47 acres and the largest one is 22.96 hectares or 66.64 acres. CBRMP project involved fishers' association as part of community engagement. CBRMP handover the *Jalmohals* to local fishers' association that are taken over from Ministry of Land.



Plate 4.8: A typical signboard of CBRMP project

The poorest of the poor fishers are excluded from the CBRMP by fishers' association. The association was formed by the fishers to take over *Jalmohals* from CBRMP are not inclusive, not all fishers get the chance to become member of fishers' association. Because of the internal competition among the fishers for scarce resources, some fishers get excluded. Before handing over a *Jalmohal*, the CBRMP makes an assessment of how many households a *Jalmohal* can support; therefore, the total numbers of association members are determined based on the assessment.

Poor fishers stated that the CBRMP had exacerbated their marginalization process. Before the inception of the CBRMP, poor fishers could access those acquired *Jalmohals*. They explained that, before the CBRMP it was like *Jal Jar*, *Jola Tar* (those who have had the net for fishing, would be the owner of the waterbody). Now these are controlled by the CBRMP. They also stated that local powerful people use the CBRMP to privatize the *beels*, association members are only docile bodies. There are also instances of resources appropriation by the president and secretary of the association and misuse of power by the CBRMP staffs.

The overall discussion presented here reveals that the local poor fishers are excluded by the exclusionary social-ecological networks supported by the existing leasing policy and local power structure. The following section will discuss the peasants' struggle against multiple actors in power dynamics and their problem with loss recovery.

4.6 Peasants' struggle against multiple actors and challenges in loss recovery

In social sciences literature, sociologists and social anthropologists have identified peasant as a distinct social category; however, often with paradoxical identities. Various authors have defined peasants or peasantry in various ways based on different criteria, such as cultural, economic, and political. From a cultural perspective, Steward defines peasants as the "horizontal socio-cultural segments" (quoted in Wolf, 1955, p. 452); and Kroeber identifies as a "part society with part culture" (quoted in Roy, 2004, p. 17). In terms of livelihood option, peasants are defined as small producers who produce only for consumption, as Shanin puts "land husbandry as the main means of livelihood" (quoted in Roy, 2004, p. 17). Wolf (1955) posits that peasant produce for subsistence, not for profit or reinvestment. He differentiates between peasant and farmers. For farmers agriculture is a business enterprise, and they produce for profit, for reinvestment. However, peasants often sell cash crops to market, not to reinvest but to buy other goods and services required to subsist. Politically, peasants are often conceived of as having an underdog position in society, sometimes as conservative and reactionary, or sometime as progressive and revolutionary (Roy, 2004). Despite the paradoxical identities, broadly peasants are identified as the marginalized, subordinate and underdog group in a society.

In the context of a wetland community, I define peasants as a social category whose livelihood mainly depends on agriculture. They produce for subsistence, rather than for profit or reinvestment. Peasants grow *boro* crops once a year in the wetland area, which is the main

source of livelihood. They often sell part of their crops to market to buy other goods and services. People belonging to peasant categories are landowning-rich peasants, small and marginal peasants, and sharecroppers. Sharecrop cultivation exists in different forms, these are locally known as *adda-bagi* (half of the crops for sharecroppers and half for landowner), *romjoma* (peasants borrow the land from landowners by giving a certain amount of money for cultivation, whatever peasants produce is his own), and *chuk* (peasants borrow the land from landowners on a deal that he must give a certain amount of crops to landowners). The latter two sharecrop cultivation arrangement always work in favor of landowners rather than peasants because if the crops are lost, peasants suffer from double loss, (i.e., payment to landowners and crop loss).

Even though authors have epitomized peasantry as a distinct social category, they are often divided along different lines, such as political, religious, economic condition. These often hinder them to act as a collective unit. In an effort to recover from crop loss due to early flash flood, peasants face multiple challenges due to constraints posed by local politics, power dynamics and government policy, which are discussed in the following sections.

4.6.1 Struggle against local power dynamics

We struggle to buy, we struggle to sell (Peasants of Bishwambarpur village)

Politics and the existing power structure of a community is often an impediment for peasants for loss recovery. Because of existing asymmetrical power structure, most of the government initiatives to help peasants to recover from losses go in favor of powerful groups. Powerful groups like local political leaders and touts often take advantage of government initiatives.

(1) *Politicizing post-disaster recovery initiatives:*

After a flooding disaster, the government provides various recovery incentives for peasants. Often political leaders or people's representatives like UP and Upazila chairman and members politicize post-disaster recovery incentives. Post-disaster recovery incentives are seeds, fertilizer, and cash. The lists of names of peasants to give away incentives to are often prepared by the Union Parishad (UP) and Upazila chairman and members. As mentioned earlier, there are often vertical class alignments in the political line; therefore, the UP and Upazila chairman and members give the names of those who are their clients. Consequently, a majority of the peasants are excluded. To ensure equity, if the Upazila Agriculture Officer tries to prepare an actual list of peasants, he does not get any cooperation from the UP chairman, and without any cooperation from the UP chairman officially, it is not possible for him to distribute the incentives because Upazila Agriculture Officer needs the UP chairman's signature for approval. The UP chairman does not sign on the list if the list does not include his clients.

Apart from the UP chairman and the Upazila chairman and members, often local leaders of ruling party, and other powerful group or individuals influence the distribution of recovery incentives. They often ask the Upazila Agriculture Officer to give them "ten names" (i.e., they want to give those incentives to ten people of their party). It is also found that family members of UP chairman and Upazila chairman try to influence to distribution of the incentives. As a result of the politicization of post-disaster recovery incentives, there are often overlapping, and multiple recipients in one family. Consequently, real victims get excluded. The Upazila Agriculture Officer said in this regard that a *lack of transparency is the reality*. A sixty years old peasant from Jirak Tahirpur village mentioned that he got those incentives once in his entire life after the independence (1971) of Bangladesh.

(2) *Exploitation by middleman:*

For loss recovery, peasants often take out loans from *Mohajans* and micro credit institutes. But there is also opportunity for peasants to take agricultural loans from Bangladesh Krishi Bank. Bangladesh Krishi Bank offers three types of loan, such as crop loan at 12% interest, mortgage loan at 13% interest, and business loan at 15% interest. When peasants lose the *boro* crop, the Bank does not pressurize the peasants for loan repayment during that particular year; however, the Bank does not waive the loan. But if the local UP or Upazila chairman recommends, the local branch of the Bank can waive 10%, the regional branch can waive 50 % and the national branch can waive 100% of the loan. By contrast, if a peasant takes a loan from *Mohajans*, then in most cases *Mohajans* takes 50% interest for six-month period, and 100 % interest for a one year period. Micro credit institutes give loans with nearly 20% interest, but peasants do not get the time to invest the money since the installment week starts from the following week. Therefore, loans from Bangladesh Krishi Bank appeared to be the best option for peasants for loss recovery rather than from *Mohajans* or micro credit institutes. However, they are unable to grab this opportunity due to several reasons, among which the exploitation of middleman is the main one.

In the process of taking loans from Bangladesh Krishi Bank, peasants suffer from exploitation from the middlemen. To take a loan from Bangladesh Krishi Bank, peasants sometimes need help from local touts or middlemen. This is because proper legal documents of land are required to take out a loan, which is missing for peasants. In most cases, agricultural lands of peasants are inherited properties that are not property documented. Local touts or middlemen have connection with Bank officials, and they make false documents for peasants so that they can take loans. Once a peasant gets the loan from a Bank, it gets divided into three portions: one portion for Bank officer, one for middleman, and a portion goes to the peasant. Moreover, peasants are unaware and do not know or understand the official

procedure of taking loans; hence, they opt to take help from middlemen. In turn, peasants get exploited by the middlemen.

(3) *Inability to get fair price of crops:*

Since the wetland-community is a single crop community, disaster loss recovery of peasants either from early or monsoon flash flood depends largely on getting the fair price of crops. Peasants sell their crops either to pay back the loan taken from *Mohajans* or micro credit institute or to buy other goods and services for their survival. Peasants do not get the fair price of crops due to strong alliance between businessman and government officials.

The government takes initiatives to buy paddy from peasants every year at a fixed rate so that peasants can get the fair price of paddy, but due to strong alliance and network between corrupt government officials and businessman, and peasants are often deprived of fair price of crops. Peasants reported various types of harassment when they try to sell paddy to government authorized buyer (e.g., LSD). For example, when a peasant takes his paddy to sell to government authorized buyer, he is told that his paddy is not well prepared for the store and the government officer asks him to dry out the moisture. It takes another one or two days to dry out the moisture from paddy. Moreover, when a peasant takes his paddy to sell to the government authorized buyer or if he cannot sell, then his overall production cost increases because of the carrying cost. As a result, peasants are bound to sell crops to businessmen at a price that is determined by businessmen.

Usually the price of paddy is low after the harvesting period. Therefore, peasants sell the paddy at a lower price. However, when it is required to buy rice, they have to buy it at a higher price. Typically peasants are bound to buy rice from local market at a higher price because of two reasons. First, at the end of the year peasants, especially small and marginal, tend to exhaust all the paddy/rice hence they buy rice from local market. Second, during

cultivation period, peasants do not have time to take paddy to rice mill to convert paddy to rice. Peasants thus do not get the fair price of rice, but also sells them at cheaper rate and buy at a higher rate.

Businessmen make profit by buying paddy from peasants cheaply and selling at a much higher price. During my conversation with a local businessman, he reported to me that last year (2013), he brought paddy from peasants at 17 BDT per KG after the harvesting period. Businessmen buy a huge volume of rice from peasants and sell them to big businessmen of other parts of the country. Before the harvesting season, these traders make a considerable profit margin because they sell rice at 29 BDT per KG.

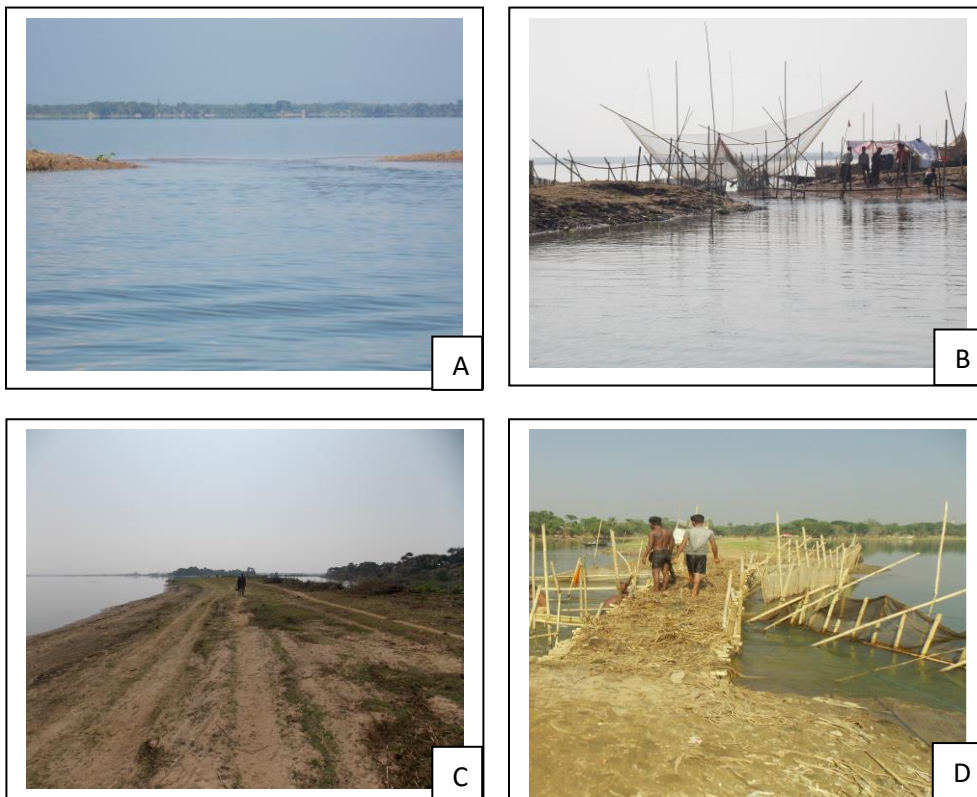
(4) Politics of embankment:

Peasants and community people have identified four sides of the *Karcharia haor*, such as east, west, north, and south. Among the four sides, the west side is identified as the most vulnerable to early flash floods. Flood water often enters through this side. This side is typically protected by a five-kilometer embankment made with mud and soil. Paradoxically, this side is often the space for political debates because of interest of multiple powerful groups including lease holders, local political leaders, and government officers.

Lease holders drain out the water for fishing at the west side of the *haor* because the west side is the lowest lying area in the *Karcharia haor*, and river the (*Rupsha River*) is close to that side. It is easier for them to drain out the water by cutting the embankment, because the embankment is in-between the *haor* and the river. They put net while draining out the water so that fish does not go to river from the *haor* (plate 4.9). They make the drain as deep as possible so that water drains out quickly, which makes this portion of the embankment weaker. They intentionally make the embankment weaker so that flood water can enter into

the *haor*. This is because if the flood water destroys the crops then it will become food for fish that will increase the fish production.

During wet season, people in the wetland area use boats for communication. During dry season the rivers dry out and the embankments become temporary roads for community people. The means for transportation is often motorized bicycle. Local politicians and powerful groups become happy when lease holders cut the embankment to drain out the water. They put a temporary bridge over the cut for transportation after taking approval from Union Parishad. Through this temporary bridge, they collect tolls from every motorized bicycle using that bridge. This business continues as long as water goes from *haor* to the river through the cut.



Plates 4.9: (A) water flows from the river to the *haor* during monsoon period, (B) lease holders are draining out water from the *haor* to the river, (C) the condition of embankment during dry season, (D) the bamboo bridge made over the drain for communication

The Water Development Board spends a large amount of money for the maintenance and repairing of the embankment each year. Total amount of allocated budget for embankment of the *Karcharia haor* is presented in Table 4.2. A big portion of the allocated budget goes to the repairing of the five kilometer embankment on the west side. The Water Development Board carries out the repairing of the embankment through local the UP chairman and members or by any contractor. If the embankment is damaged and requires repair then it generates interest of multiple groups.

Peasants become anxious when lease holders make the drain deeper because it can make easier for the flood water to enter the *haor* through this gap. Typically, the lease holders make the drain deeper during night time, to stop that peasants whom often monitor the activity of the lease holders. Nonetheless, peasants are often divided into different lines; therefore, they cannot collectively act together. Some peasants, especially the rich peasants, often work in favor of the lease holders.

Table 4.2: Budget allocated by Water Development Board for the construction of embankment of the *Karcharia haor*

Sl#	Year	Amount US\$ ¹⁹
01	2007-08	90450.96
02	2008-09	70138.26
03	2009-10	120286.85
04	2010-11	89084.82
05	2011-12	85579.53
06	2012-13	103695.56
07	2013-14	96524.09

Source: Water Development Board (Sunamganj office), 2014

¹⁹ 1 US \$ = 77.39 BDT on 18/06/2015

4.6.2 Government policy and politics

a. Struggle over control of water: Whose water?

When I want to keep the water for irrigation, they [lease holders] want to drain out water for fishing; when I want to drain out water, they want to keep the water (Ghani Ansari, Key informant)

The above statement highlights the conflict between peasants and lease holders over the control of water. The question that remains is whether the water is agricultural lands' or *Jalmohals*'? Water as a common pool resource remains as the area of struggle between peasants and lease holders. Government typically leases out the *khash* water bodies (*beel*) inside *haors*, and as mentioned earlier, lease holders set control over the entire *haor*. During dry or fishing period, lease holders want to drain out the water from the *haors* for fishing. The way they drain out the water is deleterious for agriculture.

Peasants need to control water for cultivation. They prepare the seedbed from November to December. During December, they plant the sapling that requires nurturing (e.g., watering) up to March. The harvesting period is typically early or mid-April. Peasants want to drain out the water from November gradually so that they can prepare the seedbed and plant the sapling, and keep some water for irrigation. Peasants must control water from the beginning of cultivation period to the end of harvesting. But the lease holders control the water and do not drain out the water quickly enough so that the peasants can prepare the seedbed and plant the sapling. They store the water and let it go together so that they can catch the fish easily. This results in delaying the preparation of the seedbed and planting the sapling. As a result the harvesting period is pushed back, which increase the risk of early flash flood as the early flash flood arrives during April. After the peasants have prepared the seedbed and plant the sapling, they need water for irrigation. But the lease holders want to

drain out the entire water from the *haor* so that they can catch the rest of the fish. As a result, due to lack of water for irrigation the total production of crops declines.

In *Jalmohal Leasing Policy of 2009*, there is a clear instruction (Clause 22 of Section 7) for lease holders that they cannot create any obstacle for irrigation. It also says that for close water bodies like *beels* inside the *haor*, lease holders can only do fishing that does not harm irrigation. Lease holders; however, do not care about storing water for irrigation, and control the water according to their needs. They hold the water and drain out the water when they think it is beneficial for them. They control the water and do the fishing according to the price of fish in the market.

Along with the lease holder of large water bodies, the CBRMP also created a similar problem for the peasants. As mentioned earlier, CBRMP controls small and medium size water bodies. Peasants state that since inception of CBRMP in 2003, it has become an additional problem for them. The CBRMP controls the water in similar fashion that lease holders do.

The problem of control over water is socially differentiated among peasants. All the peasants do not experience the problem the same way. Peasants' differential struggle over control of water can be clearly explained using the Figure 4.3. This figure was prepared by peasants to identify the problem within the *haor*. Even though this map depicts a number of problem peasants face with cultivation, here I will focus on their struggle over control of water. Peasants divided the entire *Karcharia haor* into six parts – from *Korcha 1* (north-east side of *haor*) to *Korcha 6* (south-west side of *haor*) - based on the pattern of land and land use (as shown in the Figure 4.3). *Korcha 1* is the high land area as opposed to *Korcha 6* as the low land area of the *Karcharia haor*. High land areas like *Korcha 1, 2, or 3* are suitable for both *boro* and *IRRI* crops. Peasants can only grow *boro* in low land area like *Korcha 5, 6*.

Peasants typically grow *IRRI*²⁰ in *Korcha 1* rather than *boro*, but because of the low laying land, peasants are bound to grow *boro* at *Korcha 6*. The price of land is highest in *Korcha 1* and lowest in *Korcha 6*. Typically rich peasants hold the ownership of land in *Korcha 1*, and poor peasants hold the ownership of land in *Korcha 6*. Poor peasants cultivating in *Korcha 6* area face problems controlling water for cultivation more severely. This is because in the low laying land water remains stagnant for a longer period of time, and they cannot plant the sapling in an appropriate time. Consequently a risk for early flash flood emerges. Lease holders drain out the water to the river at the west side of the *haor* since this side is low lying. It is easier for them to drain out the water at this side. Because of low economic status, poor peasants have less bargaining power compared to rich peasants. Thus, poor peasants are in double jeopardy (i.e., they solely rely on *boro* crops and at more risk of flash flood due to water stagnation and also cannot get maximum production due to irrigation problem).

²⁰ The production of *IRRI* is almost double of *Boro*, even though the production cost is almost double.

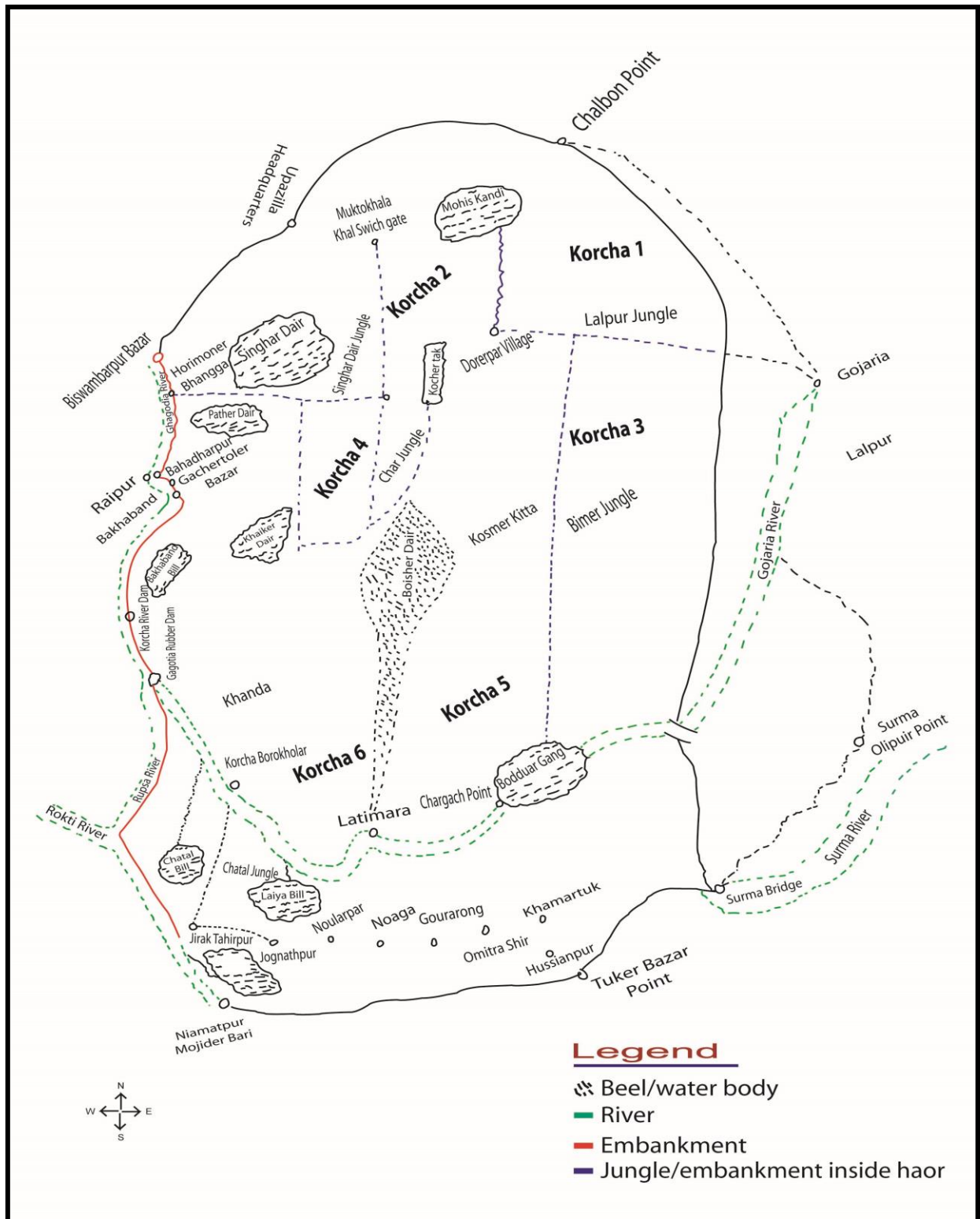


Figure 4.3 Distribution of areas inside the *Karcharia haor*

b. Problems with government measures

The government takes various measures to help peasants to reduce disaster losses, such as various recovery interventions during post-disaster situation, and other measures to tackle flash flood, such as constructing embankment. However, often such initiatives are either insufficient or creates further problem for peasants.

Almost every year government provides recovery incentives for peasants, such as providing subsidized or free fertilizer and seeds. However, a number of problems with recovery incentives often arise. The first problem with recovery incentives is that they are often insufficient. For example, during the post-monsoon 2014 flash flood period, the seedbed of *aman* paddy was severely damaged in Bishwambarpur Upazila. The Upazila Agricultural Office initially estimated the total damage of 3000 hectaress land, and total peasants affected as 5,700 persons. In the final report, which was prepared to submit to government, the total damaged area was reduced to 950 hectares. The reason behind this is that there was pressure from the central government on local government to show least amount of damage as possible. On the basis of the report, government sent recovery incentives only for 280 peasants, which was only for 4.9 % of the total affected peasants. The second problem with recovery incentives is the timing of incentives. The recovery incentives do not come at appropriate times. For example, recovery for *aman* loss arrives at *boro* season or vice versa. As mentioned in Chapter three cultivating *boro* or *aman* depends on land pattern. Most of the agricultural land at the Fotehpur Union is low lying and suitable for only *boro* crop. Peasants do not cultivate *aman* in that area because the *haor* gets inundated. If the recovery incentives for *boro* crops arrive at *aman* season to the locality, the peasants would not be benefited. The recovery incentives are often also politicized (i.e., provided to selective peasants). As a result, actual victims mostly remain out of recovery incentives coverage.

Therefore, timing, volume, and proper distribution of recovery incentives is necessary for peasants' disaster loss recovery.

Another problem with government measure is the increasing formalization of informal collective actions. Previously, peasants collectively drained out water from the *haor* by cutting the embankment, but now they require permission from the Union Nirbahi Officer (UNO) since it is a government property. To obtain take permission from government, it takes at least one week. It results in two problems: first, peasants cannot drain out the water to prepare seedbed and plant sapling, and second, peasants and local community members also cannot drain out the rain water that inundates the crops. Thus, the government measures to address or mitigate problems actually create other additional problems for peasants. This problem relates to formalization of informal collective action, and will remain a major concern unless peasants are empowered or authority is given to peasants.

4.7 Household strategies to diversify livelihood options

Because of marginalization, exclusion and resources degradation, community people are taking different strategies to raise household incomes. As mentioned earlier, the two main sources of livelihood options for the majority of the local people are fishing and crop cultivation. The strategies taken by fishers' and peasants' households can be divided into two parts, following Haque, Idrobo, Berkes, and Giesbrecht (2015), namely *intrasectoral* and *intersectoral* diversification. These strategies are discussed below.

(1) *Intrasectoral diversification*: *Intrasectoral diversification* means diversification with the existing livelihood options (i.e., vertical diversification) (Salagrama & Koriya, 2008). Limited options exist for peasants and fishers for *intrasectoral* diversification. The options for *intrasectoral* diversification are often capital intensive. As I have mentioned above that peasants cultivating at the *Karcharia haor* area belong to a single-crop community due to the

pattern of the land. The only option available to them for diversification is to try improved varieties rather than local *boro* crops. Peasants cultivate local improved varieties, such as BRRI-28 or BRRI-29 for increasing production. The production of BRRI-28 or BRRI-29 per unit of land is almost double compared to local varieties like *boro*. But the production cost is also almost double. A comparison between improved varieties (BRRI-28 or BRRI-29) and local varieties (*boro*) in terms of production cost and output is presented in Table 4.3. It shows that in one hectare of land a peasant can grow approximately 1,000 KG of paddy using local varieties, whereas he can get approximately 2,000 KG of paddy using improved varieties. However, this sort of diversification is capital intensive (Table 4.3). Such diversification also involves high risk, because if the crop is damaged by early flash flood, the loss would be severe.

Another example of intrasectoral diversification is related to paddy business. This type of diversification is also capital intensive. Peasants having financial capital can normally afford this type of diversification. In this case, peasants typically buy paddy from other small and marginal peasants just after the harvesting period and sell them to big businessman with some profits.

Table 4.3: A comparison between local improved varieties and local varieties

Amount of land	BRRI-28 or BRRI-29/hectare	<i>boro</i>/hectare
Production cost	US \$ 63.82 or (4,940 BDT) (approximately)	US\$ 32.0-40.0 or (2,400-3,000 BDT) (approximately)
Production	2,000 KG (approximately)	1,000 KG (approximately)

Source: Field survey data, 2014

As mentioned before, fishers are excluded from their customary rights of fishing due to the leasing policy, local power structure and exclusionary social-ecological network. As a consequence, fishers either opt for fish related business like buying and selling or the business of dry fish. Diversification of this kind is very capital intensive. To opt for dry fish

business, fishers need to invest large sum of money for buying fish, make a bamboo roof to dry fish (like the one shown in Plate 4.10), and hire labor to process the fish. To make a medium size bamboo roof of 30 feet width and 45 feet long (Plate 4.10), it requires around US \$ 321.79 or (25,000 BDT). In addition they need money to buy fish and hire labor. It is almost impossible for one fisher to do dry fish business; in such case, they form a group together to carry out the business or borrow money from big dry fish businessman (*arotdar*). *Aarotdars* also invest money in dry fish business. *Arotgars* keep 5% of the total profit made from such venture.

Another way of diversifying is to share fishing with lease holders. Shared fishing means fishing for lease holders. When fishers do not have any other option, they go for shared fishing, but may not get adequate remuneration. Lease holders often ask fishers to catch fish for them. Payment for fishing is determined by lease holders, and is done on the basis of verbal agreement. But lease holders do not give a fair portion in such arrangement.



Plate 4.10: Bamboo roof for preparing dry fish

2. Intersectoral diversification

Oezkhali cooperative society took the Karcharia haor, CBRMP took Sunatula Kaikkar Dhai²¹, but CBRMP is not inclusive. Normally ten to twenty people form a cooperative society and then lease-in a beel. Only twenty people from a village can access a beel, but other 100 people are deprived. What they can do for survival? The only means for survival for them is to do day-labor, but day-labor is not available every day. If they manage to work for one day, they do not make to work for two more days. How these people can then survive with their family?... To avoid suffering from acute poverty, some people are going to Bhulagang²², other are going to Dhaka...

Intersectoral diversification means livelihood diversification other than existing one (i.e., *horizontal diversification*) (Salagrama & Koriya, 2008). People tend to inter-diversify their livelihood options because of lack of limited options available for *intrasectoral diversification* and lack of capital. Community people now do not rely on a single occupation for their livelihood. Data in tables 4.4 and 4.5 show the example of intersectoral livelihood diversification. A total of 31 out of 109 respondents opted for the main livelihood option as fishing, but 30 of them have a secondary occupation. Fishers are involved in work with multiple sectors, like agriculture, day labor, fish business, and other self-employed occupations. Similarly, 47 respondents' main occupation was agriculture, but 43 of them are now involved in other occupations along with agriculture, other 4 peasants are rich peasants. Fishers and peasants have also tertiary occupation (Table 4.5). 14 out of 31 fishers are also

²¹ It is a *beel* managed by CBRMP.

²² People go to Bhulagang to work at sand and stone quarries.

engaged with tertiary occupation, and 15 out of 47 peasants are also involved with tertiary occupations.

Table 4.4: Cross tabulation between main and secondary occupation (n=109)

Main occupation	Secondary occupation							Total
	Fishing	Agriculture	Day labor	Fish business	Boatman	Other (e.g., self-employed)	Not applicable	
Fishing	0	10	7	10	1	2	1	31
Agriculture	11	0	12	2	5	13	4	47
Day labor	1	0	0	0	0	0	1	2
Fish business	4	2	0	0	0	1	0	7
Boatman	0	1	1	1	0	0	1	4
Other (e.g., self-employed)	3	11	1	0	0	1	2	18
Total	19	24	21	13	6	17	9	109

Source: Field survey data, 2014

Table 4.5: Cross tabulation between main and tertiary occupation (n=109)

Main occupation	Tertiary occupation					Total
	Agriculture	Day labor	Fish business	Other (e.g., self-employed)	Not applicable	
Fishing	4	8	0	2	17	31
Agriculture	0	6	1	8	32	47
Day labor	0	0	0	0	2	2
Fish business	1	1	0	0	5	7
Boatman	0	0	0	0	4	4
Other (e.g., self-employed)	1	2	1	2	12	18
Total	6	17	2	12	72	109

Source: Field survey data, 2014

Apart from working in other sectors by community residents, community people often seasonally migrate to other places for work; though few households were bound to migrate permanently. Adger (2000) equates seasonal migration with “circular” migration and permanent migration as “displacement”. People migrating to other places seasonally or permanently are mostly fishers. The main reason for migration, as mentioned by fishers, is the exclusion from fishery resources. Inhabitants in Raipur, Bahadarpur, and Katakali villages are mostly fishers. People from these villages often seasonally migrate to other places for work. It was found that, sometimes household head migrate to other places for work, or other household members or entire household migrate (some of the example of migration is given in Chapter 3). Thus seasonal migrations are *circular* in form. It was also noticed that few households permanently migrated to other Divisional cities (e.g., Dhaka) (Plate 4.11). They are displaced due to their inability to cope with exclusion.



Plate 4.11: An example of displaced household

4.8 Conclusion

This chapter highlights some of the internal and external drivers of change that shape wetland-social-ecological resilience. External drivers of change are market integration, technological integration, national policy for resources management, and external sources of power. Internal drivers of change are population growth, practices related to resources extraction, ecological processes, and internal sources of power. It is also evident that the current resources management policy and asymmetrical power structure create marginalization, exclusion and consequently income and livelihood instability and community vulnerability to flash flood hazard especially of the poor fishers and peasants. Further reflection on these internal and external drivers of change is necessary for building resilience and ensuring the sustainability of wetland-communities.

Chapter Five

Multilevel institutional interfaces in disaster response and recovery process

5.1 Introduction

Our Society is increasingly taking measures to mitigate the impacts of disasters and to manage the consequences of natural disasters, as natural hazards are inevitable and unavoidable. Management of natural disasters is necessary to ensure sustainability of socio-economic development, and to make society resilient in the face of natural hazards. In this regard, institutions are the key factors, which can potentially generate and mobilize resources (e.g., financial, and technical) to manage the consequences of natural hazards. In addition, institutions also facilitate collective action prior to and during the period of crisis.

Considering this background, the focus of this chapter is to understand the role of institutions – formal and informal and horizontal and vertical – in the community self-organization process. In this chapter, I will explore the aspects of self-organization and transformation as I hold the view that these two dimensions of resilience are fundamental in understanding the institutional dynamics of disaster response and recovery. This chapter addresses the third objective (i.e., to assess the dynamics of multi-level participation of institutions in flash flood disaster management and recovery policy process).

To this end, in this chapter, I first draw on the literature on resilience and self-organization and transformation in institutional settings. Second, I offer an overview of institutional change in Bangladesh for disaster management. Third, I provide an overview of the role and responsibilities of local institutions in the flash flood context is made. Fourth, response capacities of local institutions are determined. Fifth, barriers to transformation of

local institution are assessed; sixth, the roles of NGO as the drivers of institutional transformation are analyzed. Lastly, the roles of horizontal and vertical institutions in sharing risk and responsibilities are examined.

5.2 Resilience and self-organization

How communities possibly adapt with the intensive, irregular natural events is a very important question. Resilience thinking offers a possible way of answering this question as it focuses on building community strength and its local institutions for immediate response and recovery. Local community institutions are the key to adaptation, community self-organization process and in building resilience in the face of natural disasters. The Hyogo Framework of Action (2005-2015) in this regard urges us to recognize the strength and engagement of community for enhancing adaptive capacity. During extreme weather events, the capacities of local institutions may not be adequate to tackle the situation. To overcome from adversity, what are required are cross-scale (horizontal and vertical) institutional linkages.

The notion of self-organization is originally from the studies of ecology, but also applied to human system research streams. Resilience Alliance (2015) defines self-organization for ecology in evolutionary terms, and relates self-organization for human systems institutions through asserting: “self-organization of human institutional patterns establishes the arena for future sustainable opportunity” (glossary, Resilience Alliance, 2015). Resilience of an SES system depends on its ability to self-organize “because nature’s cycles involve renewal and reorganization” (Berkes, 2007. p.290). Key to self-organization of an SES system (community) is the institution that links social systems with ecological systems.

Four aspects of self-organization discussed by Berkes (2007) are noteworthy and paraphrased here. These four aspects create “opportunities” for self-organization. These four aspects are:

(1) **Community based organization or local institutions:** During disasters, the first responder is the local institution of a community. For immediate response and recovery, local institutions play a vital role because assistance from external organizations often takes a longer time. I examined what facilitates and constrains local response capacity during disaster. However, local institutions are necessary conditions, but are not sufficient for response and recovery.

(2) **Cross-scale institutional linkage, both horizontally and vertically:** The cross-scale institutional linkage is required because often local institutions or community based organizations are not sufficient for disaster response and recovery. I examined how cross-scale institutional linkages (a) operate during disaster response and recovery, and (b) how it helps strengthening local institutions through technical capacity building and financial assistance.

(3) **“Institutional memory”:** Organizations and institutions learn from past event as an individual does. Institutional memory has implication to future planning and response. I looked into the factors that build or erode institutional memory.

(4) **Sharing of learning and adaptive co-management:** To share learning experience and adaptive co-management, a participatory platform is required where everybody shares their own experience, and problem solving takes place based on feedback. I explored whether these kinds of participatory spaces exists, and if it does exist, how then does the process take place.

Institutions are therefore the key to the community self-organization process. These institutions range from local to international. In this thesis, to understand self-organization process, I have focused mainly on the role of institutions on disaster response and the recovery phase to address the third objective of my thesis (i.e., the dynamics of multilevel participation of institutions in flash flood disaster management and recovery policy process).

5.3 Positioning transformation in institutional settings

Resilience has been defined in various ways by the scholars. Most definitions of resilience within social-ecological system resilience and disaster resilience literature are concerned with the ability of a system to cope, and adapt with change and uncertainty, learning, anticipation, self-organization, and to maintain structure, function, and feedback (Berkes & Seixas, 2005; Walker et al., 2004; Adger, 2000; Cutter et al., 2008; Paton & Johnson, 2001; UNISDR, 2009; Djalante et al., 2012; IPCC, 2012; Gilbert, 2010). Only Folke's (2006) and Norris et al.'s (2008) definitions has gone beyond the issue of maintenance of structure, function, and feedback by stressing on "transformation" and "positive trajectory" respectively. However, Folke's (2006) definition of *transformation* or *transformability* and Norris et al.'s (2008) conceptualization of *positive trajectory* require further elaboration.

"Transformability" is defined by Folke (2006, p.262) as the "capacity of people to create a fundamentally new social-ecological system when ecological, political, social, or economic conditions make the existing system untenable". This definition of transformability is problematic. Because a fundamental change by people in the social structure along with economic and political structure means a revolutionary change in the socio-economic-political system, let alone ecological change. Transformation in the socio-economic-political system does not hold the same meaning as transformation in the ecological system. It begs to

ask the question: transformation, by whom and for whom? Transformation depends on power structure. Power is often asymmetrically distributed within a community. This kind of definition of transformability or transformation in the socio-economic-political system has some normative and political implications.

Pelling and Manuel-Navarrete (2011) elaborated how transformation can be facilitated or blocked by power structure. Institution holds power, and power is the key for transformation. Power can be more fruitfully understood by Giddens (1984) theory of “structure of domination”, which has two key components: power and resources. There are two forms of resources, namely allocative resources (command and control over goods), and authoritative resources (command and control over people). Institution holds power and command and control over people and goods. Therefore, societal transformation largely depends on institutional power structure, and transformation within an institution depends who holds power for whom.

In this Chapter, I define transformation as institutional transformation or increasing adaptive capacity of local institution in the face of natural disasters. Often transformation is linked to a paradigmatic shift in adaptive capacity (Matyas & Pelling, 2014). Here transformation is understood with limited scope, considering that local institutions (i.e., UDMC) operate within the guideline provided by government. It is unlikely to create a paradigm shift in disaster management by local institution, rather to move forward within the guideline.

Institution is crucial for understanding disaster response and recovery, and it has the potential to create opportunities for community self-organization. Self-organization is a type of change, but it does not necessarily mean maintaining the status quo and returning to the previous equilibrium point or a process that takes to a *positive trajectory* (Norris et al., 2008).

Rather, a question that remains is that whether this change is a transformative one and toward a *positive trajectory*, or is returning to a previous equilibrium point dependent on a power structure.

5.4 Institutional shift in disaster management in Bangladesh

In recent times, there has been a paradigm shift in the institutional arrangements for disaster management in Bangladesh. Government institutions strongly felt the integration of development process with disaster management activities from national to local level was necessary (which can reduce community vulnerability to natural disasters, and can build capacity of community in the long run). Apart from the government institutions, various national and international development agencies also felt the need for better preparedness and risk reduction at community level. These recognitions by government and non-governmental agencies have resulted in an institutional shift in disaster management in Bangladesh (Haque & Uddin, 2013).

Recognizing these needs, the government of Bangladesh formulated a National Plan for Disaster Management (2010-2015) in 2010. This policy document strongly acknowledges the disaster-development linkage by highlighting the importance of national and international drivers of change, such as MDG, PRSP-Bangladesh, Hyogo Framework for Action (2005-2015), UNFCC, SFA (2006-2015), and Bangladesh Climate Change Strategy and Action Plan 2009. The core principles of this plan are: first, promotion of national ownership of strategies by ensuring participation of government, NGO and civil society; second, more focus on the benefit of marginalized and disadvantaged groups; third, adopting a comprehensive and all-hazard approach in risk reduction; fourth, involvement of development partners; and fifth, adoption of long-term perspective on risk reduction. Based on these core principles, overall disaster management system has been formulated where the institutional linkages among

various disaster management institutions from the national level (e.g., National Disaster Management Council) to the very local level (e.g., Union Disaster Management Committee) were established (see **Annex 4** for complete institutional arrangement). Besides the National Plan for Disaster Management (2010-2015), the Bangladesh government also formulated a “Standing Orders on Disaster” (SOD) in 1997, which clearly outlined the role and responsibilities of each institution (discussed in the following section).

5.5 Flash flood and local institution: The UDMC

The government of Bangladesh has formulated a “Standing Orders on Disaster” (SOD) in 1997, which was periodically updated (last updated in 2010) to ensure effective participation of local community as Bangladesh is one of the signatories of Hyogo Action Framework (2005 to 2015). SOD is primarily a guideline and provides a detailed description of the roles and responsibilities of every organization (from ministries to local level) involved in disaster risk reduction and emergency response management. There is a committee at each administrative level to manage disaster.

Union Parishad (UP) is the lowest administrative unit in Bangladesh. The committee that operates in the Union level is *Union Disaster Management Committee* (UDMC). The UDMC consists of 36 members, which includes Union Parishad (UP) chairman, members, government officials working at Union level, NGO representatives, local elite, and community people (complete structure of committee included in **Annex 5**). Along with this committee, a group of volunteers consist of male and female (from community people) workers during disasters. There is a specific guideline for the UDMC for what to do, and how to do activities at different phases of disaster management (i.e., risk reduction, warning, onset of disaster, and post disaster). **Annex 6** outlines role and responsibilities of the UDMC in disaster management in Bangladesh.

Through this guideline the UDMC holds power to take initiatives in risk reduction and to respond effectively during disaster. Authoritative power is prescribed upon them through SOD. The UDMC is supposed to have the command and control over allocative resources and authoritative resources that can help prepare plan before disasters and response during disasters. Here, I examined to what extent disaster open the window of opportunity for the UDMC, whether they are able to grasp this opportunity for transformation; to what extent NGOs play a facilitating role in transforming the UDMC. To examine these issues, here I have focused on monsoon and post-monsoon flash floods considering that the UDMC as a local institution often deals with these two phases of floods. I have drawn examples from the 2014 flood even though it was not declared as flood by government authority for political reasons.

It is important here to have some background information on the 2014 flood in the wetland area. In the wetland area there were two big flood events in the recent past (i.e., floods in 2004 and 2007). Table 5.1 provides the scope for a comparison of the 2014 flood with past big flood events. It shows that in 2014, the discharge was even much higher compared to the 2004 and 2007 floods. Because of the high volume of water discharge, during the 2014 flood community people suffered from considerable degree of loss and damage. The following section provides a comparison between the 2007 flood and the 2014 flood in terms of loss and damage, and explains the response strategies taken by the UDMC. Whether current capacity of the UDMC is adequate to tackle big event like the 2007 flood is also examined.

Table 5.1: Water level and discharge, Surma River (Station SW569, Sunamganj)

River	2004		2007		2014	
	Water level (mPWD)	Discharge (m ³ /s)	Water level (mPWD)	Discharge (m ³ /s)	Water level (mPWD)	Discharge (m ³ /s)
Surma, Danger level (8.25 mPWD)	8.98	2227.05	9.04	2318.59	8.68	3133.22

Source: North-Eastern Measurement Division, Water Development Board, Bangladesh

5.6 Local response capacity: The role of the UDMC

Before I proceed to discuss the response capacity of the UDMC, it is worthy of presenting a comparison between the 2007 flood (last big event) and the 2014 flood in terms of loss and damage. Table 5.2 presents loss and damage data for the 2007 flood. The result is based upon a purposively conducted survey in the community in six villages covering 109 households. It is evident that every household experienced loss and damage, whereas in 2014 only 400 households were affected out of 5,974 households in the community (Bishwambarpur UNO office report). In terms of loss and damage, the 2014 flood was not even close to the 2007 flood. In this backdrop, I explored the response strategy by the UDMC during the 2014 flood, and asked the question whether they were able to tackle an extreme event like the 2007 flood with their current capacity, and what factors facilitated or hindered the enhancement of adaptive capacity (i.e., transformation).

Table 5.2: Range in loss and damage caused by the 2007 flood, n=109 (in current market value)

Items	Max (US \$)	Mean (US \$)
Total loss due to flash flood	3114.94	519.11
Amount of fodder loss	386.15	15.94
Amount of fuel loss	257.43	21.52
Amount of livestock loss	1287.16	104.33
Amount of property loss	1364.39	235.70
Amount of loss due to health problem	643.58	37.09
Amount of crop loss	1930.75	101.30

Source: Field survey data, 2014

a. Response to recent flood (2014)

Local response capacity is examined in terms of the capacity of formal local institution (i.e., the UDMC) to respond during disasters, and how volunteers play a decisive role in the response and recovery process. Response by the UDMC is divided into two parts; first, response by UP chairman and members; and second, response by the UDMC volunteers (male and female). During disaster, the UDMC mobilize the volunteers, and such volunteers work as complementary force to the UDMC.

1. Response by UP chairman and members

The SOD clearly outlines roles and responsibilities of a UP chairman during the alert and warning stage, on-set of disaster, and rehabilitation stage. During the alert and warning stage, for example, the chairman is responsible for disseminating warning signals; arrange evacuation for people at risk during the on-set of disaster, and conduct rescue and relief operation at the rehabilitation stage.

In Fotehpur, the UP chairman during the 2014 flood disseminated a warning message prior to flooding. He used local village police and volunteers to disseminate the warning message. During the emergency, they called an emergency meeting to alert community people. During the on-set of flooding, he was the focal person to coordinate all rescue activities. From Union Parish fund, he utilized US \$ 322 (25,000 BDT)²³ to supply dry food. Along with UP chairman, other members also participated in rescue operation. One male UP member said that he helped 45 families to move to a safer place.

2. Response by volunteers

A group of volunteers work as a supplementary force for the UDMC. The total numbers of volunteers are 36 (18 male and 18 female). During recent 2014 flood, the volunteers played a decisive role in rescue activity. Male and female volunteers worked under the instruction of the UDMC. They divided their roles and responsibilities and worked as a team that accelerated the rescue activity.

Participation in rescue activity during disaster is often a physical activity and involves a special skill. Sometimes female volunteers cannot participate in the rescue activity without the help of a male. To take people to a safer place, they need the help of a male to drive a boat. More often, the flood shelter is far away from the affected villages. So, in that case female volunteers need help from the male volunteers. During FGD with female volunteers, they added:

Suppose I need rice, fuel for people, then I need a help of a male. Or I cannot take them to flood center. I have to ask my boy for help to take us to flood center

²³ Taka is Bangladeshi currency. One US \$ = 77.69 BDT

Security is a big concern for people taking refuge at flood emergency shelters. During the night, male volunteers (typically medium age and old age) stay at flood shelter as a watchman to ensure safety and security of people. A female volunteer (age 25) who was awarded a medal and a certificate for her efforts in the rescue activity adds:

When water entered people's houses, then I went to people's houses. I took a boat and asked a man for help. I took people to Fotepur Union Parishad. But I could not stay at night, male volunteers stayed at night.

A male volunteer (age 55) who was awarded a medal and a certificate for his effort in the rescue activity adds:

We had to stay at the center during night. Around 150 people were here; we had to provide them security, because they come with their young boys and daughters. During night, we cannot move out from the center. We did not have to stay here if Union Parishad could provide them security.

Thus volunteers both male and female worked as a team that facilitated the rescue activity during the recent 2014 flood. They coordinated activity of each other effectively under the guidance of the UDMC.

b. Current capacity of the UDMC to tackle a big flash flood

The UDMC operates within the jurisdiction of UP. Capacity of the UDMC to tackle a big flash flood like 2007 largely depends on financial and technical capacity of the UP. Here, I examined the degree of autonomy of decentralized institution (e.g., UP), because I posit that response capacity is largely determined by the autonomy of the local institution. There are three aspects of decentralization: i) political, ii) administrative, and iii) financial decentralization. Fiscal decentralization is defined as the degree to which central government

cede fiscal impact to local bodies; administrative decentralization refers to the degree of autonomy local bodies has relative to central government; and political decentralization refers to transfer of political function of governance, like representation (Schneider, 2003).

As a decentralized institute, UP is politically decentralized (i.e., its chairman and members are elected in every five years). However, the real autonomy depends on administrative autonomy and financial capacity. As mentioned earlier, during the 2014 flood the UP chairman was able to spent only US \$ 322 (25,000 BDT) from UP, which signifies the financial strength of UP. To examine the financial autonomy of UP, I examine the percentage of UP's own contribution to its annual budget, and percentage of fund allocated for disaster response activities. In last five years, UP's own contribution to total budget was maximum of just above 14%, twice they allocated just over 1% of total budget for disaster response and preparedness (Table 5.3). That shows the financial autonomy or capacity to face a big event like the one in 2007. The UP chairman said that they were not able to reach the target in terms of collecting tax, which reflects its administrative incapability. This is a typical case of *de jure* decentralization rather than *de facto* decentralization (Yosuf, 2000). UP chairman and members also agreed that their current capacity is insufficient to tackle a big event like the 2007 flood. With this level of financial and administrative autonomy or capacity, it is highly unlikely for the UDMC to work as per the guideline of the SOD.

Table 5.3: Percentage of UP fund in the budget, and percentage of budget allocated for disaster response and preparedness, Fotehpur Union

Fiscal year	Total annual budget (development) (US \$)	UP's own fund (US \$)	% of UP's own fund in budget (development)	% of budget allocated for disaster response²⁴
2010-2011	43132.19	875.27	02.03	0.059
2011-2012	62114.81	8019.05	12.91	1.036
2012-2013	92793.20	13669.71	14.73	0.69
2013-2014	110909.25	13952.89	12.58	0.58
2014-2015	116353.45	12897.41	11.08	1.10

Source: Fotehpur Union Parishad office, 2014

As noted in Chapter three, Section 3.4.2, Fotehpur Union consists of 43 villages with 5,974 households. Total 28,390 people live within 39.56 square km. Sixty-five % of the total households are at high risk of flooding (ASD, 2014). Presently, there are 36 volunteers registered (18 male and 18 female), but all of them are not active. While conducting FGD, both male and female volunteers mentioned that they lack logistical supports, like flashlights. With the level of financial capacity mentioned above, it is questionable that UDMC would be able to manage a big event like the 2007 flood, which required protecting around six thousand households.

²⁴ The remaining shares (i.e., 99 %) of the budget are allocated for other development activities mostly infrastructure development.

5.7 Barriers to local level transformation: The UDMC

For effective disaster response, there are multitudes of barriers to transformation. In addition to the financial constraints alluded to above, these barriers not only constrain institutional transformation, but also hinder effective response during disaster recovery efforts as well as in post-disaster situations. As the UDMC operates under the UP, the dynamics of the UDMC is largely shaped by the dynamics of the UP. Two notable examples of barrier to institutional transformation (i.e., how the dynamics of the UDMC shapes the dynamics of the UP) are cited here to illustrate these barriers.

1. Lack of coordination, consciousness, and bargaining power as barrier to transformation

The first barrier involves lack of coordination, consciousness, and trust among the UDMC members, specifically among the UP Chairman and members. Lack of coordination, consciousness, and trust among the UP Chairman and members result in weakening the bargaining power of the UDMC.

According to the SOD, the UDMC should function like a team, where the chairman is the focal person and other members are supposed to assist the chairman. The chairman is also supposed to take the leadership role. But the UDMC does not function as a team; rather it functions haphazardly, without much trust and confidence, these hinder the UDMC to function as a collective unit. Such factionalism results from the different political affiliation of members and chairman. The UDMC functions as a weak body due to the factionalism. It in turn limits its bargaining power. Disaster opens the window of opportunity for the UDMC to strengthen their bargaining power. In practice, it fails to work as a collective unit as it is unable to see the opportunity.

Despite financial and technical capacity, the UDMC members are not aware of the role, responsibility, and function of the UDMC. UP members and chairman do not even regularly attend the UDMC meeting. Sometimes they struggle to meet minimum quorum of people (i.e., one-third of the members).

2. Lack of learning and nurturing of institutional memory

Nurturing learning institutions and institutional memory is one of the key components that can create opportunity for community self-organization. But the way UP functions does not help nurturing learning and memory. As mentioned earlier, the UDMC consists of UP chairman, UP members, community people of different social classes and professional background, local government and NGO people, and member secretary of the UP. Apart from government officials, most of the UDMC members are nominated by the UP chairman. Along with committee members, the volunteers are also selected by the UP chairman and UP members. If the UP chairman and members change, the UDMC members and volunteers are likely to be changed as well. In Fotehpur Union, a new chairman was elected in each of the last three terms.

The member secretary is the only permanent member of this committee. The member secretary was changed four times in last three and half years. The reasons behind the frequent change of member secretary are probably two-fold: first, Fotehpur Union is located in a remote area and in deep *haor* area; for this reason communication facility is very poor. Because of the lack of communication and other facilities, member secretary tend to drop out; and second, organizational cohesiveness is very poor because of the lack of coordination, communication, and trust between UP chairman and member secretary. For these reasons, institutional memory does not build up in the Fotehpur Union.

However, despite the barriers and constraints discussed above, NGOs are playing some facilitating roles in institutional transformation. The following section expands on role of NGOs in facilitating transformation of the UDMC.

5.8 NGO initiatives as the drivers of institutional transformation

As mentioned earlier, the SOD clearly outlines the role and responsibilities of the UDMC for a comprehensive disaster management at the local level. The question that remains is whether the UDMC has the knowledge, skill, technical and financial capacity to follow those guidelines. The answer is probably negative. Here, a number of NGOs (e.g., ASD, VARD) are working on disaster management and recovery are trying to enhance the technical capacity of the UDMC, if not financially. NGOs are basically playing a facilitating role to enhance the adaptive capacity of the UDMC. NGOs work as per the guideline of the SOD taking the UDMC as a partner so that they can strengthen the capacity of the UDMC.

As part of risk reduction strategies, the SOD urges the UDMC to prepare a “Comprehensive Disaster Management Plan”. With the help of NGO (ASD), to cite an example of NGO initiatives, the UDMC was able to prepare a “Comprehensive Disaster Management Plan” through a participatory process. This plan consists of resources and risk mapping (Plate 5.1), risk assessment, identifying vulnerable people in the community, and hazard identification among others. As part of technical capacity building, NGOs arranged training (e.g., evacuation during disaster, preparedness) for volunteers. Thus, NGO activities do play a vital role in enhancing the technical capacity of the UDMC.



Plate 5.1: Resources and risk map of Fotehpur Union

NGOs also play the role of a positive catalyst in UP planning and budget formulation. For example, for the last few years, UP is allocating some contingency fund to disaster response and recovery. This positive move toward considering disaster management as part of development process was the product of influence by the NGOs.

In terms of learning and sharing through monthly meeting, NGOs are playing a facilitating role. After the 2014 flood, in a monthly meeting, volunteers shared their experience of the events (i.e., what problem they faced, how they overcame). This sharing and decisions making was documented. As I mentioned earlier, the chairman and members are often reluctant to participate in the monthly meeting. If the decision makers do not participate in learning sharing, then it is difficult to infer whether the learning that will be taken into account for further decision making.

In sum, the NGO initiatives to transform the UDMC are mostly technical. NGOs, along with other horizontal and vertical institutions, play a decisive role in disaster response and recovery phase, as the capacity of local institutions are not adequate for timely response and recovery.

5.9 Multi-level governance: Sharing risk and responsibilities

Often during disaster the capacity of a local institution may not be adequate for responding and recovering rapidly. During the 2014 flood, the UDMC capacity was not adequate for recovery and response, let alone a big event like the 2007 flood. During my field study, I observed that multiple institutions came to share the risk and responsibilities for efficient response and recovery. The institutions that came to share risk and responsibilities are both at the horizontal level and vertical level. The overall multilevel governance of risk and responsibilities (*de facto*) are shown in Figure 5.1. It should be noted that the multilevel governance explained here (for sharing risk and responsibilities for disaster response and recovery) is what was observed in the field during the 2014 flood.

a. *Horizontal institutes (local NGOs)*

There are around 24 NGOs currently working in Fotepur Union. Their areas of intervention include disaster management, health, sanitation, hygiene, microcredit, solar system, and livelihood. Two NGOs are directly working with community-based disaster preparedness, response and recovery. NGOs directly working with disaster tend to have some funds to participate in relief operations. Even though other NGOs do not work with disasters directly, they also tend to have some contingency funds to respond during disasters. To give an example, ASD (Assistance from Slum Dwellers) is an NGO working with disaster management, and participated in the relief operation (box 5.1). Another NGO – JESIS – does not work with disasters, but since they work in the disaster-prone area, they had a contingency fund with which they also participate in relief operations (box 5.2).

Box 5.1: ASD

1. 12 KG of rice
2. One KG of beans
3. One KG of salt
4. Two KG of potato
5. One litter of soybean oil
6. One packet of child food (400 gram of milk) for 200 family

For 900 households in Fotepur Union

Box 5.2: JESIS

For each household:

1. 2500 BDT to each family
2. Water pot
3. Two soups (bath)
4. Two soups (cloth)
5. Ten oral saline
6. 30 water purification tablets
7. Two piece of cloths for women
8. Bleaching power (4 kg)

For 500 households for three Unions (for 208 households in Fotepur Union)

Often, there are problems with horizontal institutes in terms of necessary coordination. The SOD clearly states that coordination of all relief activities should be carried out in such a manner so that social justice is ensured. Relief distributions should be on the basis of who needs what, and how much, so that overlapping can be avoided. NGOs have prepared their own list (even though they said they consulted with the chairman and members) of victims to distribute relief. However, UP members reported that they did not know anything about NGO relief distribution. They said NGOs did not consult with them. They accused the chairman of not monitoring and coordinating the overall process. One UP member said that his ward was severely affected, but no one of his ward received anything from NGOs. When the chairman was asked about this issue, he said that often members have political motivation; members want relief operation to be carried out in their ward so that they can gain politically. He also mentioned that NGOs are doing “a good job”, because they do not have any political motivation.

NGOs have different motivation than the governmental institutions. They have a certain number of beneficiaries at the community (if they are working with livelihood or health). During relief distribution, NGOs tend to give priority to their beneficiaries. The beneficiaries also expect to receive relief from NGOs. These beneficiaries also tend to receive relief from the government as they have been affected by the disaster. There is always a possibility of overlap and duplication due to lack of coordination.

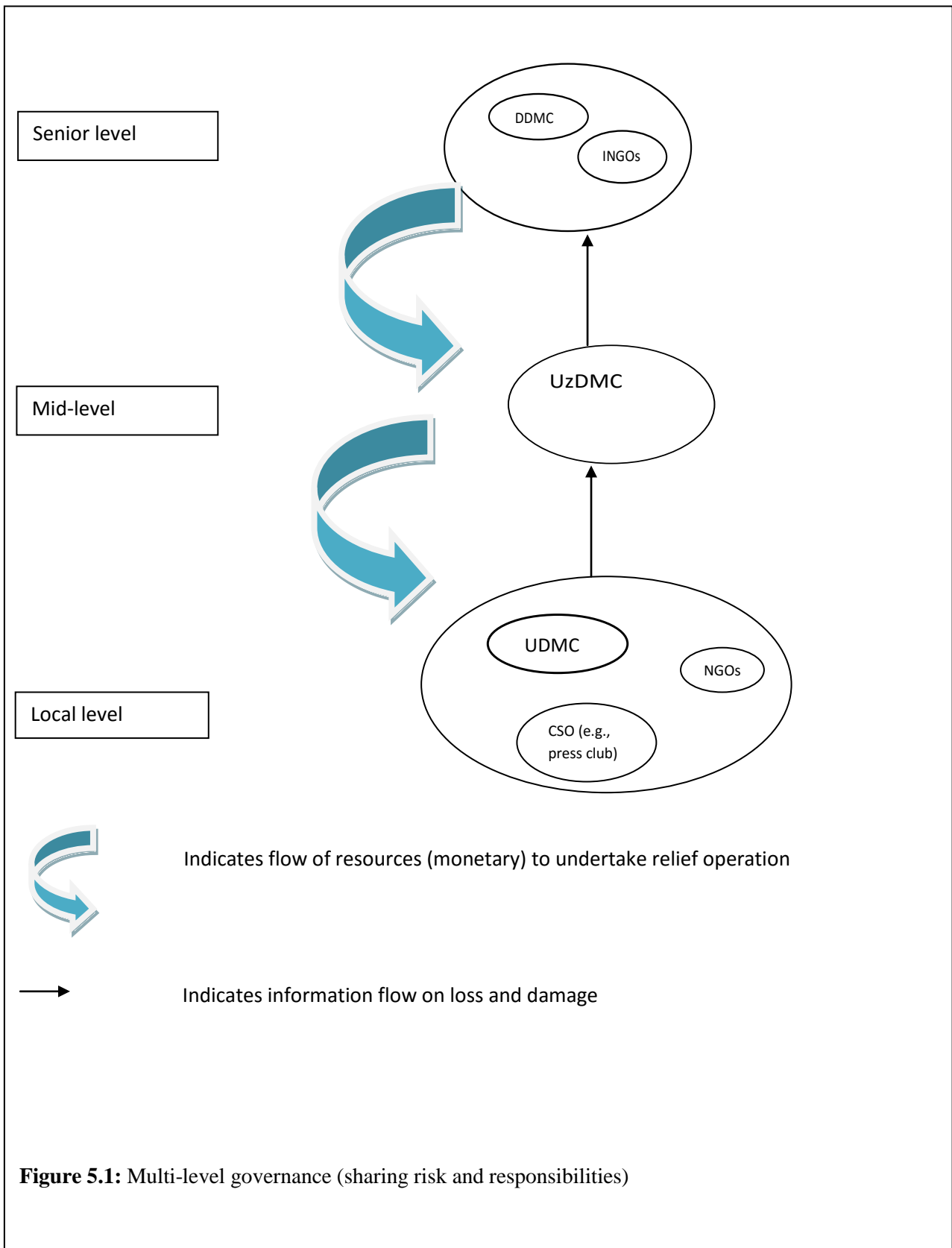
b. Vertical institutions (Upazila level, district level and INGO)

Vertical linkages are discussed here is in terms of relief and financial assistance during disaster response and recovery phase. Vertical linkages are mainly two-fold: i) linkage among government bodies, and ii) linkage with international NGOs or donor agencies (Figure 5.1). Institutional linkages among government bodies function in two ways, such as bottom up and top-down. Bottom-up means all the information regarding disaster loss and damage, and it demands for relief first goes from the UDMC to the UzDMC (Upazila Disaster Management Committee) then from the UzDMC to the DDMC (District Disaster Management Committee). The DDMC, mainly DC (Deputy Commissioner) office, decides how much financial assistances are required to be given, based on their past experience. Typically, there is always a wide gap between the demand from the UDMC and the assistance from the DC office.

During 2014 flood, inability of the UDMC to adapt with the devastating event required assistance from Upazila and district level. The Upazila office distributed dry food as relief worth US \$ 1,355 (105,240 BDT). The DC office disbursed US \$ 644 (50,000 BDT). Assistance from INGO, such as Oxfam, Diakonie Katastrophenhilfe (DKH)- Germany stepped in to help the distributed relief.

Funds released from the DC office often take two or three days to reach the community level. Therefore, the leadership or proactive role of local government officials or public representatives plays a vital role in quick response and arranging emergency relief for flood victims. For example, Bishwambarpur Upazila UNO (Upazila Nirbahi Officer) asked local businessmen to lend him dry food so that he could quickly assist the flood victims. He also called on an emergency meeting and asked all the NGOs to come forward, which eventually worked.

Different INGO or donor policy shapes local response and recovery processes. The 2014 flood was not declared as a “flood” by government. Some donor policy is that if an event is not declared as disaster, a local NGO funded by external donor cannot utilize their contingency fund. For instance, VARD (an NGO) has been implementing a project on food security funded by CARE. Under this project they have had a contingency fund of US \$1,287 (100,000 BDT) that they could not utilize since there was no declaration from the government. By contrast, JESIS (an NGO) working in Bishwambarpur Upazila is funded by Oxfam. This NGO distributed relief in all the affected Unions including Fotehpur, even though Fotehpur was not its working area. Because of the donor policy, JESIS was not required to wait for declaration from the government to undertake relief operation.



c. Who defines disaster, and for whom?

Vertical institutional linkage has few drawbacks. It tends to create a form of dependency for the lower level institutions on senior level institutions, particularly in terms of decision making or declaring an event as a disaster. This is because resources mobilization at lower level is largely shaped by government's declaration or decision making. Locally, DC the office is at the top of administrative tier, and declaration of disaster typically is made from the DC office. In a meeting at the DC office with government and NGO officials, after a long discussion they came to the conclusion that they sense that a flood is impending. However, they did not declare a flood, which hindered some NGOs to utilize their contingency fund.

It is important to understand how government officials (those who typically declare flood) perceive flood, because this has implications for emergency response and community adaptation. A local government official said, "...this is flash flood, not flood". Government officials define "flood" when water stays for a longer period of time. Flood water in 2014 did not stay for longer period of time compared to 2007. That is why government did not declare it as a flood, and before declaring the event as a flood the water level receded down. However, the damage has already been made by flood water. This becomes clearer if we analyze and compare water level and discharge between the 2007 and the 2014 floods. It is evident from the Figures 5.4 and 5.5 that when the discharge level surpasses above 2000 m³/sec, it exceeds community threshold level. In 2007, discharge level remained around 2000 and water level remained above the danger level (8.25 mPDW) for a period of three months. In 2014, even though the discharge was even larger compared to 2007, it did not stay too long. Even though water did not stay too long, the impact crossed the threshold level.

The community people who experienced the 2014 flood claimed that it was a devastating flood for them. They were on the street demanding that their community should have been declared as a flood affected area. For the community, flooding is not a new phenomenon as they live with floods. From a community perspective, they better understand what is a “flood for them and what is not. Even though the vertical (top-down) institutional linkage has the potential to strengthen community adaptive capacity, sometimes such institutional structure cannot reflect community voice.

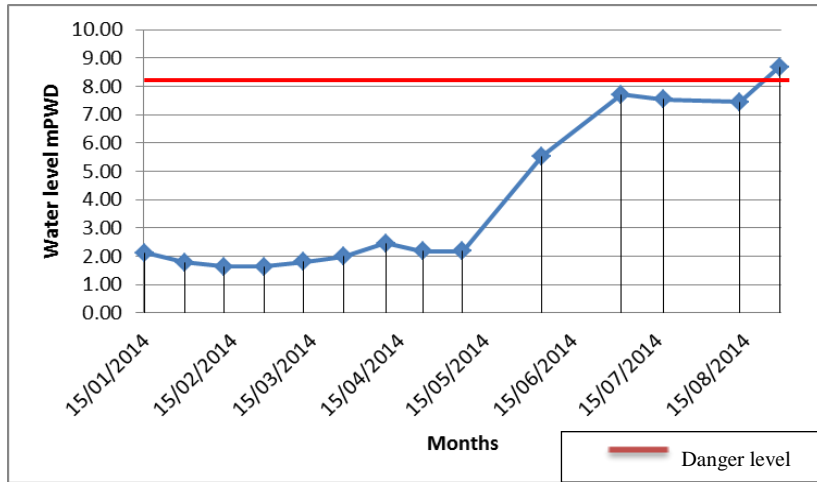


Figure 5.2: Water level of the Surman River in 2014

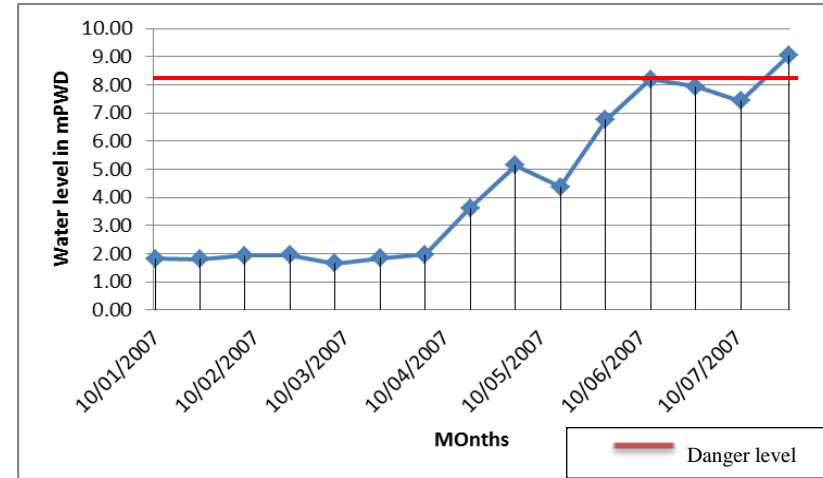


Figure 5.3: Water level of the Surma River in 2007

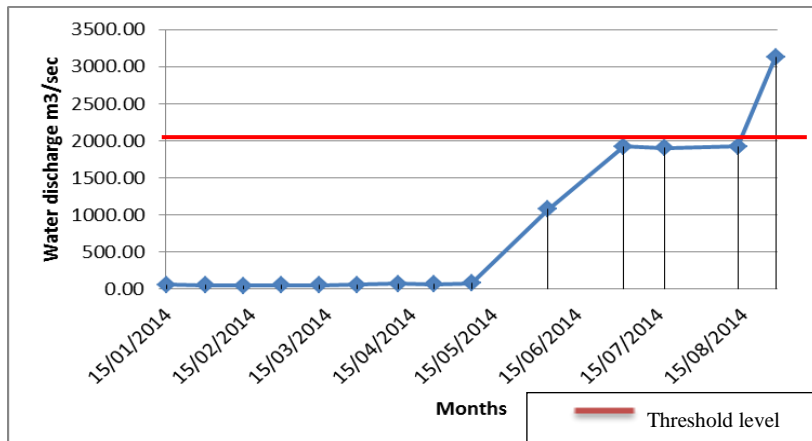


Figure 5.4: Water discharge of the Surma River in 2014

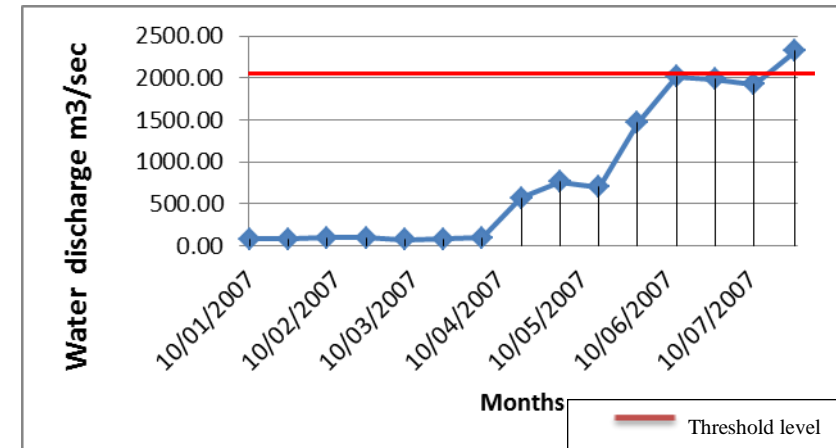


Figure 5.5: Water discharge of the Surma River in 2007

Data Source: North-Eastern Measurement Division, Water Development Board, Bangladesh, 2014

5.10 Conclusion

The strength and capacity of local community-based institution, like the UDMC is crucial for immediate response and recovery. The capacity of the UDMC was insignificant; even to tackle an event like the 2014 flood, let alone big event like the 2007 flood. Due to strong horizontal and vertical institutional linkages, the UDMC was able to overcome its limitations. This in turn helped the community self-organize and recover from the disaster. As mentioned, the UDMC operates within the jurisdiction of UP. Therefore, the strength of the UDMC depends on the strength and capacity (autonomy) of UP. A strong local institution (UP) with full financial and administrative autonomy is likely to have more adaptive capacity. It is very unlikely that a weak UP would be able to follow the guidelines of the SOD. Still there is a tendency to rely on higher administrative authority. Therefore, strengthening UP should be the first priority in national policy arena.

Disasters often open the window of opportunity for transformational change within the UDMC. However, due to lack of awareness, and coordination, trust among members and chairman, the UDMC is unable to see the opportunity, and to build on learning. NGOs, nonetheless, are increasing the adaptive capacity of the UDMC through building technical capacity, and facilitating in future planning for mitigation and quick recovery based on learning, which can be labeled as “incremental adjustment” (Matyas & Pelling, 2014).

Chapter Six

Conclusion

This chapter provides a synthesis of the results based on the five months of intensive fieldwork from August to December 2014, and conclusions of the study. First, I present the key findings of my thesis; second, the contributions of this thesis to literature are noted; third, the policy implications of this thesis are offered; finally, the limitations of this research.

4.7 Key findings

In this section, I offer a synthesis of overall findings and relate these key findings with my study objectives. Table 6.1 shows key findings with the corresponding objectives. Key findings are explained below.

Table 6.1: Key finding and research objectives

S/I#	Key findings	Objective one: To examine the economic losses and recovery processes at household and community levels from flash flood disasters	Objective two: To examine the resilience of wetland-social-ecological system to flash flood disaster, with a focus on multi-level interfaces (individual, community and ecosystem)	Objective three: To assess the dynamics of multi-level participation in flash flood disaster management and recovery policy process
01	Flash flooding has complex and variable impact on wetland social-ecological systems	√	√	
02	Due to (a) limited options for intrasectoral livelihood diversification, (b) to cope with flash flood disaster loss, and (c) with marginalization and exclusion, out-migration, social	√	√	

	network and relationship, and intersectoral livelihood diversification are generally effective livelihood strategies			
03	Due to income instability, efforts to recover from direct loss can create indirect loss	√		
04	Recovery by peasants from flash flood disasters is largely constrained by the asymmetrical power structure		√	
05	Due to asymmetrical power structure and existing leasing policy, poor fishers suffer from exclusion from the common pool resources at multiple level		√	
06	Response capacity of local institutions to flash flood disaster is shaped by their relative autonomy			√
07	Cross-scale intuitional linkage enhances adaptive capacity; however it may reduce community voice and/or increase vertical dependency			√

1. Flash flooding has complex and variable impact on wetland social-ecological system

Flash floods create intra and inter differential impacts on social-ecological system. Inter differential impacts on social-ecological system are that early, monsoon, and post-monsoon flash flood destroy crops and property. However, for ecosystems, flash floods are blessing as they replenish the land, increase the fish production, and open the window of ecological opportunities. Flash floods have intra differential impacts on ecological system. For example flash floods are beneficial for ecosystem in the short-term but deleterious in the long-term as they bring sediment and silt that reduce the water carrying capacity of rivers, and *beels*. These in turn reduce the production of fish and other aquatic species. On social systems, flash floods create intra

differential impacts based on class position of individuals and their position in power structure. For early, monsoon, and post-monsoon flash floods, the main beneficiaries are the *Mohajans*, microcredit institutes, local political leaders, people's representatives, and the losers are the poor community people, which include peasants, fishers, and day laborers. Early flash floods destroy crops, but increase fish production. Unfortunately, poor community people do not get the benefits because of exclusion and marginalization by the powerful and rich class.

Because of temporal variability, flash flood can be unpredictable and can occur three times in a year. This unpredictability and successive nature of flash flood can create varied type of loss and damage, such as crop loss due to early flash flood and property loss due to monsoon and post-monsoon flash floods.

2. Due to (a) limited options for intrasectoral livelihood diversification, (b) to cope with flash flood disaster loss, and (c) with marginalization and exclusion, out-migration, social network and relationships, and intersectoral livelihood diversification are generally effective livelihood strategies.

Household take a number of strategies to recover from disaster loss and damage and to cope with marginalization and exclusion processes (Section 3.5.3 and 3.6, and Section 4.7 of chapters three and four respectively). Community people do not have the opportunity to earn income throughout year because February to mid-April is a lean period and they suffer from income instability due to number of anthropogenic (e.g., marginalization and exclusion) and natural stresses (e.g., flash flood). Therefore, community people try to reduce their dependency on natural resources by diversifying their livelihood options. For local residents, often intrasectoral diversification options are limited and they are also capital intensive. As a result, they often chose intersectoral

diversification options, such as farmers are opting for cultivation during *boro* season, peasants and farmers are opting to work in day labor or small business. They often adopt the intersectoral diversification option by staying inside the community. However, some household heads or the entire household migrate to other places seasonally for earning or compensate income, and activate social network and relationships to raise household income and recover from flash flood disaster. I also found that few households migrated to other places permanently to secure their livelihood. Ability to migrate to other places has turned out to be an important factor in recovery from flood disaster loss and to coping with anthropogenic and natural stresses. Because of family responsibilities (e.g., having young children or aged parents), often people are unable to migrate other places for work.

3. Due to income instability, efforts to recover from direct loss create indirect loss

Recovery from flash flood disasters largely depends on income stability. As discussed in the preceding paragraph and Section 3.5.3, community people suffer from income instability. Due to income instability, community peoples' effort to recover from direct economic loss often results in further asset losses. As discussed in Section 3.5.2, the direct loss and damage include property, crops, livestock, fuel, fodder, and economic loss due to post-disaster health problems. To rebuild their houses, people often sell other assets like cows, agricultural and non-agricultural land, or they take loans from the local *mohajans*. To pay the installments of the loan, they are often bound to sell property due to the lack of income. Direct loss due to flood disasters in this way often results in further losses, though indirect, through income instability.

4. Recovery by peasants from flash flood disasters is largely constrained by the asymmetrical socio-political power structure

As discussed in Section 4.6.1 and 4.6.2 that peasants face a number of problems with loss recovery and struggle against multiple actors in the socio-political power structure. Because of the constraints imposed by the asymmetrical power structure, peasants are excluded from the recovery incentives provided by the government during post-disaster situation; they are exploited by the middleman when they try to procure agricultural loan; and they do not get the fair price of rice due to the strong alliance among corrupt government officials and businessmen. As discussed earlier, peasants cultivate crops once in a year (i.e., *boro* crop). Recovery from losses depends on the level of production of crops. I elaborated in Section 4.6.2 that a peasants' inability to control water for irrigation affects the production of crops, and also increases the risk of early flash flood. Efforts to recover from flash flood disasters by peasants are thus undermined by the asymmetrical power structure.

5. Due to asymmetrical power structure and existing leasing policy, poor fishers suffer from exclusion from the common pool resources at multiple levels

I have discussed in Section 4.5 how fishers are excluded from the common pool resources due to the existing leasing policy and asymmetrical power structure. Fishers are excluded from their customary rights of fishing due to the exclusionary nature of leasing policy, which favors financially capable group, typically non-fishing groups. They are excluded from the large water bodies (*Jalmohals*) due to the leasing policy. Apart from the large water bodies, the poorest of the poor fishers are excluded from the small and medium size water bodies due to the exclusionary nature of social-ecological network. Thus poor fishers are excluded from the

common pool resources at multiple levels because of the existing leasing policy and asymmetrical power structure.

6. *Response capacity of local institutions to flash flood disaster is shaped by their capacity to make decisions independently*

Considerable emphasis is given to local institutions for immediate disaster response and recovery in theoretical discourse and in national and international policy making. The National Plan for Disaster Management (2010-2015) in Bangladesh, and Hyogo Action Framework (2005 to 2015), for example, focus on the strength and capacity of local institutions for disaster response and recovery. Berkes (2007) documents the role of a local institution – a necessary condition – in creating opportunity for community self-organization. I have found that the lack of financial and administrative capacity, largely shape the disaster response and recovery capacity of local institutions during the onset and post-disaster situations respectively. Because of the lack of financial capacity to make decisions independently, local institution is required to work under the guideline of the senior level institution (e.g., Upazila). As a result, it becomes difficult for the local intuitions (e.g., Union Parishad) to allocate fund according to local needs and demands, (e.g., allocating a contingency fund for disaster response and recovery). In last five years, Union Parishad allocated just over 1% of total budget for disaster response and recovery activities (Table 5.4), which is inadequate for a disaster prone community. Moreover, due to lack of administrative autonomy Union Parishad was not able to generate funds through revenue and taxes, which consequently compromises it financial autonomy.

7. Cross-scale intuitional linkage enhances adaptive capacity; however it may reduce community voice and/or increase vertical dependency

Strong local or community-based institutions are necessary for immediate and effective disaster response and recovery, which can create opportunities for community self-organization processes. However, strong local or community-based institutions are not sufficient. What is required are cross-scale institutional linkages (both horizontal and vertical) for disaster response and recovery. During the 2014 flood, I found that response capacity of local institution (i.e., the UDMC) was limited, where vertical (e.g., District and Sub-district level institutions) and horizontal institutions, like local NGOs played a crucial role in response and recovery activities. However, over dependency on vertical institutions may erode the capacity of local institutions and may reduce community voice. For example, disaster in Bangladesh is declared by Deputy Commissioner (DC) office (District level), not by the local institutions (i.e. UDMC). During recent flood (2014), community people felt that the flood affected them; they brought out a procession demanding that their community should be declared as a “flood affected area”, but flood water came to normality before DC office declared that area as flood affected zone. Vertical linkage, nonetheless, is required because local institutions require financial and logistic support from senior level institutions for disaster response and recovery assistance.

6.2 Contributions of the research

My thesis research has contributed to the existing literature in the following specific areas:

- (1) Drawing on the current literature, I argued in Chapter three that ‘agency’ is central to understanding adaptive capacity, and in Chapter four, I argued that socio-political power is the key to understanding transformability. In my thesis research, I found that power is central to understanding both adaptability and transformability - two prerequisites of resilience. For

adaptability or successful adaptation, individuals are required to exercise agency. Exercise of agency is linked with power and authority. Ability to exercise some forms of agency means the ability to exercise some kinds of power. As evident from discussion in Chapter four, the socio-political power in wetland communities, which is asymmetrically distributed hinders individuals' exercise of agency, and conversely, successful adaptation. For instance, peasants struggle against multiple actors in their effort to recover from losses (key findings 5). Their recovery efforts were severely constrained by the asymmetrical power structure. For transformability, I explained how asymmetrical power structure blocks wetland-social-ecological transformation, and as a result, erodes resilience. This is because asymmetrical power structure results in distributional inequalities of varied social and ecological outcomes.

- (2) Adaptive capacity is seen as a latent characteristic that can be activated for successful adaptation (Brown & Westaway, 2011, Berkes & Ross, 2013). It is seen as an attribute. This latent characteristic can be activated when people exercise agency. From the data analysis outcomes, it is evident that activating agency does not necessarily lead to successful adaptation, because agency does not operate in vacuum, rather constrained and/or facilitated by social-ecological-economic-political factors (e.g., class values, ecosystem, and loan). I explained in Chapter three that agency was constrained and/or enabled by ecological factors (i.e. availability of natural resources), social factors (e.g., social networks), and economic factors. For a better understanding of adaptive capacity, agency should be understood within the socio-economic-ecological context. In this connection, Dwiartama and Rosin (2014) make a useful explanation regarding how the exercise of agency is shaped by human and non-human interaction and is constrained or facilitated by micro-ecological factors (e.g., crop diseases), and consequently shapes adaptive capacity. The influence of socio-economic factor

on agency is well documented in social science literature as well (Kabeer, 1999, 2001; Cleaver, 2007; Klugman et al., 2014).

- (3) In Chapter five, I have discussed the role of local institutions in the process of community self-organization. Scholars and policy makers are increasingly emphasizing the role of local institutions as the necessary condition that can create opportunities for community self-organization. During disasters, local institutions are considered to be the first responders. In Bangladesh, increasing emphasis is also given to local institutions, but the local response capacity is largely determined by the autonomy (specifically financial and administrative) of local institutions. From this finding, I concluded that enhancing autonomy (financial and administrative) of local institutions (e.g., UP) may enhance response capacity of local institution and community resilience to natural disasters.

6.3 Policy implications

1. Reactive, proactive and transformative response to flash flood hazards both at individual and community levels is constrained or facilitated by multiple factors like availability of natural resources, social network and relationships. Analysis highlights how conscious reactive, proactive and transformative responses can positively influence resilience. **As these responses are constrained by the lack of availability of financial and natural resources, better management of natural resources and availability of financial resources can enhance response capacity at individual and community levels to flash flood hazards.**

2. The government of Bangladesh has given special attention to the role of local institutions (e.g., the UDMC) in disaster risk management. SOD offers the guidelines for local institutions for undertaking appropriate disaster risk management interventions. **However, government's**

generalized guidelines of SOD for local institutions have appeared to be insufficient. What is required includes the consideration of specific context where the SOD will be implemented. The first thing that needs to be taken into account concerning the context is the political culture. This is because the Union Disaster Management Committee (UDMC) members are often affiliated with different political parties. Political tension often hampers the functioning of the UDMC. The second issue related to this context is the local natural environment. For example, some areas (like Fotepur Union) are more disaster prone. People struggle to pay taxes, which is linked to the financial capacity of a local institution. In this case, government's special attention is required to strength local institutions, giving full autonomy to local institutions so that they can mobilize and generate enough financial capital to respond to a disaster. The third issue related to this context is the GO and NGO collaboration. In my study area, I found that the NGOs are playing a decisive role in strengthening the technical capacity of the UDMC. This may not be the case in other disaster prone areas of Bangladesh. Scaling-up the GO and NGO collaboration for disaster risk reduction is therefore required and government should encourage NGOs to work collaboratively in disaster prone and vulnerable areas.

3. Chapter four illustrates how the current institutional regime for resources management (e.g., leasing policy) and existing asymmetrical power structure are eroding resilience of wetland-community and consequently blocking the process that can enhance resilience (i.e., transformability). **As human community depends on ecosystem for livelihood, unless rigid institutional regimes and power structure are changed, it is likely that these will continue to block the resilience building process. What is required here is “deliberate or directional or purposive transformation” (O'Brien, 2012, p. 670; Moore et al., 2014) by government, based on ethics and sustainability principle.**

4. Bangladesh Haor and Wetland development Board under the Ministry of Water Resources formulated a master plan for the *haor* areas. This document considers flash flooding as the major potential disaster in wetland area and a major cause of poverty. **I conclude that to enhance resilience of wetland-community to flash floods or any other disaster, plan or policy intervention in wetland areas should take into account the dynamic interaction of human community with ecosystem.** For example, leasing policy that is eroding resilience of a wetland-community by marginalizing poor fishers from common pool resources and violating customary rights of peasants on water for irrigation is a missing part in this document. Moreover, the *haor* is defined in this document and in other government documents in physical terms (see Chapter One for definition), but *haors* needs to be defined from a community livelihood perspective because community people living in the *haor* area depends on the ecosystem services.

The Haor Master Plan has nine strategic pillars that recognize the components of both human community and ecosystem, but these components should be viewed from the perspective of complex system dynamics (i.e., how the interaction of human community and ecosystem shape the overall progress of wetland-community). The factors that shape the interaction of human community and ecosystem require a special attention. For example, the *haor* ecosystem services are regulated by annual flood or water cycle. Therefore, appropriate water resources governance, such as increasing the water carrying capacity of rivers and *beels* with appropriate management strategies is of utmost importance.

6.4 Limitations of the Study

Wetland areas in Bangladesh cover 16,000 sq. km. area, and there are 411 *haors* in Bangladesh that include areas of the *Sunamganj, Sylhet, Moulvibazar, Hobigonj, Netrokona, and Kishoreganj* districts. In Sunamganj, there are at least 133 *haors* alone. In terms of resource

dependency and in the context of flash floods, each wetland community may have separate social-ecological attributes. **I conducted my study on one specific wetland area, focusing on one haor (i.e., the *Karcharia haor*). This wetland area may not be representative of the entire wetland area of Bangladesh in terms of the attributes related to flash floods, resource dependency, and other socio-ecological characteristics like power and politics.**

Conceptually, I defined community by drawing insights from social-ecological system resilience, disaster resilience, and from other relevant literature like sociology, and community development. For operational purposes, I set a boundary around the community. **The conceptual definition that I presented in Chapter Three may not represent all the attributes of the wetland-community.** In terms of resource dependency, community people do not rely exclusively on the delineated boundary. During wet season, all the *haors* get connected and resources especially fishery resources flow from one *haor* (i.e., from sanctuaries) to another. Community people bring other natural resources necessary from other parts of the wetland area. Moreover, for my research – based on the conceptual and operation definition of community - I focus on the west side of the *Karcharia haor*.

I conducted my research from August to December, 2014. In the wetland area, August to October is typically the wet season and November and December is the transitional period from wet season to dry season. Dry season typically starts from January and often continues up to mid-April. **Since I conducted my research during the wet season; some key ecological aspects were not possible to observe that are relevant with flash flood hazards. During monsoon, the entire haor was inundated. For this reason, I was not able to apply data collection techniques like transect walks and direct observation inside haor to understand some key ecological issues related with flash flood hazards (such as problem with**

embankment and water bodies (*beels*) inside the *haor*). Therefore, I could only rely on community people's response and their experimental knowledge.

This study is only limited to specific period of time and place. **To understand disaster response and recovery processes and resilience of wetland community to flash flood hazards, a longitudinal study may offer a deeper insight to the problem, which was not possible for this study due to time and cost limitations.**

I conducted household surveys in five villages that included 109 households, but Fotehpur Union has 43 villages and 5,974 households. Each village has some specific characteristics with a predominance of different occupational groups. Due to time constrains, it was not possible to cover more villages and households for more household surveys that could represent the different occupational groups more fruitfully to get a better and more comprehensive view of the community. Moreover, my study did not consider gender dimension in disaster response and recovery, which is beyond the scope of this study.

I conducted this study within the assumed parameter of hydrological regimes. Studies (Jain & Kumar, 2012; Revadekar, Patwardhan & Kumar, 2011) found that due to climate change, extreme weather events like extreme precipitation is likely to increase. Additionally, IPCC (2014) led scenario-building exercises with the General Circulation Models also depict the north-eastern part of Bangladesh as "hot spots". Given this scenario, the assumption of present coping threshold and its associated resilience of wetland-community may not hold valid if there is a flash flood event twice bigger than the previous events like 2004 and 2007.

One problem that I faced with during data collection and analysis processes was the presence of local dialects. In Bangladesh, Sunamganj is one of the districts of Sylhet Division;

other districts include *Sylhet, Moulvibazar, and Hobigonj*. People in Sylhet Division have different local dialects compared to other part of Bangladesh, and local dialects also vary slightly among these four districts. I was born and raised in the Sylhet district; hence I understand *Sylheti* local dialect. But local dialects vary slightly between Sylhet and Sunamganj districts. In this case, my key informant helped me comprehend some of the words I did not understand. I conducted interviews in local dialects so that the community people could understand my questions; recordings were transcribed and then translated in English for analysis. Sometimes it was difficult for me to find the English translation for local dialectics. Translation was carried out with caution so that the meaning did not change.

Another problem I faced during my research, especially during household surveys, was the **availability of household heads who were not always home during the day**. Household heads go out for work during the day time. In Bishwambarpur Upazila, there are two weekly market days. During these two days, often male members go to market (bazar) or sometimes just to socialize over a cup of tea. Therefore, it took longer to complete household survey than expected. However, when household heads were contacted, discussions were fruitful.

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Annex 1**Household survey questionnaire****District:** Sunamganj**Upazila (Sub-district):** Bishwambarpur

Code:

Union: Fotehpur**Village:****Block-I****Socio-demographic profile of households**

1. Occupation
 - a. Main source of earning
 - b. Other:
 - I.
 - II.
 - III.
 - IV.
 - V.

2. Formal years of education

3. Age

4. Sex

5. Religion

6. Family members

Male	Female
Total	

7. Earning members

8. Sources of income

Name of the sources	Income in taka/yearly

9. Land ownership

a. Agricultural

i. Self-owned

ii. *Khasland*

iii. Amount of rice from these lands

iv. Amount of agricultural land in the *Kharchariar Haor*

b. Non-agricultural land

i. Self-owned

ii. *Khasland*

c. Other land

10. Property (Both moveable and non-moveable)

Block-II**Loss to flash flood disaster**

11. Types of natural hazards faced.

12. Biggest flash flood faced in last 20 years

13. Types of loss during flash flood

14. Types of damage

- a. crop (in quantity)
 - b. health (nature of health hazards)
 - c. property (housing and others)
 - d. livestock (types and quantity)
 - e. fuel sources/fodder
 - f. other (please explain)
 - g. Amount of crop loss after 2008 due to natural hazards
-

Annex 2 Guided questions for FGDs

Focused area	Main questions to be asked
Crop cultivation	<ol style="list-style-type: none"> 1. What are the common practices for crop cultivation (e.g., share cropping, time of the year)? 2. How does crop cultivation and fishing practices affect ecosystem? 3. How to multi-level intervention can help recover effectively from crop loss? 4. What could be the appropriate intervention for crop loss recovery?

	5. How does market variability affect the crop loss recovery?
Fishing	<ol style="list-style-type: none"> 1. What are the common practices for fishing (e.g., where you can or cannot fish, time of the year)? 2. How does crop cultivation and fishing practices affect ecosystem?
Disaster (e.g., flash flood)	<ol style="list-style-type: none"> 1. What do you understand by disaster loss? 2. What collective efforts you take to overcome from economic losses? 3. How do the linkages among different households help recovery at neighborhood (para) level? 4. How do the linkages among different neighborhood (para) help recovery at community level? 5. What is the role of other organization like NGOs, local government (external and internal)? 6. What the forms of help from other organizations (e.g., financial and/or material)? 7. What support you get from local ecosystem for financial loss recovery? 8. What are the immediate sources of finance to address the above mention losses? Please explain. 9. How do you recover from asset losses? Please explain 10. How does social network and relationship paly in the financial loss recovery? 11. What factors constraints the financial loss recovery? 12. What could be the appropriate recovery intervention?

Annex 3 (list of *Jalmohals* leased out by Bishwambarpur Upazila Committee)

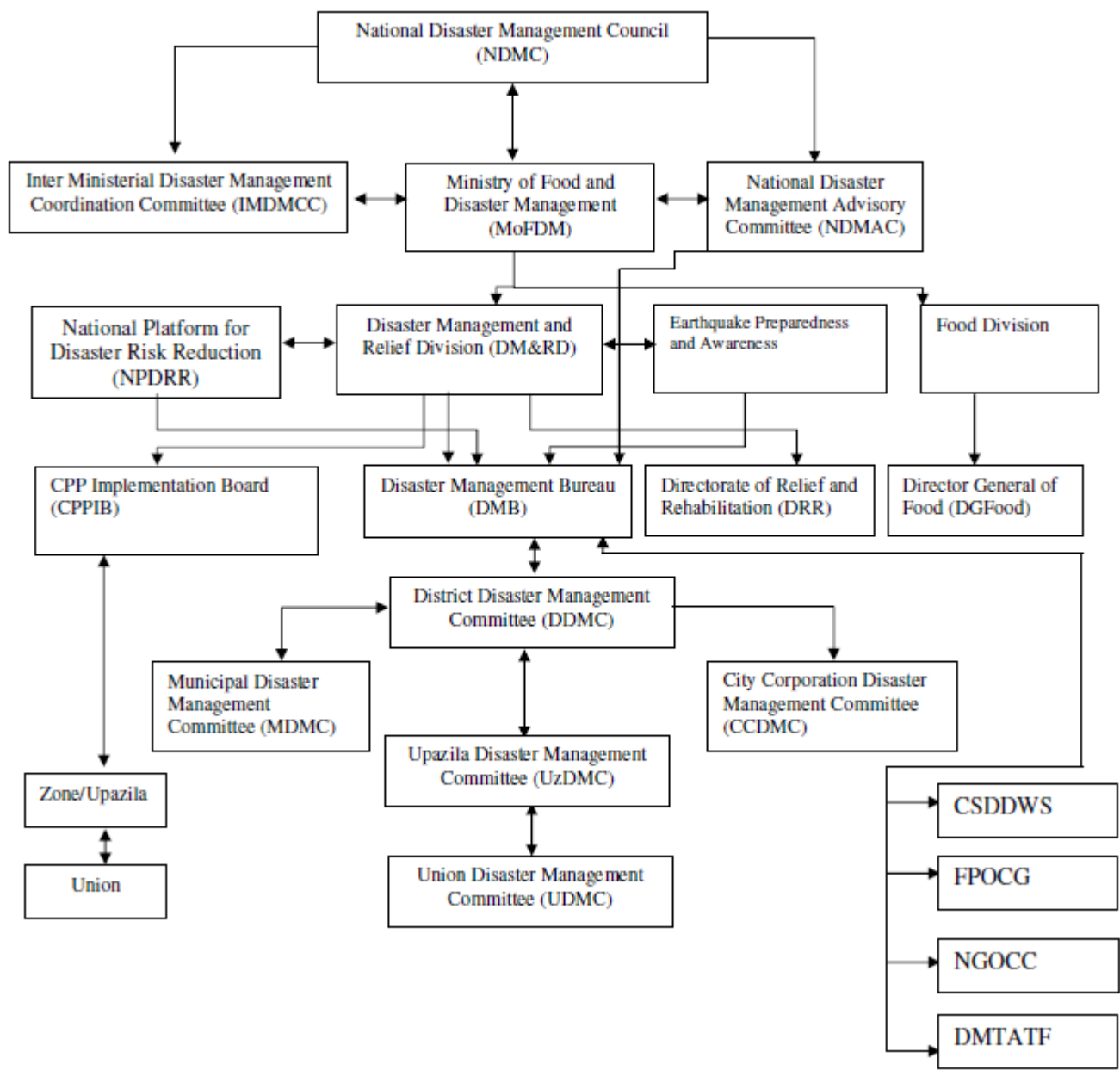
List of partially flats Jalmohals					
Sl#	Name of Jalmohals	Current lease money US \$ and BDT	Lease holders name and address	Lease period	
				Bengali year	Gregorian Months
01	Ghaghotia river	475.15 US\$ or 36,800 BDT	Sham Chandra Bormon, President of Purnima Jubo and Jubo Mohila Corporate Society Limited, Bishwambarpur	1412-1421	2005-06 to 2014-15
02	Shudamkhali river	356.63 US \$ or 27,600 BDT	MD. Hifzur Rahman, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Muktiikhola, Bishwambarpur	1413-1422	2006-07 to 2015-16
03	Chitolia group fisheries	323.03 US \$ or 25,000 BDT	Kamrul Islam, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Muktiikhola, Bishwambarpur	1415-1417	2008-09 to 2010-11
04	Haruar Duba	223.86 US\$ or 17,325 BDT	Muhibur Rahman, Vice- President of Sunartori Jubo Mohila Corporate Society Limited, Chanpur, Bishwambarpur	1416-1425	2009-10 to 2018-19
05	Proshadia Duba	109.83 US\$ or 8,500 BDT	MD. Hifzur Rahman, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Muktiikhola, Bishwambarpur	1416-1418	2009-10 to 2011-12
06	Chatol Moushakuri	130.50 US \$ or 10,100 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1415-1417	2008-09 to 2010-11
07	Tin Biga Beel	244.21 US\$ or 18,900 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1417-1426	2010-11 to 2019-20
08	Gozaria Haor Singirdair Group Fisheries	730.06 US \$ or 56,500 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1415-1417	2008-09 to 2010-11

09	Kuri Beel	976.01 US \$ or 75,534 BDT	MD. Hifzur Rahman, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Mukti khola, Bishwambarpur	1415-1424	2008-09 to 2017-18
10	Mora Nodi o Kara	29.71 US \$ or 2,300 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1413-1422	2006-07 to 2015-16
11	Ramshor Purer Kuri Beel o Takurdara	169.59 US \$ or 13,125 BDT	Babulal Bishwash, Secretary, Shapla Jubo and Jubo Mohila Corporate Society Limited, Bishwambarpur	1416-1418	2009-10 to 2011-12
12	Pondua Beel	339.19 US \$ or 26,250 BDT	MD. Hifzur Rahman, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Mukti khola, Bishwambarpur	1417-1419	2010-11 to 2012-13
13	Shapurur Khal	81.34 US \$ or 6,295 BDT	Mohammed Shohidul Hoque, President of Purnima Jubo and Jubo Mohila Corporate Society Limited, Bishwambarpur	1417-1426	2010-11 to 2019-20
14	Chatol Beel	625.46 US \$ or 48,405 BDT	MD. Juyadur Rahman, President of Fulbori Jubo and Jubo Mohila Corporate Society Limited, Fullbori, Bishwambarpur	1417-1426	2010-11 to 2019-20
List of open (<i>choloman</i>) Jalmohals					
15	Monikamarer Kuri	75.41 US \$ or 5,836 BDT	MD. Juyadur Rahman, President of Fulbori Jubo and Jubo Mohila Corporate Society Limited, Fullbori, Bishwambarpur	1413-1421	2006-07 to 2014-15
16	Tiyar Beel, Lomba Beel, Gul Bell	111.44 US \$ or 8,625 BDT	MD. Juyadur Rahman, President of Fulbori Jubo and Jubo Mohila Corporate Society Limited, Fullbori, Bishwambarpur	1414-1423	2007-08 to 2016-17
17	Dhupurer Duba o Bullar Gup	83.99 US \$ or 6,500 BDT	Zontu Bormon, Brozendo Pur, Bishwambarpur	1415-1417	2008-09 to 2010-11
18	Sridorpurur Jalabisrar Duba	51.68 US \$ or 4,000 BDT	Kamrul Islam, President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Mukti khola, Bishwambarpur	1415-1417	2008-09 to 2010-11

19	Mohispurra Beel	203.06 US \$ or 15,715 BDT	Muhibur Rahman, Vice- President of Ekota Jubo and Jubo Mohila Corporate Society Limited, Muktikhola, Bishwambarpur	1417-1426	2010-11 to 2019-20
20	Lomba Beel Majer Kirta	478.09 US\$ or 37,000 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1415-1417	2008-09 to 2010-11
21	Sonar Haor Group Fisheries	46.06 US\$ or 3,565 BDT	MD. Juyadur Rahman, President of Fulbori Jubo and Jubo Mohila Corporate Society Limited, Fullbori, Bishwambarpur	1415-1424	2008-09 to 2017-18
22	Singhar Ghotia Beel	2170.82 US \$ or 168,000 BDt	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1417-1419	2010-11 to 2012-13
23	Almadhorer Beel	37.89 US\$ or 2933 BDT	MD. Juyadur Rahman, President of Fulbori Jubo and Jubo Mohila Corporate Society Limited, Fullbori, Bishwambarpur	1414-1423	2007-08 to 2016-17
24	Alipurer Khal	21.70 US \$ or 1,680 BDT	Zontu Bormon, Brozendo Pur, Bishwambarpur	1417-1419	2010-11 to 2012-13
25	Korarwora Beel		Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1417-1419	2010-11 to 2012-13
26	Khalinath Shamer Duba		Open for public use		
27	Kolaya Dakband		Open for public use		
28	Majer Kitta		Open for public use		
29	Babonpura Beel	203.51 US\$ or 15,750 BDT	Romzan Ali, President of Jagoron Jubo and Jubo Mohila Corporate Society Limited, Boshontopur, Bishwambarpur	1417-1419	2010-11 to 2012-13

Source: Bishwambarpur Upazila Fishery Office (2014)

Annex-4 (Institutional arrangement for disaster management in Bangladesh)



Source: National Plan for Disaster Management 2010-2015, Bangladesh

Annex-5 (Structure of the UDMC)

(i)	Union Parishad Chairman	1	Chairperson
(ii)	Members of the Union Parishad	12	Member
(iii)	Teacher Representative (Nominated by Chairman)	1	Member
(iv)	Government officials working at Union Level (Sub-Assistant Agriculture Officer, Union Health and Family Planning Center in-charge, Union Tax Collector (<i>Tahshildar</i>), BRDB Field Worker, Representative of Social welfare department)	7	Member
(v)	Representative of Vulnerable Women (Nominated by Chairman)	1	Member
(vi)	Representative of the CPP (in appropriate case)	1	Member
(vii)	Representative of Bangladesh Red Crescent Society (in appropriate case)	1	Member
(viii)	Representatives of NGOs (one representative each from Local, National and International NGOs nominated by the Chairman)	3	Member
(ix)	Representative of the Peasant and Fishermen Society (If no society, person will be nominated by Chairman)	2	Member
(x)	Socially Reputed Persons or Civil Society Representatives (Nominated by the Chairman)	2	Member
(xi)	Representative of Freedom Fighter (Nominated by Upazila Freedom Fighters Command Council)	1	Member
(xii)	Imam/Priest/Other religious leader (Nominated by Chairman)	2	Member
(xiii)	Representative of Ansar and VDP (Nominated by Upazila Ansar VDP Officer)	1	Member
(xiv)	Secretary, Union Parishad	1	Member Secretary

Source: (SOD, 2010)

Annex-6 (Role and responsibilities of the UDMC according to SOD)

Role and responsibilities	Key features
Meeting	<ul style="list-style-type: none"> - During normal time, the committee will meet once in a month. - During warning phase and pre-disaster period, the committee shall meet more than one time in a week. - During disaster period the committee shall meet as and when needed (once daily), at least once in a week. - In recovery phase the committee will meet once a week - The committee can request any member(s) or specialist(s) of the locality to attend any particular meeting. - The committee can meet any time if needed or part of the committee can meet with the other development committees bi-laterally or multilaterally - Quorum will be constituted by 1/3rd members of the committee during normal period and post-disaster period. During warning phase and disaster period, quorum will be constituted by 1/4th members of the committee - An updated list of members of UDMC will have to be submitted to UzDMC by 15 January of each year duly signed by the chairperson of the UDMC. The list must be submitted irrespective of any changes in the composition of the committee.
Risk reduction	<ul style="list-style-type: none"> - Ensure that local people are kept informed and capable of taking practical measures for the reduction of risk at household and community level and also disseminate the success stories of reducing disaster risks at household and community level widely among the local people. - Arrange training and workshops on regular basis on disaster issues and keep the UzDMC informed. - Hold a hazard, vulnerability and risk analysis at Union level. - Identify the most vulnerable or people at high risk by sex, age, physical ability, social status, occupation and economic status. - Prepare a short, medium and long term vulnerability reduction and capacity building action plan for the identified high-risk people with active participation of the people at risk. - Facilitate coordination among the development agencies and service providers through quarterly coordination meeting and take decision about implementation of the action plan for risk reduction as well as review the progress of the risk reduction action plan. - Raise fund at local level to implement the risk reduction action plan. - Update the progress of implementation of action plan and other activities and report

	<p>to the Upazila Disaster Management Committee</p> <ul style="list-style-type: none"> - Prepare a Comprehensive Disaster Management Action Plan with a view to enabling local people, Union authority and local organizations to increase the capacity of poor and vulnerable people to enhance their income and other assets for risk reduction and also to take up security arrangement in the perspective of imminent danger related warnings or occurrence of disaster including the issues already mentioned under this paragraph. -Take steps for capacity building of relevant persons and institutions, union authority, volunteers and people in a way that they can forecast and publicize warnings relating to hazards (cyclones, storms, floods, droughts, tidal surge, tsunami, over-rainfall under-rainfall, water logging, high tide, cold wave etc.) in the quickest possible manner and also inform people about their responsibilities of saving their lives and properties from disaster. -Build the capacity of local institutions, volunteers and people in a way that they can help and motivate people to adopt disaster (Cyclone/Tidal surge/Tsunami/ Earthquake/ Tornado/ Flood/ Water Logging/ Salinity/ High Tide/ Cold Wave) resistant housing features. - Build the capacity of local institutions, volunteers and people in a way that they can help and motivate people to adapt with disaster resistant agriculture and other livelihood options. - Determine specific safe centre/shelter where the population of certain areas will go at the time of need and assign responsibilities to different persons for various services and securities at the shelter/centre. - Ensure supply of safe water and if necessary other services from specific points near the shelter/centre with the help of Upazila authority. - Train the students, youths, local club members and volunteers on community based water purification technology. So that during disaster, they can supply water-purifying technology during emergencies in their community until external support reaches the high-risk people. - Plan for preparing some community Based High land, which can be used as playground in normal time and can be used as shelter place during disaster period and where livestock, poultry, emergency food, kerosene, lamp, candle, matches, fuel wood, radio and other important resources could be shifted along with the people. - Stock emergency life-saving medicines at union level (Union Health and Family Welfare Centre) for use during disaster. - Prepare relevant plans for rescue, primary relief operation, and restoration of communication with Upazila Headquarters and local arrangement for rehabilitation of severely affected families. - Arrange for rehearsals or drills on the dissemination of warning signals/forecasts, evacuation, rescue and primary relief operations (if necessary committee can seek assistance from Upazila Authority).
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<p>Warning Period</p>	<ul style="list-style-type: none"> - Disseminate warning and security messages, evacuate the vulnerable people as per evacuation plan, cast an eye on the last moment check of rescue team and its preparation and take effective measure to minimize gap as a high priority. - Engage trained institutions, volunteers and people in field for effective and rapid dissemination of early warning messages to the vulnerable community and monitor the whole security and warning message dissemination activities. - Visit the pre-determined emergency shelter centre and be sure that for essential services and security different organizations and volunteers are alert and ready to provide services. - Review the practicality of water supply sources nearby the shelter/centre and if necessary, fill the gaps that people can get safe water supply during disaster from these water sources. - On a minimum scale, conduct a mock or drill to ensure that the trained students, youths, clubs and volunteers can prepare water-purification technology at their locality and can supply to the victims during emergencies and to monitor that adequate materials are ready to prepare such water-purification technology. - Review the stock of life saving medicines at union level and evaluate its adequacy for supply among the victims during disaster. - To prepare a checklist of emergency works to-do during disaster and be sure that appropriate materials and people are available for use.
<p>During disaster onset</p>	<ul style="list-style-type: none"> - Organize emergency rescue work by using locally available facilities in times of need and if directed assist others in rescue work. - Prepare water purification technology (tablet) at local level with the help of trained students, youths, clubs and volunteers; and distribute those products at emergency among the people at risk before being caught by diarrhoea or other water borne diseases. - Coordinate all relief activities (GO-NGO) in the union in a manner that social justice (on the basis of who needs, what is needed and how much is needed) is ensured in relief distribution; - Protect people from upset creating rumour during hazard period by providing them correct and timely information. - During hazard ensure security of the local and outside relief workers. - Ensure the security of women, children and person with disability during hazard. - Take necessary actions to protect environmental degradation by quick funeral of corpses and burying the animal dead bodies. - Help people to transfer their essential resources (livestock, poultry, essential food, kerosene, candle, matches, fuel, radio, etc.) to safe places.
<p>Post-disaster period</p>	<p>-Collect statistics of loss incurred in disaster in the light of guidelines of Disaster Management Bureau and Upazila Disaster Management Committee and send the same to Upazila Disaster Management Committee.</p>

	<ul style="list-style-type: none"> - Take steps for distribution of articles for rehabilitation received locally or from Relief and Rehabilitation Directorate and from any other source following the guidelines from Disaster Management Bureau and Upazila Disaster Management Committee. - Send accounts of materials received to UzDMC and donor agency (if the donor provided relief fund). - Ensure that due to hazard the people who were displaced can come back to their previous place; in this case, dispute (if any) regarding the land of the displaced people should not be an obstacle to come back to the place after disaster. - Counsel the psycho traumatic people due to hazard with the support of community and experts. - Ensure that the injured people are getting fair and just treatment from health service providers, if necessary; committee can recommend for Upazila and District level assistance. - Arrange a lesson learning session with the participation of concern institutions and individuals on learning from during hazard and after hazard. - In addition to the above follow Standing Orders on disaster management related issues and instant orders of appropriate authority
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Source: Standing Order on Disaster-Bangladesh (2010)

Annex-7 Informed consent forms

Informed consent for UDMC members



Informed Consent
Natural Resources Institute
 70 Dysart Rd,
 Winnipeg, Manitoba
 Canada R3T 2N2

General Office (204) 474-7170

Fax: (204) 261-0038

http://www.umanitoba.ca/academic/institutes/natural_resources

Research Project Title: Wetland-community resilience to flash flood hazards (*Bonna*) in Sunamganj district, Bangladesh

Researcher: Mahed Choudhury

The text of the consent form will be in both English and Bengali languages and will be translated to the community people in local dialects.

I am a graduate student at the Natural Resources Institute, University of Manitoba, (Canada) and I am conducting a field research for my Master's Thesis. My research focuses on the wetland-community resilience to flash flood (*Bonna*) hazards in Sunamganj district. In Sunamganj district, flash flood is a chronic problem. It destroys crops and property. My purpose is to examine the wetland-community disaster recovery processes (i.e., in terms of shocks) and resilience to flash flood-hazards. The research is being funded and carried out under the Social Science and Humanities Research Council (SSHRC) project and by Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Canada. The study has already been approved by the Joint-Faculty Research Ethics Board at the University of Manitoba (Canada).

This consent letter, a copy of which will be left with you for your records and reference, is part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like know more details about something mentioned here, or information not included here, please feel free to ask for clarifications. Please take the time to read this carefully and to understand this information.

In the course of the research you will be asked a series of questions that will help me understand the issues related to UDMC initiatives in the disaster management and recovery process, what strategies it takes to ensure equal participation of community people and what are the strategies taken to sure women's participation. You will be requested to participate in an interview session that will last for 45 – 60 minutes. If more time is required, a subsequent meeting can be arranged at your convenience. These interviews may be conducted at your place of work, home, or at another location of your preference. After the interview, if the need arises, you may be contacted for further clarifications.

The interview will be recorded on a digital recorder provided that you do not have any objections. Your name and contact information will be kept in secure location and will be destroyed upon completion of the study. If you wish to receive an integrated output of the study, you can indicate your email and you

will receive an email when the preliminary results are ready. Your feedback on integrated results will be highly appreciated and will be taken into account while preparing the final results. The data provided by you will be used to complete a progress reports, my Master's thesis, and will potentially be published in an academic journal. You will not be identified by name in any such publications unless you explicitly waive your right for confidentiality and anonymity.

You are free to decline to participate in this research, withdraw from the study at any time, and/or choose not to answer any questions you may not be comfortable with. If you do decline to participate in the study or answer any questions, you will not face any negative consequences. If I have not explained the study clearly, please feel free to ask for clarifications or additional information at any time throughout your participation.

My cell phone number is ... and my email is ...

If you have any complaints or further questions about the nature of this research, your concerns may be directed to:

The Human Ethics Secretariat at the University of Manitoba

Phone:

E-mail:

or to my advisor:

Dr. C. Emdad Haque

Phone:

E-mail:

Please be advised that the staff at these offices speak only English (and maybe French).

Do you understand and agree to the terms described here?

Participant's consent (please check the box):

- I am aware of the purpose and objectives of this study, scope of the study, nature of the questions to be asked, and the nature and extent of my involvement in the study.
- I am aware that I can contact the researcher, Mahed Choudhury (tel. Email: regarding any complaints or queries with respect to the research.
- My participation is completely voluntary and I can withdraw from the research at any point in time.
- I have participated in the study because the researcher has assured me that he will safeguard my identity by keeping my responses confidential and all identifying information will be removed from any data associated with me.

By signing below, I am affirming the truth of the above statements and consenting to participate in this study.

Name: _____ Date: _____

Signature: _____

Informed consent for community people (For applying PRA to techniques and survey purpose)



Informed Consent Natural Resources Institute

70 Dysart Rd,
Winnipeg, Manitoba
Canada R3T 2N2

General Office (204) 474-7170

Fax: (204) 261-0038

<http://www.umanitoba.ca/academic/institutes/naturalresources>

Research Project Title: Wetland-community resilience to flash flood hazards (*Bonna*) in Sunamganj district, Bangladesh

Researcher: Mahed Choudhury

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I am a graduate student at the Natural Resources Institute, University of Manitoba, (Canada) and I am conducting a field research for my Master's Thesis. My research focuses on the wetland-community resilience to flash flood (*Bonna*) hazards in Sunamganj district. In Sunamganj district, flash flood is a chronic problem. It destroys crops and property. My purpose is to examine the wetland-community disaster recovery processes (i.e., in terms of shocks) and resilience to flash flood-hazards. The research is being funded and carried out under the Social Science and Humanities Research Council (SSHRC) project and by Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Canada. The study has already been approved by the Joint-Faculty Research Ethics Board at the University of Manitoba (Canada).

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In the course of the research you will be asked a series of questions that will help me understand the issues related to your coping and adaptation process, socio-economic data of your household, economic loss during the on-set and recovery process during post-disaster situation, what factors constraints and facilitates your recovery process, what you know about your ecosystem, fishing and cropping practices, and nature of your participation in the UDMC process. You will be requested to participate in an interview session that will last for 45 – 60 minutes. If more time is required, a subsequent meeting can be arranged at your convenience. These interviews may be conducted at your place of work, home, or at another location of your preference. After the interview, if the need arises, you may be contacted for further clarifications.

The interview will be recorded on a digital recorder provided that you do not have any objections. Your name and contact information will be kept in secure location and will be destroyed upon completion of

the study. If you wish to receive an integrated output of the study, you can indicate your email and you will receive an email when the preliminary results are ready. Your feedback on integrated results will be highly appreciated and will be taken into account while preparing the final results. The data provided by you will be used to complete a progress reports, my Master's thesis, and will potentially be published in an academic journal. You will not be identified by name in any such publications unless you explicitly waive your right for confidentiality and anonymity.

You are free to decline to participate in this research, withdraw from the study at any time, and/or choose not to answer any questions you may not be comfortable with. If you do decline to participate in the study or answer any questions, you will not face any negative consequences. If I have not explained the study clearly, please feel free to ask for clarifications or additional information at any time throughout your participation.

My cell phone number is... and my email is ...

If you have any complaints or further questions about the nature of this research, your concerns may be directed to:

The Human Ethics Secretariat at the University of Manitoba

Phone:

E-mail: margaret.bowman@umanitoba.ca

or to my advisor:

Dr. C. Emdad Haque

Phone:

E-mail:

Please be advised that the staff at these offices speak only English (and maybe French).

Do you understand and agree to the terms described here?

Participant's consent (please check the box):

- I am aware of the purpose and objectives of this study, scope of the study, nature of the questions to be asked, and the nature and extent of my involvement in the study.
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- I have participated in the study because the researcher has assured me that he will safeguard my identity by keeping my responses confidential and all identifying information will be removed from any data associated with me.

By signing below, I am affirming the truth of the above statements and consenting to participate in this study.

Name: _____ Date: _____

Signature: _____

Informed consent for FGD



Informed Consent Natural Resources Institute

70 Dysart Rd,
Winnipeg, Manitoba
Canada R3T 2N2

General Office (204) 474-7170

Fax: (204) 261-0038

[http://www.umanitoba.ca/academic/institutes/natural
resources](http://www.umanitoba.ca/academic/institutes/natural_resources)

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In the course of the research you will be asked a series of questions that will help me understand the issues related to your coping and adaptation process, economic loss during the on-set and recovery process during post-disaster situation, what factors constraints and facilitates your recovery process, what you know about your ecosystem, fishing and cropping practices, and nature of your participation in the UDMP process. You will be requested to participate in the discussion session that will last for 45 – 60 minutes. If more time is required, a subsequent meeting can be arranged at your convenience. These interviews may be conducted at your place of work, home, or at another location of your preference. After the interview, if the need arises, you may be contacted for further clarifications.

Whatever discussed in this discussion section should remain confidential. Participants should not disclose any information to non-participants of this discussion which is harmful for the participants. If this happens, researcher will not be liable for this.

The interview will be recorded on a digital recorder provided that you do not have any objections. Your name and contact information will be kept in secure location and will be destroyed upon completion of the study. If you wish to receive an integrated output of the study, you can indicate your email and you will receive an email when the preliminary results are ready. Your feedback on integrated results will be highly appreciated and will be taken into account while preparing the final results. The data provided by you will be used to complete a progress reports, my Master's thesis, and will potentially be published in an academic journal. You will not be identified by name in any such publications unless you explicitly waive your right for confidentiality and anonymity.

You are free to decline to participate in this research, withdraw from the study at any time, and/or choose not to answer any questions you may not be comfortable with. If you do decline to participate in the study or answer any questions, you will not face any negative consequences. If I have not explained the study clearly, please feel free to ask for clarifications or additional information at any time throughout your participation.

My cell phone number is... and my email is...

If you have any complaints or further questions about the nature of this research, your concerns may be directed to:

The Human Ethics Secretariat at the University of Manitoba

Phone:

E-mail:

or to my advisor:

Dr. C. Emdad Haque

Phone:

E-mail:

Please be advised that the staff at these offices speak only English (and maybe French).

Do you understand and agree to the terms described here?

Participant's consent (please check the box):

- I am aware of the purpose and objectives of this study, scope of the study, nature of the questions to be asked, and the nature and extent of my involvement in the study.
- I am aware that I can contact the researcher, Mahed Choudhury (; email, regarding any complaints or queries with respect to the research.
- My participation is completely voluntary and I can withdraw from the research at any point in time.
- I have participated in the study because the researcher has assured me that he will safeguard my identity by keeping my responses confidential and all identifying information will be removed from any data associated with me.

By signing below, I am affirming the truth of the above statements and consenting to participate in this study.

Name: _____ Date: _____

Signature: _____

Informed consent for taking photographs



Informed Consent Natural Resources Institute

70 Dysart Rd,
Winnipeg, Manitoba
Canada R3T 2N2

General Office (204) 474-7170

Fax: (204) 261-0038

[http://www.umanitoba.ca/academic/institutes/natural
resources](http://www.umanitoba.ca/academic/institutes/natural_resources)

Research Project Title: Wetland-community resilience to flash flood hazards (*Bonna*) in Sunamganj district, Bangladesh

Researcher: Mahed Choudhury

The text of the consent form will be in both English and Bengali languages and will be translated to the community people in local dialects.

I am a graduate student at the Natural Resources Institute, University of Manitoba, (Canada) and I am conducting a field research for my Master's Thesis. My research focuses on the wetland-community resilience to flash flood (*Bonna*) hazards in Sunamganj district. In Sunamganj district, flash flood is a chronic problem. It destroys crops and property. My purpose is to examine the wetland-community disaster recovery processes (i.e., in terms of shocks) and resilience to flash flood-hazards. The research is being funded and carried out under the Social Science and Humanities Research Council (SSHRC) project and by Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Canada. The study has already been approved by the Joint-Faculty Research Ethics Board at the University of Manitoba (Canada).

This consent letter, a copy of which will be left with you for your records and reference, is part of the process of informed consent. It should give you the details idea of my purposes of taking your photographs. If you would like know more details about something mentioned here, or information not included here, please feel free to ask for clarifications. Please take the time to read this carefully and to understand this information.

I would like to take your photographs for the following reasons:

1. As part of my record that you have participate as a respondent in my research.
2. To visually present your coping and adaptation strategies.
3. To use in public presentation like academic conference.
4. To use in my final thesis report

Your name and contact information will be kept in secure location and will be destroyed upon completion of the study. You will not be identified by name in any such publications unless you explicitly waive your right for confidentiality and anonymity.

You are free to decline to participate in this research, withdraw from the study at any time. If you do decline to participate in the study, you will not face any negative consequences. If I have not explained the purpose of taking your photographs clearly, please feel free to ask for clarifications or additional information at any time throughout your participation.

My cell phone number is... and my email is ...

If you have any complaints or further questions about the nature of this research, your concerns may be directed to:

The Human Ethics Secretariat at the University of Manitoba

Phone:

E-mail:

or to my advisor:

Dr. C. Emdad Haque

Phone:

E-mail:

Please be advised that the staff at these offices speak only English (and maybe French).

Do you understand and agree to the terms described here?

Participant's consent (please check the box):

- I am aware of the purpose and objectives of taking my photographs for this study.
- I am aware that I can contact the researcher, Mahed Choudhury (tel. email regarding any complaints or queries with respect to the research.
- My participation is completely voluntary and I can withdraw from the research at any point in time.

By signing below, I am affirming the truth of the above statements and consenting to take my photographs for this study.

Name: _____ Date: _____

Signature: _____