THE ROLE OF SOCIAL LEARNING IN ENHANCING COMMUNITY RESILIENCE AND RECOVERY FROM FLASH FLOODS IN SUNAMGANJ, BANGLADESH

BY

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Abstract

The purpose of this research was to examine how social learning occurs with regard to flash floods in the wetland communities in the northeastern region of Bangladesh and what role it plays in enhancing community resilience. I followed a Case Study approach within the framework of qualitative research design. The field investigation was carried out in two village-communities, namely Rajapur and Fenarbak of Fenarbak Union, of Sunamganj District from July to December 2020. To attain the required data, the following tools and techniques were applied: Key Informant Interviews (24), Focus Group Discussions (6), Semi-Structured Interviews (13), Oral Histories (7), and participation observation (2 events).

The findings reveal that social learning stems primarily from first-hand experience with flash floods and through sharing the flood experiences of the affected people with others in various informal and formal learning platforms. This process takes place in an iterative way that generates substantial innovative knowledge influencing local communities to take social learning-based actions – both individually and collectively. The learning-based innovative measures play a profound role in mitigating the adverse effects of flash floods and in reinforcing community resilience. However, the application of innovative actions is undermined by a number of embedded factors – including learning capacity, social, economic, political, and institutional structure. To nurture innovative knowledge for building community resilience, a social learning-based approach is required that would help thriving innovative adaption strategies to deal with environmental shocks.

Acknowledgment

DEDICATION

This thesis is dedicated to my late grandfather Foyez Uddin Akhond and my late sister-in-law Nadira Sultana

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Acronyms

BDT	Bangladeshi Taka
BRRI	Bangladesh Rice Research Institute
BWDB	Bangladesh Water Development Board
CBOs	Community-based Organizations
FGDs	Focus Group Discussions
IPCC	Intergovernmental Panel for Climate Change
KIIs	Key Informant Interviews
MM	Millimeters
MoFL	Ministry of Fisheries and Livestock
MoWR	Ministry of Water Resources
MT	Metric Tonnes
NGOs	Non-governmental Organizations
OHIs	Oral History Interviews
PIC	Project Implementation Committees
PIO	Project Implementation Officer
SES	Social-Ecological System
SMC	School Managing Committee
SoD	Standing Order on Disasters
SSIs	Semi-Structured Interviews
UDMC	Union Disaster Management Committee
UK	United Kingdom
UNISDR	United Naitons Office for International Strategy for Disaster Reduction
UP	Union Parishad
USD	United States Dollar
UzDMC	Upazila Disaster Management Committee
VDC	Village Development Committees

Glossary[1]

Adaptation: Adaptation encompasses a wide range of adjustment measures in the social and ecological systems to respond to the effects of environmental extremes and shocks. It strengthens the capacity of the systems to reduce the future risks of environmental and/or climatic stimuli or it fosters possible options to adapt to the undesirable effects (IPCC, 2012).

Arenas: Arenas are spaces of interaction and dialogues, in which diverse actors of social domains are deliberately engaged in debates, confrontation, and generating networks for achieving the common goals (Strauss, 1978).

Bonna: Abnormal flooding that exceeds the coping capacity of a community.

Boro rice: A winter season paddy that is cultivated by farmers in the dry season in rural areas of Bangladesh.

Borsha: Normal seasonal flooding during the monsoons that supports ecosystem sustainability and livelihoods in the floodplain regions.

Collective action: It is defined as an action taken by a group of people jointly to achieve a common goal (Assuah & Sinclair, 2019; Ireland & Thomalla, 2011).

Community Resilience: Community resilience implies the potential capability of community members to deploy necessary community resources to resist and adapt to unanticipated environmental changes and uncertainty. It also implies potential actions taken by community members to influence the changes for enhancing the community's ability to absorb undesirable shocks (Magis, 2010).

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[1] References of this section are incorporated in the reference section of the Introduction chapter.

Coping: A set of short-term measures taken by the vulnerable groups immediately after the onset of extreme events at the household or community level for the reduction of the effects of a disaster (Berkes & Jolly, 2001).

Courtyard meeting: An informal learning space in disaster-prone area that organizes community people to get together and stimulates them to share their diverse ideas and experiences for generating a collective problem-solving approach to protect community-owned resources.

District: A second level administrative unit under a Division in Bangladesh.

External Innovations: Innovative adaptive ideas and techniques are introduced by the formal institutions for the adaptation of the vulnerable population to extreme environmental events (Kluvánková et al., 2018).

Faith-based group meeting: It is a religion-based learning space, in which a group of spiritual persons get together and share ideas for the purpose of protection against natural disturbances and the improvement of religious properties.

Flash floods: Flash foods are rapid onset natural events, which occur due to heavy rainfalls in the adjacent hilly or elevated upper catchment areas. They usually strike the downstream communities very rapidly without providing much scope for preparedness (Collier, 2007 Choudhury & Haque, 2016).

Flood experience: Flood experience means direct contact with floods and observation of flood events. Flood experience is also reshaped by the magnitude of damage and loss experienced by a community (Kuang & Liao, 2020).

Flood memory: The accumulated experiences of observation and ideas of past flood events that generate flood-related knowledge to adapt to floods (Garde-Hansen, McEwen, Holmes, & Jones, 2017).

Gopats: A large cattle path that is used for the communication and transportation of crops.

Haor: A bowl-shaped lowland lying between natural levees of rivers; collectively, the low-lying areas are locally known as a *haor* basin.

Institutions: Institutions are defined as a set of rules, regulations, and norms, which are operated within the context of society and locality (Ostrom, 2005). Institutions can be structured as formal and informal institutions. Formal institutions usually have a legal basis and are administered by the formalized regulatory rules. In contrast, informal institutions can be noted as societal norms, shared identify or network of people (Pahl-Wostl, 2009). Quasi-formal institutions imply a set of rules and regulations when actors from formal and informal institutions generate a set of rules and regulations and a shared network and work together to achieve a common consensus.

Jalmahals: A sanctuary of fish that is leased by the government organizations to earn revenues.

Mahalla: Mahalla means a small neighborhood in rural Bangladesh.

Mohajon: Mohajon implies a person who generates income by lending money with a high interest rate in the locality.

Public hearing: Public hearing is defined as a large forum or social space that combines diverse audiences – including the general public, local government representatives, and government officials for addressing the problems of crop-protection embankments and

identifying and sharing the responsibilities of different entities to repair and protect crop-protection embankments.

Resilience: Resilience is defined in terms of the capacity or ability of a system, community or society to withstand, absorb, and recover from the adverse consequences of an environmental shock efficiently. The ability to adapt to unintended consequences assists to restore essential structure and functions in the aftermath of a disturbance (IPCC, 2012).

Social learning: Social learning refers to a change in understanding or knowledge that occurs iteratively when people share diverse perspectives and experiences with one another for taking a purposeful action to thrive in unfavorable environmental changes (Reed et al., 2010; Berkes, 2009).

Union Parishad (**UP**): The lowest administrative unit in Bangladesh, headed by the chairperson.

Upazila: It refers to a sub-district under a district.

Ward Council: a sub-division of a Union, which usually consists of two or more villages within a particular boundary.

Chapter 1: Introduction

1.1 Context of the study

Climate change-related extreme shocks have increased rapidly in recent years, especially in the developing countries and small islands, which are more exposed to floods, cyclones, heatwaves, and droughts (World Economic Forum, 2018). People living in these countries have six times greater exposure to these extreme events than the developed countries. In South Asian countries, particularly in Bangladesh, Nepal, and India, floods often create destructive environmental shocks, which have been affecting millions of lives adversely. For instance, in South Asia, floods took 1,200 lives in 2017 and destabilized the socio-environmental equilibrium (United Nations Office for Disaster Risk Reduction (UNISDR, 2018)). Weather-triggered events thus have emerged as a key challenge to achieving the goals set out in the global sustainable development agenda as they may pose a protracted crisis in these regions that would be chronic in nature (Haque & Burton, 2005)

Bangladesh – one of the South Asian countries – on an average, has experienced at least one devastating flood every six years over the last 48 years (Dewan, 2015; Ghatak, Kamal, & Mishra, 2012). Studies affirm that floods inundate about 20-25% of the total land of the country each year (Haque, 1997; Intergovernmental Panel on Climate Change (IPCC), 2012). Locally, normal flooding is considered as a *borsha* (Haque, 1993, p. 368). For farming communities, normal flooding is a blessing as it performs a crucial role to increase soil nutrients in the floodplain areas of Bangladesh. Abnormal floods, locally known as *bonna*, hit Bangladesh periodically causing massive destruction of crops, properties, and livelihoods of vulnerable groups. In recent years, the country has experienced four catastrophic floods in 2004, 2007, 2012 (Choudhury & Haque, 2016), and 2017 (Bamforth, 2017; Kamal et al., 2018). Of these catastrophic floods, the 2017 floods were atypical, with devastating impacts. The 2017 floods

caused the death of 145 vulnerable people and damage to 100,000 houses; more than 8 million of the vulnerable populations were forced to live elsewhere. Nearly 42% of the country was under water in the monsoon period. Around 62,000 km^2 of land area was deluged by floodwater (Flood Forecasting Warning Centre (FFWC), 2017). Additionally, prevailing heavy rainfalls in mountain bases during the monsoon period (June to September) and abrupt melting of glaciers in the Himalayan region, particularly by an unprecedented rate of warming of temperatures, cause severe flash hazards each year in the northeastern part of Bangladesh (Allamano, Claps, & Laio, 2009; FFWC, 2017). Climatic factors combined with social factors (e. g., high population growth, limited access to natural resources, social inequality, limited opportunity to access to the national and international economic system) in northeastern Bangladesh have been increasing the exposure to various flash floods and exacerbating vulnerability (Choudhury & Haque, 2016).

The geographical location and context of the present study are in the northeastern region of Bangladesh. The northeastern region of Bangladesh consists of seven districts[2] – including Sylhet, Sunamganj, Netrokona, Brahmanbaria, Habiganj, Moulvibazar, Netrokona, and Kishoreganj (Ministry of Water Resources (MoWR), 2012). It is noted that there are eight administrative divisions and 64 administrative districts in Bangladesh. Each division consists of a number of districts and a district has been divided into a few sub-districts (*Upazila*). A sub-district is also comprised of several unions (group of villages and the lowest administrative unit of local government) (see Appendix 8 for the administrative structure of Bangladesh). The present study is undertaken in Sunamganj District, which is under the Sylhet Division. The region is located in the downstream region of the Meghna River basin and is surrounded by the mountainous area of Assam and Meghalaya of India. As a consequence, the region receives the

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[2] A District is the second level administrative unit in the four-tier administrative hierarchy of the government. The first level unit is known as a Division in Bangladesh.

maximum rainfall in monsoon season annually – ranging from 2200 mm (millimeters) to 5800 mm (millimeters) (MoWR, 2012). The northeastern region is also covered by the Surma-Kusiyara floodplain and numerous internal bowl-shaped watersheds resulting from natural depressions. These wetlands are locally known as *haor*[3] (Choudhury & Haque, 2016; Choudhury, 2015; Haque, Bremer, Aziz, & van der Sluijs, 2017; Khan, 2011). There are 373 *haors* consisting of 8,590 km^2 of land, which serve as the main source of livelihood maintenance for the resource-dependent communities in the wetland of Bangladesh (MoWR, 2012). This region remains under water for six months each year – from June to November. Some wetlands also contain water for the whole year. They provide habitat for diverse fishes and contain rich biodiversity. During the winter season (November – February), the *haors* become a key resource for crop cultivation. Farmers cultivate a staple crop, which is known as *boro*[4] rice, during the winter season. The *haors* thus generate diverse natural resources for people living in the low-lying areas of the northeastern region of Bangladesh (Choudhury, 2015; Khan, 2011).

However, the low-lying areas, a large portion of the northeastern Bangladesh, is geographically susceptible to various forms of flooding – including flash flooding (late March – early May), seasonal or monsoon flooding (late July – early November), and post-monsoon flooding (late August – early November) (Choudhury & Haque, 2016; Rahman & Hickey, 2019). *Flash flooding* as an atypical flood mainly occurs in northeastern Bangladesh because of sudden excessive precipitation in the upstream hilly areas of Assam and Meghalaya, India. These events are rapid onset hazards and hit the downstream locality within a very short time period without providing much scope for flood forecasting (Collier, 2007; Choudhury &

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[3] *Haor* is a marshy wetland located in northeastern Bangladesh, which is physically bowl-shaped lowland lying between natural levees of rivers. As a low-lying area, hoar is more exposed to regular flooding; collectively, the low-lying areas are familiar as a *haor* basin.
[4] A winter season paddy that grows in the dry season in rural Bangladesh.

Haque, 2016). Flash flooding usually takes place from April to May and September to November in the northeastern region of Bangladesh. Notably, flash flooding that strikes in early April often causes severe damage to the main staple food and enhances cumulative vulnerabilities. *Monsoon flooding* is another typical flood that happens due to the overflow of major rivers as a result of heavy precipitation in the Himalayas and some of the upstream regions in India (Kamal et al., 2018). Typically, there is no difference between a monsoon flood and a post-monsoon flood as both are rapid onset phenomena and caused by excessive rainfall (Choudhury & Haque, 2016). It is noted that this research has been conducted in Sunamganj District, which is one of the most flash flood prone districts in northeastern Bangladesh.

A recent study by Ahmed and his collegues (2017) reveals that six flash floods hit northeastern Bangladesh from 2000 to 2017 and the average return period of flash floods was about 3.5-year (FFWC, 2018). In 2017, the wetland communities in the northeastern Bangladesh experienced three flash floods – pre-monsoon flooding, seasonal or monsoon flooding, and post-monsoon flooding due to excessive rainfall in all periods in the Meghna Basin. Consequently, most of the economic and agricultural functionalities were damaged by the flash floods (Aldhshan, Mohammed, & Shafri, 2019). Extreme floods have severely affected the communities' livelihood, fishing, and productive activities, intensifying vulnerabilities of the communities living in the low-lying areas (Haque et al., 2017; Khan & Haque, 2010). However, local communities through learning from flash floods and social interaction have been generating a sense of living and reshaping their adjustment capacity to deal with flash floods (Choudhury, 2015; Khan, 2011) because learning generates knowledge for local adaption and innovation to withstand flash floods (Rahman & Hickey, 2019). Notably, an understanding of the interrelationship between learning from flash floods and their roles in flood response and recovery mechanisms is still poor, which indicates the urgent need for further research on this issue. In consideration of this gap, the present study draws insights

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from social learning and its role in flood response and recovery mechanisms in strengthening community resilience to flash floods.

To deal with extreme environmental pressures, particularly flash floods, social learning – a change in understanding that happens through sharing direct experience and social interaction within the community – is regarded as a critical community capacity that performs decisive roles in mitigating vulnerabilities and withstanding uncertainty (Berkes, 2009). While climatic stimuli, such as floods influence individuals to learn from first-hand experience and on avoiding the adverse effects of environmental events (Berkes, 2009; Kuang & Liao, 2020), individuals transform their experiences into knowedge through the social learning process and learning-by-doing to cope and adapt to social and enviromental dynamism and complexities (Keen & Mahanty, 2006; Reed et al., 2010). As well, in the pertinent literature, it is further denoted that individal learing occurs primarily through social learning by means of social networking, interactions and sharing experiences at the community level (Preston, Chadderton, Kitagawa, & Edmonds, 2015; Pahl-Wostl, 2006).

As social learning occurs within a social space in an iterative way, it generates effective knowledge and understanding for coping and adapting to undesirable shocks (Berkes, 2009; Reed et al., 2010). Social learning is also conceded as an effective means to empower community members and decision-makers as it generates innovative knowledge for purposeful actions, espeically for coping and adaption mechanisms. As noted above, for more understanding and innovations, individuals share experiences and knowledge at the societal level through social interaction to adapt to environmental change (Preston et al., 2015). Such participatory sharing reshapes a self-organized learning system and builds a social network (Berkes & Ross, 2016), in which a "communities of practice", a shared understanding and belief, contributes to the collaborative decision-making and problem-solving process of risk

mitigation (Wenger, 1998). As depicted in Figure 1.1, individual leanring starts with observation on enviromtnal purternations that stimulate individuals to learn. Individual learning is closely intertwined with social learning which takes place simultaneously at the community level. The learning process leads to the formation of knowledge and brings substantial change for coping and adaptation mechanisms. In turn, these changes often enhance community resilience to flash floods iteratively. This is because social learning as a participatory learning process strengthens the community's adaptive capacity to respond to and to live with uncertainty and changes (Berkes, 2007; Preston et al., 2015).
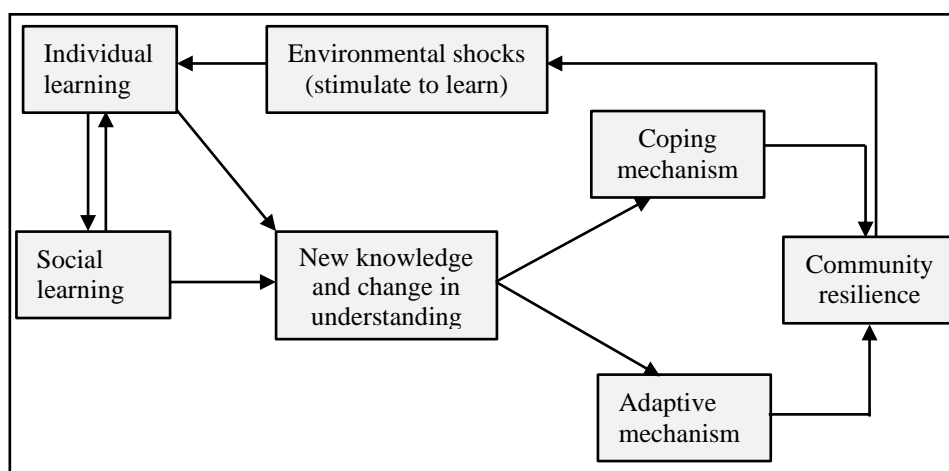
Figure 1:1 Interconnections depicting how environmental shocks stimulate social learning for fostering new knowledge for enhancing community resilience

In relation to social learning, various theoretical explanations exist on the aspects of coping and adaptation to disasters. Some scholars view and analyze them from a human dimension perspective (e.g., Berkes & Jolly, 2001; Haque, 1997; Wisner, Blaikie, Cannon, & Davis, 2004), while others examine from a social-ecological system (SES) standpoint (IPCC, 2012). Despite the existence of varied perspectives, a common parlance is about short- and long-term adaptation to a disrupted system (Berkes & Jolly, 2001; Lei, Wang, Yue, Zhou, & Yin, 2014). The scholars (e.g., Berkes & Jolly, 2001; Wisner et al., 2004) focusing on human

aspects define *coping* measures as a set of temporal activities, which are undertaken individually or collectively to respond to the adverse effects for sustaining livelihood during an emergency. In contrast, *adaptation* refers to a long-term process, thereby undertaking a set of actions to modify productive resources and reframing institutional arrangements to safeguard human lives and adjustment with unpredictable perturbations (Berkes & Jolly, 2001; Wisner et al., 2004). In connection to this conceptualization, it has been affirmed that social learning has the potential to make significant changes in the existing practices of adaptive mechanisms (Armitage, Marschke, & Plummer, 2008; Berkes, 2009), as well as preparedness and adaptation strategies to floods (Johannessen & Hahn, 2013; Pahl-Wostl et al., 2007). Social learning thus is embedded in the process of coping and adaptation mechanisms to enhance community resilience through changing understanding and generating knowledge.

In contemporary literature, varied views exist on resilience. For example, the behavioral perspective emphasizes the individual's ability, whereas the social-ecological perspective emphasizes focus on a system's ability to withstand shocks (Berkes & Ross, 2016). However, these standpoints share common insights about resilience (Berkes & Ross, 2016). In the natural resource management field, *resilience* is seen as an integrated approach that connects all levels in the continuum of building community resilience. In Berkes and Ross's analysis (2013), *community resilience* is viewed as the capacity of community members to use the existing resources, knowledge, and skills to cope with and absorb uncertain risk and environmental pressures. Such assertion also claims community resilience as "the ability of community members to take meaningful, deliberate, collective action to remedy the effect of a problem, including the ability to interpret the environment, intervene and move on" (Pfefferbaum, Reissman, Pfefferbaum, Klomp, & Gurwitch, 2007, p.349). In the present research, community resileince is conceptualized as a shared network and collective agency that enhances the capacity of the community members to work individually and collectively to absorb and

withstand flash floods. Social learning is viewed as a promoter of community resilience (Aldunce, Beilin, Handmer, & Howden, 2016). Community members work as affirmative agents to transfer experiences and knowledge in this resilience continuum (Klein, Nicholls, & Thomalla, 2003).

To transform social learning into community resilience, local institutions also perform a key role by influencing local decisions, addressing vulnerability, and taking various disaster management mechanisms (Agrawal, 2010; Wilbanks & Kates, 1999). Institutions create provisions for social learning to incorporate diverse knowledge and social values for collective action through a network with multiple stakeholders (Folke, Colding, & Berkes, 2003). In Bangladesh, numerous formal and informal institutions are nurturing social learning platforms and translating social learning into collective action for enhancing community resilience to disasters and shocks. In this connection, several studies (Azad, Uddin, Zaman, & Ashraf, 2019; Choudhury, Uddin, & Haque, 2019; Uddin, Haque, & Khan, 2020) reveal that formal institutions, such as the Union *Parishads* and the Union Disaster Management Committees, as bridging institutions at the local level, have been taking community-based disaster management strategies collaboratively with community members and community-based organizations (CBOs) to withstand flash flood shocks and disasters (Choudhury et al., 2019). However, these earlier studies have not provided much direction on how local level institutions nurture social learning and transform social learning as a problem-solving tool into collective action in enhancing community resilience to flash floods. In the context of flash floods, social learning can be considered as a problem-solving approach to mitigate risks if it can generate appropriate knowledge for adaptation and community resilience.

Although social learning has been seen as a dynamic and system-oriented approach to the problem-solving process in many fields (e. g., natural resource management, ecology,

psychology, and education), empirical investigations are insufficient (Armitage et al., 2008; Reed et al., 2010), especially in the context of flash floods. Studies on social learning at the initial stage require many perspectives to theorize it (Rodela, 2011). Little guidance and direction thus are observed, particularly about how social learning takes place at the local levels and how it fosters community resilience to flash floods in the low-lying areas of Bangladesh (Choudhury et al., 2019; Rahman & Hickey, 2019). Many studies have focused on the understanding of vulnerability reduction and risk management as well as examined the underlying reasons for vulnerable people living in flood-prone areas. However, studies on the contribution of social learning from flash floods to flood response and recovery mechanisms and their implications in enhancing resilience to floods are very scant. In this context, my research aims to examine the critical aspects of social learning of the vulnerable communities from flood experience, and how communities apply social learning in fostering community resilience at the community and institutional levels.

1.2 The rationale of the study

The point of entry in my thesis is to explore how social learning has been promoting community resilience to floods in Bangladesh. Numerous studies consider social learning a catalyst to bring modifications in preparedness, prevention, and recovery mechanisms to lessen unprecedented risks pertinent to floods (Pahl-Wostl, 2006; Preston et al., 2015; Tran, James, & Pittock, 2018). In the context of Bangladesh, there is a need for an investigation on how social learning takes place in the context of floods and how it enhances community resilience to floods. The growing body of literature affirms that community resilience requires learning from disasters, community-based knowledge, social network, collectiveness, and institutional linkage (Berkes, 2007; Mochizuki, Keating, Liu, Hochrainer-Stigler, & Mechler, 2018; Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). Social learning can build these resources and can

engage community members in disaster readiness and response activities through a learning-based platform (Norris et al., 2008). A scholarly understanding thus is needed to investigate how unprecedented events engender a participatory learning-based platform and yield new knowledge in promoting community resilience.

Recognizing the significance of social learning, this research values this platform as a collective learning-based entity that can develop a range of knowledge for adaptive measures (Berkes, 2007, 2009). Aldunce and his associates (2016) state that fostering adaptive strategies can only be successful if social learning occurs in an iterative way. While it can generate opportunities for new knowledge and adaptation mechanisms, the significance of social learning-based approaches to flood risk reduction has been addressed only by a few studies (Benson, Lorenzoni, & Cook, 2016; Haque, Choudhury, & Sikder, 2019; Johannessen & Hahn, 2013; Pahl-wostl, 2006). Literature on how social learning bolsters community resilience, and what types of learning-based attributes accelerate the community's adaptive capacity to flood risks is very limited. In consideration of such limited existing literature, and to frame social learning in the context of floods, my study has attempted to explore how social learning helps to foster adaptive strategies to floods at the community level as well as at the local institutional level.

Although a few studies have attempted to postulate social learning as central to community resilience, they ignore its practical implications in producing new knowledge. Appropriate examination relating to social learning and resilience, and how both correlate adaptive knowledge in risk reduction is still quite limited. A few studies (e.g., Eriksen, Nightingale, & Eakin, 2015; Wamsler, 2014) affirm that the discourse of resilience has not yet documented the role of social learning widely in minimizing extreme weather-related risks.

The overall goal of this study is, therefore, to reinforce the emerging literature of social learning relating to flood risk management by identifying how social learning that occurs at the community as well as the local institutional level enhances community resilience. This research, furthermore, contributes to developing intensive ideas of flood risk management by investigating how social learning brings changes in understanding and flood risk management practices. My research, moreover, has responded to how social learning from previous experiences with disasters is taken into consideration for flood risk management at the local community level.

1.3 Purpose and objectives

The primary purpose of this thesis research was to explore how social learning has been regarded by disaster survivors and how some of the lessons learned were being applied by various stakeholders at the local community (village and Union) level. This research has been guided by the following specific objectives:

i. To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;

ii. To investigate the social learning processes of the local institutions in the context of flash flood disasters;

iii. To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

The specific objectives of the thesis have been expanded into six sub-objectives which are presented in the result sections of this thesis manuscript. Founded on Objective One, three sub-objectives were formulated and they are presented in Chapter Two. Objective Two and Objective Three were disaggregated into three sub-objectives. These sub-objectives are

discussed in Chapter Three of this thesis. Table 1.1 represents the specific objectives of the thesis and the sub-objectives of the result sections.

Table 1:1 The specific objectives of the thesis and the sub-objectives of the result sections

Specific objectives of the thesis	Sub-objectives
i. To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;	a) To examine how flood memories shape coping and adaptation; b) To determine the roles of social learning from first-hand flood experience in formulating coping and adaptation measures; and c) To examine the roles of local and external innovative adaptation measures in social learning-based adaptation actions.
ii. To investigate the social learning processes of the local institutions in the context of flash flood disasters; iii. To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.	a) To investigate the issues of social learning in diverse learning platforms by the institutions at the local level; b) To analyze the processes and attributes of social learning; c) To examine the role of local institutions in translating social learning and channeling collective attributes toward collective action for strengthening community resilience to flash floods.

1.4 Methodological approaches

The objectives of my research require a prudent understanding of how social learning paves a way of adaptation practices in enhancing community resilience to floods. They also seek to identify the key factors of social learning, which are directly and indirectly involved in generating knowledge in building community resilience in the northeastern part of Bangladesh, which is more prone to frequent floods each year than other parts of the country. These salient features of my research instigate the idea of applying a qualitative research approach (Creswell, 2014).

A qualitative research design was used for developing a clear understanding of how social learning takes place and plays an imperative role in transforming learning from flash floods into flood risk management. Qualitative research is coherently appropriate due to the subject matter of my study as I explore both social and human dimensions (Creswell, 2014), behaviors, and specific aspects that resulted through experiencing flash floods and sharing flood experiences within the community. This qualitative research approach also empowered me to investigate emerging questions from the participants' settings (Creswell, 2014). The qualitative research also assisted to capture participants' understanding within the context of experiences and problems in a society. In my research, I applied this participatory research approach that allowed me to capture holistic picture of what participants perceive about the problems and changes in a natural setting (Creswell, 2014).

An inductive data analysis process (Creswell, 2014) has also been taken into consideration to generalize phenomena from the participants' views in the context of the effects of floods. The inductive approach has also generated an understanding of how social relationships generate adaptive knowledge from experiences with floods in socio-cultural settings, in which collaborative action and decision-making processes are embedded.

1.4.1 Strategies of inquiry and study area

To make an in-depth understanding of the role of social learning in strengthening community resilience to flood hazards, I employed a Case Study strategy of inquiry. Case studies are widely used in research for empirical investigation of a bounded phenomenon (Mabry, 2012). Case study research employs a community approach (Minkler, 2005; Neuman, 2014) to explore contemporary social dimensions, critical problems faced in the real-life context, and social processes of a community (Yin, 2014). The goal of the Case Study approach is to engage the participants in the systematic inquiry to understand manifold insights into the cases that have

affected them and changed the goals of actions (Green et al., 1995; Minkler, 2005). As the purpose of my study was to examine social learning from flash floods and the application of learning in recovery mechanisms in the wetland communities of Bangladesh, this approach helped to expound salient features of social learning from the participants' settings that supported to generate a detailed "knowledge of [the] case" (Neuman, 2014). The approach also assisted to observe the cases and nature of flood events in the context of the surrounding situation of a community and develop a clear idea of how social learning from lived experiences as well as collective sharing helped to deal with environmental stresses, and what learning emerged from these processes in a natural setting.

The Case Study research of this thesis work was undertaken in Sunamganj District; the district is located in the *hoar* basin and is one of the most flash flood-prone districts in the northeastern region of Bangladesh. According to the Department of Disaster Management, in 2017, more than 39.2 % of the households were affected by flash floods in Sunamganj District (Figure 1.2), which was the highest portion of households in comparison to other districts, such as Sylhet (35.7%), Habiganj (18.9%), and Netrokona (34.9%) (cited in Nirapad, 2017). As can be seen in Figure 1.2, in 2017, the flood water inundated around 42% of the country (FFWC, 2017). The study area of the present research, which was inundated by three consecutive flash floods in 2017, is encircled on the map for easy detection (Figure 1.2).

To limit the scope of my study, two separate field visits were conducted to understand learning from and experiences with flash floods. Initially, I performed a reconnaissance visit to select a union (a lowest administrative unit of local government) and study villages. I was engaged in a series of consultations with the key stakeholders, including a Member of the Parliament, the chairman and members of the Union Disaster Management Committees, group consultation with the villagers, and meetings with local NGO officials. To select the Union and

study villages, the following criteria were considered: i) inundation of the entire village community by the three spells of heavy flash floods (pre-monsoon, monsoon, and post-monsoon period) in 2017, ii) exposure to the destruction of standing crops, livelihood, and collective properties by the flood impact, iii) a reliance of community members on primary production, chiefly on agriculture and fishing activities; and (iv) possession of a potential to contribute to empirical data procurement on the process of social learning in flood risk management.

After a series of consultations, I found that almost all villages of the Fenarbak Union had been affected by three devastating flash floods. Therefore, the Fenerbak Union (sub-division of Jamalganj Upazila) from the Sunamganj District was selected as part of my case study research, which has 41 villages with an approximate area of 51.00 km^2. The Fenarbak Union is located in the low-lying area, and it is surrounded by *Paknar Haor* and *Halir Haor.* For an in-depth understanding, I also focused on those villages which would be representative to depict past experiences with flash floods, first-hand learning from flash floods, and communities taking social learning-based adaptive measures to tackle flash floods. For this, two categories of communities – a fishing-based community (i.e., Rajapur) and a farming-based community (i.e., Fenarbak) from the Fenarbak Union – were selected as Case Study areas.

In this research, a *community* is defined from a social-ecological system perspective and community resilience scholarship. Concurring with the notion of Norris et al. (2008), I conceptualize community as "an entity that has geographical boundaries and shared fate … composed of built, natural, social, and economic environments that influence one another in complex ways" (2008, p. 128). For the present study, I use the term "wetland-community" from a broader lens to imply a group of vulnerable people who have been living together in a

given boundary of the wetlands determined by the wetland ecosystem and natural resources, and generated by a sense of living with risks by local communities (Choudhury, 2015). Each resource-dependent community has certain traits, such as i) a *fishing-based community* implies a group of fishermen who have been living together based on social relationships, shared values, and norms relying on fishing as a primary activity for livelihood, though some of them practice farming to support their family during the dry season; ii) a *farming community* indicates a specific boundary and social connection in the wetland area in which the overwhelming majority of the inhabitants predominantly live from farming practices. Some of them are also engaged with fishing activity to meet their daily nutrition needs; iii) communities have been experiencing multifaced vulnerabilities due to socio-political (i.e., the pressures of local elites to restrict fishing by the community members in open waterbodies) and environmental factors, such as flash floods; iv) communities have been nurturing various skills, knowledge, shared understanding, and self-organizing collective capacities to regain their livelihood and cope with flash flood impacts in the wetland regions of Bangladesh.

Utilizing these attributes, the village of Rajapur was considered as a fishing-based community. Fishermen living in Rajapur have generated collective ideas and shared understanding through social learning and social network to deal with flash floods. Similarly, social learning in Fenarbak has promulgated innovative knowledge for farming practices and adaption to flash floods. Therefore, this village was conceded as a farming community. Both villages are situated in the middle of *Paknar Haor*; here, in a normal year, floodwater submerges the wetland for six months of the year. Due to prolonged waterlogging, single-crop cultivation is only one livelihood option for farming communities. The primary goal to select these villages was to document a detailed picture of social learning and how social learning occurs at the community level as well as the local institutional level.
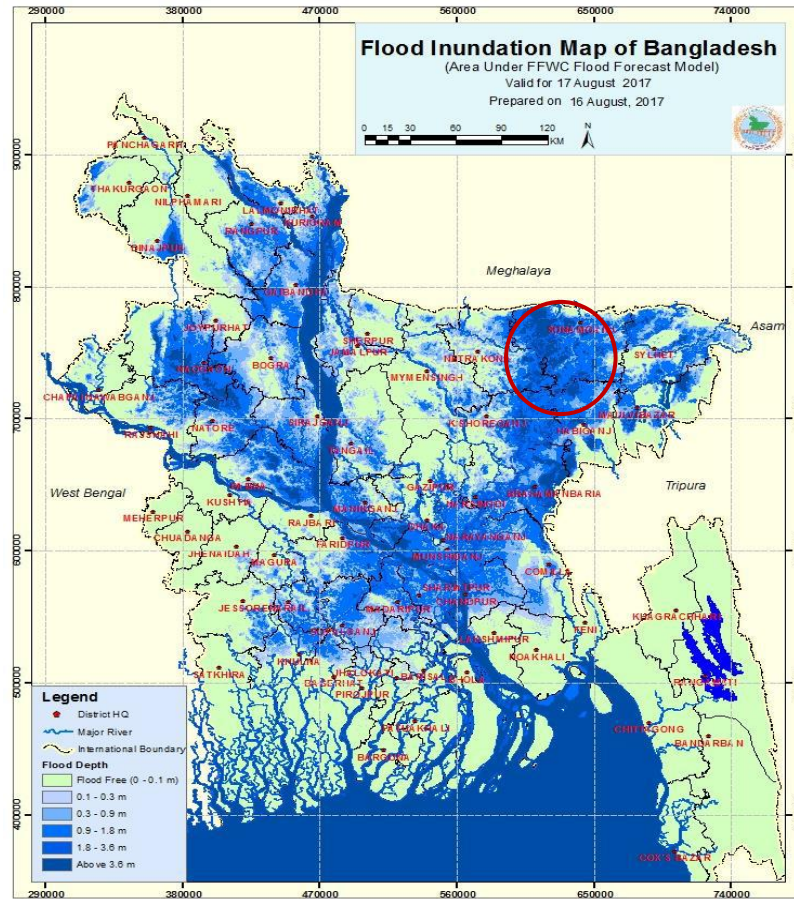
Figure 1:2 Flood Inundation Map on August 17, 2017. The study area of my empirical investigation is also located in the encircled region.

Source: Flood Forecasting Warning Centre (FFWC), 2017.

1.4.2 The selection procedures of the study participants

The selection of the study participants began with the ethical approval from the Joint-Faculty Research Ethics Board (JFREB), the University of Manitoba (see Appendix 2 for the ethical clearance). Purposive and snowball sampling techniques were key instruments to select the study participants for my research. As purposive sampling helps researchers to depict the core phenomenon of the subject matter of the study (Creswell, 2014), the purposive sampling assisted me to determine relevant participants who had potential experiences with flash floods.

For selecting potential participants from the local level institutions, I collected the cell phone numbers of potential key stakeholders from the website of the Union *Parishad*. I conducted a reconnaissance visit in the study area, which helped me to build a rapport with key actors of local level institutions. To recruit participants, I approached them over the cell phone and visited their offices personally. If the potential participants would agree to participate in the study, I interviewed them at their convenient time and date. These potential participants were also requested to identify key informants, especially former members of the local level institutions. The application of snowball sampling was very effective to identify them because they were known to the present members of the local level institutions (Bernard, 2011). While these stakeholders were popular, gaining access and tracing their location was difficult. I recruited the former members of the local level institutions following a snowball sampling procedure (Bernard, 2011). It is important to note that these stakeholders bear a significant importance for my study as they hold previous institutional dynamics and know the learning process at the community level. For local level NGOs and the representatives of community-based institutions, I personally visited the offices of NGOs and households of the representatives of community-based organizations. I invited the potential participants to be major contributors to my study. When they agreed verbally, I interviewed them in accordance with their convenient date and time.

Similarly, I also took an initiative to determine appropriate respondents from the communities. This selection process was supported by purposive sampling procedures; it helped me to explore a bounded system and certain phenomena of the research problem (Creswell, 2014). To recruit my study participants for Focus Group Discussions (FGDs), Key Informant Interviews (KIIs), Semi-structured Interviews, and Oral Histories, I selected the participants *purposively*. The participants were recruited using three criteria: (i) extensive exposure and sensitivity to flash flood disasters, (ii) experience of adverse flash flood effects

on standing crops and livelihood, (iii) member of vulnerable groups who largely rely on farming and fishing-based livelihood. In order to get an in-depth understanding about learning from first-hand flood experience and their role in coping and adaption, I visited the houses of vulnerable groups personally. I sought their interest and willingness to be a potential participant for my study. If they showed their interest willingly to partake in the study, they were interviewed at their convenient time.

All data were garnered through face-to-face interviews and these were recorded on audiotape recorder with consent. A formal informed consent was also obtained before conducting the interviews. All interviews were conducted in Bengali and then transcribed in the local language to understand the pattern of flood experiences and learning from flash floods.

1.4.3 Methods of data collection

In qualitative research, researchers explore human experiences to develop an understating of the key drivers shaping human behavior in the social contexts (Gelling, 2015). To understand how flood experiences have reshaped learning and flood response mechanisms in the wetland communities, I garnered both primary and secondary data. For primary data, I employed five specific techniques of data collection, namely, Key Informant Interviews (24), Focus Group Discussions (6), Semi-structured interviews (13), Oral Histories (7), and participant observation (2 events). Table 1.1 provides an overview of the methods of data collection pertinent to specific objectives and their rationale.

To understand the social learning processes and their role in innovative adaption, at the beginning of my field work, I conducted 24 key informant interviews (KIIs) with the key stakeholders of the local level institutions using predetermined questions (see Appendix 3). Key informants provided detailed insights about the key questions and issues (Patton, 2015). In the context of flood disasters in northeastern Bangladesh, the key informants, such as

representatives of local government institutions, NGO practitioners, and community leaders, hold key information on the overall effects of flash floods, learning dimensions, and the nature of social learning-facilitated adaptive mechanisms at the community as well as the local-level institution. The key underlying reason for the selection of these actors was that they were solely engaged in flood disaster management during and aftermath of flash floods with community members at the community level. To build a holistic perspective, the key informant interviews thus helped me to garner a deeper insight into the adverse effects of flash floods on communities and the learning processes of community members in building community resilience. Additionally, KIIs provided data on critical aspects of communities, community level learning from flood damages and losses, and how community members had been engaging in transforming their learning into the resilience process.

To construct group-based flood narratives and social learning for my research, I also administered 6 FGDs, which unfolded the opportunity to gain a wide range of views of the collective decision-making process and common interests of communities to tackle flash floods. For FGDs, a small group of villagers (8-12) was invited to discuss and share their views, especially for understanding about their collective learning from direct contact with flash floods and social interaction, the engagement of the community's resources such as the social network to build a resilient society, social learning processes at the community level institutions, and their roles in collective action for enhancing community resilience (see Appendix 4). The participants for the FGDs were selected depending on their experiences with flash floods, their involvement in communities, and their willingness to partake in the discussion.

For the present study, I also yielded field data by utilizing semi-structured interviews and oral history. I conducted 13 semi-structured interviews using a guided questionnaire

(attached in Appendix 5) with community members who were directly affected by flash floods and took various innovative adaptive strategies based on social learning from flash floods and social interaction. The semi-structured interviews contributed first-hand information on individuals' reflections, their direct experiences with floods, and their learning from flash floods and social interaction, which had not been widely addressed in Focus Group Discussions. This technique was feasible to elucidate what roles social learning played in taking coping and adaptation measures as learning is socially constructed by sharing experiences through social interactions.

Subsequently, using specified guiding questions (see in Appendix 6), I also conducted oral histories with experienced persons who had extensive experience with past flood events and held rich information on previous experiences of the local community members and the pertinent dynamics. Oral histories were an appropriate tool to generate flood memories. This approach to data collection fostered information on how flood memories developed over time and generated flood-related knowledge through experiencing past flash floods events and sharing flood memories. For this research, I applied oral history techniques to collect data related to the First Objective of my study. Oral histories provided a basis for understanding how flood-prone communities had been generating social learning through social interaction and applying flood memories during flash floods to mitigate adverse impacts of flash floods.

To understand social learning at the local institutional level, I obtained data using participant observation and the document review method. Participant observation allowed me to be an observer as well as a participant. I observed informal conversations, dialogues, and the daily practices of the communities for reviving their livelihood. As an ideal observation technique (Patton, 2015), it helped me to grasp critical insights into human interactions and suitable contexts of the study. Observations were made in the form of direct communication

with community members, and participation in the meetings of the formal institutions. By partaking in the formal meetings, I observed how key actors interact, engage in problem formulations, and take collective decisions (see Appendix 7 for thematic areas of participant observation). The document review method yielded data on the trends of social learning and how collective decisions were made for collective action. Furthermore, the document analysis supplemented the findings that were generated from the interviews.

To gain a wide range of understanding, more than one data collection technique was applied for each specific objective. A particular group of participants was chosen for each type of data gathering method. For each method, a separate data gathering instrument was applied. In the data collection instruments, a few questions remained the same as they would meet more than one purpose.

Table 1:2 Methods of data collection and rationale

Specific Objectives	Methods of data collection	Rationale
To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;	Key Informant Interviews (14)	To understand community's learning from loss and damage, and the use of learning in coping and adaption strategies at the community level.
	Focus Group Discussions (6)	To understand learning from damage and losses from flash floods at the community level (i.e., village), I conducted focus group discussions among different occupational groups, such as fishing and farmer communities. Six FGDs were conducted to understand social learning-based coping, adaptation strategies, and experiences of different occupational groups at the community level. Of these, one FGD was with farmers; one FGD was with fishermen; two FGDs were with female community members; and two FGDs were with mixed occupational groups.
	Semi-structured interviews (7)	Semi-structured interviews were applied to understand learning from losses and damages at the household levels. I employed this technique to examine the nature of coping, adaptation practices, and learning from floods at the household levels.
	Oral histories (7)	I applied oral history to collect flood memory, past flood experiences, and how flood memories contributed to mitigate adverse impacts in the face of flash floods.
	Participant observation	To understand how community members practice their knowledge in flood risk reduction.
To investigate the social learning processes of the local institutions in the context of flash flood disasters;	Key Informant Interviews (24)	Key informant interviews were administered to document social learning processes at the local-level institutions (i.e., Community-based organizations, the Union Parishad, and local NGOs). The technique also helped me to examine how social learning led to undertaking collective action for flood risk reduction at the village-community level as well as the Union level. Additionally, I also examined

		how local-level institutions transformed social learning into collective action for strengthening community resilience.
	Focus Group Discussions (6)	Focus Group Discussions generated data on how local community participated in the formal and informal learning processes, learning from collective platforms, and key consensus for enhancing community resilience.
	Semi-structured interviews (10)	The semi-structured interviews contributed to understand the learning process, individuals' reflections, power dynamics in learning platforms, and key roles of actors in collective learning platforms.
	Participant observation (2 events)	To foster a better understanding of how local-level key actors interact and share their views in social learning platforms for taking collective decisions and collective action. It also helped me to understand how the local level institutions worked with other local institutes.
	Document review	The document review focused on institutional memory and what collective decisions were made for collective action for flood risk reduction at the Union level.
To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.	Key Informant Interviews (24)	The method assisted in capturing key factors of social learning in influencing to take collective action for flood risk reduction at the institutional and community level. It was employed to examine various types of adaptive actions and their implications for community resilience.
	Focus Group Discussions (6)	Focus Group Discussions generated data on how social learning facilitated collective action at the informal institutional level and how community members engaged themselves in generating knowledge through collective interaction.
	Semi-structured interviews (10)	Semi-structured interviews examined the area of concern for collective risk reduction and social learning-based adaptive practices and changes at the community level.

1.4.4 Methods of data analysis

In order to yield the required data, prospective participants were communicated with over a cell phone. Subsequently, the researcher visited their households regularly to obtain their consent for partaking in the study. After receiving their consent, the potential participants were interviewed at their convenient time (Informed consent attached in Appendix 10). The interviews were conducted in Bengali and recorded on an audio-tape recorder when consent was obtained. All recorded data were transcribed in the local language to understand the meanings and underpinnings of social learning from flash floods and social interactions.

To analyze the collected data, a Data Reduction Approach (Miles & Huberman, 1994) was applied to identify key themes in the transcribed data. Using research questions and interview guides, at first, data were coded. The key themes, sub-themes, key similarities and dissimilarities, and context that appeared within the transcribed data were then identified. Data were also coded for understanding the patterns that emerged directly from the transcribed data (DeWalt & DeWalt, 2011).

A paper-based system was used to trace out key themes and sub-themes from each interview by running the text. After identifying the key themes and sub-themes corresponding to the thesis research objectives, based on research objectives and sub-objectives, data were analytically described by synthesizing the key information. The analytical description was also provided in connection with concurrent literature.

1.5   Organization of the thesis

This thesis is organized into four chapters. Chapter One highlights an introduction to the study consisting of the context, the rationale of the study, purpose and objectives, research design, methodological approaches, and organization of the thesis. Building upon the results, Chapter Two and Chapter Three offer a detailed description of the three objectives of my research.

Pertinent literature, methodology, key findings, and discussions are incorporated to serve the goal of each chapter. Finally, an overall discussion is incorporated in Chapter Four, highlighting the major contributions of the study, key policy implications, suggestions for future research, and key limitations of the study (Table 1.3).

For this present thesis research, I have followed a manuscript-based format and written two papers based on research findings. Therefore, each chapter is a "stand-alone" chapter for my thesis. As the techniques of data collection and the methods of data analysis for these chapters were similar in most cases, there are some overlaps in the method sections. Despite such overlapping, each chapter offers key insights into the role of social learning with regard to flash floods and offers key policy implications.

Table 1:3 Chapters and content of the thesis

Chapter	Description
Chapter *One*	*Introduction* (context of the study, the rationale of the study, purpose and objectives, research questions, methodological approaches, organization of the thesis, and references).
Chapter *Two*	*The application of social learning and innovative adaptation in enhancing community resilience to flash floods* (Abstract, keywords, introduction, methods and study area, findings and analysis, discussion conclusion, and references).
Chapter *Three*	*The role of social learning and local institutions in collective action for disaster resilience* (Abstract, keywords, introduction, methods and materials, findings and analysis, discussion, conclusions, and references).
Chapter *Four*	*Discussion and Conclusions* (Introduction, key findings of the study, major contributions of the research, policy implications, future research, key limitation of the study, and references).

1.6 References

Agrawal, A. (2010). Local institutions and adaptation to climate change. In R. Mearns & A. Norton (Eds.), *The social dimensions of climate change: Equity and vulnerability in a warming world* (pp. 173–197). Washington, D.C.: The World Bank.

Ahmed, R. M., Rahaman, K. R., Kok, A., & Hassan, Q. K. (2017). Remote sensing-based quantification of the impact of flash flooding on the rice production: A case study over northeastern Bangladesh. *Sensors*, *17*(10), 2347. https://doi.org/10.3390/s17102347

Aldhshan, S. R. S., Mohammed, O. Z., & Shafri, H. Z. M. (2019). Flash flood area mapping using sentinel-1 SAR data: A case study of eight upazilas in Sunamganj district, Bangladesh. *IOP Conference Series: Earth and Environmental Science*, *357*(1). https://doi.org/10.1088/1755-1315/357/1/012034

Aldunce, P., Beilin, R., Handmer, J., & Howden, M. (2016). Stakeholder participation in building resilience to disasters in a changing climate. *Environmental Hazards*, *15*(1), 58–73. https://doi.org/10.1080/17477891.2015.1134427

Allamano, P., Claps, P., & Laio, F. (2009). Global warming increases flood risk in mountainous areas. *Geophysical Research Letters*, *36*(24), 1–5 https://doi.org/10.1029/2009gl041395

Allamano, P., Claps, P., & Laio, F. (2009). Global warming increases flood risk in mountainous areas. *Geophysical Research Letters*, *Geophysical Research Letters*, *36*(24), 1–5. https://doi.org/10.1029/2009gl041395

Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global Environmental Change*, *18*(1), 86–98. https://doi.org/10.1016/j.gloenvcha.2007.07.002

Assuah, A., & Sinclair, A. J. (2019). Unraveling the relationship between collective action

and social learning: Evidence from community forest management in

Canada. *Forests*, *10*(494), 1–15. https://doi.org/10.3390/f10060494

Azad, M. A. K., Uddin, M. S., Zaman, S., & Ashraf, M. A. (2019). Community-based

disaster management and its salient features: A policy approach to people-centred risk

reduction in Bangladesh. *Asia-Pacific Journal of Rural Development*, *29*(2), 135–160.

https://doi.org/10.1177/1018529119898036

Bamforth, T. (2017, September 12). While the world's attention is elsewhere, Bangladesh

faces a humanitarian crisis. *The Guardian*. Retrieved from

https://www.theguardian.com/voluntary-sector-network/2017/sep/12/bangladesh-severe-

disaster-flooding, accessed on October 4, 2018.

Benson, D., Lorenzoni, I., & Cook, H. (2016). Evaluating social learning in England flood

risk management: An "individual-community interaction" perspective. *Environmental

Science and Policy*, *55*, 326–334. https://doi.org/10.1016/j.envsci.2015.05.013

Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: Lessons from

resilience thinking. *Natural Hazards*, *41*(2), 283–295. https://doi.org/10.1007/s11069-

006-9036-7

Berkes, F. (2009). Evolution of co-management : Role of knowledge generation, bridging

organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692–

1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Berkes, F., & Jolly, D. (2001). Adapting to climate change : Social-ecological resilience in a

Canadian Western Arctic Community. *Conservation Ecology*, *5*(2), 18–32.

https://doi.org/10.5751/es-00342-050218

Berkes, F., & Ross, H. (2013). Community resilience: Toward an integrated approach.

Society and Natural Resources, *26*(1), 5–20.

https://doi.org/10.1080/08941920.2012.736605

Berkes, F., & Ross, H. (2016). Panarchy and community resilience: Sustainability science and policy implications. *Environmental Science and Policy*, *61*, 185–193. https://doi.org/10.1016/j.envsci.2016.04.004

Bernard, H. R. (2011). *Research methods in anthropology : Qualitative and quantitative approaches*. Walnut Creek, CA: AltaMira Press.

Choudhury, M. U. I., & Haque, C. E. (2016). "We are more scared of the power elites than the floods": Adaptive capacity and resilience of wetland community to flash flood disasters in Bangladesh. *International Journal of Disaster Risk Reduction*, *19*, 145–158. https://doi.org/10.1016/j.ijdrr.2016.08.004

Choudhury, M. U. I. (2015). *Wetland-community resilience to flash flood hazards (Bonna) in Sunamganj district, Bangladesh* (Master's thesis, University of Manitoba). Retrieved from http://mspace.lib.umanitoba.ca/xmlui/handle/1993/30998, accessed on 5 November, 2018.

Choudhury, M. U. I., Uddin, M. S., & Haque, C. E. (2019). "Nature brings us extreme events, some people cause us prolonged sufferings": The role of good governance in building community resilience to natural disasters in Bangladesh. *Journal of Environmental Planning and Management*, *62*(10), 1761–1781. https://doi.org/10.1080/09640568.2018.1513833

Collier, C. G. (2007). Flash flood forecasting: What are the limits of predictability? *Quarterly Journal of the Royal Meteorological Society*, *133*(622), 3–23. https://doi.org/10.1002/qj.29

Creswell, J. W. (2014). *Research Design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles: Sage Publications Ltd.

DeWalt, K. M., & DeWalt, B. R. (2011). *Participant 0bservation: A guide for field workers*. Plymouth, UK: AltaMira Press.

Dewan, T. H. (2015). Societal impacts and vulnerability to floods in Bangladesh and Nepal. *Weather and Climate Extremes*, *7*, 36–42. https://doi.org/10.1016/j.wace.2014.11.001

Eriksen, S. H., Nightingale, A. J., & Eakin, H. (2015). Reframing adaptation: The political nature of climate change adaptation. *Global Environmental Change*, *35*, 523–533. https://doi.org/10.1016/j.gloenvcha.2015.09.014

Flood Forecasting and Warning Centre (FFWC). (2017). *Annual flood report 2017*. Retrieved from Flood Forecasting and Warning Centre (FFWC), Dhaka website: http://www.ffwc.gov.bd/images/annual17.pdf, accessed on 15 June, 2018.

Flood Forecasting and Warning Centre (FFWC). (2018). *Annual flood report 2018*. Retrieved from Flood Forecasting and Warning Centre (FFWC), Dhaka website: http://www.ffwc.gov.bd/images/annual18.pdf, accessed on October 20, 2020.

Folke, C., Colding, J., & Berkes, F. (2003). Synthesis: Building resilience and adaptive capacity in social–ecological systems. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating social-ecological systems* (pp. 352–387). Cambridge: Cambridge University Press.

Garde-Hansen, J., McEwen, L., Holmes, A., & Jones, O. (2017). Sustainable flood memory: Remembering as resilience. *Memory Studies*, *10*(4), 384–405. https://doi.org/10.1177/1750698016667453

Gelling L. (2015). Qualitative research. *Nursing Standard*, *29*(30), 43–47. https://doi.org/10.7748/ns.29.30.43.e9749

Ghatak, M., Kamal, A., & Mishra, O. P. (2012). Background paper on flood risk management in South Asia. In O. P. Mishara, M. Ghatak, & A. Kamal (Eds.), *Flood risk management*

in South Asia (pp. 1–22). New Delhi: SAARC Disaster Management Centre.

Green, L. W., George, M. A., Frankish, D. M., Herbert, C. J., Bowie, W. R., & O'Neil, M. (1995). *Study of participatory research in health promotion : Review and recommendations for the development of participatory research in health promotion in Canada*. Ottawa: Royal Society of Canada.

Haque, C. E., Choudhury, M. U. I., & Sikder, M. S. (2019). "Events and failures are our only means for making policy changes": Learning in disaster and emergency management policies in Manitoba, Canada. *Natural Hazards*, *98*(1), 137–162. https://doi.org/10.1007/s11069-018-3485-7

Haque, C. E. (1993). Flood prevention and mitigation actions in Bangladesh: The 'sustainable floodplain development' approach. *Impact Assessment*, *11*(4), 367–390. https://doi.org/10.1080/07349165.1993.9725839

Haque, C. E. (1997). *Hazards in a fickle environment: Bangladesh*. Dordrecht: Kluwer Academic Publishers.

Haque, C. E., & Burton, I. (2005). Adaptation options strategies for hazards and vulnerability mitigation: An international perspective. *Mitigation and Adaptation Strategies for Global Change*, *10*, 335–353. https://doi.org/10.1007/s11027-005-0050-y

Haque, M. M., Bremer, S., Aziz, S. Bin, & van der Sluijs, J. P. (2017). A critical assessment of knowledge quality for climate adaptation in Sylhet Division, Bangladesh. *Climate Risk Management*, *16*, 43–58. https://doi.org/10.1016/j.crm.2016.12.002

Intergovernmental Panel on Climate Change (IPCC). (2012). *Managing the risks of extreme events and disasters to advance climate change adaptation*. Cambridge: Cambridge University Press.

Ireland, P., & Thomalla, F. (2011). The role of collective action in enhancing communities'

adaptive capacity to environmental risk: An exploration of two case studies from Asia. *PLoS Currents*, *3*,1–16. https://doi.org/10.1371/currents.RRN1279

Johannessen, Å., & Hahn, T. (2013). Social learning towards a more adaptive paradigm? reducing flood risk in Kristianstad municipality, Sweden. *Global Environmental Change*, *23*(1), 372–381. https://doi.org/10.1016/j.gloenvcha.2012.07.009

Kamal, A. S. M. M., Shamsudduha, M., Ahmed, B., Hassan, S. M. K., Islam, M. S., Kelman, I., & Fordham, M. (2018). Resilience to flash floods in wetland communities of northeastern Bangladesh. *International Journal of Disaster Risk Reduction*, *31*, 478–488. https://doi.org/10.1016/j.ijdrr.2018.06.011

Keen, M., & Mahanty, S. (2006). Learning in sustainable natural resource management: Challenges and opportunities in the pacific. *Society and Natural Resources*, *19*(6), 497–513. https://doi.org/10.1080/08941920600663896

Khan, S. M. M. H. (2011). *Participatory wetland resource governance in Bangaldesh: An analysis of community-based experiments in Kakaluki Haor* (Doctoral disssertation, University of Manitoba). Retrieved from https://mspace.lib.umanitoba.ca/xmlui/handle/1993/4952, accessed on 2 December, 2020.

Khan, S. M. M. H., & Haque, C. E. (2010). Wetland resource management in Bangladesh: Implications for marginalization and vulnerability of local harvesters. *Environmental Hazards*, *9*(1), 54–73. https://doi.org/10.3763/ehaz.2010.SI08

Klein, R. J. T., Nicholls, R. J., & Thomalla, F. (2003). Resilience to natural hazards: How useful is this concept? *Environmental Hazards*, *5*(1), 35–45. https://doi.org/10.1016/j.hazards.2004.02.001

Kluvánková, T., Brnkaľáková, S., Špaček, M., Slee, B., Nijnik, M., Valero, D., … Gežík, V.

(2018). Understanding social innovation for the well-being of forest-dependent

communities: A preliminary theoretical framework. *Forest Policy and Economics*, *97*,

163–174. https://doi.org/10.1016/j.forpol.2018.09.016

Kuang, D., & Liao, K. H. (2020). Learning from floods: Linking flood experience and flood

resilience. *Journal of Environmental Management*, *271*, 111025.

https://doi.org/10.1016/j.jenvman.2020.111025

Lei, Y., Wang, J., Yue, Y., Zhou, H., & Yin, W. (2014). Rethinking the relationships of

vulnerability, resilience, and adaptation from a disaster risk perspective. *Natural

Hazards*, *70*(1), 609–627. https://doi.org/10.1007/s11069-013-0831-7

Mabry, L. (2012). Case study in social research. In P. Alasuutari, L. Bickman, J. Brannen, &

J. Brannen (Eds.), *The SAGE handbook of social research methods* (pp. 214–227).

London: SAGE Publications Ltd.

Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society and

Natural Resources*, *23*(5), 401–416. https://doi.org/10.1080/08941920903305674

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded

sourcebook* Thousand Oaks, CA: SAGE Publications, Inc.

Ministry of Water Resources (MoWR). (2012). *Master plan of haor area* (Volume no. 1).

Retrieved from Department of Bangladesh Haor and Wetlands Development website:

https://dbhwd.portal.gov.bd/sites/default/files/files/dbhwd.portal.gov.bd/publications/baf

5341d_f248_4e19_8e6d_e7ab44f7ab65/Haor Master Plan Volume 1.pdf, accessed on 02

December, 2020.

Minkler, M. (2005). Community-based research partnerships: Challenges and opportunities.

Journal of Urban Health, *82(2),* 3–12. https://doi.org/10.1093/jurban/jti034

Mochizuki, J., Keating, A., Liu, W., Hochrainer-Stigler, S., & Mechler, R. (2018). An

overdue alignment of risk and resilience? A conceptual contribution to community

resilience. *Disasters*, *42*(2), 361–391. https://doi.org/10.1111/disa.12239

Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches*

Edinburgh: Pearson Education Limited.

Nirapad (2017). *Flash flood situation update*. Retrieved from Nirapad website

https://reliefweb.int/sites/reliefweb.int/files/resources/Update%20Report%20of%20Flas

h%20Flood_MAY%2003%2C%202017.pdf, accessed on 15 November, 2020.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008).

Community resilience as a metaphor, theory, set of capacities, and strategy for disaster

readiness. *American Journal of Community Psychology*, *41*(1–2), 127–150.

https://doi.org/10.1007/s10464-007-9156-6

Ostrom, E. (2005). *Understanding institutional diversity*. New Jersey: Princeton University

Press.

Pahl-Wostl, C. (2006). The importance of social learning in restoring the multifunctionality

of rivers and floodplains. *Ecology and Society*, *11*(1). https://doi.org/10.5751/ES-01542-

110110

Pahl-Wostl, C., Sendzimir, J., Jeffrey, P., Aerts, J., Berkamp, G., & Cross, K. (2007).

Managing change toward adaptive water management through social learning. *Ecology

and Society*, *12*(2). https://doi.org/10.5751/ES-02147-120230

Pahl-Wostl, C. (2009). A conceptual framework for analysing adaptive capacity and multi-

level learning processes in resource governance regimes. *Global Environmental Change*,

19(3), 354–365. https://doi.org/10.1016/j.gloenvcha.2009.06.001

Patton, M. Q. (2015). *Qualitative evaluation and research methods: Integrating theory and

practice*. Newbury Park: SAGE Publication, Inc.

Pfefferbaum, B. J., Reissman, D. B., Pfefferbaum, R. L. ., Klomp, R. W., & Gurwitch, R. H. (2007). Building resilience to mass trauma events. In L. Doll, S. E. Bonzo, J. A. Mercy, & D. A. Sleet (Eds.), *Handbook of injury and violence prevention* (pp. 347–358). New York, NY : Springer.

Preston, J., Chadderton, C., Kitagawa, K., & Edmonds, C. (2015). Community response in disasters: An ecological learning framework. *International Journal of Lifelong Education*, *34*(6), 727–753. https://doi.org/10.1080/02601370.2015.1116116

Rahman, H. M.T., & Hickey, G. M. (2019). What does autonomous adaptation to climate change have to teach public policy and planning about avoiding the risks of maladaptation in Bangladesh? *Frontiers in Environmental Science*, *7*, 1–14. https://doi.org/10.3389/fenvs.2019.00002

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., … Stringer, L. C. (2010). What is social learning? *Ecology and Society*, *15*(4). https://doi.org/10.5751/ES-03564-1504r01

Rodela, R. (2011). Social learning and natural resource management: The emergence of three research perspectives. *Ecology and Society*, *16*(4). https://doi.org/10.5751/ES-04554-160430

Strauss, A. (1978). A social world perspective. *Creating Sociological Awareness*, *1*, 119–128. https://doi.org/10.4324/9780203794487-18

Tran, T. A., James, H., & Pittock, J. (2018). Social learning through rural communities of practice: Empirical evidence from farming households in the Vietnamese Mekong Delta. *Learning, Culture and Social Interaction*, *16*(October 2017), 31–44. https://doi.org/10.1016/j.lcsi.2017.11.002

Uddin, M. S., Haque, C. E., & Khan, M. N. (2020). Good governance and local level policy

implementation for disaster-risk-reduction: Actual, perceptual and contested

perspectives in coastal communities in Bangladesh. *Disaster Prevention and*

Management: An International Journal. https://doi.org/10.1108/DPM-03-2020-0069

United Nations Office for Disaster Risk Reduction (UNISDR) (2018). *UNISDR annual*

report 2017. Retrieved from the United Nations Office for Disaster Risk Reduction

(UNISDR), Geneva website https://www.preventionweb.net/files/58158

unisdr2017annualreport.pdf, accessed on June 20, 2018.

Wamsler, C. (2014). *Cities, disaster risk and adaptation*. London, UK: Routledge.

Wenger, E. (1998). *Communities of practice: Learning, meaning, and identity*. Cambridge:

Cambridge University Press.

Wilbanks, T. J., & Kates, R. W. (1999). Global change in local places: How scale matters.

Climatic Change, *43*(3), 601–628. https://doi.org/10.1023/A:1005418924748

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: Natural hazards, people's*

vulnerability and disasters. London: Routledge.

World Economic Forum. (2018). *The global risks report 2018*. Retrived from World

Economic Forum, Geneva website

http://www3.weforum.org/docs/WEF_GRR18_Report.pdf, accessed on June 16, 2018.

Yin, R. K. (2014). *Case study research : Design and methods*. *SAGE*. Los Angeles: SAGE .

Chapter 2: The application of social learning and innovative adaptation in enhancing community resilience to flash floods[5]

Abstract

Purpose – Much of the country of Bangladesh consists of low-lying floodplains and wetlands, placing nearly two thirds of its population - around 163 million people - at risk for flooding. However, existing literature on how these communities manage and adapt to these flood-risks and the role played by social learning in resilience-building is scant. In this context, the purpose of this study is to examine the application of social learning in the formulation of disaster coping and adaptation mechanisms in selected wetland communities of Bangladesh.

Design/methodology/approach – Applying a qualitative research approach, the empirical field-based research was carried out in the Fenarbak Union of Sunamganj District, Bangladesh between July and December 2019. The primary data were procured using a participatory approach and qualitative techniques, namely Key Informant Interviews (KIIs), Focus Group Discussions (FGDs), Semi-Structured Interviews (SSIs), and Oral History Interviews (OHIs). During the data collection process, special attention was paid to social learning from flood experiences and to social interactions.

Findings – The results of the study yielded three key findings: (i) social learning and memory have enabled wetland communities to adopt diverse coping and adaptive measures in response to flash floods; (ii) social learning-based actions have resulted in reduced flood-risk and enhanced community resilience to flash floods when these actions were supported by both local and external innovations; and (iii) the aforementioned social learning stemmed from first-hand experience of flash floods, which was shared via various collective learning platforms.

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Originality/value – Despite the wide recognition of the central role of social learning in strengthening and building resilience to shocks and stresses, only limited efforts have hitherto been made to determine i) how the actual process of social learning from disaster shocks takes place, and ii) how innovative adaptation strategies lead vulnerable communities to take up social learning-based actions. Our research attempts to fill these knowledge gaps by providing an evidence-based account of community resilience-building responses to flash flood hazards.

Keywords Flash floods, social learning, social interaction, coping, innovative adaptation, community resilience

2.1 Introduction

Disaster risks from hydro-meteorological extreme weather events are increasing worldwide due to climate change (Schiermeier, 2011). The intensity and frequency of associated extreme events like flash floods – defined as a sudden discharge of water due to heavy rainfall upstream – are also increasing (Choudhury & Haque, 2016). For example, the communities of the Meghalaya foothills and *haor* (wetlands) in northeastern Bangladesh have witnessed more frequent and intense flood disasters in recent years. How can these vulnerable communities cope, adapt, and build their resilience to extreme weather events? We draw insights from experiential learning, social learning, and community resilience scholarship to seek answer to this critical question.

Resilience is broadly defined as the capacity of communities to absorb shocks and stresses and to persist under continual disturbances (Folke, 2006). Learning is posited as a precondition for building and enhancing community resilience to shocks and stresses (Berkes, 2007; Haque, Choudhury, & Sikder, 2019), implying that a change in understanding, knowledge, skill, and behaviour is required to enhance resilience (Keen & Mahanty, 2006; Reed et al., 2010) at all levels (e.g. individual, community etc.) (Berkes, 2007; Folke, 2006).

Learning therefore can stem from first-hand experience of extreme events and/or indirect experience from social interactions and communication.

Learning gained experientially (from first-hand experience) is transformed into knowledge through a continuous feedback process. As Kolb (2015) states, "[through this process,] knowledge is continuously derived from and tested out in the experiences of the learner (p. 38)". In the context of flash floods, learning by actors starts with the direct encounter with flooding i.e. gathering of experiences, which is subsequently transformed into flood-knowledge through social interaction (Kuang & Liao, 2020). *Experiential learning* is thus an iterative process of gaining knowledge and understanding (Kolb, 2015). In this regard, Keen and Mahanty (2006) maintain that the combination of direct experience, reflection, and abstract conceptualization generates knowledge for active experimentation.

Experiential learning does not remain confined only to the individual level, but typically disseminates through larger social units through social interaction and communication. Thus, following Reed et al.'s (2010) definition, we frame *social learning* as "a change in understanding that goes beyond the individual to become situated within wider social units or communities of practice through social interactions between actors within social networks" (Reed et al., 2010). Similar to experiential learning, social learning takes place through an iterative process, in which individuals share their memories, experience, and knowledge, and obtain a common understanding or solution in a reflexible way (Berkes, 2007, 2009). We thus consider social learning to be a *process* as well as an *outcome* that aims to foster resilience and sustain livelihoods by reshaping existing practices at times of shocks and stresses (Armitage, Marschke, & Plummer, 2008; Berkes, 2009).

It has been cited that through an iterative process of social learning, past experiences of floods gradually transform into flood memory and knowledge (Garde-Hansen, McEwen, Holmes, & Jones, 2017). Berkes and others (2003) observed that collective memories generated

through experience confer knowledge which response and preparedness mechanisms can employ to withstand future changes. Subsequently, the previous memories, experiences, and social learning instigate human actions – individual and collective – that ameliorate risks and effects of disaster-shocks (Folke, Colding, & Berkes, 2003).

In the present study, the term 'flood memory' refers to reflections upon past flood experiences and the shared understanding used by flood-affected communities to prepare for, respond to, and recover from devastating floods (McEwen, Krause, Jones, & Garde Hansen, 2012). Flood memories are typically multi-narrative and embedded within a social practice (Folke, Hahn, Olsson, & Norberg, 2005). Notably, limited attention has hitherto been paid to understanding how such multi-featured flood memories shape coping and adaptation to flood-risks and impacts, and community resilience to disaster-shocks.

We argue that social learning mobilizes a bundle of actions - including coping and adaptation mechanisms - in order to build resilience to flash floods. In relation to resilience, coping and adaptation relate to adaptive capacity – a human attribute and a precondition for resilience (Walker, Holling, Carpenter, & Kinzig, 2004). Both coping and adaptation imply a change or adjustment to absorb shocks and stresses. *Coping* implies a "change at the margins" (Handmer & Dovers, 1996, p.482), while *adaptation* indicates at least a modest level of change. Coping here is understood as a bundle of immediate and short-term measures (i.e. *ex post* action) taken by individuals or groups to respond to the adverse impacts of natural disturbance, such as floods (Berkes & Jolly, 2001; Wisner, Blaikie, Cannon, & Davis, 2004). Adaptation refers to planned or more deliberate actions (i.e. *ex ante*) adopted by vulnerable people or groups to adjust to climatic stimuli by changing productive activities and modifying norms and values to the emerging or changing conditions (Birkmann, Tetzlaff, & Zentel, 2009).

Both coping and adaptation are shaped by *antecedent conditions* (Cutter et al., 2008). People's capacity to respond to and recover from disasters is largely shaped by pre-existing

social, economic, and political factors and processes, such as existing asymmetrical power structures and financial capacity (Wisner et al., 2004). These factors may either facilitate or hinder social learning-based coping and adaptation measures. Under these circumstances, we argue that innovative adaptation (IA) strategies that are relatively novel to the local context may help overcome these constraints and facilitate social learning-based actions for building resilience (Biesbroek, Termeer, Klostermann, & Kabat, 2014). Such IAs may emerge spontaneously and collectively at the local level through social networks, relationships, and shared understanding among locals. External-formal institutions may also bring some innovative ideas to locals (Kluvánková et al., 2018). We posit that IAs have greater potential to ensure livelihood stability and encourage self-organization when local innovation is combined with external innovation.

The primary goal of our study is to investigate the application of social learning in the formulation of coping and adaptation measures to flash floods that enhance community resilience in the northeastern region of Bangladesh. The specific objectives of the study are three-fold: i) to examine how flood memories shape coping and adaptation; ii) to determine the roles of social learning from first-hand flood experience in formulating coping and adaptation measures; and iii) to examine the roles of local and external innovative adaptation measures in social learning-based adaptation actions.

2.2 Methods and study area

In the present study, we apply a Case Study approach developed by (Yin, 2014) that investigates empirically a phenomenon in a real-life context and is suitable where the boundaries between the phenomenon and the context are not clearly evident (see Choudhury, Uddin, & Haque, 2019). As the parameters of learning from flood experiences, flood-related knowledge, and actions of key agents in the context of wetland (*haor*) communities of

Bangladesh are not clearly spelled out in the literature, we found a Case Study approach most suited to our purpose.

The wetlands of northeast Bangladesh, locally known as *haor*, have been identified by IPCC-led scenario-building research endeavours as "hot spots" for environmental extremes associated with climate change (Choudhury et al., 2019; Intergovernmental Panel on Climate Change (IPCC), 2014). Considering this vulnerability to environmental extremes, and using multiple criteria concerning recent flash flood disaster experience and the rural livelihood characteristics of the population, we selected the Fenarbak Union (the lowest level of administrative unit of a four-tier administrative hierarchy) of Sunamganj District as our study area. This Union is situated in the low-lying area of northeastern Bangladesh, and it is surrounded by the *Paknar* Haor and *Halir Haor* watersheds (Choudhury & Haque, 2016).

Upon completion of a series of consultation forums with various stakeholders, local government officials, and local community leaders, we selected two villages – Rajapur and Fenarbak (Figure 2.1) to carry out our empirical investigation. The two study villages were selected because they were (i) prone to flash floods and monsoon floods; (ii) severely affected by the 2017 flash floods; and (iii) primarily reliant on agriculture and fishing.

Employing a participatory approach and qualitative techniques, a 4-tier study design was formulated and implemented with the assistance of two field research assistants. Pertinent primary data were collected between July and December 2019 using four main methods: i) Key Informant Interviews (KIIs), ii) Focus Group Discussions (FGDs), iii) Semi-Structured Interviews (SSIs), and iv) Oral History Interviews (OHIs). A total of 14 KIIs were conducted; of these two were with the present and former chairpersons of the Union *Parishad*, five members of the Union *Parishad* who were also members of the Union Disaster Management Committee (UDMC), two former-members of the Union *Parishad*, three representatives of Community-Based Organizations (CBOs), and two official representatives from local NGOs.

The KIIs enabled us to gain the overall insight into first-hand flood experiences, learning from flood experiences, and the nature of coping and adaptation strategies and measures at the local community level.

To document insights regarding collective and iterative social learning processes and outcomes from flood experiences and coping and adaptation strategies, we carried out a total of six FGDs – three FGDs in each study village. Of these, one group discussion was organized with farmers; one was held with fishermen; two were with female members of the communities, and two group discussions were administered with different mixed groups combining males and females, different occupational groups, and elders. Each focus group consisted of 8 to 12 villagers who were engaged in conversations on collective learning. The duration of FGD meetings ranged between one and two hours. Seven SSIs were also conducted in the farming and fishing-based communities with guided questions that focused on individual-level flood-disaster experience and learning through sharing experiences. These also involved social interactions and their use in developing coping and adaptive measures. Four interviews were held with farmers and three was in fishing communities. These interviews lasted an average of 30-35 minutes. Finally, we conducted seven OHIs with elders to explore how flood memories assisted in accumulating flood-related knowledge and whether this played a significant role in flood-risk reduction. During the data collection process, through the 'participation-observation' technique, we also directly observed informal conversations, dialogues, daily practices, and the ways in which the studied communities took various adaptive measures in the face of flood risks. This technique allowed us to gain deeper insights into how flood-sensitive actors interact and share their ideas in order to adapt to flash floods.

To select participants, both *purposive* and *snowball* sampling procedures were used (Creswell, 2014). Purposive sampling strategies were used to determine suitable participants who enabled us to acquire appropriate and rich information (Patton, 2015), while snowball

sampling helped us to identify the key stakeholders who had the ability to provide comprehensive perspectives (Creswell, 2014). Following sample selection, prospective participants were contacted to obtain their consent and subsequently interviewed at a time convenient for them (Informed consent attached in Appendix 10). All interviews were conducted in *Bengali* and then transcribed in local language to comprehend the data holistically. Data were recorded using an audiotape recorder when appropriate consent could be obtained.

For synthesizing and analyzing the qualitative data, a Data Reduction Approach (Miles & Huberman, 1994) was applied to select themes, sub-themes, key concepts, and contexts. These processes were based on the research objectives and questions through running the transcribed data. Data were also coded using a paper-based system for understanding the patterns of prior themes that emerged directly from the transcribed data (DeWalt and DeWalt, 2011). To depict the various aspects of learning from flash flood experience in a comprehensive manner, key themes were determined in relation to the research objectives.
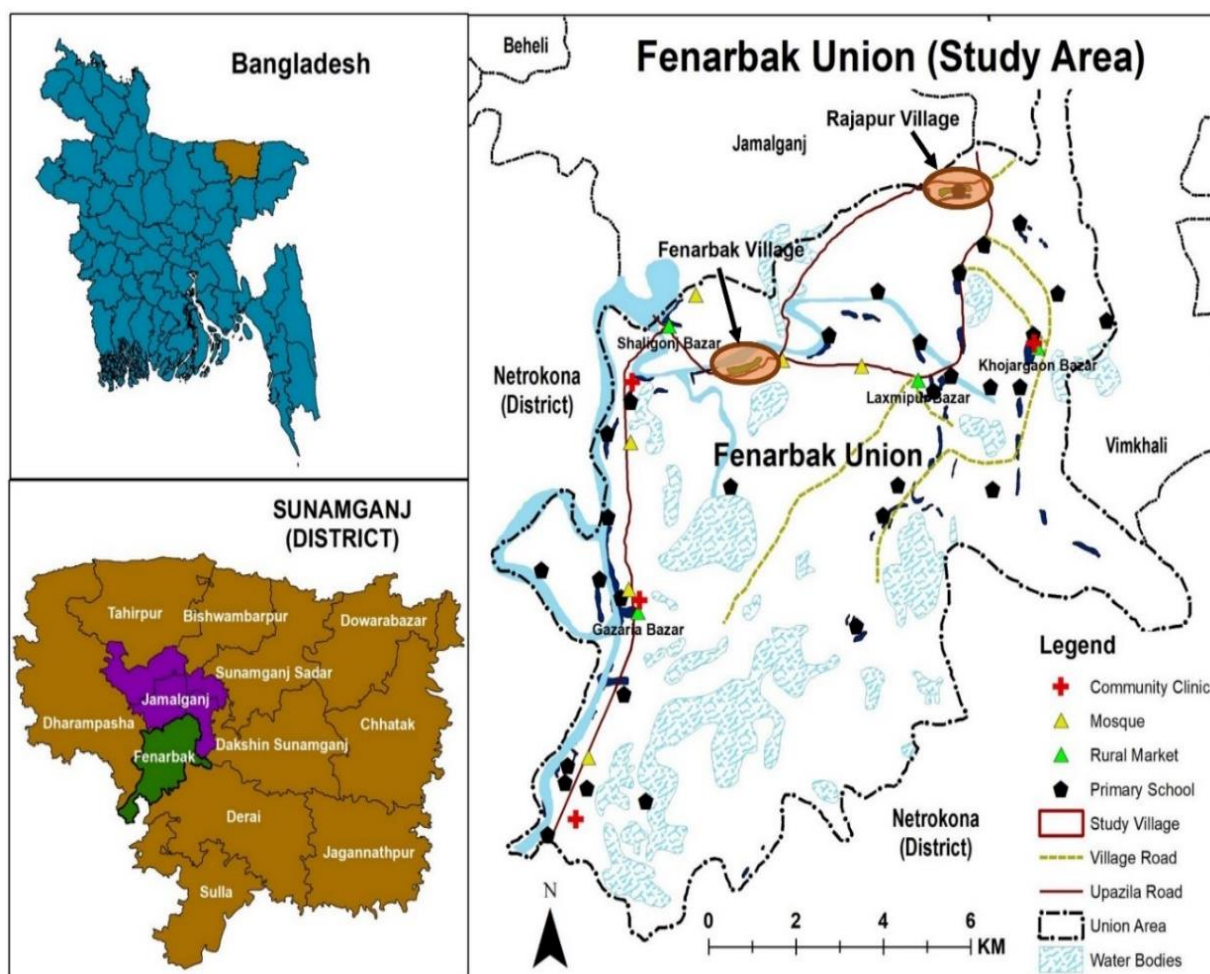
Figure 2:1 Location map of the study villages in Fenarbak Union of Sunamganj District.

2.3 Findings and analysis

2.3.1 Flood memory, flood knowledge, and resilience to flash floods

The key insights gained into past flood memory and knowledge and their contribution to flood-related coping and adaptation strategies are analyzed in this section. In-depth interviews with elders and key informant interviews revealed that past flood memory and knowledge encompass a wide spectrum of characteristics. These include physical attributes of floods (e.g., past water levels, extreme waves, severity of floods), socio-psychological, flood proofing, and ecological features (Table 2.1). Such multi-featured flood memory and knowledge helped

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wetland-community people take diverse measures in order to cope with and adapt to immediate

shock of flash flooding in 2017.

Table 2:1 Flood memories and the use of flood-related knowledge in flood risk reduction in
the study area

Attributes of flood memory	Salient features and experiences with floods	Flood-related knowledge	Coping and adaption with the 2017 flash floods
Past water Levels	- Unusual water levels (eight to ten feet above normal). - Devastating floods overflowing homestead land in 2004.	- Use of bamboo for measuring water levels. - Knowledge and skills required to navigate in strong winds and high waves.	- Community members raised the house plinths based on 1988 and the 2004 flood levels; this measure helped to reduce loss during the 2017 floods. - People kept track of flood levels during the 2017 flooding in order to reduce future flood-risk.
Extreme waves	-High waves of floodwater in 1974, 1998, and 2004. -Convergence of wind from the north and south sides causing rapid wave-induced erosion.		
Temporal variability and severity of flash floods	-Experience of devastating flash floods in pre-monsoon, monsoon, and post-monsoon periods.	- Predictability of temporal variability of flash flooding that can result in loss reduction, such as crop loss due to pre-monsoon and vegetables due to post-monsoon floods.	-Diversification and early harvesting of crops. After the 2017 floods, the studied community members cultivated winter crops to recover from potential flood losses.
Flood proofing	-Learning that locally available natural resources (e.g. plants and species) can be used for flood proofing.	- Knowledge about how to make less vulnerable houses. -Understanding of intended consequences without minimum flood preparedness.	- Collecting and using water hyacinth (*Eichhornia crassipes*) for flood proofing. - These measures helped to protect homesteads from high wave erosion during the 2017 floods.
Ecological	-Observation concerning the gradual erosion of ecological resilience (i.e. reduction of water retention capacity of water bodies).	- Generating a sense of place for living with floodwater by sharing ecological memory. - Identifying the new flood-prone zones.	- Ideas of early harvesting assisted procuring paddy in a timely manner. - Adaptive decision to harvest crops from paddy fields quickly.
Past hardship	- Acute hardship in the aftermath of floods (food crises, economic crises, and unemployment).	- Adjustments in food habit as a coping measure (e.g., changing food habit from parboiled rice to white rice). - Flood awareness for saving the *haor* ecosystems through mobilizing collective action.	- Hiring labourer and procuring rice and livestock fodder from unaffected areas.
Psychological stress and reliance on super-natural power	-Shock and trauma from past flash flood events and the belief that the creator or supernatural power would save the community. -Enhanced mental strength and coping capacity.	- Increased shock-tolerant mindset and capacity. - Unable to recover losses inflicted by flash floods.	- Finding the courage to take protective and adaptive action. - It helped locals to cope with the financial and property losses inflicted by the 2017 flash floods.

Empirical evidence revealed that memory and knowledge in relation to the physical attributes of floods assisted the formulation of coping measures and the reduction of future flood risks. For instance, flash flooding is normally a seasonal phenomenon in the northeastern region of Bangladesh. However, the elders elicited that they experienced numerous flash floods in the past at times outside the normal monsoon seasons. Experience-based memory of this untimely flood risk helped reduce the loss of crops by instigating a number of risk-reduction measures that included the diversification of cropping patterns and early crop-harvesting. Experience-based memory of this untimely flood risk helped reduce loss of crops by instigating a number of risk-reduction measures that included diversification of cropping patterns and early crop-harvesting. Flood water level monitoring was introduced proactively by local communities to enable faster evacuation of people and livestock to safer elevated locations. On this subject, an elder respondent stated that:

"*there was no measurement technique available in our community to understand the depth of floodwater in the hoar area, but we used a locally grown bamboo innovatively to measure the flood water depth. Initially, we marked the present water level on the bamboo, monitored the changes in levels every day to get a sense of emerging flood situation*".

Local flood proofing has also been enhanced by drawing lessons from social memory and knowledge. For instance, the results of the focus group discussions informed that cultivating aquatic plants such as water hyacinth (*Eichhornia crassipes*) allowed community members to protect their homestead plinths from high flood water and waves in *haor* areas. During the 2017 flash floods in the study area, several self-organizing initiatives were undertaken at both individual and collective levels. These activities included flood proofing through increasing the height of house plinths, organizing food and livestock-fodder procurement from the neighbouring communities or local markets, and hiring labourers to

harvest crops more quickly. During a FGD with a mixed group, one elder community member stated:

> "*In 2004, an extreme flash flood struck our locality. The height of flood waves was around 10 feet. Our village was inundated, and our houses were hammered by these high waves. These high magnitude phenomena changed our previously constructed perception of floods and their associated waves. We are now re-considering our present level of house plinths and thinking this new level and magnitude as a changed base to raise the house plinth levels".*

The psycho-social foundation of flood memory led the study communities to strengthen their worldview of living and adapting to recurrent flash floods in the region. It was widely reported by the elder participants that shocks and trauma associated with past abnormal flash floods and acute hardship led them to believe that, during the post-flood period, acute food crises, economic hardship, and unemployment could be expected. Memory and recurrent experiences of flood-related hardships and crises have led to the development of a well-prepared a shock-tolerant mindset. For example, during floods many community members temporarily migrate to unaffected areas, where they attempt to earn wages and procure food and fodder. However, when the extended *haor* areas are flooded, such measures are not possible. The scale of the 2017 flash floods was extensive, with 1195.2 square kilometres being affected in Sunamganj (Aldhshan, Mohammed, & Shafri, 2019). During a semi-structured interview, a farmer reported:

> "*Due to damage of crops and paddy-straw in my agricultural field in 2017, I could not feed my livestock. I had four cows, of which I sold two at a very low price; I transferred two cows to a relative's house to save from flash floods. In addition, I had to procure rice and fodder from distant locations to cope with the flash flood damages.*

2.3.2 Social learning and enhancing resilience to disaster-shocks

In this Section, we focus on social learning from the 2017 flash floods and previous extreme events and its role in shaping resilience to future extreme environmental events. We identified three main areas where community people were able to translate their learning into actions to enhance resilience: i) homestead property, ii) livestock and poultry, and iii) livelihoods (Table 2.2). Some of the social learning resulted from first-hand flood experience while others were introduced by the formal institutions.

Empirical results[6] unveiled that key understanding for flood risk reduction mechanisms stemmed from learning about the damage inflicted on homestead properties and the dearth of preparedness mechanisms. For example, learning that low-cost and sustainable housing infrastructure can offer protection from damages incurred by flash floods spurred community members to innovate adaptive strategies such as placing sandbags around the house plinth, raising the house plinth or floor using a mixture of local plants, cow dung, and clay, and placing fences around the houses using local plants and bamboo.

Parallel to local innovation, external innovation also facilitated learning-based adaptation initiatives such as constructing brick-built pillars and brick-built basements for protection against floodwater. An in-depth analysis with key informant interviews affirmed that a number of community members also made use of low-cost energy sources, such as solar panels and gas stoves, as alternative sources of light and energy due to high cost and fuel wood scarcity (Table 2.2), as one of the female respondents explained:

> *"I had taken a number of preparedness measures to cope with and adapt to the flash floods. I collected gas stoves, fuelwood, dried food including rice, flattened and puffed and lentils to prepare my family to survive through the impending flood. I figured out*

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[6] The results were reported by most of the study participants.

that if and when flood water would inundate our village, I would not be able to go to the market. I therefore procured the stated items and buried them in mud-pots at a higher elevation."

Learning in the study communities was also related to disruptions of livelihood activities and resources. The results from empirical analyses[7] revealed that flood-affected people learned that flash floods can damage livestock and fodder, and consequently, force them to sell their livestock at lower than market prices. These lessons motivated community members to take preemptive action such as selling livestock before the onset of flooding in order to get a fair price. Rearing livestock collectively was another common strategy. The results of semi-structured interviews uncovered that community people in Rajapur hired caretakers (cowboys) to graze and look after their livestock in *haor* areas. Instead of cash wages, the caretakers were given 40 kilograms of paddy per cow after the harvesting period. This process of exchange created a win-win condition by reducing both the cost of rearing livestock and the caretakers' livelihood vulnerability (Table 2.2).

The results of our empirical investigation revealed that social learning plays a key role in dealing with livelihood stresses. Learning from livelihood stresses stemming from flood losses and damages spurred community people to seek alternative income sources, or temporarily migrate to other places to generate income (Table 2.2). As fishing and farming are two main livelihood activities in the *haor* communities, in the following section we present our findings on the role of social learning among farmers and fishers.

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[7] The findings were observed in most of the face-to-face interviews.

Table 2:2 Flash flood experience, social learning, and coping and adaptation measures in the study area

Areas of social learning	Flood experience	Learning	Coping strategies and measures	Innovative Adaptation	
				Local innovation	External innovation
Homestead properties	-Damaged houses, trees, and vegetables. -Limited or no time to prepare house structures.	-Spontaneous protective ideas for flood response mechanisms. -New knowledge of low-cost housing.	-Procuring fuelwood, bamboo, and boats. -Using portable stoves. -Preserving acuatic plants, such as *chamura* and water hyacinth to protect house plinths from floodwater and waves.	-Placing sandbags around the house plinths. -Raising house plinths by using a mixture of local vegetation, cow dung, and clay. -Placing fences around houses by using local vegetation and bamboo.	-Using solar panels as an alternative source of energy for light. -Constructing brick pillars to protect houses. -Constructing brick basements. -Using gas stoves instead of fuelwood.
Livestock and poultry	-Damaged fodder. -Loss of livestock. -Being forced to sell livestock and poultry at less than market price, leading to economic hardship.	-Knowledge of adaptive measures such as selling livestock before the onset of floods. -Community network-based self-organizing capacity enhancements, such as collective livestock fodder procurement and collective livestock rearing.	-Selling livestock prior to the onset of flash floods.	-Rearing livestock. -Collecting straw and fodder from non-flooded areas. -Collectively hiring livestock caretakers.	-Receiving training on rearing livestock. -Fostering knowledge for regaining livelihood strategies.
Livelihood	-Reduced earning and ceased saving capacity. -Abject poverty. -Severe food crises. -Lowered socioeconomic status. -Fell into debt trap.	-Increased economic hardship after recession of floodwaters. -Aspiration and courage to sustain livelihoods. -Enhanced awareness about flood risk-reduction measures and adaptive livelihood practices. -Procurement of information regarding employment opportunities in other areas. -Greater understanding of alternative livelihood options.	-Procuring dried food, lentils, and sugar. -Rationing food consumption. -Borrowing money from relatives. -Receiving relief from the government and NGOs.	-Seasonal migration. -Changing occupation. - Migrating to cities or abroad and working in garment factories. -Educating children as an earning source or for long-term recovery.	-No external innovation was observed.

2.3.3 Social learning, coping, and adaptation to livelihood stress

2.3.3.1 Farming communities

In regard to livelihood, we identify two areas upon which social learning among farming communities was grounded. These are: i) an experience and sufferings from crop loss and farming practice, and ii) the logistical and emotional toll from a labour crisis during harvesting period (Table 2.3). We noticed that social learning in regard to livelihood stemmed through a two-stage process: i) first-hand encounter with flash flooding, and ii) sharing flood experience and learning through various collective learning and sharing platforms.

Due to the early flash floods of 2017, *haor* communities in the study area suffered from severe crop losses. It was widely reported by most of the study participants that the abnormal inundation and high water level was caused primarily by institutional procrastination, namely by the local office of Bangladesh Water Development Board (BWDB) in repairing submergible earthen embankment for protection of crops.

Interviews with the farmer respondents informed that farmers typically harvest *boro* crops in mid-April, and suffer crop loss if the *haor* inundates before the paddy is ready to harvest. In normal years, inundation takes place gradually starting in March, with flooding peaking in June and July. As shown in Figure 2.2, the level of the Surma River during the 2004 and 2007 floods reached its peak of 8.25 m during the monsoon months of May to July. In contrast, the 2017 flash flood occurred in April, during the pre-monsoon period. This early inundation lead to the breaching and overtopping of earthen embankments, resulting in serious crop damage and loss. Furthermore, the floodwaters did not retreat until October, leading to widespread waterlogging and significant delays in cultivating and replanting crops for the winter season.

Table 2:3 Social learning-based coping and adaptation strategies and practices by the farming communities

Area of social learning	Experience	Learning	Coping strategies and measures	Innovative adaptation	
				Local innovation	**External innovation**
Crop loss and the need to change farming practices	-Unseasonal flooding - especially before the harvest - resulting in limited or no time to harvest crops due to institutional procrastination -High floodwaters and waves damaging half-ripe crops. -Delays in planting crops due to prolonged waterlogging.	- Need for improved flood awareness and understanding. -Knowledge of improved seeds and alternative crops. -Better knowledge of appropriate timing for crop cultivation.	-Selling paddy at less than market price. -Early harvesting of crops.	-Preparing seedbeds on the yard by using polythene sandbags. -Homestead gardening. -Cultivating alternative crops, such as chili, brinjal, or turmeric. -Leasing out agricultural land. -Taking out loans at high interest rates.	-Cultivating early-maturing, high-yield crops (BRRI 28, 29, 52).
Labour shortages	-Labour shortage during harvesting period. -Psycho-social shocks stemming from cumulative crises.	-Increasing cost of cultivation. -Psychosocial impact of crop losses. -Collective crop harvesting. -Building trust and social networks.	-Making sharecropping arrangements. -Communicating with local government offices (e.g., the Union Parishad and the Police station) to seize sand and stone loading work in the locality.	-Sharecropping arrangements for livelihood recovery. -Reducing cultivation costs.	-Arranging for shared use of husking machines and tractors to improve efficiency and reduce costs.
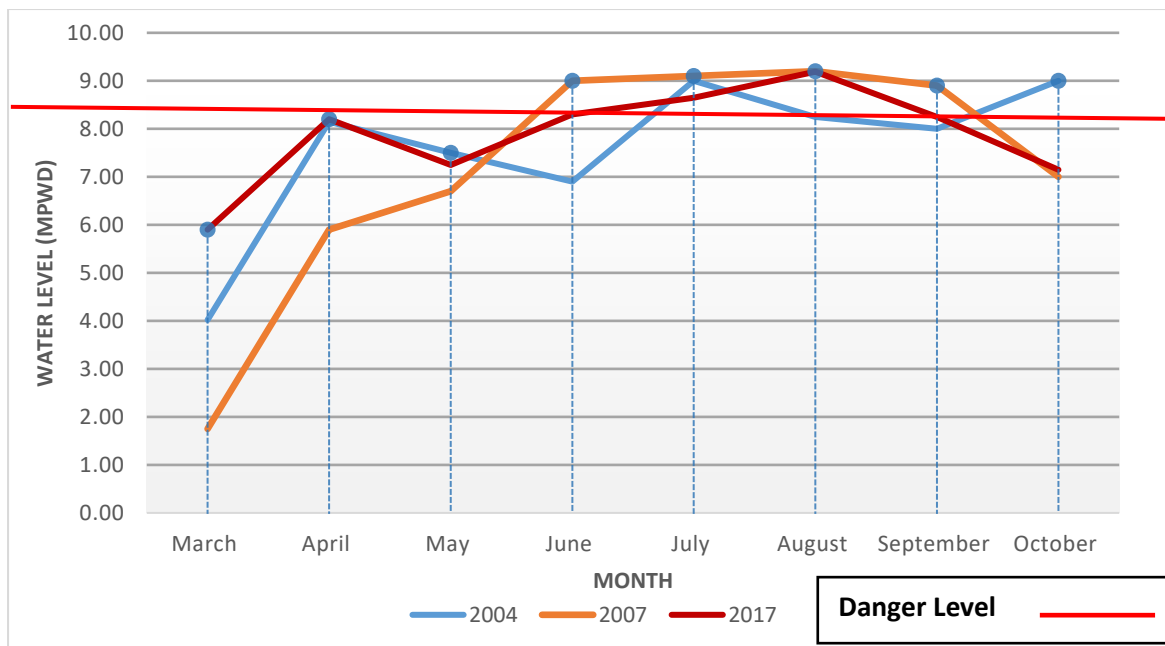
Figure 2:2 Hydrograph readings of peak water levels in the Surma River for selected years (2004, 2007, 2017) for the March-October period.

Source: Based on data from the Flood Forecasting and Warning Centre (FFWC), 2017.

The 2017 floodwaters damaged half-ripe crops, leading to serious economic hardship in the study communities. Both formal-institutional and informal-social interactions were required to find appropriate coping and adaptive measures. The results[8] from empirical analysis revealed that first-hand experience with flood impacts was transformed into flood-related learning and knowledge through the processes of sharing, understanding, and dialogue among community members and agricultural extension officers. The aim of these sharing platforms was to generate a sphere of collective knowledge and understanding on how to cultivate new high-yield crop varieties, choose appropriate crop cultivation timing, and prepare waterlogged seedbeds. Community members later shared their understanding with neighbours and family members. Most of this sharing occurred through courtyard meetings, causal meetings, and visits to the local agricultural extension office.

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[8] Most of the study participants reported similar information on sharing first-hand flood experience.

We noticed that social learning facilitated several adaptation measures required to overcome the livelihood stresses caused by flood losses. Two forms of adaptation measures were evident: first, local innovation by community people including preparing seedbeds in polythene sandbags, planting alternative crops, and homestead gardening. Second, a handful external innovations were also adopted by the study communities through interactions with formal institutions. These included local market and business counsels, the local Department of Agricultural Extension office, and NGOs who introduced short (BRRI 28, 52) and early-harvesting crop varieties (BRRI 29). As one of the interviewed farmers recounted:

> *I cultivated BRRI 28 in last year to recover from crop loss due to 2017 flash floods. Many farmers watched my field and strategy and asked me whether one needs to preserve paddy seeds for the following year. I informed them that it's not needed as this variety is available in the local market."*

A shortage of day labourers in the locality during harvest time created a major crisis. The results from semi-structured interviews affirmed that the gravity and urgency of the problem inspired farmers to develop a collective sharecropping arrangement to allow the crops to be harvested in a timely manner. To address cash-flow problem, arrangements were made to share harvested paddy among the farm-owners and the labourers.

Several cost-reduction methods were also innovatively developed by means of sharing and collaboration among farmers. One such practice was the shared use of husking machines and tractors for plowing agricultural land. However, as this equipment was expensive, its shared use was limited to relatively wealthy farmers. The Agricultural Extension Department thus assisted in the adoption of these new technologies, resulting in a significant improvement in overall crop production in the *haor* communities.

2.3.3.2 Fishing communities

Social learning in fishing communities as a result of the 2017 flash floods related mainly to two areas: i) damage to fisheries; and ii) livelihood stresses created by local powerful elites (Table 2.4). Empirical evidence of the study substantiated that similar to the farming communities, among the fishers, social learning emerged both from first-hand experience of flash flood impacts, and through sharing fishing-related experiences through social interactions with neighbours and *Jalmahals* (water body) leaseholders.

Typically, early flash flooding is considered not a hazard but rather a blessing by the fishing community in Bangladesh, as it inundates the *haor* and creates decaying vegetation that serves as food for the fish. However, the 2017 flash floods revealed that early flash floods may not always be a blessing. Data from the interviews with fishermen and key informants confirmed that unlike in previous years, the 2017 flash floods caused massive fish die-offs due to decaying vegetation producing large amounts of toxic methane (CH_4) and nitrous oxide (N_2O) According of the Ministry of Fisheries and Livestock, 213.95 metric tonnes (MT) of fish were killed in the *haor* region, leading to severe economic hardship for local fishers (cited in Nirapad, 2017). This experience prompted fishing communities to procure minimum livelihood sustaining materials in preparation for future flooding events - for example by drying fish for long-term storage.

Table 2:4 Social learning-based coping and adaptation strategies and practices by the fishing communities

Areas of social learning	Experience	Learning	Coping strategies and measures	Innovative Adaptation	
				Local innovation	External Innovation
Disruption in fishery	-Acute unemployment problems. -Damage to fisheries through methane (CH4) and nitrous oxide (N2O) formation from vegetation decay. -Destruction of minnows in *hoars*.	-Early flash floods may not always be a blessing. -Destruction of fisheries results in economic hardship for fishers.	-Fishing in open waters during floods if permitted by the *Jalmahal* leaseholder*s*. -Procuring boats and nets prior to the onset of flash floods. -Consuming dried fish instead of fresh fish.	-Taking loans from *mohajon* or NGOs to purchase nets and boats. -Making nets and selling them to local fishermen. -Drying fish and selling them in local markets. -Taking sub-lease of *Jalmahals* collectivel*y* from VDC.	-No external innovation was observed.
Local elite-induced exclusion of fishers and fishing crisis	-No access to open water fishing due to *Jalmahal* grabbing by the water lords.	-Powerless to fight the leaseholders. - Local elites are engaged in fishery sector by leasing-in *Jalmahals.* -A collective effort was made to establish a dialogue with the leaseholders. -Building trust and community bonds among the fishers.	No coping measures were observed.	-Migrating to nearby towns or cities to earn a living. -Purchasing nets and boats for fishing collectively. -Taking sub-lease of *Jalmahals* collectively.	-No external innovation was observed.

An in-depth analysis of the findings of key informant and semi-structured interviews unveiled that fishing communities transformed their experiences into local knowledge through social interactions to revive their livelihoods. Social interactions during the post-flood period led to dialogues among the fishers to look for alternative livelihood strategies (e.g. obtaining loans from *mohajon* or NGOs to purchase boats and nets, preparing dried fish, starting small-scale retail businesses). Social interactions with fellow fishers also generated collective ideas such as taking out a sub-lease of *Jalmahals* from the Village Development Committee (VDC),

a local informal institution. As small *Jalmahals* in nearby villages were maintained by the VDC, a network of the fishers with them enabled the fishers to get organized and to take collective action to enhance their adaptive capacity via livelihood diversification.

The social learning processes of the fishing communities have also played a major role in the fishing crisis perpetrated by local elites. Interviews with fishing community members revealed that through alliances with government officials, local elites managed to purchase long-term leases on the *Jalmahals* and are consequently able to prevent poor fishers from catching fish on open water bodies.

Facing limited access to *Jalmahals* and threats from local elites, local fishers created a collective social learning platform in order to negotiate with the lease-holders. For example, fishers collectively purchased fishing equipment and short-term leases on the *Jalmahals*, allowing them to maintain their livelihoods. However, such collective initiatives were the exception rather than the rule in the study area. Most fishers, when denied access to fishing areas in the *haor* basin, were forced to seek alternative livelihoods. As one respondent explained:

> *"Fishing activity is the main occupation for our survival. Before the 2017 flash flood, we could catch fish in open waterbodies during flood, however, the leaseholders did not allow us to access these open waterbodies during and after flash floods. We could not fight the powerful water lords. Eventually, we were forced to settle with them to take a sub-lease of a Jalmahal, but only for a few months period – just to sustain our livelihood in the locality"*

2.4 Discussion and Conclusion

In this study, we set out to investigate the role of social learning in coping with and adapting to flash floods in a wetland community in Bangladesh. The findings revealed three characteristics of social learning in the context of flash floods in the northeastern region of Bangladesh: (i) multi-featured flood memory and knowledge assisted *haor* communities in adopting diverse coping and adaptive measures; (ii) social learning-based actions have shown greater potential to reduce risk and enhance resilience to flash floods when supported by both local and external innovations; (iii) social learning stemmed chiefly from first-hand experience of flash floods and from sharing flood experiences through various collective learning platforms.

In the context of flooding, McKinnon's (2019) and Garde-Hansen et al.'s (2017) studies concluded that flood memories are key to disaster management and strengthening community resilience by nurturing local flood knowledge. However, these studies fall short in terms of analyzing the linkage between flood memory, knowledge, and necessary action (i.e. coping and adaptation) for building community resilience. Findings of the present study specifically identify five key features of flash flood memory and knowledge, and provide evidence that multi-featured flood memory and knowledge inspired the *haor* communities to adopt diverse flash flood coping and adaptive measures (Figure 2.3). In this regard, Folke et al. (2003) and Berkes et al. (2003) documented that accumulated social memories enable necessary actions required to withstand environmental change and foster adaptive capacity for self-organization and building resilience.
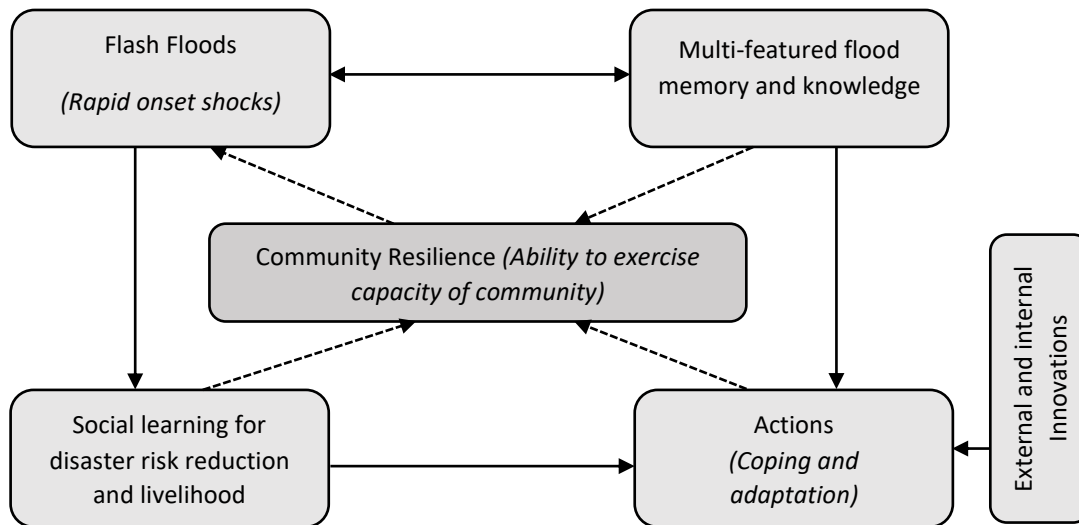
Figure 2:3 Social learning towards building community resilience to flash floods

Some features of flood memory may not be applicable to all future extreme environmental events. For example, the 2017 flash flood events were very unusual, creating a prolonged social crisis due to the devastating loss of crops and damage to fisheries such that knowledge gained from past abnormal floods (e.g. the floods in 1974, 1998, and 2004) was inapplicable. This result is also consistent with Madsen and Mullan's observation (2013) that the 2010 and 2011 floods in Theodore, Australia far surpassed the last great flood event of 1956.

We noticed that social learning-based actions have greater potential to reduce risk and enhance resilience to flash floods when supported by both local and external innovations (Figure 3). For example, social learning in farming communities yields innovative knowledge for advancing adaptive capacity through the cultivation of short, high-yield crop varieties. Such external innovations are found to be consistent with local innovations, knowledge, and aspirations. In the context of *haor* communities in Bangladesh, Shahidullah and others (2020) found that external innovation can enhance resilience if aligned with local skills and knowledge. Similarly, Cooper and Wheeler (2015) found that social learning among farming

communities in Uganda fortified livelihood resilience through increasing problem-solving knowledge. Tran and Rodela (2019) also observed that social learning in the farming communities of the Vietnamese Mekong Delta helped to foster critical knowledge of crop cultivation in order to adapt to flood-risks.

However, in contrast to farming communities, absence of external innovations in fishing communities resulted in increased sensitivity to flood hazards. Heavy reliance on fishing activities made the fishers very susceptible to flood disaster-induced crises. Under such circumstances, social learning is likely to function as a key adaptation tool for generating collective social capital, changing relational practices, and fostering collective understanding in order to adjust to complex situations. In this regard, Keen and his colleagues (2005) argued that social learning generates shared understanding, social networks, and trust, which fosters the capacity for self-organization and collaborative action. In the context of the present study, we recorded that social learning among smaller-scale farmers fostered collective understanding and social network for partnership-based harvesting, sharecropping, and appointing livestock caretakers when individual coping and adaptation measures failed.

Similarly, social learning processes which led to collective efforts by fishers increased their negotiating capacity, enabling them to challenge the power of leaseholders. Shared practices and social networks assisted small fishers in collectively purchasing nets and boats and sub-leasing *Jalmahals* from leaseholders. These innovative coping measures allowed the fishers to recover their livelihoods. Our findings concur with the studies on collective understanding on potato bacterial disease management in Ethiopia (Tafesse et al., 2020) and the South African *mafisa* system which entrust livestock care to others (Fazey et al., 2010).

Our empirical results revealed that experiential learning from first-hand experiences of flash floods triggered key changes in understanding of the need of social learning in addressing

emerging livelihood crises. Collective effort toward recovering livelihood supports and flood disaster risk reduction for building community resilience to flash floods was a good example of such change. The *haor* communities transformed flood-related experience into practice by adopting various social learning-based coping and adaptation strategies (Figure 2.3).

Here, we highlight the major policy implications of our research findings. Flood memories are vital to shaping and redesigning coping and adaptation actions at the community level. To foster more sustainable flood memories, appropriate institutional interventions should be undertaken to preserve and nurture experiential knowledge of flood and other disasters. We observed that social learning relating to disaster management has contributed substantially to both local and external innovations. To nurture local innovative adaptations and introduce innovations through external formal institutions in the context of communities' knowledge and capacity, appropriate institutional structures and policies should be formulated at all levels. It is noteworthy that though flood-prone communities possess multifaceted learning and knowledge, they are not always capable to applying their learning and coping and adapting to flash floods due to social, political, economic, and institutional barriers. Future research should therefore focus on how external factors pose challenges to social learning processes and building resilience to flash floods and other environmental risks and hazards.

2.5 References

Aldhshan, S. R. S., Mohammed, O. Z., & Shafri, H. Z. M. (2019). Flash flood area mapping using sentinel-1 SAR data: A case study of eight upazilas in Sunamganj district, Bangladesh. *IOP Conference Series: Earth and Environmental Science*, *357*(1), 12034–. https://doi.org/10.1088/1755-1315/357/1/012034

Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global Environmental Change*, *18*(1), 86–98. https://doi.org/10.1016/j.gloenvcha.2007.07.002

Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards*, *41*(2), 283–295. https://doi.org/10.1007/s11069-006-9036-7

Berkes, F. (2009). Evolution of co-management : Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692–1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Berkes, F., Colding, J., & Folke, C. (2003). *Navigating social-ecological systems: Building resilience for complexity and change*. Cambridge, UK: Cambridge University Press.

Berkes, F., & Jolly, D. (2001). Adapting to climate change : Social-ecological resilience in a Canadian Western arctic community. *Conservation Ecology*, *5*(2), 18–32. https://doi.org/10.5751/es-00342-050218

Biesbroek, G. R., Termeer, C. J. A. M., Klostermann, J. E. M., & Kabat, P. (2014). Rethinking barriers to adaptation: Mechanism-based explanation of impasses in the governance of an innovative adaptation measure. *Global Environmental Change*, *26*(1), 108–118. https://doi.org/10.1016/j.gloenvcha.2014.04.004

Birkmann, J., Tetzlaff, G., & Zentel, K.-O. (2009). *Addressing the challenge: Recommendations and quality criteria for linking disaster risk reduction and adaptation to climate change* (DKKV Publication Series, Vol. 38). Retrieved from German Committee for Disasters, Bonn website: https://www.preventionweb.net/files/10193_DKKVreport.pdf, accessed on 18 June, 2020.

Choudhury, M. U. I., & Haque, C. E. (2016). "We are more scared of the power elites than the floods": Adaptive capacity and resilience of wetland community to flash flood disasters in Bangladesh. *International Journal of Disaster Risk Reduction*, *19*, 145–158. https://doi.org/10.1016/j.ijdrr.2016.08.004

Choudhury, M. U. I., Uddin, M. S., & Haque, C. E. (2019). "Nature brings us extreme events, some people cause us prolonged sufferings": The role of good governance in building community resilience to natural disasters in Bangladesh. *Journal of Environmental Planning and Management*, *62*(10), 1761–1781. https://doi.org/10.1080/09640568.2018.1513833

Cooper, S. J., & Wheeler, T. (2015). Adaptive governance: Livelihood innovation for climate resilience in Uganda. *Geoforum*, *65*, 96–107. https://doi.org/10.1016/j.geoforum.2015.07.015

Creswell, J. W. (2014). *Research Design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles: Sage Publications Ltd.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008). A place-based model for understanding community resilience to natural disasters. *Global Environmental Change*, *18*(4), 598–606. https://doi.org/10.1016/j.gloenvcha.2008.07.013

DeWalt, K. M., & DeWalt, B. R. (2011). *Participant 0bservation: A guide for field workers*. Plymouth, UK: AltaMira Press.

Fazey, I., Gamarra, J. G. P., Fischer, J., Reed, M. S., Stringer, L. C., & Christie, M. (2010). Adaptation strategies for reducing vulnerability to future environmental change. *Frontiers in Ecology and the Environment*, *8*(8), 414–422. https://doi.org/10.1890/080215

Folke, C. (2006). Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, *16*(3), 253–267. https://doi.org/10.1016/j.gloenvcha.2006.04.002

Folke, C., Colding, J., & Berkes, F. (2003). Synthesis: Building resilience and adaptive capacity in social–ecological systems. In F. Berkes, J. Colding, & C. Folke (Eds.), *Navigating social-ecological systems: Building resilience for complexity and change* (pp. 352–387). Cambridge: Cambridge University Press.

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, *30*, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Flood Forecasting and Warning Centre (FFWC). (2017). *Annual flood report 2017*. Retrieved from Flood Forecasting and Warning Centre (FFWC), Dhaka website: http://www.ffwc.gov.bd/images/annual17.pdf, accessed on 15 June, 2018.

Garde-Hansen, J., McEwen, L., Holmes, A., & Jones, O. (2017). Sustainable flood memory: Remembering as resilience. *Memory Studies*, *10*(4), 384–405. https://doi.org/10.1177/1750698016667453

Handmer, J. W., & Dovers, S. R. (1996). A typology of resilience: Rethinking institutions for

sustainable development. *Organization and Environment*, *9*(4), 482–511. https://doi.org/10.1177/108602669600900403

Haque, C. E., Choudhury, M. U. I., & Sikder, M. S. (2019). "Events and failures are our only means for making policy changes": Learning in disaster and emergency management policies in Manitoba, Canada. *Natural Hazards*, *98*(1), 137–167. https://doi.org/10.1007/s11069-018-3485-7

Intergovernmental Panel on Climate Change (IPCC). (2014). *Climate change 2014: Synthesis report*. Retrieved from Intergovernmental Panel on Climate Change (IPCC), Geneva website: https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf, accessed on 10 October, 2020.

Keen, M., Brown, V. A., & Dyball, R. (2005). *Social learning in environmental management :Towards a sustainable future*. London : Routledge.

Keen, M., & Mahanty, S. (2006). Learning in sustainable natural resource management: Challenges and opportunities in the pacific. *Society and Natural Resources*, *19*(6), 497–513. https://doi.org/10.1080/08941920600663896

Kluvánková, T., Brnkaľáková, S., Špaček, M., Slee, B., Nijnik, M., Valero, D., … Gežík, V. (2018). Understanding social innovation for the well-being of forest-dependent communities: A preliminary theoretical framework. *Forest Policy and Economics*, *97*, 163–174. https://doi.org/10.1016/j.forpol.2018.09.016

Kolb, D. A. (2015). *Experiential learning: Experience as the source of learning and development*. New Jersy: Pearson Education, Inc.

Kuang, D., & Liao, K. H. (2020). Learning from floods: Linking flood experience and flood resilience. *Journal of Environmental Management*, *271*, 111025.

https://doi.org/10.1016/j.jenvman.2020.111025

Madsen, W., & Mullan, C. O. (2013). Responding to disaster Applying the lens of social memory. *Australian Journal of Communication*, *40*(1), 57–70. Retrieved from https://search-proquest-com.uml.idm.oclc.org/docview/1446431392/fulltextPDF/1865CF5B409445B7PQ/1?acc ountid=14569, accessed on 15 October, 2020.

McEwen, L. J., Krause, F., Jones, O., & Garde Hansen, J. (2012). Sustainable flood memories, informal knowledge and the development of community resilience to future flood risk. *WIT Transactions on Ecology and the Environment*, *159*, 253–264. https://doi.org/10.2495/FRIAR120211

McKinnon, S. (2019). Remembering and forgetting 1974: The 2011 Brisbane floods and memories of an earlier disaster. *Geographical Research*, *57*(2), 204–214. https://doi.org/10.1111/1745-5871.12335

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis:An expanded sourcebook* Thousand Oaks, CA: SAGE Publications, Inc.

Nirapad (2017). *Flash flood situation update*. Retrieved from Nirapad website: https://reliefweb.int/sites/reliefweb.int/files/resources/Update%20Report%20of%20Flas h%20Flood_MAY%2003%2C%202017.pdf, accessed on 15 November, 2020.

Patton, M. Q. (2015). *Qualitative evaluation and research methods: integrating theory and practice.* Newbury Park: SAGE Publication, Inc.

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., & Laing, A. (2010). What is social learning ? *Ecology and Society, 15(4).* https://doi.org/10.5751/es-03564-1504r01

Schiermeier, Q. (2011). Increased flood risk linked to global warming. *Nature*, *470*(7334),

316–316. https://doi.org/10.1038/470316a

Shahidullah, A. K.M., Choudhury, M. U. I., & Haque, C. E. (2020). Ecosystem changes and
community wellbeing: Social-ecological innovations in enhancing resilience of wetlands
communities in Bangladesh. *Local Environment: The International Journal of Justice
and Sustainability*, *25*(11-12), 967-984. https://doi.org/
10.1080/13549839.2020.1849077

Tafesse, S., van Mierlo, B., Leeuwis, C., Lie, R., Lemaga, B., & Struik, P. C. (2020).
Combining experiential and social learning approaches for crop disease management in
a smallholder context: A complex socio-ecological problem. *Socio-Ecological Practice
Research*, *2*(3), 265–282. https://doi.org/10.1007/s42532-020-00058-z

Tran, T. A., & Rodela, R. (2019). Integrating farmers' adaptive knowledge into flood
management and adaptation policies in the Vietnamese Mekong Delta: A social learning
perspective. *Global Environmental Change*, *55*, 84–96.
https://doi.org/10.1016/j.gloenvcha.2019.02.004

Walker, B., Holling, C. S., Carpenter, S. R., & Kinzig, A. (2004). Resilience, adaptability and
transformability in social-ecological systems. *Ecology and Society*, *9*(2), 5.
https://doi.org/10.5751/ES-00650-090205

Wisner, B., Blaikie, P., Cannon, T., & Davis, I. (2004). *At risk: Natural hazards, people's
vulnerability and disasters*. London: Routledge.

Yin, R. K. (2014). *Case study research : Design and methods*. Los Angeles : Sage .

Chapter 3: The role of social learning and local institutions in collective action for disaster resilience[9]

Abstract

Despite widespread recognition that social learning can potentially contribute toward enhancing community resilience to climate-induced disaster-shocks, studies on this process remain few and far in between. This study investigates the role of local institutions (formal, informal, and quasi-formal) in creating learning arenas and translating social learning into collective action. We follow a Case Study approach using qualitative research methods. Primary data were collected through 24 key informant interviews, 10 semi-structured interviews, six focus-group discussions, and two participation-observations events. Our results reveal that the diversity and flexibility of local-level institutions creates multiple learning platforms in which social interaction, problem formulation, nurturing diverse perspectives, and generating innovative knowledge for collective action can take place. Within these formal and informal learning arenas, communities' desire and willingness to be self-reliant and to reduce their dependency on external funding and assistance was clearly evident. Social learning thus paves the way for institutional collaboration, partnership, and multi-stakeholder engagement, which eventually facilitates social learning-based collective action.

KEYWORDS Social learning; local-level institutions; collective action; disaster resilience; Bangladesh

3.1 Introduction

Given the increasing intensity and frequency of extreme weather events, it is imperative for local communities to build resilience to climate-induced disaster-shocks (Intergovernmental

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[9] This manuscript is prepared for the *Environmental Hazards* journal.

Panel on Climate Change (IPCC), 2012). *Resilience* is often defined as the capacity of communities to absorb shocks and stresses and to persist under continual disturbances (Berkes & Ross, 2013; Folke et al., 2010). This ability is largely shaped by the capacity of local institutions to learn from shocks and stresses and self-organize. Learning in resilience sense thus implies social and institutional learning (Berkes, 2007).

The various framings of social learning in the literature often results in confusion. In this regard, Armitage et al. (2008) have highlighted the "paradox of learning", documenting five key areas of confusion regarding social learning: i) definitions of learning; ii) learning goals and expectations; iii) learning mechanisms; iv) identity of the person or organization engaged in learning; and v) the risks and ethical ambiguities faced by different actors. In this connection, Rodela (2011, 2013) documents that social learning literature involves individual-, network-, and system-centric approaches, often tries to examine learning at the collective or social level from a change at the individual level.

In the context of climatic variability, social learning is seen as a prerequisite for moving up the adaptation ladder (Collins & Ison, 2009; Tàbara et al., 2010). In the disaster risk reduction and resilience literature, social learning is a necessary condition for adaptation or adaptive resilience (Berkes, 2009; Cutter et al., 2008; Lei, Yue, Zhou, & Yin, 2014). Common themes found in the literature are that: (i) social learning be considered as a collective means of framing and reframing lessons learned; (ii) participation in the process is made by different stakeholders; (iii) the process could be externally driven or spontaneous; (iv) social interactions and sharing are important means of formulation; and (v) it is characteristically a process and/or an outcome (Baird, Plummer, Haug, & Huitema, 2014; Benson, Lorenzoni, & Cook, 2016; Collins & Ison, 2009; Ensor & Harvey, 2015; Johannessen & Hahn, 2013). For the purpose of the present study, concurring with Reed et al. (2010), we define 'social learning' as a *process* involving demonstrated changes in understanding that goes beyond boundaries of an individual

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person to become situated within the wider social units or communities of practice through social interactions among various social actors and networks.

We consider social learning as an iterative process as well as an outcome (Reed et al., 2010). We focus on two-pronged outcomes: i) social learning itself, and ii) collective attributes (e.g. social networks, partnerships, and mutual agreements). For an iterative process to take place and social learning to emerge, it is necessary to have "*arenas*" or spaces where diverse social actors can deliberately engage in dialogue, debate, and network creation in order to achieve collective goals (Lumosi, Pahl-Wostl, & Scholz, 2019; Strauss, 1978). Thus, arenas facilitate the process of framing and reframing issues and problems, nurturing diverse perspectives, resolving conflicts, and generating collective assumptions and consensus (Lumosi et al., 2019; Steyaert et al., 2007). As Berkes (2009) posits, a change in knowledge or understanding takes place when ideas and experiences are shared by individuals through social interactions in an iterative way.

 However, some have raised concerns regarding such normative framing of social learning (Choudhury, Haque, Nishat, & Byrne, 2020; Reed et al., 2010). For example, these arenas may not be a level playing ground due to differential power relationships and institutional structures (Rist, Chidambaranathan, Escobar, Wiesmann, & Zimmermann, 2007). Such power-imbued learning arenas may shape the sharing of experiences (Purdon, 2003). We contend that different local institutions are likely to offer different opportunities for local community members to share their experiences and learning.

We posit that different types of local-level institutions play critical roles in creating learning arenas (Ensor & Harvey, 2015; Lebel, Grothmann, & Siebenhüner, 2010). Concurring with Young (2002) we define 'institutions' as systems of rules, decision-making procedures, and programs that shape social practices, assign roles to the participants in these practices and direct interactions among the actors with assigned roles. These rules and roles can be formal,

informal, or quasi-formal (Gupta et al., 2010; Uddin, Haque, & Khan, 2020a). In this study, we investigate the role played by these three forms of local institutions in creating participatory and interactive arenas for facilitating social learning and collective action.

Social learning and its collective attributes are not sufficient for building resilience. Learning needs to be translated into actions to build resilience. Community resilience largely depends on the ability to act collectively. Communities' 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" (Dale, 2013). Collective attributes, such as social networks, trust, and mutual agreement may facilitate social learning-based collective action. There remains a significant gap in our understanding of how local-level institutions translate social learning into collective action for building resilience. By focusing the role of local formal, informal, and quasi-formal institutions, the present study addresses this gap through the results of an empirical investigation. Collective action by institutions may be carried out through collaboration at the local level (i.e. horizontal and vertical linkages) (Berkes, 2009; Choudhury, Uddin, & Haque, 2019). To this end, resource mobilization, multi-stakeholder engagements, and institutional networks are important. In Bangladesh, quasi-formal and formal institutions (e.g. Union Parishads, Union Disaster Management Committees, Upazila Disaster Management Committees, and local NGOs), and informal institutions (e.g. faith-based committees, social networks, school committees) have been working collaboratively at the local level to foster community resilience (Uddin et al., 2020a).

The purpose of this study is to examine the role of social learning and local-level institutions in enhancing resilience to flash floods in the wetland communities of Bangladesh. The specific objectives are to: (i) investigate the issues of social learning in diverse learning platforms by the institutions at the local level; (ii) analyze the processes and attributes of social learning; and iii) examine the role of local institutions in translating social learning and

channeling collective attributes toward collective action for strengthening community resilience to flash floods.

3.2 Methods and materials

3.2.1 Study area and research design

The study was carried out in the northeastern region of Bangladesh, in a floodplain union of Sunamganj District which in recent years has experienced frequent flash floods. The District is one of the wettest areas in the Sylhet Division with mean yearly precipitation of 5357.56 mm (SD=784.68 mm) between 1997 and 2016. In 2017, the District experienced three consecutive abnormal flash floods caused by high rainfall in late March, July, and August (Flood Forecasting and Warning Centre (FFWC), 2017). These floods affected around 172,612 households and damaged 102,617 hectares of crops in the Sunamganj district (Kamal et al., 2018).
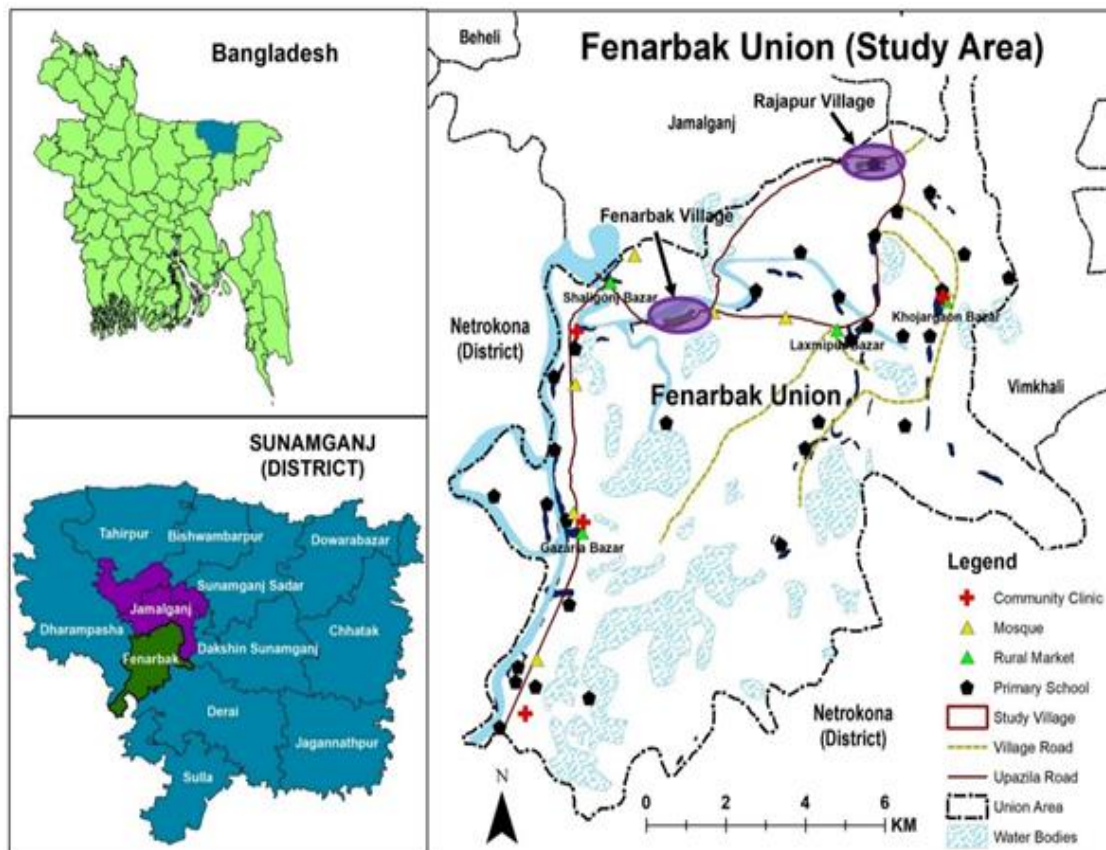
Figure 3:1 The map of the study area

To examine the role of social learning and local-level institutions in enhancing community resilience, we applied a Case Study strategy of inquiry (Yin, 2014) using the framework of qualitative research in the Fenarbak Union of Sunamganj District (Figure 3.1). The Case Study approach (Creswell, 2014; Neuman, 2014) allowed us to investigate the salient processes of social learning and how social learning reshapes mechanisms for collective action towards flash flood risk reduction. The Case Study approach also helped with documenting in-depth insights into social learning within local-level institutions and its role in fostering community resilience.

Two communities were selected for the study: Rajapur and Fenarbak in the Fenarbak Union. The main goal of selecting local-level institutions was to appraise how multi-scale institutions collaborate to foster community resilience through the social learning process. At the community level, various informal institutions – such as the Village Development

Committees (VDC) and faith-based institutions – often organize learning arenas in which groups of community members can interact and share their experiences in order to obtain a collective consensus (Wenger, 1998). Additionally, based on their social learning, several formal and quasi-formal institutions perform flood risk management activities collaboratively. To gain deeper insights into social learning at the formal and quasi-formal institutional level, we selected the Fenarbak Union Parishad (UP), the Union Disaster Management Committee (UDMC), the Project Implementation Committees (PIC), and two local NGOs for in-depth study. It is notable that the UDMC in cooperation with the UP facilitates disaster management activities at the local level. There are 36 members in the UDMC comprising of chairperson, members of the Union *Parishad*, representatives from communities and local voluntary organizations, local NGO officials, and official from government institutions (see Appendix 9 for the composition of the UDMC) (Ministry of Disaster Management and Relief (MoDMR), 2019). These institutes establish social learning platforms in the form of meetings and public hearings in which key actors engage in social interaction in order to take collective measures. Thus, key actors preserve critical knowledge and dynamics of collective measures taken for flood risk management.

3.2.2 Data collection and data analysis

Guided by qualitative research, both primary and secondary data were collected between July and December 2019. A total of 40 face-to-face in-depth interviews using semi-structured questionnaires were administered to elicit key insights into the roles of social learning and local-level institutions in fostering community resilience. The primary data gathering process involved 6 focus group discussions (FGD), 10 semi-structured interviews, 24 key informant interviews (KIIs), and two participant- observation events. Six focus group discussions were conducted with two communities (three from each community), of which one with farmers, one with fishermen, two with females, and two with mixed occupational groups – including

farmers, fishermen, parents, private tutors, and elders. Each FGD meeting involved 8 to 12 participants and lasted between 60 and 75 minutes. FGD meetings typically focused on how the social learning processes took place within the context of flash floods and how it fostered collective resilience-building action. Ten semi-structured interviews with farmers (6) and fishermen (4), who were also members of the Project Implementation Committee (PIC), were conducted to garner field data relating to key social learning of the participants and to record their major concerns resulted from social learning for collective action.

Twenty-four KIIs were also conducted with representatives from formal, quasi-formal, and informal institutions. The Key Informants represented various local stakeholders (Table 3.1). Data provided by the Key informant interviews (KIIs) assisted us in unearth the dynamics of social learning and key concerns identified through social learning processes for collective measures. During the filed investigation, potential participants were recruited using both purposive and snowball sampling procedures (Creswell 2014). Primary data were also supplemented by participant observation. Two participatory learning platforms (i.e. a meeting of the Union Parishad (UP) and a meeting of the Union Disaster Management Committee (UDMC)) were observed to understand how participants interact and nurture their ideas in order to identify key issues and problems and reframe their shared understanding and decision in terms of flood-related collective problems.

Table 3:1 Techniques of data collection and distribution of interviews

Techniques of data collection	Frequency	Participants
Focus group discussions	6	• One FGD with only farmers. • One FGD with only fishermen. • Two FGDs with females. • Two FGDs with mixed occupational groups (e.g. farmers, fishermen, parents, and private tutors).
Semi-structured interviews	10	• Six with farmers. • Four with fishermen.
Key informant interviews	24	• Two with the present and former chairman of the Union Parishad (UP). • Eight with the present members of the UP, who were also members of the Union Disaster Management Committee (UDMC). • Two the former members of the UP • Three with the members of the UDMC representing civil society organizations, such as farmers community, freedom fighters, and a representative from a local NGO. • Four with the local NGOs practitioners. • Two with the government officials working at the Union level. • Three with the representatives of informal institutions, such as the village development committees and mosque committees.
Participant Observation	2 (events)	• Union Parishad meeting. • UDMC meeting.

All data were recorded using an audio-tape recorder and transcribed for data analysis. The transcribed data were analyzed using a data reduction method that assisted in identifying specific issues, simplifying themes, and transforming these themes into codes that were observed in the transcribed data (Miles & Hubermasn, 1994). Utilizing research objectives and guided questions, primary themes and sub-themes were also generated from the transcribed data through running texts. Key primary and sub-themes included were: (i) social learning spaces and the key attributes of learning processes amongst formal, quasi-formal, and informal institutions; (ii) key social learning from learning spaces and its roles in identifying key areas of intervention for collective action; (iii) collective attributes of social learning that foster to adopt collective action; and (iv) dimensions of social learning and local-level institution

facilitated-collaborative measures and their potential implications in building community resilience. To substantiate the dynamics of social learning, secondary documents such as meeting minutes of the UDMC, the UP, and the Ward meetings were also procured.

3.3 Results

3.3.1 Social learning and informal institutions

In the wetland-communities, we identified two informal social learning arenas, such as courtyard meetings and faith-based group meeting arenas. Participants in such learning arenas tend to vary in terms of concerned issues and problems. For example, empirical results from an in-depth analysis of the key informant interviews (KIIs) unveiled that courtyard meetings were mostly facilitated by the village leaders and concerned stakeholders (e.g. farmers and fishers), whereas religious leaders took the lead in faith-based learning arenas. However, one common concern in both informal learning arenas was the need to safeguard and protect collective assets (e.g. roads, mosques, temples). One key lesson which emerged from these informal institutional learning arenas is the community's need to be self-reliant and reduce its dependency on external funding and assistance (Table 3.2).

Table 3:2 Informal institutional arena and social learning process

Learning arena	Problems and key concerned issues	Participants (Who/institutions)	Participatory and interactive processes	What had been learned?	Collective consensus on areas of intervention identified
Courtyard meeting	- Communication systems such as *Gopats* – cattle path - used for communication and transportation of crops from the *hoar* and roads	- Village Development Committees (VDC). - Village leaders. - Community members.	- Addressing possible problems through interactive discussion. - Discussing availability of funds. - Sharing possible time to construct *gopats*.	- Repairing and constructing collective assets like, *Gopats.* requires collective initiatives. - Inability to act collectively may create community-wide hardships. - Collective initiatives will reduce dependency on local government.	- Mobilize necessary funds and human resources. - Opening a joint bank account of VDC to ensure transparency. - Scheduling activities for repairing *Gopats.*
	- Dissemination of flood-related information and protecting embankment	- Villages leaders. - Motivated community members. - The secretary and president of VDC.	- Discussion on how flood-forecasting information can be shared with the entire community quickly. - Seeking opinion on community people can be organized to protect an embankment.	- Protecting the embankments from a sudden onset of flash flood requires a quick release of flood information. - Self-reliance is more important rather than dependence on government institutions. - The elevation of earthen embankments with strong compaction is needed to protect floodwaters.	- Collective decisions for repairing an embankment. - Strengthening social networks with other villagers to speed the dissemination of flood information. - Managing necessary resources and food from the *Union Parishad* during the repairing period. - Disseminating flood-forecasting information using mosque megaphone.
	- Waterlogging	- Farmers and waterbody leaseholders.	- Suffering from waterlogging problem for crop cultivation. - Cost per *hal* (90 decimals) for drying out of water body. - Time of drying out of waterbodies.	- Artificial waterlogging by leaseholders is a major problem that delays in crop cultivation. - Drying out water bodies is a maladaptation practice as it causes drought in the dry season.	- Removing barricades and arranging machine for mitigating waterlogging. - Increasing negotiation power to secure water. - Resolving conflicts between farmers and leaseholders.
	- Children's education	- Parents of school-going children (secondary school), especially women. - Private tutor. - Boatman.	- Participatory discussion for possible ways to continue child's education. - Discussions regarding boat rentals and scheduling.	- Abrupt flood distracts child's education. - Continuing education will reduce the drop-out rate of the children and increase quality of education.	- Arranging a boat for school-going children. - Necessary arrangement to pay rent on a daily basis. - Setting a specific schedule of the boat.

Faith-based group meetings					
				- Without cooperation, children's education during flooding is impossible.	
Faith-based group meetings	- Damage to community-owned properties, such as the mosque, temple, divine trees (*Thakur*), and graveyards	- Faith-based institutes, such as the mosque committee, *imam*, temple committee. - Village leaders, and community members.	- Discussing problems faced in performing religious activities and burying dead bodies. - Identifying major vulnerable areas by visiting collective properties. - Interactive discussions among participants for managing funds.	- Failing to perform religious activities is considered as a sin and a collective problem. - Feeling profanity without repairing faith-based collective properties. - Protecting faith-based properties ensures social harmony in the community.	- Legalizing collective ownership to protect faith-based properties. - Mobilizing funds through personal networks. - Sustainable and long-term solution to the problem measures for protecting damage from floodwater.

Empirical evidence of the study[10] substantiated that community members sought to reduce their external dependency and enhance their self- reliance by repairing and protecting their collective assets to reduce risk to their livelihoods from flash floods. For instance, Village Development Committees (VDC), village leaders, and community members took collective action to repair *gopats* (large cattle path used for communication and transportation of crops), recognizing that the inability to act collectively can lead to community-wide hardship and an over-reliance on local elites that can significantly delay the recovery process. Such learning-driven initiatives were evident after the 2017 flash floods. Based on this learning, they mobilized funds to carry out necessary activities.

In relation to livelihood risks, other areas of collective concern were: i) disseminating information on flash flooding as quickly as possible, and ii) resolving waterlogging problems. It was widely reported by most of the participants that protecting embankments from the sudden onset of flash floods requires speedy dissemination of flood information. This in turn can help with the rapid mobilization of community members to take collective action, reduce dependence on local government institutions such as the local office of the Bangladesh Water Development Board (BWDB).

In-depth interviews with farmers also corroborated that social networks among community people (especially farmers) helped in the resolution of waterlogging problems. Such problems are caused by water body leaseholders, whose interests conflict with those of the farmers. Farmers wish to drain out the excessive water for irrigation whereas leaseholders wish to retain the water for fish production. The results of an in-depth analysis of key informant interviews confirmed that to resolve this conflict, a learning platform was created to facilitate the negotiation process between farmers and the *haor* leaseholders. As part of negotiation

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[10] It was widely reported by most of the study participants.

process, farmers had to pay BDT 170 (USD 2.05) per *hal* (a local measure of land; ninety decimals is equivalent to one *hal*) to leaseholders to drain out water from inside the *haor*. However, some farmers pointed out that drying out the *haor* leads to water shortages and irrigation problems during the dry season and can increase the cost of crop production, as one respondent explained:

> *"We were unable to plant crops in a timely manner due to prolonged waterlogging created by the leaseholders. For addressing the waterlogging problem, we had to negotiate and settle for drying out a waterbody as he placed a barricade to restrict our access and keep the water for fishing. Though we suffer from water crisis after drying out water bodies, we are bound to do to get rid of logged water so that we could cultivate our crops".*

Other collective initiatives included those directed towards protecting faith-based properties (e.g. graveyards, mosques, and temples) and safeguarding children's education. Community members sought to find sustainable and long-term solutions to both of these problems. Recognizing that protecting faith-based properties ensures social harmony in the community, different stakeholders including village leaders and faith leaders came to the decision to give collective properties a legal status.

In-depth discussion with parents and private tutors revealed that sudden flash floods were undermining their children's education. Therefore, a group-based social learning process involving parents, teachers, and boatmen attempted to reduce drop-out rates by establishing regular ferry services to and from school.

3.3.2 Formal and quasi-formal institutional spaces and social learning processes

Empirical analysis of the qualitative data demonstrated that several learning platforms, such as public hearings, Ward Council (a sub-unit of Union *Parishad*, usually consisted of two or three villages) meetings, monthly and emergency meetings, quarterly meetings, and co-committee meetings were functioning at the formal and quasi-formal institutional levels. Such diverse learning arenas emerged in order to address the many challenges faced by local people and institutions in reducing their vulnerability to flash floods. Several aspects thus varied in terms of learning arenas which included key actors, issues of reflective discussions, learning, and the community major concerns (Table 3.3). Like informal learning spaces, an example of key social learning that emerged in the formal institutional learning arenas was the community's desire to be self-reliant and reduce their dependency on external funding and assistance.

We identified three formal institutional learning arenas: UP and UDMC meetings, Ward Council meetings, and quarterly feedback meetings organized by NGOs. Of these, the latter two provided relatively more space for vulnerable community people to share their experiences and concerns. For example, in-depth conversation with key informants unveiled that multi-stakeholders learning occurred at the Ward level that was generated explicitly through a shared understanding to establish a coordinated effort to protect community properties and manage relief items. Consequently, these learning platforms paved the way to obtaining necessary demands from local governments.

It was evident from the data that the most common concern expressed at the formal institutional level was with reducing communities' vulnerability to flash floods through preparedness and managing the adverse effects of flash floods through efficient and timely relief operations. The key lessons which emerged from these discussions included: i) anticipatory preparedness was required to arrange relief before the onset of flash floods; ii) relief packages needed to be culturally appropriate; iii) there was a need to enhance the

financial and technical capacities of local institutions, and iv) coordination and partnership between institutions and community members was required in order to carry out effective response, evacuation, and recovery operations. Collective consensus reached through the participatory-learning process included: i) ensuring equity and justice in relief operation; ii) engaging multiple stakeholders (e.g. primary schools, religious leaders, local businessmen, and community volunteers) in preparedness, evacuation, and recovery operations; iii) prioritizing the list of vulnerable groups to resolve conflicts; and iv) maintaining international standards for relief items and being sensitive to cultural concerns such as dietary restrictions. In this respect, one key informant, a manager of a local NGO office, stated:

> *We purchased parboiled rice from Satkhira. But local people did not like to eat parboiled rice. They preferred to eat white rice (atop chal). They could not cook parboiled rice. Many villagers needed relief items distributed in 2017. Later, we decided not to purchase parboiled rice.*

The results of an in-depth examination of key informant interviews affirmed that sometimes participatory learning spaces are jointly managed by formal (e.g. Union Parishad) and quasi-formal institutions (e.g. School Managing and Project Implementation Committees). Examples of such joint undertakings are public hearing and co-committee meetings (Table 3). Unlike formal institutional learning spaces, these spaces are less imbued with power relations. Consequently, community people have greater opportunities to meaningfully participate in discussions and decision-making. For instance, interviews with the members of project implementation committees (PIC) substantiated that public discussions on problems with crop production and embankment maintenance, for instance, created an opportunity for farmers to share their concerns. It was noted that the current practice of embankment management by the Bangladesh Water Development Board (BWDB) was unsustainable and created long-term problems such as increasing siltation inside the *haor*. This discussion revealed that ensuring

farmers' ownership and participation in the decision-making process could reduce institutional inefficiency and lead to better management of the embankment.

Another example of a joint undertaking was co-committee meetings, which involved parents, staffs of local NGOs, members of the School Managing Committee (SMC), teachers, and boatmen. Field evidence[11] revealed that the concern here was the declining educational performance of the secondary-school going children in the community. This issue was also a matter of discussion in the informal learning arenas discussed above.

The *modus operandi* were different. In case of informal learning space, parents sought to solve the problem on their own while the quasi-formal co-committee preferred to spread out the responsibility and burden among multiple stakeholders and institutions. For example, co-committee decided to rent seven engine-driven boats, BDT 1000 (USD 12.42) as rent per boat, for the secondary school going children. A local NGO provided BDT 700 (USD 8.69) and parents paid the rest for renting the boat. The committee also monitored the overall process to ensure safety and security of the children during flooding.

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[11] The results were reported by most of the key informants.

Table 3:3 Formal and quasi-formal institutional arenas and social learning process

Learning arena	Problems and key concerned issues	Participants (Who/institutions)	Participatory and interactive processes	What had been learned?	Collective consensus on area of intervention identified
Public hearing	-Crop-protection embankments	- Farmers. -Members of the Project Implementation Committee (PIC). - Members of the UP. - Officials of the Bangladesh Water Development Board (BWDB).	- Public interaction with key officials of the BWDB. - Farmers sharing their personal experiences and major problems of crop-protection dams. - Discussing major damages of crop-protection embankments.	- Protecting crops requires collective consensus that whoever owns the land owns the embankment (*jami jar badth tar*). - Ensuring farmers' ownership of crop-protection embankments can reduce institutional procrastination and corruption in repairing the embankments. - Current institutional practice of embankment repair causes siltation in the *haor* basin.	- Ensuring mutual trust through monitoring of the works. - Establishing partnerships and collaboration between farmers and BWDB to manage the embankments. - Involving multiple stakeholders to ensure transparency and accountability. - Ensuring mutual trust through monitoring of maintenance and repair work.
Ward council meetings	-Identification of major vulnerabilities - Prioritization of development-related works	- All community members. - The chairman. - The members of the UP and UDMC. - Officials of the UP. - Local politicians.	- Addressing key vulnerabilities of communities and collective-owned resources by villagers. - Providing equal opportunity to address key problems.	- Food support needs to be continued until the next harvest. - Flood victims were unable to recover the loss 100% and thus suffered severely. - Understanding actual sufferings is important rather than only considering vulnerability.	- Establishing coordination between villagers and the Union Parishad to protect common properties. - Organizing relief items until the next harvest.
Monthly and emergency meetings of the UDMC and UP	- Preparedness of flash floods - Vulnerable areas and groups - Relief items	- The chairman. - Members of the *Union Parishad* (UP). - The members of the Union Disaster Management Committee (UDMC).	- Sharing the flooding situation of the respective villages. - Discussing the current needs of people. - Distribution of relief items as early as possible. - Key community problems addressed by respective members of each Ward. - Discussing errors in decisions (e.g. constructing roads without guide walls) - Democratic systems for collective decisions.	- Anticipatory preparedness is required to arrange relief before onset of flash floods. - Engaging volunteers or community members in disseminating flood-related information. - UDMC requires a contingency fund to carry out prompt relief operations. - Only providing relief fails to reduce vulnerability. - The crisis of relief items in the local market during flooding increases vulnerability.	- New items must be included in relief packages such as charger light and firebox. - Organizing delivery system at the shelter Center. - Decision to engage primary schools, religious leaders (e.g., imams), local businessmen, and community volunteers in preparedness, evacuation, and recovery operations. - Nurturing risk-informed collective decisions for flood risk management.

				Low investment in flood risk reduction is not sustainable.	
Quarterly and feedback meeting of NGOs	-Management of relief items and distribution of relief	- NGO project representatives. - Local NGO office managers.	- Sharing problems faced in the distribution of relief. - Discussing errors regarding the distribution of relief. - Agreements and disagreements in selecting vulnerable groups.	- Delayed relief can increase the suffering of the flood-affected people. - Selection of relief items needs to account for cultural issues like dietary restrictions. - Violating international humanitarian standards defames institutional goodwill.	- Deciding to purchase relief items from the local market. - Prioritizing the list of vulnerable groups to resolve overlapping and conflicts.
Co-committee meeting	- Education for secondary school-going children.	- Parents. - Staff of Local NGOs. - Members of the School Managing Committees (SMC). - Teachers and boatmen.	- Sharing the impacts of floods on education. - Sharing ideas for the selection of suitable boats and boatmen.	- Sharing of risk and burden can reduce the cost of transportation. - Involving all parties ensures the security of children and the quality of education during flooding.	- Establishing an institutional network between parents, teachers, and local NGOs. - Co-committee for monitoring and observing the school boats. - Collective and participatory responsibilities of all parties.

3.3.3 Role of local institutions in adopting social learning, collective action, and their potential implications for disaster resilience

Based on our findings, as depicted in Table 3.2 and Table 3.3, we trace out a set of collective process attributes that fostered social learning in the studied community. Through the process attributes (e.g. collective interaction and information sharing), social learning helped resolve conflicts, enhance partnership, reach collective consensus, and mutual agreement. Such collective attributes of social learning helped local institutions identify a set of interventions for reducing risk and building resilience (Figure 3.2).
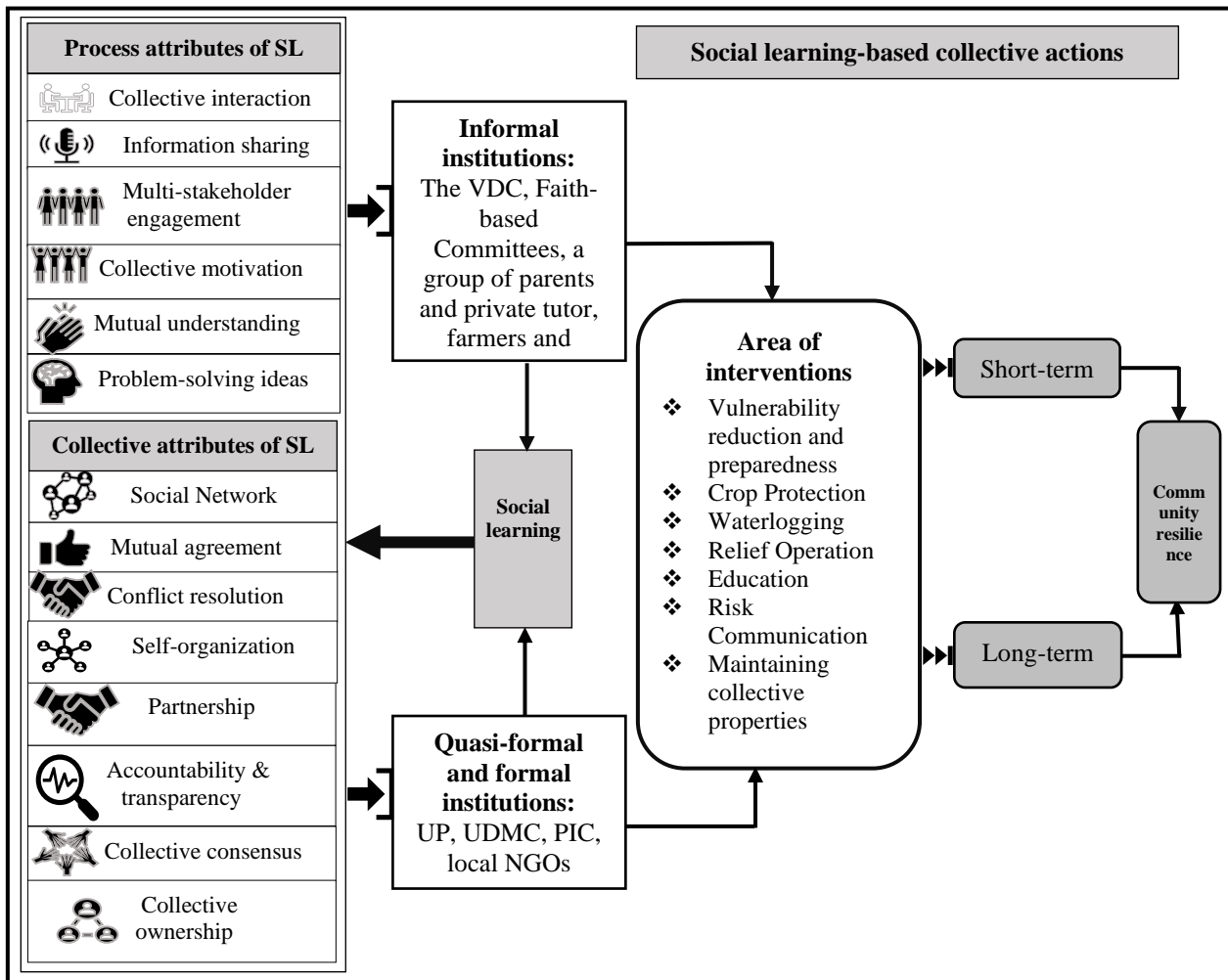
Figure 3:2 A schematic diagram on the connection among social learning, local institutions, and collective action

There are some clear differences between the interventions carried out by these various institutions. First, the short-term and long-term actions of some institutions (both formal and informal) are limited to specific areas, while others took action in multiple areas. This implies that certain institutions specifically emerged to address specific issues. For example, empirical results of key informant and semi-structed interviews unearthed that the co-committee only took action on education-related issues, while the VDC took both short- and long-term actions to address issues involving vulnerability, improving communication systems, and protecting collective properties (Table 3.4).

Table 3:4 Social learning-based collective action in terms of local institutions

Types of institutions		Area of interventions	Social learning-based collective action		Potential implications for community resilience
			Short-term	Long-term	
Informal institutions	The Village Development Committees (VDC)	-Vulnerability reduction. -Maintaining collective properties and crop protection.	- Putting soil, sacks of soil, and bamboo fence around the embankment. - A bamboo bridge between two *mahallas* (neighborhoods). - Rotation-based bamboo bridge by the *mahallas*.	- Constructing cattle paths (*gopats*) and roads. - Repairing flood protection wall.	- Enhancing community's self-reliance in protecting community-owned resources. - Improving communication system results in the reduction of damage to houses and crops. - Enhancing knowledge and skills on how to deal with collective problems.
	A group of farmers and leaseholders	-Waterlogging.	- Drying out waterbodies for crop cultivation.	**NA**	-Cultivating crops.
	Faith-based institutions i.e. Mosque, temple	-Maintaining collective properties.	- Placing sandbags around the boundary of the mosque. - Placing sand and vegetation around the temple.	- Building mosque protection walls and staircases for communication. - Constructing protection walls around graveyards. - Constructing protection walls around *Thakur Gach* (divine tree).	- Fostering social and religious values at the community level. - Increasing societal cohesion.
Quasi-formal and formal Institutions	The Project Implementation Committee (PIC)	-Crop protection	-Repairing crop-protection embankment in the post-flood.	-Shifting the repairing work of crop-protection dam from BWDB to PIC.	-Capacity to harvest crops before flash floods. -Economic solvency to pay unpaid loans. - Timing the harvest to increasing resilience to flooding.
	Co-committee	-Education.	-Engine-driven boat during flooding.	**NA**	-Ensuring education for children.
	The *Union Parishad*	-Vulnerability reduction and relief operation	-Distributing relief items, such as rice, dry food, sugar, charger light, and oral saline. --Providing bamboo, fences, sacks, and dry food for repairing embankment during flooding.	-Distributing 30-kilogram rice and BDT 500 per month until the next harvesting. -Corrugated iron and bamboos for constructing house. -Constructing bamboo-bridge on the road. -Repairing roads. -Reforming the committee of the UDMC.	- Empowering key local government agents to perform future maintenance and repair work. - Reducing communication cost.
	The UDMC	-Risk communication	- Disseminating flood-related information through mosque, temples, volunteers, and social media. - Establishing a 24/7 control room and mobile response team. - Managing primary school key for preparing temporary shelter. - Rescuing and evacuating. - Arranging a delivery system at the shelter centre.	**NA**	- Observing flood situation to increase flood prediction capability. - Enhancing managerial skills of local institutions. - Enhancing institutional preparedness capacity to manage resources during and after floods. - Improving risk communication systems.
	Local NGOs	-Relief operation	- Distributing relief items, such as rice, soap, bucket, menstrual hygiene kits.	- Engine-driven boat for secondary school-going children.	- Immediate response minimizing their livelihood complications.

Second, some interventions were found to be limited to formal institutions. For example, interviews with the members of the UDMC revealed that short- and long-term actions for risk communication and relief operation are only carried out by the UP, the UDMC, and NGOs. However, such actions were often carried out in collaboration with other formal and informal institutions. The key lesson drawn from such collaboration was a realization of the benefits derived from sharing risk and responsibility, among people and institutions. For instance, formal local institutions (i.e. UDMC) maintain a social learning-based network to gather and disseminate flood-related information. To this end, the UDMC enacted several short-term measures in collaboration with other informal institutions, including i) using community resources (mosque megaphones) and social platforms (e.g. Facebook); ii) establishing a 24/7 control room and mobile response team.

Third, social learning facilitated self-organization capacity and engaged multiple stakeholders in collective measures. For example, interviews with potential participants indicated that long-term strategies for the reduction of vulnerability (e.g. repairing roads and constructing bamboo bridges) were jointly implemented by the Union Parishad and the VDC; in particular, the UP provided the necessary resources while the VDC mobilized community members to engage in collaborative work. The construction of crop-protection embankments was also an example of collective understanding and action. While the BWDB was responsible for financial and technical assistance, the engagement of multiple stakeholders – e.g. the UP, the PIC, officials of the BWDB, and farmers - in the collaborative work played a substantial role in ensuring quality, accountability, and transparency. These collaborative efforts were essential to augmenting crop harvesting capacity and reducing transaction costs.

However, some pitfalls were also evident in the collaboration process. While risk-reduction measures enacted prior to the catastrophic 2017 floods resulted in significantly

reduced property damage and loss of life, poor collaboration by the local political leaders hindered the relief distribution process and the implementation of flood management projects. Poor coordination was also observed between formal and quasi-formal institutions. Collaboration with non-government institutions, such as NGOs, volunteers, and local trader associations was only facilitated when a particular need emerged during the flash flood crisis.

3.4 Discussion

We set out to investigate the role of social learning and local-level institutions in enhancing resilience to flash floods in the wetland communities of northeastern Bangladesh. We draw three broad conclusions based on our findings: i) diversity and flexibility of local-level institutions help to harness social learning from disaster shocks; ii) institutional collaboration can facilitate social learning-based collective action; and iii) communities' desire and willingness to be self-reliant led to the emergence of collective action for strengthening community resilience.

Catastrophic nature-triggered disasters create diverse opportunities for learning and change (Birkmann et al., 2008; Choudhury & Haque, 2018; Davidsson, 2020). Such opportunities can be captured when there is a diversity of institutions operating at the local level. Our findings reveal that the 2017 flash floods created many opportunities for social learning; different local institutions (formal, informal, and quasi-formal) created different learning arenas for the local community to share their experiences and concerns. For example, informal institutions created courtyard and faith-based arenas while quasi-formal institutions created public hearing and co-committee learning areas. Problems and issues discussed in each type of institution are typically different. These learning spaces are different compared to formal institutional learning arenas, such as UP and UDMC meetings. Flood-triggered learning spaces at the informal institutional level were more self-organized, whereas quasi-formal and

formal institutional learning platforms followed structured and relatively inflexible institutional procedures.

Diversity permits local level institutions to nurture diverse perspectives and values (Berkes, 2012), which are important to enhancing knowledge, skills, and adaptive capacity (Koontz, Gupta, Mudliar, & Ranjan, 2015; Ostrom, 2005). We document that diversity of institutions facilitates in addressing issues and problems from multiple sectors, such as livelihood, education, and health. For example, discussions conducted in informal learning arenas were by and large concerned with protecting collective properties and individual livelihoods while issues related to managing disasters through relief, response, and evacuation were discussed chiefly in formal institutional arenas. Key knowledge such as the inclusion of new items, such as fireboxes and charger lights in relief packages and organizing delivery supplies at the shelter centers for pregnant mothers played an essential role in mitigating flood-related vulnerability at the local community level. In summary, empirical results of our study affirmed that institutional diversity has created opportunities for nurturing diverse problem-solving ideas and knowledge at the local level.

Participants varied widely in the learning arenas they attended and the issues which concerned them. Some learning arenas attracted a specific set of stakeholders while others hosted a more diverse group. The diversity of participants allowed a more varied range of opinions, ideas, and experiences to be expressed, which eventually led to a common understanding and collective consensus on required areas of intervention. Berkes (2007) in this regard highlights that diversity of actors and stakeholders assists in incorporating diverse learning and ideas and framing and reframing of issues and problems, which eventually creates arenas for action (also see Ostrom, 2005).

Joint undertakings by formal and quasi-formal institutions were more flexible compared to formal learning arenas, which helped collectively identify problems and possible solutions. Flexibility in learning spaces, especially public hearings, ward councils, and courtyard meetings generated more opportunities for vulnerable groups to share their experiences and concerns. Tran et al.'s research (2018) on farmers in the Vietnamese Mekong Delta and Lumosi et al.'s study (2019) on several committees of Zambezi Basin management in Zambia documented similar findings.

Institutional collaboration facilitated social learning-based collective action for enhancing resilience. Cross-level institutional collaborations are recognized as critical components for generating community resilience (Berkes, 2017; Choudhury et al., 2019). Our study documented that some informal and formal institutions were collaborating vertically and horizontally during the pre and post-flood periods. In the wetland communities, a strong collaboration was instituted between formal institutions (e.g. the UP and UDMC) and informal institutions (faith-based institutions, volunteers, and community members) for disseminating flood-related information and taking collaborative measures to repair community-owned properties. A recent study on the dissemination of flood forecasting information and the evacuation during the 2017 Bangladesh flash floods reveals that collaborative actions taken by Community-based Organizations (CBOs), volunteers, and local NGOs played key roles in lessening the vulnerability of flood-affected populations in northern Bangladesh (Sultana, Thompson, & Wesselink, 2020). These community-based organizations foster collective capital at the local level, which is key to taking collective action in the face of uncertainty.

The vertical collaborations among the Union *Parishad*, the UDMC, the PIC, the local office of BWDB, and the Upazila office took place for receiving financial and technical supports by the village-communities. For example, local level community-based organizations

and institutions worked together to provide financial assistance and monitoring for the construction of crop-protection embankments.

Flood management processes can be strengthened through participatory work (O'Donnell, Lamond, & Thorne, 2018). However, poor collaboration was also evident among the BWDB, PIO (the Project Implementation Officer), volunteer groups, and NGOs. Other factors that hampered collaboration were lack of financial supports, the political influence of key actors in the decision-making process, and tendency to work as disparate sectors.

Social learning fosters a precondition for enhancing community resilience through sharing experiences and knowledge and creating a range of opportunities for adapting to environmental change (Berkes, 2009; de Kraker, 2017). Our findings reveal that social learning performed a key role in encouraging collective risk reduction actions. One of the key themes we identified was the community's desire and willingness to be self-reliant and reduce its dependency on external funding and assistance. Such learning emerged through the process of collective interaction, sharing, and multi-stakeholders' participation, eventually resulting in mutual agreement, partnership, and conflict resolution. These sets of collective attributes facilitated both formal and informal institutions taking both short-term and long-term actions for strengthening community resilience. Our findings are also consistent with other studies conducted in similar regions of Bangladesh (Choudhury & Haque, 2016; O'Donnell et al., 2018; Uddin, Haque, Walker, & Choudhury, 2020b).

3.5 Conclusions

We found that local-level institutions create diverse arenas for social learning. Learning spaces emerged from collective concerns about reducing vulnerability and protecting collective properties. Our results reveal that while learning arenas generate context-specific social learning from flash flood experiences, the goal of arenas as a whole is to foster social learning

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for building community resilience against flash floods. To this end, learning arenas within local-level institutions create opportunities for social interaction, deliberation, problem solving, and the generation of collective knowledge and action.

Our empirical study reveals that persistent institutional diversity at the local level is key to engaging multiple stakeholders in social learning. In order to create a resilient community, local institutions must foster various collective properties – including collective ownership, shared understanding, social networks, partnerships, and collaboration (Dale, 2013). Utilizing these properties, local-level institutions translate social learning into collective action (Berkes, 2009; Choudhury et al., 2019). However, several key constraints hinder the social learning process and collective action, including poor collaboration among local institutions and community members.

Our results suggest several overall policy recommendations. Firstly, institutional diversity is key to nurturing diverse knowledge and formulating decisions for collective action. Secondly, local-level institutions are a repository of knowledge and must thus be encouraged to more systematically apply knowledge of past flood experiences to disaster management and vulnerability-reduction initiatives. Institutional culture may also create constraints for social learning. Removing social barriers and strengthening local institutions are thus essential for fostering social learning as greater flexibility results in more creative and effective problem-solving. Future studies, therefore, should investigate how persistent barriers constrain social learning and the process of its transformation into collective action.

3.6 References

Armitage, D., Marschke, M., & Plummer, R. (2008). Adaptive co-management and the paradox of learning. *Global Environmental Change*, *14*(1), 86–98. https://doi.org/10.1016/j.gloenvcha.2007.07.002

Baird, J., Plummer, R., Haug, C., & Huitema, D. (2014). Learning effects of interactive decision-making processes for climate change adaptation. *Global Environmental Change*, *27*(1), 51–63. https://doi.org/10.1016/j.gloenvcha.2014.04.019

Benson, D., Lorenzoni, I., & Cook, H. (2016). Evaluating social learning in England flood risk management: An "individual-community interaction" perspective. *Environmental Science and Policy*, *55*, 326–334. https://doi.org/10.1016/j.envsci.2015.05.013

Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards*, *41*(2), 283–295. https://doi.org/10.1007/s11069-006-9036-7

Berkes, F. (2009). Evolution of co-management : Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692–1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Berkes, F. (2012). *Sacred Ecology*. New York, NY: Routledge.

Berkes, F. (2017). Environmental governance for the anthropocene? Social-ecological systems, resilience, and collaborative learning. *Sustainability*, *9*(7), 1232-. https://doi.org/10.3390/su9071232

Berkes, F., & Ross, H. (2013). Community resilience: Toward an integrated approach. *Society and Natural Resources*, *26*(1), 5–20. https://doi.org/10.1080/08941920.2012.736605

Birkmann, J., Buckle, P., Jaeger, J., Pelling, M., Setiadi, N., Garschagen, M., … Kropp, J.

(2008). Extreme events and disasters: a window of opportunity for change? Analysis of

organizational, institutional and political changes, formal and informal responses after

mega-disasters. *Natural Hazards*, *55*(3), 637–655. https://doi.org/10.1007/s11069-008-

9319-2

Choudhury, M.U.I., & Haque, C. E. (2018). Interpretations of resilience and change and the

catalytic roles of media: A case of Canadian daily newspaper discourse on natural

disasters. *Environmental Management*, *61*(2), 236–248. https://doi.org/10.1007/s00267-

017-0980-7

Choudhury, M. U. I., & Haque, C. E. (2016). "We are more scared of the power elites than

the floods": Adaptive capacity and resilience of wetland community to flash flood

disasters in Bangladesh. *International Journal of Disaster Risk Reduction*, *19*, 145–158.

https://doi.org/10.1016/j.ijdrr.2016.08.004

Choudhury, M. U. I., Haque, C. E., Nishat, A., & Byrne, S. (2020). Social learning for

building community resilience to cyclones: Role of indigenous and local knowledge,

power, and institutions in coastal Bangladesh. *Ecology and Society.* Accepted on 23

November 2020.

Choudhury, M. U. I., Uddin, M. S., & Haque, C. E. (2019). "Nature brings us extreme events,

some people cause us prolonged sufferings": The role of good governance in building

community resilience to natural disasters in Bangladesh. *Journal of Environmental

Planning and Management*, *62*(10), 1761–1781.

https://doi.org/10.1080/09640568.2018.1513833

Collins, K., & Ison, R. (2009). Jumping off Arnstein's ladder: Social learning as a new policy

paradigm for climate change adaptation. *Environmental Policy and Governance*, *19*(6),

358–373. https://doi.org/10.1002/eet.523

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles: Sage Publications Ltd.

Cutter, S. L., Barnes, L., Berry, M., Burton, C., Evans, E., Tate, E., & Webb, J. (2008). A place-based model for understanding community resilience to natural disasters. *Global Environmental Change*, *18*(4), 598–606. https://doi.org/10.1016/j.gloenvcha.2008.07.013

Dale, A. (2013). Agency: Individual "fit" and sustainable community development. *Community Development Journal*, *49*(3), 426–440. https://doi.org/10.1093/cdj/bst055

Davidsson, Å. (2020). Disasters as an opportunity for improved environmental conditions. *International Journal of Disaster Risk Reduction*, *48*, 101590. https://doi.org/10.1016/j.ijdrr.2020.101590

de Kraker, J. (2017). Social learning for resilience in social–ecological systems. *Current Opinion in Environmental Sustainability*, *28*, 100–107. https://doi.org/10.1016/j.cosust.2017.09.002

Ensor, J., & Harvey, B. (2015). Social learning and climate change adaptation: Evidence for international development practice. *Wiley Interdisciplinary Reviews: Climate Change*, *6*(5), 509–522. https://doi.org/10.1002/wcc.348

Flood Forecasting and Warning Centre (FFWC). (2017). *Annual flood report 2017*. Retrieved from Flood Forecasting and Warning Centre (FFWC), Dhaka website: http://www.ffwc.gov.bd/images/annual17.pdf, accessed on 15 June, 2018.

Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: Integrating resilience, adaptability and transformability. *Ecology and Society*, *15*(4), 20-. https://doi.org/10.2967/jnumed.116.180406

Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van den Brink, M., Jong, P., …
Bergsma, E. (2010). The adaptive capacity wheel: A method to assess the inherent
characteristics of institutions to enable the adaptive capacity of society. *Environmental
Science and Policy*, *13*(6), 459–471. https://doi.org/10.1016/j.envsci.2010.05.006

Intergovernmental Panel on Climate Change (IPCC). (2012). *Managing the risks of extreme
events and disasters to advance climate change adaptation*. Cambridge: Cambridge
University Press.

Johannessen, Å., & Hahn, T. (2013). Social learning towards a more adaptive paradigm?
Reducing flood risk in Kristianstad municipality, Sweden. *Global Environmental
Change*, *23*(1), 372–381. https://doi.org/10.1016/j.gloenvcha.2012.07.009

Kamal, A. S. M. M., Shamsudduha, M., Ahmed, B., Hassan, S. M. K., Islam, M. S., Kelman,
I., & Fordham, M. (2018). Resilience to flash floods in wetland communities of
northeastern Bangladesh. *International Journal of Disaster Risk Reduction*, *31*, 478–
488. https://doi.org/10.1016/j.ijdrr.2018.06.011

Koontz, T. M., Gupta, D., Mudliar, P., & Ranjan, P. (2015). Adaptive institutions in social-
ecological systems governance: A synthesis framework. *Environmental Science and
Policy*, *53*, 139–151. https://doi.org/10.1016/j.envsci.2015.01.003

Lebel, L., Grothmann, T., & Siebenhüner, B. (2010). The role of social learning in
adaptiveness: Insights from water management. *International Environmental
Agreements: Politics, Law and Economics*, *10*(4), 333–353.
https://doi.org/10.1007/s10784-010-9142-6

Lei, Y., Yue, Y., Zhou, H., & Yin, W. (2014). Rethinking the relationships of vulnerability,
resilience, and adaptation from a disaster risk perspective. *Natural Hazards*, *70*(19),
609–627. https://doi.org/10.1007/s11069-013-0831-7

Lumosi, C. K., Pahl-Wostl, C., & Scholz, G. (2019). Can 'learning spaces' shape
    transboundary management processes? Evaluating emergent social learning processes in
    the Zambezi basin. *Environmental Science and Policy*, *97*, 67–77.
    https://doi.org/10.1016/j.envsci.2019.04.005

Mancini, J. A., Bowen, G. L., & Martin, J. A. (2005). Community social organization: A
    conceptual linchpin in examining families in the context of communities. *Family
    Relations*, *54*(5), 570–582. https://doi.org/10.1111/j.1741-3729.2005.00342.x

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded
    sourcebook*. Thousand Oaks, CA: SAGE Publications, Inc.

Ministry of Disaster Management and Relief (MoDMR), 2019). Standing order on disasters
    2019. Retrieved from Ministry of Disaster Management and Relief, Dhaka website:
    https://modmr.gov.bd/sites/default/files/files/modmr.portal.gov.bd/policies/7a9f5844_76
    c0_46f6_9d8a_5e176d2510b9/SOD%202019%20_English_FINAL.pdf, accessed on 5
    November 2020.

Neuman, W. L. (2014). *Social research methods: Qualitative and quantitative approaches*.
    Edinburgh: Pearson Education Limited.

O'Donnell, E. C., Lamond, J. E., & Thorne, C. R. (2018). Learning and action alliance
    framework to facilitate stakeholder collaboration and social learning in urban flood risk
    management. *Environmental Science and Policy*, *80*, 1–8.
    https://doi.org/10.1016/j.envsci.2017.10.013

Ostrom, E. (2005). *Understanding institutional diversity*. New Jersey: Princeton University
    Press.

Purdon, M. (2003). The nature of ecosystem management: Postmodernism and plurality in
    the sustainable management of the boreal forest. *Environmental Science and Policy*,

6(4), 377–388. https://doi.org/10.1016/S1462-9011(03)00064-9

Reed, M. S., Evely, A. C., Cundill, G., Fazey, I., Glass, J., Laing, A., … Stringer, L. C.

(2010). What is social learning? *Ecology and Society*, *15*(4). https://doi.org/10.5751/ES-

03564-1504r01

Rist, S., Chidambaranathan, M., Escobar, C., Wiesmann, U., & Zimmermann, A. (2007).

Moving from sustainable management to sustainable governance of natural resources:

The role of social learning processes in rural India, Bolivia and Mali. *Journal of Rural*

Studies, 23,23–37 https://doi.org/10.1016/j.jrurstud.2006.02.006

Rodela, R. (2011). Social learning and natural resource management: The emergence of three

research perspectives. *Ecology and Society*, *16*(4), 30–. https://doi.org/10.5751/ES-

04554-160430

Rodela, R. (2013). The social learning discourse: trends, themes and interdisciplinary

influences in current research. *Environmental Science and Policy*, *25*, 157–166.

https://doi.org/10.1016/j.envsci.2012.09.002

Steyaert, P., Barzman, M., Billaud, J. P., Brives, H., Hubert, B., Ollivier, G., & Roche, B.

(2007). The role of knowledge and research in facilitating social learning among

stakeholders in natural resources management in the French Atlantic coastal wetlands.

Environmental Science and Policy, *10*(6), 537–550.

https://doi.org/10.1016/j.envsci.2007.01.012

Strauss, A. (1978). A social world perspective. *Creating Sociological Awareness*, *1*, 119–128.

https://doi.org/10.4324/9780203794487-18

Sultana, P., Thompson, P. M., & Wesselink, A. (2020). Coping and resilience in riverine

Bangladesh. *Environmental Hazards*, *19*(1), 70–89.

https://doi.org/10.1080/17477891.2019.1665981

Tàbara, J. D., Dai, X., Jia, G., McEvoy, D., Neufeldt, H., Serra, A., … West, J. J. (2010). The climate learning ladder. A pragmatic procedure to support climate adaptation. *Environmental Policy and Governance*, *20*(1), 1–11. https://doi.org/10.1002/eet.530

Tran, T. A., James, H., & Pittock, J. (2018). Social learning through rural communities of practice: Empirical evidence from farming households in the Vietnamese Mekong Delta. *Learning, Culture and Social Interaction*, *16*(October 2017), 31–44. https://doi.org/10.1016/j.lcsi.2017.11.002

Uddin, M. S., Haque, C. E., & Khan, M. N. (2020a). Good governance and local level policy implementation for disaster-risk-reduction: Actual, perceptual and contested perspectives in coastal communities in Bangladesh. *Disaster Prevention and Management: An International Journal*. https://doi.org/10.1108/DPM-03-2020-0069

Uddin, M. S., Haque, C. E., Walker, D., & Choudhury, M. U. I. (2020b). Community resilience to cyclone and storm surge disasters: Evidence from coastal communities of Bangladesh. *Journal of Environmental Management*, *264*(September 2019). https://doi.org/10.1016/j.jenvman.2020.110457

Wenger, E. (1998). *Communities of practice: Earning, meaning, and identity*. Cambridge: Cambridge University Press.

Yin, R. K. (2014). *Case study research : Design and methods*. *SAGE*. Los Angeles : SAGE.

Young, O. R. (2002). *The institutional dimensions of environmental change: Fit, interplay, and scale*. Massachusetts: The MIT Press.

Chapter 4: Discussion and Conclusions

4.1 Introduction

The main goal of my thesis research was to examine the role of social learning in enhancing community resilience to flash floods in northeastern Bangladesh. Using a Case Study approach, the present study offers key insights into how social learning has been a cornerstone in fostering flood-related knowledge for enhancing community resilience.

Recognizing that learning and reflections from changes in evolving precarious situations assures emerging vulnerabilities. To avert unavoidable situations in the future, learning instigates to transform risks through changing existing practices (Kates, Travis, & Wilbanks, 2012). However, the growing body of literature in examining community resilience primarily emphasizes on the identification of coping and adaptation techniques (e.g., Fakhruddin & Rahman, 2014; Islam, Ingham, Hicks, & Kelly, 2018); inadequate attention has yet been paid to examine how learning from experiencing risks and uncertainty fosters innovative adaptation techniques. Consequently, this thesis has emphasized to fill this gap by examining how social learning from flood experience generates innovative coping and adaptation techniques to foster community resilience.

A number of research pertinent to social learning have been conducted on various thematic areas, such as forest management (Assuah & Sinclair, 2019), water governance (Pahl-Wostl, 2019), floodplain management (Johannessen & Hahn, 2013), and policy learning (Haque, Choudhury, & Sikder, 2019). A substantial gap exists in studies on social learning relating to disaster-risk and its role in enhancing resilience at the community as well as the institutional levels. This thesis research therefore was undertaken to advance our understanding of social learning practices at the local level and how local institutions transform social learning through collaborative measures into community resilience to flash floods. The specific

objectives of this research were to: i) examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level; ii) investigate the social learning processes of the local institutions in the context of flash flood disasters; and iii) examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

The following Section is intended to offer an overview on these critical aspects in the context of wetland communities in Bangladesh.

4.2 Key findings of the study

To understand overall insights into my thesis, this section provides a synthesis of the results pertinent to the three objectives. Key findings in connection with the objectives of my thesis have been presented in Table 4.1. Brief explanations of key results have been given below.

Table 4:1 Major results of the study corresponding with the objectives of the study

Key thematic areas	Objective One: To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level.	Objective Two: To investigate the social learning processes of the local institutions in the context of flash flood disasters.	Objective Three: To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.
Flood memory as an integral element of social learning has been fostering flood-related knowledge to withstand flash floods.	√		
Extensive experiences related to floods and livelihood stresses create opportunities for social learning, which advances knowledge for enhancing resilience.	√		
Social learning is about adaptation to, and transformation of, flood-related risk into resilience through integrating local and external innovations.	√		
Learning arenas vary between local-level institutions in terms of the scale of problems, but large-scale arenas provide ample opportunity to raise more voice for problem formulation.		√	√
More diversity in local institutions means a greater possibility to nurture diverse knowledge in dealing with complex problems.		√	√
Enhancing resilience to flash floods relies on how institutions at the local level function in implementing social learning-based collective action.		√	√

- **Flood memory as an integral element of social learning has been fostering flood-related knowledge to withstand flash floods.**

Flood memory is a key repository of flood knowledge that emerges from multiple dimensions and the extent of flood experiences. Flood memories provide appropriate perceptual cues and knowledge in the decision-making process to combat emerging risks. Integration of lessons from the past with coping and adaptation in the face of crisis makes profound impacts in reducing risks. Biggs et al.'s (2015) study argues that vulnerable communities withstand social-ecological effects using past knowledge and actions. Findings of my study revealed that flood memory has generated a coping culture to deal with the flood crisis. For example, spontaneous knowledge assists community members to build stronger and less vulnerable houses using local resources; it also encourages them to harvest crops before the arrival of floodwater. I also observed that flood memory also enabled communities to adopt self-organizing measures and flood preparedness (i.e. increasing the height of the plinths of houses, organizing food and boats with highest priority). The proactive actions are substantially facilitated by flood memories, which play a decisive role to respond to and recover from flood losses. Flood memories thus are essential elements of social learning that generate new strategies to withstand natural disturbances (Berkes, Colding, & Folke, 2003; Folke, Hahn, Olsson, & Norberg, 2005).

- **Extensive experiences related to floods and livelihood stresses create opportunities for social learning, which advances knowledge for enhancing resilience.**

As I elaborated in Section 2.3.2 and 2.3.3, social learning pertinently emerges from first-hand flood experience and sharing flood experience. Social learning is thus a reflective observation on the extent of flood events, damage and losses of properties, and livelihood stresses. The 2017 floods that struck before harvesting destroyed crops, damaged household properties, and

impacted livelihood in the study area. I observed that experiencing catastrophic floods in 2017 engendered key knowledge and changes, particularly in understanding sustainable flood management strategies using low-cost building materials and increased awareness about risk-based measures for regaining livelihood. Experiencing economic losses also created an aspiration to maintain social status by doing alternative livelihood strategies.

Based on lessons learned, vulnerable groups procured information from other community members to look for suitable jobs in other areas. Social learning reshaped thinking and generated collective understanding for regaining livelihood. I observed that both farming and fishing communities suffered from serious livelihood stresses (e.g., labour crisis and the destruction of fishes respectively). Facing livelihood stresses created a scope for change and to establish relational practices, which was very imperative to adjust to flash floods. My empirical analysis showed that farming communities harvested crops through a partnership arrangement with the labourers, whereas fishing communities adopted initiatives collectively (e.g., purchasing nets and boats). In fact, experiencing more flood shocks has resulted in producing new knowledge and in increasing their risk awareness in an iterative way that allowed small-scale fishers and farming communities to transform flood-related experiences into actionable knowledge and practice. In this regard, it worth citing O'Brien and others (2010) who assert that building resilience is embedded in the learning process from crisis.

- **Social learning is about adaptation to, and transformation of, flood-related risk into resilience through integrating local and external innovations.**

Social learning is a key tool of adaptation that grounds both coping and adaptation strategies. Both coping and adaption is reshaped by social learning as it creates innovative knowledge to transform flood risk into resilience. Argyris and Schön (2010) argue that social learning happens when individuals change their actions following innovative knowledge and skills. I

observed that social learning in the wetland communities generates innovative ideas for local and external innovations. Local innovations are mostly generated from long-term experiences with floods and local knowledge. Learning-based local innovations (e.g. preparing seedbeds in polythene bags, leasing out agricultural land) reduce adaptation cost and incrementally augment adaptive capacity to withstand flash floods. In addition, external innovations, such as husking machines and solar panels as alternative energy source, are more innovative to avoid precarious conditions and increase adaptive capacity. However, they are cost-sensitive; only economically solvent families are viable to procure external innovations. Despite some loopholes, social learning works as a key type of adaptation (Armitage, Berkes, Dale, Kocho-Schellenberg, & Patton, 201; Berkes & Ross, 2016) in the wetland communities that characterizes both local innovations and external innovations to transform flood risk into strengthening resilience.

- ■ **Learning arenas vary between local-level institutions in terms of the scale of problems, but large-scale arenas provide ample opportunity to raise their voice more for problem formulation.**

Results about how social learning occurs at the local-level institutions are illustrated in Section 3.3.1 and Section 3.3.2. In this respect, I observed that multifaced arenas are the cornerstone for facilitating social learning in the wetlands of Bangladesh. The nature of arenas for problem formulation differed in terms of the scale of problems and concerned issues dealt with by the local level institutions. For example, learning arenas of formal institutions (e.g., the Union *Parishad*) deal with flood risk of the entire Union, while informal learning arenas only deal with specific collective problems of a village-community. I found that some learning arenas are more confined to specific learners, which provides little scope for the emergence of knowledge. Conversely, large-scale learning arenas can engage diverse stakeholders for

deliberation and problem formulation. This occurs when formal and informal institutions engage deliberately to deal with complex problems. I illustrated that public hearings and the Ward Council are more flexible learning arenas that empower the flash flood victims to raise their voice for the deliberation and formulation of problems in the light of the emerging needs. For example, farmers in public hearings received more opportunities to address their farming problems due to institutional procrastination in repairing crop-protection embankments. Large-scale learning arenas in the wetland regions of Bangladesh thus are more about the space and time that engage multiple participants for problem formulation through deliberation and negotiation (Steyaert et al., 2007).

- ■ **More diversity in local institutions means a greater possibility to nurture diverse knowledge in dealing with complex problems.**

Diverse local-level institutions are engaged in dealing with complex problems that resulted from flash floods and their disastrous effects (Section 3.3.1 and 3.3.2). In the wetland, this diversification allows institutions to nurture diverse problem-solving ideas for enhancing resilience. I found that at the community level, each informal institution – such as the Village Development Committees, faith-based institutions, and a group of farmers – inextricably nurtures knowledge to deal with emerging complex problems, including susceptibilities of community-owned resources, problems of child education, and waterlogging and irrigation problems. Similarly, formal institutions – for example, the Union *Parishad*, the UDMC – fosters new knowledge for new relief items, delivery systems at shelter centers, and opening a control room to 24/7 to monitor flood situations. I argue that nourishing diverse knowledge is a key trait of local-level institutions that generates risk-informed decisions and augments adaptive capacity to withstand flash flood effects. Though it depends on how local-level institutions function to deal with complex problems, institutional diversity permits local-level

institutions to yield multiple perspectives. Flash floods are key wheelers to reshape diverse knowledge through addressing the emerging problems. Diverse institutional structures have enabled social learning to be more successful as local-level institutions and social learning complements to foster a range of capacities for strengthening community resilience.

- **Enhancing resilience to flash floods relies on how institutions at the local level function in implementing social learning-based collective action.**

I have substantiated in Section 3.3.3 that local-level institutions perform an inseparable role in transforming social learning into collective action to reinforce community resilience. Social learning at the informal, quasi-formal, and formal institutional levels fosters a set of collective attributes (e.g., collective consensus and ownership for building resilience), which are key levers to motivate local-level institutions to undertake a set of short- and long-term actions. I found that local-level institutions are becoming more self-organized through social learning. For example, informal institutions (e.g., faith-based institutions) mobilize resources using social networks and leasing endowment lands. Likely, formal institutions (e.g., the Union *Parishad* and the UDMC) in the face of an emergency establish a new social network with local trader associations to manage necessary relief through social learning. Utilizing a preexisting or establishing a new social network, local-level institutions engage multiple actors in flood preparedness and response activities (Norris, Stevens, Pfefferbaum, Wyche, & Pfefferbaum, 2008). This strategy particularly engenders opportunity for "self-organization" in the face of crisis (Folke et al., 2005; Berkes & Ross, 2016), which empowers local institutions to take collective measure in enhancing resilience to flash floods.

In taking social learning-based collective measure, institutional collaboration is a prerequisite to transforming flood risk into resilience. I found that the transformation of flood risk mitigation measures into resilience takes place through generating a bridge among

institutions when existing capacity is inadequate to deal with the flood crises. For example, the Fenarbak Union *Parishad* as a bridging organization (Berkes, 2009) collaborates with other informal institutions to disseminate flood-related information and protect against floodwater. Similarly, collaboration with other institutions such as the PIC, and the Bangladesh Water Development Board is also evident as collective risk reduction measures. Such collaboration creates an opportunity to engage multiple stakeholders and augments institutional capacity to deal with collective problems. I, therefore, argue that risk-based collective action towards strengthening resilience are considerably influenced by local institutional self-organizing capacity and collaboration.

4.3 Major contributions of the research

The present research has made major contributions in the following areas:

- ■ Findings of my research reveal that flood memories are constitutive and work as a major source of knowledge for coping and adaptation in northeastern Bangladesh. Earlier studies primarily focused only on vulnerability reduction and ignored the examination of the role of past experiences in reducing flood risks. My study focused on how previous flood memories provide spontaneous ideas for pre-adaptation and foster the self-organizing capacity of the local community. Another contribution of this study is also the advancement of the understanding of psycho-social memory, which enhances the flood-tolerant capacity and confidence of flood-sensitive actors to deal with flood uncertainty.

- ■ Examining the interrelationship between social learning, coping, and adaptation is necessary to understand how social learning contributes to community resilience in northeastern Bangladesh. In disaster studies, substantial gaps exist in research, especially how learning can be fostered for coping with, and adapting to, flash floods.

Coping and adaptation mechanisms are reshaped by social learning when flood-prone people integrate both local and external innovations. My thesis research thus provides ample evidence on how social learning of different occupational groups assist coping and adaptation practices within the context of wetland social-ecological systems in northeastern region of Bangladesh.

■ By examining the role of social learning and local-level institutions, my thesis postulates that social learning is an integral component of local-level institutions. In Chapter Three, I claim that social learning lays a key foundation for institutional collaboration that can generate new knowledge through the engagement of multiple stakeholders. Although several contemporary studies have examined social learning pertinent to floodplain management, water management (Pahl-Wostl, Mostert, & Tabara, 2008), the interlinkage between social learning, local-level institutions, and community resilience have not yet been examined adequately. In this regard, my thesis research examines substantially the co-existence of social learning and local-level institutions within the context of flash floods; the research establishes an argument for viewing social learning as an adaptive decision-making process that instigates local institutions to generate collective decisions in the context of emerging complexities. Indeed, social learning to strengthen community resilience to flash floods comes into action through a range of activities (e.g., social network, diverse perspectives) performed by the local-level institutions.

4.4 Policy implications

In my research, social learning is conceded as a key tool for adaptation in building resilience that has several policy implications.

- Flood memories are vital in flood response and adaptation to flood-related livelihood stresses. To enhance community resilience, the documentation of past knowledge is critically important as catastrophic floods generate new memories. For the best practice, empowering local-level institutions is very imperative to nurture and preserve flood memories. Additionally, the sustainability of flood memories can be ensured through archival preservation and their application to address the emerging risks and hazards.

- Nurturing community resilience to floods necessitates social learning-based actions, which generate and advance the learning possibility and adaptive capacity to reduce adverse effects of floods. Therefore, I suggest to introduce a social learning-based adaption approach that can nurture learning from floods and empower local communities to withstand flash floods.

- Cross-scale institutional collaboration plays a pivotal role in the social learning process and in organizing collective resources in enhancing community resilience. To advance cross-scale collaboration between local-level institutions, institutional supports need to be increased and sustained. I also found an active collaboration during an emergency between informal and formal institutions, while in normal periods, there is limited collaboration and dialogue among the local formal and informal institutions. While the Standing Order on Disasters (SoD) prescribes the local institutions – especially the Union Disaster Management Committee (UDMC) – to undertake measures collaboratively with other institutions, this collaboration only occurs when an extreme crisis emerges. This process is ineffective in engaging key stakeholders in a sustained way for flood risk management. Therefore, a proper guideline and required resources should be provided so that local institutions can maintain institutional collaboration through sharing learning from flood and collective initiatives even in normal periods.

■ In my study, I observed competing livelihoods between different occupational groups, such as farmers, fishermen, and leaseholders. Many poor occupational groups rely on natural resources for their livelihood. Unless reshaping the dynamics of the relationship between different occupational groups and natural resources of the wetland, competing livelihood would be a persistent constraint in building community resilience. Despite prevailing self-initiatives of vulnerable groups, such local power dynamics are adversely affecting resilience-building strategies. I, therefore, suggest that the policy initiatives should consider the dynamic relationship between different occupational groups and natural resources in the wetlands of Bangladesh. This understanding may help to reduce the influence of local elites and pave an appropriate way to implement the *Jalmahal* Act 2009.

■ The results of my thesis underscore that persistent institutional diversity is a key strength to deal with emerging problems and reinforce community resilience. Therefore, continuous supports for nurturing institutional diversity is necessary as it nurtures distinct perspectives and promotes problem-solving ideas for risk reduction. As local institutions perform a pivotal role in transforming social learning into community resilience, special attention is required to understand the potentialities and capacities of local-level institutions.

4.5 Future research

■ I found that flood memories often create false confidence as community members apply previous memories to cope with new situations. Future research for understanding community resilience hence needs to examine the complexities of flood memories deeply, and the relationship between flood memories and lay knowledge.

- Future research should examine the complexities of how flood disaster management and water resource management are interrelated in generating adaptive capacity. Ethnographic research can be undertaken to understand the dynamic relationship between community members and ecosystems.

- Further research agenda should include scientific investigations to examine the underlying drivers of social learning from and about floods and other disasters, the barriers in fostering social learning at the local institutional level, and the ways of applying social learning for flood risk reduction in a sustainable manner.

4.6 Major limitations of the study

- My study focused only on a small Union in the Sunamganj District. This study area may not represent the overall scenario of the wetland communities in northeastern Bangladesh as social learning may vary in terms of the extent of experience associated with flash flood-related damages and losses in different regions. Any generalization of the findings of this thesis research should therefore be made cautiously.

- The institutional dimensions and leaning processes at the sub-national level (e.g, the *Upazila* and District level) remained undiscovered as well as how they are contributing to strengthening resilience at the local level has remained unknown. Local-level institutions in other areas, such as in the coastal regions, may have different experiences and learning opportunities in the context of cyclones, and these still by and large remain unknown. Thus, it may be difficult to establish an overall generalization on the role of local-level institutions though a Case Study approach generates a wide understanding of the cases (Creswell, 2014). It may not be appropriate to apply findings of our case study to other contexts without further eveidence.

- The study was conducted between July and December, 2019. Since I collected my data during the wet season, some critical understanding relating to the direct impacts of flash floods and actions taken by communities to withstand flash floods may be missing. The specific time-scale does not allow me to obtain a longitudinal perspective of social learning and flood response mechanisms. My research is principally addressing key learning from flash floods in the wetland communities. Due to climatic shifts, other types of natural disturbance, such as riverbank erosions, heavy precipitation, thunderstorms, drought, and hailstorm have been functioning as key triggers for learning from increased exposure and severity. In this thesis research, key learning from these disasters is generally absent. However, the findings of thesis lay a strong foundation for its application to other disaster contexts.

4.7 References

Argyris, C., & Schön, D. A. (2010). Organizational learning: A theory of action perspective. *Reis*, (77/78), 345. https://doi.org/10.2307/40183951

Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E., & Patton, E. (2011). Co-management and the co-production of knowledge: Learning to adapt in Canada's Arctic. *Global Environmental Change*, *21*, 995–1004. https://doi.org/10.1016/j.gloenvcha.2011.04.006

Assuah, A., & Sinclair, A. J. (2019). Unraveling the relationship between collective action and social learning: Evidence from community forest management in Canada. *Forests*, *10*(6), 494-. https://doi.org/10.3390/f10060494

Berkes, F. (2009). Evolution of co-management : Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management*, *90*(5), 1692–1702. https://doi.org/10.1016/j.jenvman.2008.12.001

Berkes, F., Colding, J., & Folke, C. (2003). *Navigating social-ecological systems: Building resilience for complexity and change*. Cambridge, UK: Cambridge University Press.

Berkes, F., & Ross, H. (2016). Panarchy and community resilience: Sustainability science and policy implications. *Environmental Science and Policy*, *61*, 185–193. https://doi.org/10.1016/j.envsci.2016.04.004

Biggs, R., Schlüter, M., & Schoon, M. L. (2015). *Principles for building resilience: Sustaining ecosystem services in social-ecological systems*. Cambridge: Cambridge University Press.

Choudhury, M. U. I., Uddin, M. S., & Haque, C. E. (2019). "Nature brings us extreme events, some people cause us prolonged sufferings": The role of good governance in building

community resilience to natural disasters in Bangladesh. *Journal of Environmental Planning and Management*, *62*(10), 1761–1781. https://doi.org/10.1080/09640568.2018.1513833

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches*. Los Angeles: Sage Publications Ltd.

Fakhruddin, S. H. M., & Rahman, J. (2014). Coping with coastal risk and vulnerabilities in Bangladesh. *International Journal of Disaster Risk Reduction*, *12*, 112–118. https://doi.org/10.1016/j.ijdrr.2014.12.008

Folke, C., Hahn, T., Olsson, P., & Norberg, J. (2005). Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources*, *30*(1), 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Haque, C. E., Choudhury, M. U. I., & Sikder, M. S. (2019). "Events and failures are our only means for making policy changes": Learning in disaster and emergency management policies in Manitoba, Canada. *Natural Hazards*, *98*(1), 137–162. https://doi.org/10.1007/s11069-018-3485-7

Islam, M. R., Ingham, V., Hicks, J., & Kelly, E. (2018). From coping to adaptation: Flooding and the role of local knowledge in Bangladesh. *International Journal of Disaster Risk Reduction*, *28,* 531–538. https://doi.org/10.1016/j.ijdrr.2017.12.017

Johannessen, Å., & Hahn, T. (2013). Social learning towards a more adaptive paradigm? Reducing flood risk in Kristianstad municipality, Sweden. *Global Environmental Change*, *23*(1), 372–381. https://doi.org/10.1016/j.gloenvcha.2012.07.009

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche, K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster

readiness. *American Journal of Community Psychology*, *41*(1–2), 127–150. https://doi.org/10.1007/s10464-007-9156-6

Kates, R. W., Travis, W. R., & Wilbanks, T. J. (2012). Transformational adaptation when incremental adaptations to climate change are insufficient. *Proceedings of the National Academy of Sciences of the United States of America*, *109*(19), 7156–7161. https://doi.org/10.1073/pnas.1115521109

O'Brien, G., O'Keefe, P., Gadema, Z., & Swords, J. (2010). Approaching disaster management through social learning. *Disaster Prevention and Management: An International Journal, 19*(4), 498–508. https://doi.org/10.1108/09653561011070402

Pahl-Wostl, C., Mostert, E., & Tabara, D. (2008). The growing importance of social learning in water resources management and sustainability science. *Ecology and Society*, 13(1), 24-. https://doi.org/10.5751/ES-02352-130124

Pahl-Wostl, C. (2019). The role of governance modes and meta-governance in the transformation towards sustainable water governance. *Environmental Science and Policy*, *91,* 6–16. https://doi.org/10.1016/j.envsci.2018.10.008

Steyaert, P., Barzman, M., Billaud, J. P., Brives, H., Hubert, B., Ollivier, G., & Roche, B. (2007). The role of knowledge and research in facilitating social learning among stakeholders in natural resources management in the French Atlantic coastal wetlands. *Environmental Science and Policy*, *10*(6), 537–550. https://doi.org/10.1016/j.envsci.2007.01.012

Appendix-1:   Certificate of completion of TCPS 2: CORE

Appendix-2:   Ethics approval form the University of Manitoba

RENEWAL APPROVAL

Date: **October 28, 2020**   **New Expiry: November 7, 2021**

To: **Md Abul Kalam Azad**   **(Advisor: C. Emdad Haque)**
           Principal Investigator

From: **Andrea Szwajcer, Chair**
            Joint-Faculty Research Ethics Board (JFREB)

Re: **Protocol # J2019:064 (HS23168)**
           **Recovery of Wetland Communities from Flash Flood Disasters in
           Sunamganj, Bangladesh: The Role of Social Learning in Enhancing
           Community Resilience**

Joint-Faculty Research Ethics Board (JFREB) has reviewed and renewed the above research. JFREB is constituted and operates in accordance with the current *Tri-Council Policy Statement: Ethical Conduct for Research Involving Humans.*

This approval is subject to the following conditions:

  i.   Any modification to the research must be submitted to JFREB for approval before implementation.

  ii.   Any deviations to the research or adverse events must be submitted to JFREB as soon as possible.

  iii.   This renewal is valid for one year only and a Renewal Request must be submitted and approved by the above expiry date.

  iv.   A Study Closure form must be submitted to JFREB when the research is complete or terminated.

Appendix-3:   Interview guide for Key Informant Interviews

3. 1 Interview guide for local government representatives (The Union Parishad and the Union Disaster Management Committee)

Code:

Location of interview:

Date:

1. What types of community resources had been damaged or lost due to the last flash flood in your locality?

2. What were the experiences of community members with flash floods in terms of flood damages, losses, and recovery strategies in your locality?

3. What types of recovery strategies are prevailing in the communities?

4. Do you think, these coping and adaptation strategies have been reducing risk or building the adaptive capacity of community members to the next floods? If yes, how? If no, what are the reasons behind it?

5. Do you think community members share their learning from floods, damages, losses, and recovery with others? If yes, how do they share their learnings from flash floods?

6. Do you think, community members, taking adaptive actions to adapt to flash floods based on collective sharing and learning? If yes, what types of learning-based collective action are taken by community members to adapt to flash floods?

7. What types of adaptive and recovery strategies had been taken by the Union Parishad to build the capacity of communities?

8. How does the union Parishad engage local-level stakeholders in collective action and learning?

9. How does an institutional platform work to engage local level stakeholders and reinforce community resilience?

10. How does the union Parishad maintain institutional linkage with other stakeholders?

11. What are the barriers and constraints in the process of social learning and flood risk management?

3.2 Interview guide for the representatives of NGOs

Interviewee ID:

Location of interview:

Date:

1. What types of community resources had been damaged or lost due to the last flash flood in your locality?

2. What were the experiences of community members with flash floods in terms of flood damages, losses, and recovery strategies in your locality?

3. What types of recovery strategies are prevailing in vulnerable communities?

4. Do you think, these coping and adaptation strategies have been reducing risk or building the adaptive capacity of community members to the next floods? If yes, how? If no, what are the reasons behind it?

5. Do you think community members learn from flood-related damage, losses, and recovery strategies? If yes, what have community members learned from flash floods, damage, losses, and recovery strategies? If no, why?

6. Do you think community members share their learning from floods, damages, losses, and recovery with others? If yes, how do they share their learnings from flash floods?

7. Do you think, community members, taking adaptive actions to adapt to flash floods based on collective sharing and learning? If yes, what types of learning-based collective action are taken by community members to adapt to flash floods?

8. What types of recovery strategies had been taken by your NGO to build the capacity of communities?

9. How does your organization engage local-level stakeholders in collective action and learning?

10. How does your organization maintain institutional linkage with other stakeholders?

11. What are the barriers and constraints in the process of social learning and flood risk management?

3.3 Interview guide for Community-based organizations (CBOs)

Interviewee ID:

Location of interview:

Date:

1. What types of community resources had been damaged or lost due to the last flash flood in your locality?

2. What were the experiences of community members with flash floods in terms of flood damages, losses, and recovery strategies in your locality?

3. What types of recovery strategies are prevailing in communities?

4. Do you think, these coping and adaptation strategies have been reducing risk or building the adaptive capacity of community members to the next floods? If yes, how? If no, what are the reasons behind it?

5. Do you think community members learn from flood-related damage, losses, and recovery strategies? If yes, what have community members learned from flash floods, damage, losses, and recovery strategies? If no, why?

6. Do you think community members share their learning from floods, damages, losses, and recovery with others? If yes, how do they share their learnings from flash floods?

7. Do you think, community members, taking adaptive actions to adapt to flash floods based on collective sharing and learning? If yes, what types of learning-based collective action are taken by community members to adapt to flash floods?

8. How does collective sharing create possibilities to implement new ideas for flood risk management?

9. What types of recovery strategies had been taken by your organization to build the capacity of communities?

10. How does your organization engage local-level stakeholders in collective action and learning?

11. How does your organization maintain institutional linkage with other stakeholders?

Appendix-4:   Interview guide for Focus Group Discussions

Code:

Location of interview:

Date:

1. What were the underlying causes or factors of flash floods in your locality in 2017?

2. What types of resources had been damaged or lost due to flash floods in your community? Please describe.

3. What were your experiences with flash floods in terms of flood damages, losses, and recovery strategies in your locality?

4. What types of recovery strategies are prevailing in your community?

5. What have you learned from damages, losses, flash floods, and recovery strategies?

6. Do you think learning from floods and recovery strategies has built community resilience to flash floods? If yes, how?

7. Are you taking different adaptation strategies based on your learning from flash floods and recovery strategies in your community? If yes, what types of adaptation strategies have been taken at the different phases of disasters collectively and individually?

8. Is there any participatory sharing platform in your community? If yes. how do you share your learning with other community members?

9. How have community members made collective decisions for flood risk management in your community?

10. What types of collective action have been taken by community members for flood risk management?

11. Do you think this collective learning and actions have increased your community's capability to cope with flash floods? If yes, how? If no, what are the reasons behind it?

12. What are the major constraints in the social learning process and collective action for flood risk reduction?

Appendix-5:   **Interview guide for Semi-structured Interviews**

Code:

Location of interview:

Date:

1. What were the underlying causes or factors of a flash flood in your locality in 2017?
2. What types of resources had been damaged or lost due to flash floods at your household? Please describe.
3. Had you taken any strategy to recover from flash floods? If yes, what types of recovery strategies had you taken collectively and individually?
4. What have you learned from damages, losses, flash floods, and recovery strategies?
5. Are you taking different adaptation strategies based on your learning from flash floods and recovery strategies in your community? If yes, what types of adaptation strategies have been taken at the different phases of disasters collectively and individually?
6. Do you share your learning with family and community members? How do you share your learning with others?
7. Is there any participatory sharing platform in your community? If yes. how do you share your learning with other community members?
8. Have you ever engaged in the collective decision-making process in your community? If yes, how have you made collective decisions for flood risk management in your community?
9. What types of collective decisions have been made for flood risk management in your community?
10. Do you think this collective learning and actions have increased your capability to cope with flash floods? If yes, how? If no, what are the reasons behind it?
11. What are the major constraints in the social learning process and collective action for flood risk reduction?

Appendix-6:   Interview guide for Oral History

Code:

Location of interview:

Date:

1. What do you understand by flash floods in the context of your locality?

2. What have you learned from flash floods in the context of your locality?

3. Could you kindly tell about local flood memories? How do you remember flood memories in the context of your locality?

4. Which factors have built your flood memories in the context of flash floods?

5. Do you use these memories to cope and adapt to flash floods? If yes, how do you use these memories to cope and adapt to flash floods?

6. Do you think flood memories are increasing your adaptive capacity? If yes, how?

7. How do you transmit your local flood history among others?

8. Which factors influenced you to share your flood memories with others?

9. How can flood memories be integrated into flood risk management?

10. How can local flood knowledge be preserved and utilized properly for flood risk management?

Appendix-7: **Thematic areas for participant observation**

Code:

Location of participant observation:

Date:

Thematic areas of participant observation

1. Understanding of community members about flash floods;

2. Underlying causes of floods in the northeastern part of Bangladesh;

3. Implications of the recent flood;

4. Recovery strategies related to livelihood;

5. Process of learning and sharing process;

6. Types of adaptive strategies addressed by the participants

7. Initiatives of local-level institutions for collective action

8. The engagement process of local-level stakeholders in collective action and decision-making process;

   Constraints that render the social learning process and adaptation actions.

Appendix-8:   Administrative units of Bangladesh

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                                    ┌─────────────────────┐
                                    │ Central government  │
                                    └─────────────────────┘
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Chattogram Division	Barisal Division	Dhaka Division	Sylhet Division	Khulna Division	Rajshahi Division	Mymensingh Division	Rangpur Division
11 Districts	6 Districts	13 Districts	4 Districts	10 Districts	8 Districts	4 Districts	8 Districts
106 Sub-districts	42 Sub-districts	89 Sub-districts	39 Sub-districts	67 Sub-districts	68 Sub-districts	35 Sub-districts	58 Sub-districts
336 Union Parishads	333 Union Parishads	1833 Union Parishads	334 Union Parishads	270 Union Parishads	558 Union Parishads	350 Union Parishads	536 Union Parishads

Appendix-9:   The composition of the Union Disaster Management Committee

1	Chairperson and member of reserved women seat by rotation	Chairperson
2	Elected member (all)	Member
3	Representatives of teachers – 3 (nominated by the Chairperson)	Member
4	Representatives from all UP-level government departments - 1 per department	Member
5	Representatives from vulnerable women - 3 (nominated by reserved female ward member)	Member
6	Representative, Cyclone Preparedness Programme (if available) or representative of local volunteers	Member
7	Representative, Bangladesh Red Crescent Society (if available)	Member
8	NGO representatives – 2 (nominated by the Chairperson)	Member
9	Representative of farmers - 1 (nominated by the Chairperson)	Member
10	Representative from fishing communities - 1 (nominated by the Chairperson)	Member
11	Respected person or social worker representative - 1 (nominated by the Chairperson)	Member
12	Representative of freedom fighters -1 (nominated by Upazila Freedom Fighters Command Council)	Member
13	Representative from religious communities	Member
14	Representative from associations of persons with disabilities	Member
15	Representatives of local Scouts - 2 (leader or rover or Girls Scout representative)	Member
16	Representative from local cultural organizations - 1	Member
17	Representative from mass media - 1	Member
18	Representative from youth/sports organization -1	Member
19	Representative from landless communities - 1	Member
20	Representative from local business organizations -1	Member
21	Representative of tribal communities/ethnic groups - 1	Member
22	Expert equipped with traditional knowledge and conversant about local disasters - 1	Member
23	Representative of Ansar and VDP - 1	Member
24	Retired local government officer/employee - 1	Member
25	Secretary, Union Parishad	Member-Secretary

Appendix-10:   Informed consent for face-to-face interview

10.1 Informed consent for Key Informant Interview

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Natural Resources Institute
Clayton H. Riddell Faculty of
Environment, Earth, and Resources

Research Title: The Role of Social Learning in Enhancing Community Resilience and Recovery from Flash Floods in Sunamganj, Bangladesh

Principal Investigator: Md. Abul Kalam Azad, MNRM student, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2M6. ████████████████████ ██████████████████ e-mail: azadmak@myumanitoba.ca

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Sponsor: Social Sciences and Humanities Research Council of Canada (SSHRC) Insight Grant (Project # 48713); Principal Investigator: Professor C. Emdad Haque, Natural Resources Institute, University of Manitoba.

This consent form, a copy of which will be left with you for your records and reference, is only 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 more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the research

I am conducting this research as a part of my master's degree at the Natural Resources Institute, University of Manitoba, Canada. The main purpose of my study is to explore how social learning is regarded by disaster survivors and how some of the lessons learned are applied by different stakeholders at the community as well as at the local institutional levels in enhancing the community's adaptive capacity to flash floods. To examine this, the research has been guided by the following specific objectives:

i.   To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;

ii.   To investigate the social learning processes of the local institutions in the context of flash flood disasters;

iii.   To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

Selection of participants

To achieve the objective of my research, I am going to interview chairman and officials of the Union Parishads, local government representatives of the Union Parishads, members of Union Disaster Management Committee, representatives of Community-based Organizations, and representatives of NGOs who have the knowledge and working on flood disaster risk reduction in Sunamganj district. I am requesting you to participate in this study as a key informant. You are directly or indirectly involved in flood risk reduction activities in your locality. Based on your learning and experiences, you can share your valuable knowledge and ideas on the effects of floods, mechanisms of flood risk reduction, and institutional challenges to building community resilience.

Study procedures

- The technique of data collection will be Key Informant Interviews (KII), which is used to conduct an interview with participants who knows about the overall functionalities of an organization.
- I will ask a set of questions to obtain information on learning and flood risk management. If you would like to review the questions, I can provide the whole set of questions for your review.
- The interview will take around 45 to 60 minutes, and I will conduct the interview at your convenience time and location.
- I (the principal investigator) will facilitate this interview. No one will accompany me during the interview session. If you have any quarry, you can ask questions for further clarification.
- I will not ask your personal information, such as name, address, and occupational and educational status. Your information will be anonymous. I am also requesting you not to mention any other names and addresses of individuals in the interview session or after the interview.
- I may wish to quote your words directly in my master's thesis paper, journal articles, and conference paper. If you wish to give your consent, I may quote your information by real name, pseudonym, or anonymously. If you do not want me to use your real name, you may choose a pseudonym for quotations. In this regard, please check the statements in the following box of the consent if you wish to give your consent for quotations.
- If you wish to receive a summary of findings (2-3 pages), you can receive it through email or mail address. The preliminary results will be prepared approximately by December 2020.

Data gathering, storage, and destruction

An audio voice recorder will be used to record the interview, and I will take notes on important issues of the discussion in my personal notebook. If you have any objections, please feel free to inform me. Audio recordings will be transcribed by the principal researcher to confirm the accuracy of information. Audio voice recorder and hand-written filed notes will be stored in a locked filing cabinet. After transcribing audio recordings and typing field notes, audio recordings will be erased, and hand-written field notes will be destroyed by July 2020. Electronic copies of transcripts and electronic field notes will be encrypted separately and stored in my personal password-protected computer, and all data will be destroyed in December 2024.

Nature of participation and compensation

Your participation in this research is voluntary. There will be no financial compensation will be given for this participation. Your valuable contribution to this study will be appreciated.

Risk and benefits

There are minimal risks for participation in this study. These risks are no greater than in everyday life. If you feel any emotional distress or psychological problem during the interview session, please feel free to share your problems. I will discontinue the interview session, and I can take necessary supports for your psychological assistance from a professional psychiatrist. I will bear all expenses for this treatment including fees, transportation costs, and medication.

There will no direct benefits immediately. The indirect benefit of your participation is that you will be a part of knowledge generation and policy recommendations. However, I will share my research findings with community members, NGOs, relevant government organizations, officials of Union Parishad, members of the disaster management committee, and representatives of CBOs; it will strengthen institutional mechanisms of flood risk reductions at the institutional level as well as the community level.

Privacy & Confidentiality

In this study, privacy and confidentiality will be maintained strictly by the principal investigator. I will not record your personal information or any directly identifiable information. Thus, your information will be anonymous. Your contact address will be stored in a locked filing cabinet so that I can send a summary of the findings (2-3 pages). Moreover. coding numbers will be used to eliminate any directly identifiable information including personal contact information. Indirectly identifying information, such as the name of organizations, and location of organization will also be coded and stored in a confidential database. I will also preserve electronic transcripts and field notes through coding. Coded information will only be used to identify raw data, and a direct linkage will be established between raw data and personal contact information. It will help to recheck and clarity of the information If any confusion arises in analyzing the data. This linkage can also be used to send a summary of the findings to your mail address. Please note that only my supervisor will have access to all information including any directly or indirectly identifiable information.

Data will be used for preparing the thesis, conference presentations, a brief summary, and journal articles. The results of the study will be presented in a descriptive and analytical mode. Direct quotes will not be used for the presentation of results. Data will be used anonymously for future publication. No information will be used in such a way that will violate your privacy and confidentiality. I will take maximum precaution measures to ensure your privacy and confidentiality.

Withdrawal

You may decline your participation from the study at any time; you will not face any negative consequences for this withdrawal. You have the full right to withdraw from the study with your consent form as your participation is voluntary. If you want to discontinue the discussions at any time, your information will not be recorded. Data will be deleted from the audio voice recorder; hand-written field notes will be destroyed. Even, if you wish to draw after the interview, the recorded information will be erased and destroyed. However, you can also withdraw your information and participation from the study in the next time if you want to do so. Please do it by April 2020.

Dissemination

The findings of the study will be disseminated in academic conferences, peer-reviewed journals, and the final thesis paper will be available on the website of the University of Manitoba. A copy of the master thesis will also be made available in the Union Parishad, and a summary of findings will be disseminated among the participants who wish to receive it.

Feedback

Upon completion of the interview, I will restate and summarize key facts and main ideas, which you share with me. I will request you to confirm that my interpretation is accurate. If you find any variation, please do not hesitate to share it with me. I will check it for my verification. Additionally, a summary of findings (2-3 pages) will be provided to the participants around December 2020. Please give a choice of mechanisms how you would like to receive the summary of findings:

| | Sent to e-mail address: _____ |

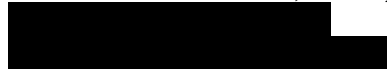| | Sent to the following address: _____ |

| | Not interested to receive the summary of findings: _____ |

Consent:

I am requesting you to indicate the following items that you agree with these.

☐ Yes ☐ No	I agree that the researcher can use the audio voice recorder for this interview.
☐ Yes ☐ No	I agree that the researcher may take notes during the interview session.
☐ Yes ☐ No	I agree that the researcher may cite my name and use quotation directly for the future publications.
☐ Yes ☐ No	I agree that the researcher may cite my direct quote by using a pseudonym.
☐ Yes ☐ No	I agree that the researcher may quote my interview for future publications anonymously.
☐ Yes ☐ No	I wish to get the primary findings of the study.
☐ Yes ☐ No	I agree that I have read out the full consent form and I have understood my rights to withdraw from the study.
☐ Yes ☐ No	I agree that I am participating in this study willingly.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. You may reach the researcher and the supervisor at:

Md. Abul Kalam Azad, Principal Researcher   **Professor C. Emdad Haque, Research Supervisor**

██████████████████████   ██████████████████

e-mail: azadmak@myumanitoba.ca   **e-mail: cemdad.haque@umanitoba.ca**

The University of Manitoba may look at your research records to see that the research is being done safely and properly.

This research has been approved by the Joint-Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at +1204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Are you agree to participate in this research?   Yes ☐   No ☐

_____   _____

Participant's Signature   Date

_____   _____

Researcher's Signature   Date

10.2 Informed consent for Focus Group Discussions

	Natural Resources Institute	220-70 Dysart Road
University **of Manitoba**	Clayton H. Riddell Faculty of Environment, Earth, and Resources	University of Manitoba, Winnipeg, MB, Canada R3T 2M6 Ph: 204-474-8373 Fax: 204-261-0038 Email: nriinfo@umanitoba.ca

Research Title: The Role of Social Learning in Enhancing Community Resilience and Recovery from Flash Floods in Sunamganj, Bangladesh

Principal Investigator: Md. Abul Kalam Azad, MNRM student, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2M6. ████████████████████████ ████████████████████ e-mail: azadmak@myumanitoba.ca

Research Supervisor: Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada. ████████████████ e-mail: cemdad.haque@umanitoba.ca

Sponsor: Social Sciences and Humanities Research Council of Canada (SSHRC) Insight Grant (Project # 48713); Principal Investigator: Professor C. Emdad Haque, Natural Resources Institute, University of Manitoba.

This consent form, a copy of which will be left with you for your records and reference, is only 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 more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

<u>**Purpose of the research**</u>

I am conducting this research as a part of my master's degree at the Natural Resources Institute, University of Manitoba, Canada. The main purpose of my study is to explore how social learning is regarded by disaster survivors and how some of the lessons learned are applied by different stakeholders at the community as well as at the local institutional levels in enhancing the community's adaptive capacity to flash floods. To examine this, the research has been guided by the following specific objectives:

    i.   To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;

    ii.   To investigate the social learning processes of the local institutions in the context of flash flood disasters;

    iii.   To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

<u>**Selection of participants**</u>

To achieve the objective of my research, I am going to interview community members of the flood-prone communities who are frequently experiencing flash floods and taking several adaption strategies to build their resilience to flash floods. Your learning-based adaptation strategies have been playing imperative role in building community resilience at the community level as well as the household level. Based on your experiences and learning from flash floods, you can share your valuable knowledge and ideas on the effects of floods and learning-based strategies. You are being requested to participate in this study as a participant of focus group discussions.

Study procedures

- The technique of data collection will be Focus Group Discussions. It will be a small group discussion with community members who have similar experiences with floods. Focus group discussions help to understand community member's ideas, experiences, and opinions about a specific issue.
- I will ask a set of questions to obtain information on experiences with and learning from floods.
- The interview will take around an hour, and I will conduct the interview at your convenience time and location.
- I (the principal investigator) will facilitate this group discussion.
- My research assistants, who are from your community, will arrange necessary logistical supports for this group discussion. They will not present during the group discussion. If it is necessary, the female assistant will be allowed to present and conduct the discussion with female participants
- During the focus group discussions, I will not ask your personal information, such as name, address, and occupational and educational status. Your information will be anonymous. I am also requesting you, not to mention any name, they know. If any participant calls them by the name, I will remove all names from the transcripts.
- To ensure privacy and confidentiality, participants will be requested to respect privacy and maintain the confidentiality of other members. Regarding privacy and confidentiality, each participant will also be asked to sign a non-disclosure statement (as described in the consent form).
- I may wish to quote your words directly in my master's thesis paper, journal articles, and conference paper. If you wish to give your consent, I may quote your information by real name, pseudonym, or anonymously. If you do not want me to use your real name, you may choose a pseudonym for quotations. In this regard, please check the statements in the following box of the consent if you wish to give your consent for quotations.
- If you wish to receive a summary of findings (2-3 pages), you can receive it through email or mail address. The preliminary results will be prepared approximately by December 2020.

Data gathering, storage, and destruction

An audio voice recorder will be used to record the interview, and I will take notes on important issues of the discussion in my personal notebook. If you have any objections, please feel free to inform me. Audio recordings will be transcribed by the principal researcher to confirm the accuracy of information. Audio voice recorder and hand-written filed notes will be stored in a locked filing cabinet. After transcribing audio recordings and typing field notes, audio recordings will be erased, and hand-written field notes will be destroyed by July 2020. Electronic copies of transcripts and electronic field notes will be encrypted separately and stored in my personal password-protected computer, and all data will be destroyed in December 2024.

Nature of participation and compensation

Your participation in this research is voluntary. There will be no financial compensation will be given for this participation. Your valuable contribution to this study will be appreciated.

Privacy & Confidentiality

In this study, privacy and confidentiality will be maintained strictly by the principal investigator. I will not record your personal information or any directly identifiable information. Thus, your information will be anonymous. Your contact address will be stored in a locked filing cabinet so that I can send a summary of the findings (2-3 pages). Moreover. coding numbers will be used to eliminate any directly identifiable information including personal contact information. Indirectly identifying information, such as name of organization, and location of organization will also be coded and stored in a confidential database. I will also preserve electronic transcripts and field notes through coding. Coded information

will only be used to identify raw data, and a direct linkage will be established between raw data and personal contact information. It will help to recheck and clarity of the information If any confusion arises in analyzing the data. This linkage can also be used to send a summary of the findings to your mail address. Please note that only my supervisor will have access to all information including any directly or indirectly identifiable information.

Data will be used for preparing the thesis, conference presentations, a brief summary, and journal articles. The results of the study will be presented in a descriptive and analytical mode. Direct quotes will not be used for the presentation of results. Data will be used anonymously for future publication. No information will be used in such a way that will violate your privacy and confidentiality. I will take maximum precaution measures to ensure your privacy and confidentiality.

Withdrawal

You may decline your participation from the study at any time; you will not face any negative consequences for this withdrawal. You have the full right to withdraw from the study with your consent form as your participation is voluntary. If you want to discontinue the discussions at any time, your information will not be recorded. Data will be deleted from the audio voice recorder; hand-written field notes will be destroyed. Even, if you wish to draw after the interview, the recorded information will be erased and destroyed. However, you can also withdraw your information and participation from the study in the next time if you want to do so. Please do it by April 2020.

Risk and benefits

There are minimal risks for participation in this study. These risks are no greater than in everyday life. If you feel any emotional distress or psychological problem during the group discussion, please feel free to share your problems. Even, if you find that the group discussion is very stressful, I will discontinue the discussion. I can take necessary supports for your psychological assistance from a professional psychiatrist. I will bear all expenses for this treatment including fees, transportation costs, and medication.

There will no direct benefits immediately. The indirect benefit of your participation is that you will be a part of knowledge generation and policy recommendations. The direct benefits will be that you would be able to understand the overall vulnerability and capacity of the communities, and how effectively social learning-based adaptation strategies are building community resilience to flash floods. Findings will also be shared with NGO practitioners, relevant government organizations, the offices of Union Parishad, the union disaster management committee who are working on the area of flood risk reduction. The research will help the decision-making process of these institutions regarding flood risk management.

Dissemination

The findings of the study will be disseminated in academic conferences, peer-reviewed journals, and the final thesis paper will be available on the website of the University of Manitoba. A copy of the master thesis will also be made available in the Union Parishad, and a summary of findings will be disseminated among the participants who wish to receive it.

Feedback

Upon completion of the focus group discussion, I will restate and summarize key facts and main ideas, which you share with me. I will request you to confirm that my interpretation is accurate. If you find any variation, please do not hesitate to share it with me. I will check it for my verification. Additionally, a summary of findings (2-3 pages) will be provided to the participants around December 2020. Please give a choice of mechanisms how you would like to receive the summary of findings:

       □ Sent to e-mail address: _____

☐ Sent to the following address: _____

☐ Not interested to receive the summary of findings: _____

Consent:

I am requesting you to indicate the following items that you agree with these.

☐ Yes ☐ No	I agree that the researcher can use the audio voice recorder for this interview.
☐ Yes ☐ No	I agree that the researcher may take notes during the interview session.
☐ Yes ☐ No	I agree that the researcher may cite my name and use quotation directly for the future publications.
☐ Yes ☐ No	I agree that the researcher may cite my direct quote by using a pseudonym.
☐ Yes ☐ No	I agree that the researcher may quote my interview for future publications anonymously.
☐ Yes ☐ No	I wish to get the primary findings of the study.
☐ Yes ☐ No	I agree that I have read out the full consent form and I have understood my rights to withdraw from the study.
☐ Yes ☐ No	I agree that I am participating in this study willingly.
☐ Yes ☐ No	I declare that I will maintain the confidentiality and privacy of all information that addressed by the participants of focus group discussions. I will not disclose any information about this discussion. If it happens, the researcher will not be responsible for this.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. You may reach the researcher and the supervisor at:

Md. Abul Kalam Azad, Principal Researcher

██████████████████████

e-mail: azadmak@myumanitoba.ca

Professor C. Emdad Haque, Research Supervisor

██████████████████████

e-mail: cemdad.haque@umanitoba.ca

The University of Manitoba may look at your research records to see that the research is being done safely and properly.

This research has been approved by the Joint-Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at +1204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Are you agree to participate in this research?   Yes ☐   No ☐

_____   _____

Participant's Signature   Date

_____   _____

Researcher's Signature   Date

10.3 Informed consent for Semi-Structured Interviews

Natural Resources Institute
Clayton H. Riddell Faculty of
Environment, Earth, and Resources

220-70 Dysart Road
University of Manitoba,
Winnipeg, MB, Canada R3T 2M6
Ph: 204-474-8373
Fax: 204-261-0038
Email: nriinfo@umanitoba.ca

Research Title: The Role of Social Learning in Enhancing Community Resilience and Recovery from Flash Floods in Sunamganj, Bangladesh

Principal Investigator: Md. Abul Kalam Azad, MNRM student, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2M6. ████████████████████ ████████████████████ e-mail: azadmak@myumanitoba.ca

Research Supervisor: Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada. ████████████ e-mail: cemdad.haque@umanitoba.ca

This consent form, a copy of which will be left with you for your records and reference, is only 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 more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the research

I am conducting this research as a part of my master's degree at the Natural Resources Institute, University of Manitoba, Canada. The main purpose of my study is to explore how social learning is regarded by disaster survivors and how some of the lessons learned are applied by different stakeholders at the community as well as at the local institutional levels in enhancing the community's adaptive capacity to flash floods. To examine this, the research has been guided by the following specific objectives:

i.   To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;
ii.   To investigate the social learning processes of the local institutions in the context of flash flood disasters;
iii.   To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

Selection of participants

To achieve the objective of my research, I am going to interview community members of the flood-prone communities who are frequently experiencing flash floods and taking several adaption strategies to build their resilience to flash floods. Your learning-based adaptation strategies have been playing imperative role in building community resilience at the community level as well as the household level. Based on your experiences and learning from flash floods, you can share your valuable knowledge and ideas on the effects of floods and learning-based strategies. You are being requested to participate in this study as a participant of the semi-structured interviews.

Study procedures

- The technique of data collection will be semi-structured interviews (SSIs). SSIs will focus on specific issues of community members, especially about experiences and learning from floods. The interview will be conducted by a guided questionnaire, but these questions are more flexible and link to the objectives of the study.
- The semi-structured interviews (SSIs) will take around 45 to 60 minutes, and it will focus on your experiences with and learning from flash floods.
- I (the principal investigator) will facilitate this interview.
- My research assistants, who are from your community, will arrange necessary logistical supports for this interview. They will not present during the interview. If it is necessary, the female assistant will be allowed to present and conduct the discussion with female participants
- During the interview, I will not ask your personal information, such as name, address, and occupational and educational status. Your information will be anonymous. I am also requesting you not to mention any other names and addresses of individuals in the interview session or after the interview session.
- I may wish to quote your words directly in my master's thesis paper, journal articles, and conference paper. If you wish to give your consent, I may quote your information by real name, pseudonym, or anonymously. If you do not want me to use your real name, you may choose a pseudonym for quotations. In this regard, please check the statements in the following box of the consent if you wish to give your consent for quotations.
- If you wish to receive a summary of findings (2-3 pages), you can receive it through email or mail address. The preliminary results will be prepared approximately by December 2020.

Data gathering, storage, and destruction

An audio voice recorder will be used to record the interview, and I will take notes on important issues of the discussion in my personal notebook. If you have any objections, please feel free to inform me. Audio recordings will be transcribed by the principal researcher to confirm the accuracy of information. Audio voice recorder and hand-written filed notes will be stored in a locked filing cabinet. After transcribing audio recordings and typing field notes, audio recordings will be erased, and hand-written field notes will be destroyed by July 2020. Electronic copies of transcripts and electronic field notes will be encrypted separately and stored in my personal password-protected computer, and all data will be destroyed in December 2024.

Nature of participation and compensation

Your participation in this research is voluntary. There will be no financial compensation will be given for this participation. Your valuable contribution to this study will be appreciated.

Privacy & Confidentiality

In this study, privacy and confidentiality will be maintained strictly by the principal investigator. I will not record your personal information or any directly identifiable information. Thus, your information will be anonymous. Your contact address will be stored in a locked filing cabinet so that I can send a summary of the findings (2-3 pages). Moreover. coding numbers will be used to eliminate any directly identifiable information including personal contact information. Indirectly identifying information, such as name of organization, and location of organization will also be coded and stored in a confidential database. I will also preserve electronic transcripts and field notes through coding. Coded information will only be used to identify raw data, and a direct linkage will be established between raw data and personal contact information. It will help to recheck and clarity of the information If any confusion arises in analyzing the data. This linkage can also be used to send a summary of the

findings to your mail address. Please note that only my supervisor will have access to all information including any directly or indirectly identifiable information.

Data will be used for preparing the thesis, conference presentations, a brief summary, and journal articles. The results of the study will be presented in a descriptive and analytical mode. Direct quotes will not be used for the presentation of results. Data will be used anonymously for future publication. No information will be used in such a way that will violate your privacy and confidentiality. I will take maximum precaution measures to ensure your privacy and confidentiality.

Withdrawal

You may decline your participation from the study at any time; you will not face any negative consequences for this withdrawal. You have the full right to withdraw from the study with your consent form as your participation is voluntary. If you want to discontinue the interview at any time, your information will not be recorded. Data will be deleted from the audio voice recorder; hand-written field notes will be destroyed. Even, if you wish to draw after the interview, the recorded information will be erased and destroyed. However, you can also withdraw your information and participation from the study in the next time if you want to do so. Please do it by April 2020.

Risk and benefits

There are minimal risks for participation in this study. These risks are no greater than in everyday life. If you feel any emotional distress or psychological problem during the group discussion, please feel free to share your problems. Even, if you find that the interview session is very stressful, I will discontinue the discussion. I can take necessary supports for your psychological assistance from a professional psychiatrist. I will bear all expenses for this treatment including fees, transportation costs, and medication.

There will no direct benefits immediately. The indirect benefit of your participation is that you will be a part of knowledge generation and policy recommendations. The direct benefits will be that you would be able to understand the overall vulnerability and capacity of the communities, and how effectively social learning-based adaptation strategies are building community resilience to flash floods. Findings will also be shared with NGO practitioners, relevant government organizations, the offices of Union Parishad, the union disaster management committee who are working on the area of flood risk reduction. The research will help the decision-making process of these institutions regarding flood risk management.

Dissemination

The findings of the study will be disseminated in academic conferences, peer-reviewed journals, and the final thesis paper will be available on the website of the University of Manitoba. A copy of the master thesis will also be made available in the Union Parishad, and a summary of findings will be disseminated among the participants who wish to receive it.

Feedback

Upon completion of the focus group discussion, I will restate and summarize key facts and main ideas, which you share with me. I will request you to confirm that my interpretation is accurate. If you find any variation, please do not hesitate to share it with me. I will check it for my verification. Additionally, a summary of findings (2-3 pages) will be provided to the participants around December 2020. Please give a choice of mechanisms how you would like to receive the summary of findings:

[ ] Sent to e-mail address: _____

[ ] Sent to the following address: _____

☐ Not interested to receive the summary of findings: _____

Consent:

I am requesting you to indicate the following items that you agree with these.

☐ Yes ☐ No	I agree that the researcher can use the audio voice recorder for this interview.
☐ Yes ☐ No	I agree that the researcher may take notes during the interview session.
☐ Yes ☐ No	I agree that the researcher may cite my name and use quotation directly for the future publications.
☐ Yes ☐ No	I agree that the researcher may cite my direct quote by using a pseudonym.
☐ Yes ☐ No	I agree that the researcher may quote my interview for future publications anonymously.
☐ Yes ☐ No	I wish to get the primary findings of the study.
☐ Yes ☐ No	I agree that I have read out the full consent form and I have understood my rights to withdraw from the study.
☐ Yes ☐ No	I agree that I am participating in this study willingly.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. You may reach the researcher and the supervisor at:

Md. Abul Kalam Azad, Principal Researcher   **Professor C. Emdad Haque, Research Supervisor**

e-mail: azadmak@myumanitoba.ca   **e-mail: cemdad.haque@umanitoba.ca**

The University of Manitoba may look at your research records to see that the research is being done safely and properly.

This research has been approved by the Joint-Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at +1204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Are you agree to participate in this research?   Yes ☐   No ☐

_____   _____
Participant's Signature   Date

_____   _____
Researcher's Signature   Date

10.4 Informed consent for Oral History

Natural Resources Institute
Clayton H. Riddell Faculty of
Environment, Earth, and Resources

220-70 Dysart Road
University of Manitoba,
Winnipeg, MB, Canada R3T 2M6
Ph: 204-474-8373
Fax: 204-261-0038
Email: nriinfo@umanitoba.ca

Research Title: The Role of Social Learning in Enhancing Community Resilience and Recovery from Flash Floods in Sunamganj, Bangladesh

Principal Investigator: Md. Abul Kalam Azad, MNRM student, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2M6. ██████████████████████ ███████████████████████ e-mail: azadmak@myumanitoba.ca

Research Supervisor: Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada. ████████████████ e-mail: cemdad.haque@umanitoba.ca

This consent form, a copy of which will be left with you for your records and reference, is only 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 more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the research

I am conducting this research as a part of my master's degree at the Natural Resources Institute, University of Manitoba, Canada. The main purpose of my study is to explore how social learning is regarded by disaster survivors and how some of the lessons learned are applied by different stakeholders at the community as well as at the local institutional levels in enhancing the community's adaptive capacity to flash floods. To examine this, the research has been guided by the following specific objectives:

i. To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;

ii. To investigate the social learning processes of the local institutions in the context of flash flood disasters;

iii. To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

Selection of participants

To achieve the objective of my research, I am going to interview elders who have past experiences with catastrophic flood events. Because of living in the local community and experiencing floods for a long period, you have a good flood memory. Your flood memory has been playing imperative role in building community resilience at the community level as well as the household level. Based on your experiences and learning from flash flood, you can share your valuable insights and flood memory on the effects of floods and learning-based strategies. You are being requested to participate in this study as a participant of oral history.

Study procedures

- The technique of data collection will be an oral history. Oral history will focus on your past memory and testimony or understanding of past experiences.
- The interviews will take around 45 to 60 minutes, and it will focus on your past flood memory and experiences.
- I (the principal investigator) will facilitate this interview.
- My research assistants, who are from your community, will arrange necessary logistical supports for this interview. They will not present during the interview. If it is necessary, the female assistant will be allowed to present and conduct the interview with female participants
- During the interview, I will not ask your personal information, such as name, address, and occupational and educational status. Your information will be anonymous. I am also requesting you not to mention any other names and addresses of individuals in the interview session or after the interview.
- I may wish to quote your words directly in my master's thesis paper, journal articles, and conference paper. If you wish to give your consent, I may quote your information by real name, pseudonym, or anonymously. If you do not want me to use your real name, you may choose a pseudonym for quotations. In this regard, please check the statements in the following box of the consent if you wish to give your consent for quotations.
- If you wish to receive a summary of findings (2-3 pages), you can receive it through email or mail address. The preliminary results will be prepared approximately by December 2020.

Data gathering, storage, and destruction

An audio voice recorder will be used to record the interview, and I will take notes on important issues of the discussion in my personal notebook. If you have any objections, please feel free to inform me. Audio recordings will be transcribed by the principal researcher to confirm the accuracy of information. Audio voice recorder and hand-written filed notes will be stored in a locked filing cabinet. After transcribing audio recordings and typing field notes, audio recordings will be erased, and hand-written field notes will be destroyed by July 2020. Electronic copies of transcripts and electronic field notes will be encrypted separately and stored in my personal password-protected computer, and all data will be destroyed in December 2024.

Nature of participation and compensation

Your participation in this research is voluntary. There will be no financial compensation will be given for this participation. Your valuable contribution to this study will be appreciated.

Privacy & Confidentiality

In this study, privacy and confidentiality will be maintained strictly by the principal investigator. I will not record your personal information or any directly identifiable information. Thus, your information will be anonymous. Your contact address will be stored in a locked filing cabinet so that I can send a summary of the findings (2-3 pages). Moreover. coding numbers will be used to eliminate any directly identifiable information including personal contact information. Indirectly identifying information, such as name of organization, and location of organization will also be coded and stored in a confidential database. I will also preserve electronic transcripts and field notes through coding. Coded information will only be used to identify raw data, and a direct linkage will be established between raw data and personal contact information. It will help to recheck and clarity of the information If any confusion arises in analyzing the data. This linkage can also be used to send a summary of the findings to your mail address. Please note that only my supervisor will have access to all information including any directly or indirectly identifiable information.

Data will be used for preparing the thesis, conference presentations, a brief summary, and journal articles. The results of the study will be presented in a descriptive and analytical mode. Direct quotes will not be used for the presentation of results. Data will be used anonymously for future publication. No information will be used in such a way that will violate your privacy and confidentiality. I will take maximum precaution measures to ensure your privacy and confidentiality.

Withdrawal

You may decline your participation from the study at any time; you will not face any negative consequences for this withdrawal. You have the full right to withdraw from the study with your consent form as your participation is voluntary. If you want to discontinue the interview at any time, your information will not be recorded. Data will be deleted from the audio voice recorder; hand-written field notes will be destroyed. Even, if you wish to draw after the interview, the recorded information will be erased and destroyed. However, you can also withdraw your information and participation from the study in the next time if you want to do so. Please do it by April 2020.

Risk and benefits

There are minimal risks for participation in this study. These risks are no greater than in everyday life. If you feel any emotional distress or psychological problem during the group discussion, please feel free to share your problems. Even, if you find that the interview session is very stressful, I will discontinue the discussion. I can take necessary supports for your psychological assistance from a professional psychiatrist. I will bear all expenses for this treatment including fees, transportation costs, and medication.

There will no direct benefits immediately. The indirect benefit of your participation is that you will be a part of knowledge generation and policy recommendations. The direct benefits will be that you would be able to understand the overall vulnerability and capacity of the communities, and how effectively social learning-based adaptation strategies are building community resilience to flash floods. Findings will also be shared with NGO practitioners, relevant government organizations, the offices of Union Parishad, the union disaster management committee who are working on the area of flood risk reduction. The research will help the decision-making process of these institutions regarding flood risk management.

Dissemination

The findings of the study will be disseminated in academic conferences, peer-reviewed journals, and the final thesis paper will be available on the website of the University of Manitoba. A copy of the master thesis will also be made available in the Union Parishad, and a summary of findings will be disseminated among the participants who wish to receive it.

Feedback

Upon completion of the focus group discussion, I will restate and summarize key facts and main ideas, which you share with me. I will request you to confirm that my interpretation is accurate. If you find any variation, please do not hesitate to share it with me. I will check it for my verification. Additionally, a summary of findings (2-3 pages) will be provided to the participants around December 2020. Please give a choice of mechanisms how you would like to receive the summary of findings:

[ ] Sent to e-mail address: _____

[ ] Sent to the following address: _____

[ ] Not interested to receive the summary of findings: _____

Consent:

I am requesting you to indicate the following items that you agree with these.

☐ Yes ☐ No	I agree that the researcher can use the audio voice recorder for this interview.
☐ Yes ☐ No	I agree that the researcher may take notes during the interview session.
☐ Yes ☐ No	I agree that the researcher may cite my name and use quotation directly for the future publications.
☐ Yes ☐ No	I agree that the researcher may cite my direct quote by using a pseudonym.
☐ Yes ☐ No	I agree that the researcher may quote my interview for future publications anonymously.
☐ Yes ☐ No	I agree that I will not disclose any names, address, and indirectly identifying information of any other community members in the interview session.
☐ Yes ☐ No	I wish to get the primary findings of the study.
☐ Yes ☐ No	I agree that I have read out the full consent form and I have understood my rights to withdraw from the study.
☐ Yes ☐ No	I agree that I am participating in this study willingly.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation. You may reach the researcher and the supervisor at:

Md. Abul Kalam Azad, Principal Researcher ████████████████ **e-mail: azadmak@myumanitoba.ca**

Professor C. Emdad Haque, Research Supervisor ████████████ **e-mail: cemdad.haque@umanitoba.ca**

The University of Manitoba may look at your research records to see that the research is being done safely and properly.

This research has been approved by the Joint-Faculty Research Ethics Board (JFREB). If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Coordinator at +1204-474-7122 or humanethics@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

Are you agree to participate in this research?   Yes ☐   No ☐

_____   _____
Participant's Signature   Date

_____   _____
Researcher's Signature   Date

10.5 Informed consent for Participant Observation

University of Manitoba

Natural Resources Institute
Clayton H. Riddell Faculty of
Environment, Earth, and Resources

220-70 Dysart Road
University of Manitoba,
Winnipeg, MB, Canada R3T 2M6
Ph: 204-474-8373
Fax: 204-261-0038
Email: nriinfo@umanitoba.ca

Research Title: The Role of Social Learning in Enhancing Community Resilience and Recovery from Flash Floods in Sunamganj, Bangladesh

Principal Investigator: Md. Abul Kalam Azad, MNRM student, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada, R3T 2M6. ███████████████████ ████████████████████ e-mail: azadmak@myumanitoba.ca

Research Supervisor: Dr. C. Emdad Haque, Professor, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, Canada. ████████████ e-mail: cemdad.haque@umanitoba.ca

Sponsor: Social Sciences and Humanities Research Council of Canada (SSHRC) Insight Grant (Project # 48713); Principal Investigator: Professor C. Emdad Haque, Natural Resources Institute, University of Manitoba.

This consent form, a copy of which will be left with you for your records and reference, is only 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 more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Purpose of the research

I am conducting this research as a part of my master's degree at the Natural Resources Institute, University of Manitoba, Canada. The main purpose of my study is to explore how social learning is regarded by disaster survivors and how some of the lessons learned are applied by different stakeholders at the community as well as at the local institutional levels in enhancing the community's adaptive capacity to flash floods. To examine this, the research has been guided by the following specific objectives:

    i.   To examine the application of social learning from flash flood experiences in formulating coping and adaptation at the community level;

    ii.   To investigate the social learning processes of the local institutions in the context of flash flood disasters;

    iii.   To examine the role of local institutions in translating social learning into taking various collective action for enhancing community resilience to flash floods.

Selection of participants

To achieve the objective of my research, I would like to participate as an observant in the participatory and sharing platform, which happens though meetings and sharing sessions. The Union Parishad Chairman, representatives of local government, representatives of the Union Disaster Management Committee (UDMC), the local NGOs, and community members participate in this platform. They are entirely working with community members for the reduction of vulnerabilities and the enhancement capacities of community members to withstand with flash floods.

Study procedures

- The technique of data collection will be participant operation. I will be participating as an observant in the learning platform that happens through meeting and sharing at the office of the Union Parishad.
- I will participate in the meeting to understand the participatory learning process and interactions processes between community members, government officials or representatives, and representatives of local NGOs. I would be able to understand who are participating in the learning sessions and what issues they are sharing in the participatory platform
- Participant observation will be around an hour.
- I (the principal investigator) will facilitate this interview.
- During the participant observation, I will not ask your personal information, such as name, address, and occupational and educational status. Your information will be anonymous.
- I may wish to quote your words directly in my master's thesis paper, journal articles, and conference paper. If you wish to give your consent, I may quote your information by real name, pseudonym, or anonymously. If you do not want me to use your real name, you may choose a pseudonym for quotations. In this regard, please check the statements in the following box of the consent if you wish to give your consent for quotations.
- If you wish to receive a summary of findings (2-3 pages), you can receive it through email or mail address. The preliminary results will be prepared approximately by December 2020.

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☐ Sent to e-mail address: _____

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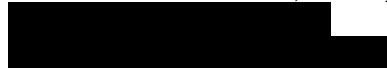
☐ erested to receive the summary of findings: _____

Consent:

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☐ Yes ☐ No	I agree that the researcher may take notes during the interview session.
☐ Yes ☐ No	I agree that the researcher may cite my name and use quotation directly for the future publications.
☐ Yes ☐ No	I agree that the researcher may cite my direct quote by using a pseudonym.
☐ Yes ☐ No	I agree that the researcher may quote my interview for future publications anonymously.
☐ Yes ☐ No	I wish to get the primary findings of the study.
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Md. Abul Kalam Azad, Principal Researcher   **Professor C. Emdad Haque, Research Supervisor**

██████████████   ████████████

e-mail: azadmak@myumanitoba.ca   **e-mail: cemdad.haque@umanitoba.ca**

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Are you agree to participate in this research?   Yes ☐   No ☐

_____   _____
Participant's Signature   Date

_____   _____
Researcher's Signature   Date