Microfinance and climate change adaptation: insights from Bangladesh

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The candidate confirms that the work submitted is his own, except where work which has formed part of jointly-authored publications has been included. The contribution of the candidate and the other authors to this work has been explicitly indicated below. The candidate confirms that appropriate credit has been given within the thesis where reference has been made to the work of others.

PhD Publications

Chapter 2 is based on the articles published as:

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Chapter 7 is under review as:

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I am lead author on the above articles. They all originate from my PhD research meaning I designed the research questions, methodology; as well as collected and analysed the data. These articles were co-authored with my supervisors whose role was in the recommendation of revisions and edits to manuscripts.

Other publications not directly related to this thesis:

Fenton, A., Gallagher, D., Wright, H., Huq, S., & Nyandiga, C. 2014. Up-scaling finance for community-based adaptation. *Climate and Development.* 6:4, 388-397 DOI:10.1080/17565529.2014.953902

Williams, C., Huq, S., Fenton, A. 2015. Knowledge & adaptive capacity. *Nature Climate Change,* 5, 82-83

Fenton, A., Wright, H., Afionis, S., Paavola, J., Huq, S. 2014. Debt relief and financing climate change action. *Nature Climate Change*, 4, 650-653.

Huq, S., Fenton, A. Roberts, E. 2013. Loss and damage. *Nature Climate Change*. 3. 947–949.

Afionis, S., Fenton, A., Paavola, J. 2012. EU climate leadership under test. *Nature Climate Change*. 2.

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Use and justification of alternative format submission

This thesis looks at three distinct areas of analysis as part of the question as to how microfinance and adaptation are linked. The first area of analysis is how households are responding to environmental and climate hazards. The second area of analysis is how microfinance has influenced adaptation outcomes. The third area of analysis is how microfinance institutions have been affected by and are responding to environmental and climate hazards. Each area has involved research with subtle differences in research methods. This has subsequently led to the collection of different empirical data and consequently led to different results. The analysis of the three areas has been better achieved with three academic papers rather than the traditional doctoral thesis design.

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Abstract

Climate change is one of the biggest environmental problems facing humanity, particularly for developing countries which are highly vulnerable to environmental and climate hazards. If citizens of these countries are to adapt there must be sufficient incentives, knowledge, resources, skills, and an absence of market failures and barriers that discourage adaptation. Growing interest exists in how microfinance can facilitate adaptation. However, much of the existing literature remains conjectural, positively biased, and insufficiently uses adaptation concepts. Additional studies of microfinance-adaptation linkages adopting an adaptation lens are needed to address knowledge gaps. The aim of this thesis has been to contribute to microfinance-adaptation literature by examining conceptual arguments and exploring empirical data.

To achieve this, a pragmatic philosophy, mixed-methods approach, and an abductive strategy were adopted. The research location was Noapara Village, Bangladesh, providing a representative case-study of the local area. The unit of analysis was the household, facilitating understanding of relationships between microfinance, livelihoods, autonomous adaptation, and environmental and climate hazards. Methods included a household survey, semi-structured interviews, and focus group discussions. The fieldwork was iterative and sequenced to facilitate subsequent research and triangulation. Analytical categorisation was undertaken iteratively, building on initial descriptive coding and drawing on literature themes to interpret the material.

The first thesis objective was to explore features and patterns of autonomous household livelihood adaptation to better understand responses to environmental and climate hazards. Most households were found to have implemented reactive measures reducing livelihood risk. Two forms of transformational adaptation linked to socioeconomic status emerged: low-cost involuntary measures which reduce income, and high-cost voluntary measures taking advantage of emerging opportunities.

The second objective was to explore the influence microfinance had on household efforts to reduce vulnerability to environmental and climate hazards. Households used credit to cope and adapt but credit limits prevented many households from adopting

transformative opportunities. Often credit usage sacrificed longer term prospects for livelihood improvement for short-term security and at times led to over-indebtedness.

The third objective was to explore how local-level microfinance institution representatives have responded to environmental and climate hazards and their ability to foster adaptation. Branch managers have done little in response to the problems posed by flooding, and are unable to screen clients or effectively manage aggregated risk. Reducing vulnerability by encouraging adaptation among clients holds promise but climate proofing products and partnering with other institutions is required.

The thesis demonstrates that the existing literature relies on an overly simplistic view of potential microfinance-adaptation linkages, arguably due to insufficient consideration of adaptation concepts. However, the microfinance-adaptation literature is in its early stages. This thesis has contributed by providing a more nuanced study, producing different types of data, employing different data collection and interpretation approaches, and exploring both positive and negative linkages. This thesis arguably represents the first in-depth empirical study using an adaptation lens. Several important research findings were uncovered which show both signs of promise and concern. Future research can build upon this thesis, deepening understanding of how and under what conditions microfinance can reduce vulnerability.

In summary, this thesis found that microfinance currently does not provide the necessary ingredients households require to transformationally adapt. Considering that future projections estimate non-marginal change to be ever more necessary, adaptation planners cannot rely upon the microfinance system to facilitate sufficient adaptation levels. The microfinance system can arguably benefit as much from adaptation planning as adaptation planning can benefit from microfinance. However, microfinance offers a potential conduit to support vulnerable communities. Microfinance programmes need climate proofing, so that investment patterns incentivised are ‘climate-compatible’. Additionally, microfinance institutions need to partner with other development actors to ensure households receive the holistic support required to adapt and thus reduce institutional vulnerability.

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Abbreviations

IPCC	Intergovernmental Panel on Climate Change
MFI	Microfinance Institution
NGO	Non-governmental Organisation
SCO	Savings-based Credit Cooperative
UNFCCC	United Nations Framework Convention on Climate Change

Chapter 1. Introduction

1.1. Background context

Climate change is one of the biggest environmental problems facing humanity. According to the latest Intergovernmental Panel on Climate Change (IPCC) report the mean surface temperature change for the period 2016-2035 compared to 1986-2005 will likely be between 0.3°C and 0.7°C (IPCC, 2013). However, climate change is not only a future problem, but one whose negative impacts are being experienced now. According to the IPCC there has been an undisputable and unprecedented warming of the climate system (IPCC, 2013). This change has had subsequent and often negative implications for natural and human systems across all continents (IPCC, 2014c).

Climate change is and will be experienced by countries across the globe; however, climate change impacts are unevenly experienced across countries (IPCC, 2013). Studies have demonstrated that climate change impacts are and will be most experienced by countries designated as *developing countries*, a term referring to countries which exhibit lower levels of human and socioeconomic development (IPCC, 2014c). Climate change impacts will be especially severe in low-lying and small island states (IPCC, 2014c).

Developing countries are not only more exposed to the negative impacts of climate change but are also at a disadvantage in terms of their ability to react. This is due to their comparative lack of resources, poor governance, and an economic dependence on natural capital (Hamilton, 2006; IPCC, 2014c). This disadvantage is most pronounced in least developed countries, a term referring to countries which globally exhibit the lowest levels of socioeconomic development. Climate change impacts and the ability to react are also experienced unevenly within countries. Once again this is often due to lack of resources and economic dependence on natural capital. However, it can also result from the politicized nature of planning processes which can result in an inability and unwillingness to provide the necessary support to reduce the vulnerability of low-income and otherwise disadvantaged groups (Adger et al., 2003; Moser and Satterthwaite, 2008).

Planning processes aiming to reduce the negative impacts of climate change are referred to as adaptation planning. It is predicated upon an acknowledgement that households will be unable to achieve optimal levels of adaptation without external support. However, existing knowledge regarding household adaptation characteristics and patterns remain underdeveloped. Households use local and external financial sources to fund activities to adapt to climate change impacts, but there is a lack of understanding about how these sources are used, including the use of microfinance. Greater understanding of the degree to which households are adapting and also how these adaptations are financed is crucial for adaptation planning, particularly in the current period as it evolves into a programmatic approach, epitomised by the development of National Adaptation Plans.

1.2. Overview of PhD

This thesis offers an in-depth empirical analysis of the relationship between microfinance, autonomous household livelihood adaptation, and environmental and climate hazards. It contributes by improving understanding of the patterns and characteristics of autonomous adaptation, in particular their potential to meaningfully reduce vulnerability. Particular emphasis is placed on contributing to the understanding of microfinance and adaptation linkages. This topic is important because microfinance is an important ingredient in household livelihoods, and consequently in autonomous adaptation. Existing knowledge of these linkages remains conjectural, with literature in an exploratory stage with few empirical studies. The implications of the research findings to contribute to existing knowledge and its practical implications for planned adaptation are then discussed.

1.3. Outline and thesis structure

This thesis is divided into nine chapters, the first of which is this introduction chapter. Chapter 2 provides a review of relevant literature. Firstly, approaches to adaptation are reviewed. Secondly, important concepts within the adopted approach to adaptation are outlined, such as transformation and autonomous adaptation. The chapter ends with a review of the current state of the microfinance-adaptation literature which justifies why additional research is required. Chapter 3 presents the

research statement of this thesis. This chapter stipulates its aim and objectives. Chapter 4 presents and justifies the research design. Firstly, the research philosophy, methodology, and strategy are explained, which act as the foundation for the research design. Secondly, the chapter details the methods used and data collected. Thirdly, the chapter details the strategy for triangulation and ethical considerations. The chapter ends with an overview of the case-study in Bangladesh.

Chapter 5 represents the research findings associated with the first research objective of exploring features and patterns of autonomous household adaptation. Firstly, this chapter outlines the suitability of the risk hazard approach for assessing autonomous adaptation and provides an analytical framework for its assessment. Secondly, case-study research findings are then assessed and autonomous adaptation patterns characterised. Insights are gained regarding how households have implemented many responses which can be reasonably described as transformational; however, not all of the transformations which have taken place can be considered positive.

Chapter 6 represents the research findings associated with the second research objective of exploring how microfinance influences autonomous household livelihood adaptation. Firstly, the chapter outlines the need for more empirical study into the influence of microfinance on adaptation. Secondly, it outlines the way in which microfinance has influenced household coping capacity and adaptive capacity. Insights are gained which show that microfinance has the potential to both facilitate and inhibit adaptation. Additionally, the insights show that there are inevitable limits to what microfinance can achieve especially when transformational responses are required.

Chapter 7 represents the research findings associated with the third research objective of examining the ability of microfinance institutions (MFIs) to foster adaptation. Firstly, the chapter outlines how MFIs are vulnerable to environmental and climate hazards. Secondly, it outlines how branch managers of MFIs have been affected by flooding and how they have responded. Insights are gained which show that MFIs at the local-level

are vulnerable to flooding and currently have few options to reduce their aggregated risk.

Chapter 8 comprises an academic discussion of the empirical research findings regarding contributions to knowledge and their practical implications for adaptation planning. Firstly, the chapter outlines how the research objectives have each been met. Secondly, the implications of the research are discussed with regards to the academic literature and adaptation planning. Thirdly, the chapter reflects upon the approaches adopted by the thesis along with how future research can subsequently build upon this thesis.

Chapter 9 provides concludes this thesis, providing a synthesis of research findings, as well as theoretical and policy implications, and ends with a summary statement.

Chapter 2. Literature Review

This thesis draws upon microfinance and adaptation as two broad areas of literature. The following sub-sections of this chapter focus on each of these literatures in turn. A relevant overview of each literature is provided outlining how this thesis relates to it, in terms of addressing topics of importance and knowledge gaps. Next, how these literatures have been thus far combined is discussed and justification for further research is provided. The chapter ends with a summary.

It is argued that further empirical study of microfinance-adaptation linkages is vital, due to the dominance of untested theoretically proposed mechanisms, contradicting empirical evidence from microfinance literature, and inadequate conceptualisation of important concepts. It is then argued that empirical studies adopting an adaptation lens are required and that until microfinance-adaptation linkages are further explored there will be uncertainty regarding this precise relationship, complicating how adaptation planners might use microfinance to facilitate autonomous adaptation.

2.1. Adaptation

2.1.1. Bodies of adaptation research

Adaptation has different meanings in different areas of research (see Janssen and Ostrom, 2006). The *ecological resilience* approach, originating from ecology, has focused on systems and thresholds, and the ability of a system to adjust and respond over the long term (Eakin et al., 2009; Eakin and Luers, 2006; Folke, 2006). The *political ecology* approach, originating from the poverty and geography literatures, has focused on power, equity, and capabilities. It is mainly concerned with immediate needs caused by structural vulnerability, causes of structural vulnerability, and how this vulnerability differs across societal groups (Eakin and Luers, 2006; Eakin et al., 2009; Adger, 2006). The *risk-hazard* approach, originating from the natural hazards literature, has focused on exposure and sensitivity to hazards. It has been primarily concerned with the practical implementation of adaptations at the sectoral and community levels (Eakin and Luers, 2006; Eakin et al., 2009; Smit and Wandel, 2006). It is increasingly focusing on enabling environments and creating decision-support tools to facilitate bottom-up adaptation by private sector, civil society and local government actors (Eakin and Lemos, 2006).

The different strands of research ask different questions, highlight different characteristics as central to vulnerability, and thus have potential strengths and weaknesses regarding a specific research topic. The ecological resilience approach focuses on studying socio-ecological systems at the system scale (Eakin and Luers, 2006). Consequently, it is less appropriate compared to other approaches for exploring household adaptations to environmental and climate hazards. The political ecology approach is relevant for studying vulnerability to environmental and climate hazards at the local-level. However, it is considered not suitable for this thesis. Within political ecology, vulnerability to environmental and climate hazards is considered as the consequence of structural or root causes of vulnerability (Eakin and Luers, 2006; Eakin et al., 2009). Consequently, adaptation is often seen as synonymous with development (see Ayers and Dodman, 2010). Such is the focus on social, cultural and economic relationships, and power hierarchies that adaptation may not need to occur in response to an environmental change (Manuel-Navarrete and Pelling, 2015; Pelling et

al., 2015). This idea of adaptation is too broad for the purposes of this thesis and is not sufficiently compatible with understanding how livelihood risk is managed and reduced at household-level.

This thesis is situated within the risk hazard approach which is relatively better placed to explore issues pertinent to both finance and adaptation, such as cost, risk, and uncertainty (Leclere et al., 2014). It is particularly well suited to household level livelihood studies, with local-level responses to climate change argued to be driven by how these changes impact on livelihoods and assets (Ayers and Forsyth, 2009; Forsyth and Evans, 2013). Consequently, adaptation refers to the process through which households adjust to changing conditions, stresses, hazards, risks, or opportunities (Smit and Wandel, 2006). For more details regarding concepts within this approach see Chapter 5, Chapter 6, and Chapter 7.

The risk hazard approach is identified by Eakin and Luers (2006) as having evolved from authors within the geography literature, in particular White (1986) and Burton et al. (1993). Contributors to this literature focused their attention on characterising hazards, risk thresholds, human behaviour, and the need to manage environmental hazards facing society (Eakin and Luers, 2006). The approach focuses on known short and medium term risks although the approach has to some extent shifted focus towards a discourse of building adaptive capacity (Smit & Wandel, 2006). The risk hazard approach typically identifies the most significant climatic hazards affecting a place, explores exposure and likelihood of damage and assesses cost-effective and practical risk reduction options (Eakin et al., 2009).

This approach can be associated with the premise that adaptation is additional to development, where risk reduction efforts lessen future climate risks and contribute to ensuring the sustainability of future development (Ayers and Dodman, 2010; Schipper, 2007). Consequently, linkages between vulnerability to environmental and climate hazards and wider vulnerability caused by structural causes are recognised but are ultimately seen as distinct (Smit and Wandel, 2006). This is more precise than under the political ecology approach for the purposes of this thesis and provides a specific

analytical reference point. It is also compatible with the assessment of microfinance for which households, livelihoods, and risk are important concepts (see Chapter 5, Chapter 6, and Chapter 7).

However, while the risk hazard approach is considered the most relevant for this study it does have limitations regarding its use for the purposes of this thesis. The approach privileges efficiency and effectiveness over equity (Eakin et al., 2009). This represents a significant weakness when understanding local-level adaptation within a developing country context (see Fenton et al., 2016a). Consequently, this thesis has incorporated the concept of equity to assess how adaptation measures might reflect or lead to inequitable outcomes (see Chapter 5.6 and 6.6.4). Two major debates exist within the risk hazard literature: the autonomous-planned adaptation divide and the incremental-transformational adaptation divide. These will be discussed in turn.

2.1.2. Autonomous adaptation

Adaptation is typically depicted as occurring in two forms, autonomously and planned. Autonomous adaptation is a continual process occurring in the absence of, or constraints imposed by, top-down policy support and intervention (Smit et al., 2001). In comparison, planned adaptations are those which are planned in anticipation of potential climate change through deliberate top-down policy decisions (Smit et al., 2001). This distinction is important as the risk hazard approach, and this thesis, is primarily concerned with the practical implementation of adaptations by households. Consequently, this thesis adopts a focus on autonomous household adaptation rather than top-down planned government efforts.

Additionally, understanding autonomous adaptation is important as much of adaptation will be autonomous (Adger et al., 2003). Within the literature the characteristics of autonomous adaptation are debated. Autonomous adaptation has been depicted as the opposite of planned adaptation; for instance, self-interest versus collective needs (Klein, 2003). However, elsewhere the distinction between autonomous and planned adaptation has been described as blurred (UNFCCC, 2009). Autonomous adaptation can be undertaken by individuals or groups and can be

independent of outside intervention, linked to government policies, or both (Smithers and Smit, 1997). Autonomous responses are not simply automatic but are planned cognitive processes and not necessarily reactive (Hisali et al., 2011; Stringer et al., 2009). Moreover, the scale at which one analyses adaptation influences whether an adaptation appears as a planned or autonomous process (Reilly and Schimmelpfennig, 2000). In practice, autonomous adaptations represent household efforts to reduce livelihood risk (Ayers and Forsyth, 2009; Forsyth and Evans, 2013). These will have different characteristics depending on the context within which they occur. Consequently, this thesis focuses on autonomous household livelihood adaptation (henceforth, autonomous adaptation) to environmental and climate hazards.

Another reason why this thesis focuses on autonomous adaptation is that knowledge of it is vital for effective adaptation planning. This is because the need for planned adaptation is predicated upon autonomous adaptation being insufficient or ineffective (Smit et al., 2001). Consequently, understanding when and why autonomous adaptation is insufficient or ineffective is a vital determinant of effective planned adaptation (Forsyth and Evans, 2013). However, understanding of autonomous adaptation at the local-level remains weak (Thorn et al., 2015), with much of local adaptation unnoticed, uncoordinated and unaided by development actors (Christoplos et al., 2009).

Consequently, this thesis seeks to contribute in this regard by examining the characteristics of autonomous adaptation (for information on selected case-study see Chapter 4.7). It adopts the framework of Smit et al. (1999) exploring what is being adapted and how risks deriving from environmental and climate hazards are experienced, who is adapting and the role of livelihood resources in influencing outcomes, and finally how adaptations are occurring including how these influence vulnerability to environmental and climate hazards and livelihood trajectories.

2.1.3. Transformation

The notion of transformational change is of increasing concern within the risk hazard literature as worsening climate change impacts are likely to cause and demand 'non-

marginal change' (see Stern, 2006). Consequently, this research also places particular attention towards contributing to the transformation debate.

The risk hazard literature has only recently started using the term transformation, despite its much longer usage within areas of adaptation research (cf. Holling, 1986; Klein et al., 2014). Much of the transformation literature remains conceptual, focusing on the differences between incremental and transformational change. The risk-hazard approach has an instrumental take on transformation. It represents the depth or extent of change needed in response to environmental and climate hazards which threaten socially negotiated norms and inhibit the ability to fulfil objectives (Leclere et al., 2014; Klein et al., 2014). Without transformation, losses would occur as adaptation limits are surpassed (Dow et al., 2013; Kates et al., 2012). For a more conceptual overview on transformation see Chapter 5 and Chapter 6.

Despite conceptual developments, empirical classifications of adaptations as transformational remain subjective and relative across multiple adaptation research communities (Fenton et al., 2016a). The difficulty associated with classifying a response as transformational is partly due to the multiple dimensions through which change can be assessed (Rickards and Howden, 2012). Relatively few empirical studies have focused on this issue, and empirical research has largely focused on case-studies from developed countries (e.g. Rickards and Howden, 2012). Empirical studies are emerging from developing countries, however, these have found more incremental than transformational responses (see Butler et al., 2016). Consequently, there is a knowledge gap regarding transformational adaptation within a developing country context. This includes its association with other adaptation characteristics such as function (see Dronkers et al., 1990), uptake (see Smit et al., 2000), and adaptive capacity (see Jones et al., 2010; Grothmann and Patt, 2005; Smit and Wandel, 2006; Williams et al., 2015).

This thesis seeks to contribute in this regard by examining autonomous adaptations to explore whether they can be classified as incremental or transformational. Particular focus will be given to: understanding what is being adapted transformationally and

how risk deriving from environmental and climate hazards is experienced; who is adapting transformationally and the role of livelihood resources in influencing outcomes; and finally how transformational adaptations are occurring, including how these influence vulnerability to environmental and climate hazards and livelihood trajectories.

A focus on transformation also has practical significance as it is increasingly likely that adaptation planning will have to be aware of incremental and transformational adaptation patterns to influence households to avoid or adopt certain pathways as climate change impacts worsen (Butler et al., 2014; Wise et al., 2014). Incremental adaptations can build capacity for future transformational change, but can also represent short-term measures creating hidden and latent systemic risks (Matyas and Pelling, 2015; Kates et al., 2012).

2.2. Microfinance

2.2.1. Overview of the microfinance literature

Microfinance is typically seen to involve microcredit, microdeposit schemes and microinsurance products. Although in modern times microcredit was first adopted and is the most common form of microfinance, rising awareness regarding the financial needs of low-income groups has led to a plethora of services and products (Wright, 1999). Modern microfinance is diverse, and consequently it is useful to differentiate the varieties of approaches. Numerous attempts have been made, such as Rutherford (1996); Matin et al. (1999); and Staschen (1999). Combining the three attempts together yields six dimensions of microfinance: the financial service offered, the provider (informal, semi-formal, and formal), ownership and management (users versus providers), and source of funds. However more dimensions could be added such as the use of an individual or group lending mechanism, and the combination of financial and non-financial services. It is important to recognise and understand the diversity of microfinance and not to homogenise. For instance different providers and ownership structures of microfinance place different emphasis on achieving financial or social objectives and performance, with a trade-off existing between the two (see Copestake, 2007).

From an economic perspective, microfinance is seen as an answer to market failure (Vanroose, 2007). Marginalised households are excluded from the mainstream financial sector despite basic economic theory arguing everyone should be bankable. In reality, low-income and otherwise disadvantaged groups are excluded due to perceived high risk, lack of financial collateral, high costs, and usury laws. These prevent the flow of capital to where it is most economically productive (Ledgerwood, 1999; Morduch, 1999; de Aghion and Morduch, 2005). Microfinance provides a way to solve these issues, allowing the financial market to reach those previously considered un-bankable (de Aghion and Morduch, 2005). Early microfinance literature argued that microfinance can reduce poverty by helping households to accumulate assets, increase income, and improve risk management by facilitating income smoothing (via livelihood diversification) and consumption smoothing when livelihood shocks occur (see de Aghion and Morduch, 2005; Sebstad and Cohen, 2001).

The microfinance literature can be interpreted as being divided into two schools of thought or narratives: the institutionalists and the welfarists. The institutionalist-welfarist debate asks what the dominant aim for microfinance should be. Institutionalists are depicted as favouring the welfare of MFIs. Welfarists are depicted as favouring the welfare of clients. Each side can be associated with discussions surrounding commercial and development paradigms respectively (Brau and Woller, 2004; Woller et al., 1999; Morduch, 2000). Understanding this debate is vital for understanding the other key microfinance debates which have been summarised in Table 1. Importantly, other key debates within the microfinance literature can be seen as having a position which relates back to the position taken within the institutionalist-welfarist debate.

Table 1: Key microfinance debates

	Key line of enquiry	Institutionalist Position	Welfarist Position
Institutionalist-welfarist debate	What should be the emphasis of microfinance?	Create financial institutions for clients not served by the formal financial system.	Immediately improve the well-being of clients.
Integrated-minimalist debate	What services should MFIs provide?	Only financial services to reduce operational costs.	Both financial and development services, to maximise poverty reduction.
Service delivery debate	What institutions are most suitable to serve clients?	Self-sufficient MFIs needed to ensure institution longevity.	Subsidised Cooperatives, NGOs or CBOs needed to ensure poorer people served.
Outreach debate	What defines significance of outreach?	Breadth of outreach1 determines if significant outreach is achieved.	Depth of outreach2 determines if significant outreach is achieved.
Mission drift debate	What type of clients should MFIs seek?	Target those near established poverty lines to ensure financial sustainability	Target those in most need, decreases in depth of outreach equal mission drift.
Impact assessment debate	How should progress towards poverty reduction be measured?	'Intermediary' school, assesses sustainability of service provider.	'Intended beneficiary' school, assesses impact on individuals or households.
Source: Authors own			

These two narratives are frequently seen as being opposed to each other with each side believing that each alternative approach threatens the goal of poverty reduction (Woller et al., 1999). This debate is commonly referred to as the schism (Woller et al., 1999; Morduch, 2000). Although the debate is often depicted as dichotomised, it is also readily accepted that MFIs can be seen to be utilising both schools of thought and therefore it is more conducive to see these sides as representing ends of a continuum (Dunford, 2000). For instance, many MFIs have benefited from donor subsidies, seeking to attain financial sustainability over the medium term as their institutions grow and costs reduce.

The service delivery debate is perhaps the most closely associated to the institution-welfarist debate and asks what type of institutions are most suitable for satisfying the needs of clients' for financial services. Institutionalists are depicted as shunning the use of subsidies and are associated with the argument that clients seek access to

[1] 'Breadth of outreach' refers to the number of users.
[2] 'Depth of outreach' commonly refers to the degree of poverty or vulnerability experienced by clients.

credit, not cheap credit (see Bhatt and Tang, 2001; Morduch, 2000; Woller et al., 1999). Welfarists are depicted as favouring subsidies which reduce the cost of credit for clients and increases the likelihood that the poorest can be served (see Bhatt and Tang, 2001; Morduch, 2000; Woller et al., 1999).

The integrated-minimalist debate is also closely related to the institutionalist-welfarist debate. This debate asks which services MFIs should provide their clients. Institutionalists argue that MFIs should focus on the provision of financial services, for which they hold a competitive advantage and expertise, in order to keep operating costs low. Welfarists argue that MFIs should provide clients with both financial and non-financial services as poverty has multiple dimensions (cf. Dunford, 2001; Woller and Woodworth, 2001; Sievers and Vandenberg, 2007; Bhatt and Tang, 2001).

Other key debates include the outreach and mission drift debates. These related debates ask what defines significance of outreach, and what type of clients MFIs should seek to serve respectively. The institutionalists are often depicted as focusing on serving as many clients as possible, placing emphasis on clients closer to established poverty levels, which also serves to keep costs low. Welfarists are often depicted as favouring the serving of the poorest clients possible (see Morduch, 2000; Woller et al., 1999; Navajas et al., 2000; Copestake, 2007; Armendáriz and Szafarz, 2009; Mersland and Strøm, 2010).

The final important debate is impact assessment which asks how progress towards achieving aims should be measured. Institutionalists can be seen as favouring the financial performance assessment of institutions. Welfarists can be seen as favouring the assessment of clients as this is where poverty is experienced. These two positions have been termed the 'intermediary' and the 'intended beneficiary' approaches respectively (Hulme, 2000).

2.2.2. Microfinance and adaptation

If sufficient levels of autonomous adaptation are to occur, then there must be sufficient levels of private incentives, knowledge, resources, skills, and a lack of market

failures and barriers that discourage adaptation (Vernon, 2008; Fankhauser et al., 1999; Smit et al., 2001; Tanner and Mitchell, 2008). This makes understanding the linkages between microfinance and autonomous adaptation important. Microfinance is a key source of financial capital for low-income and otherwise disadvantaged groups. Financial capital is a component in the construction and improvement of livelihoods as demonstrated through various frameworks (Bebbington, 1999; Ellis, 2000; Blaikie et al., 1994; Moser and Satterthwaite, 2008; Carney, 1998). Additionally, microfinance has been the main tool through which the failure of traditional financial services to reach low-income and otherwise disadvantaged groups has been addressed. Consequently, it is likely to influence autonomous adaptation which has been shown to be centred on livelihoods and how these livelihoods interact with environmental scarcity and risk (Ayers and Forsyth, 2009; Forsyth and Evans, 2013).

Academic literature has only recently started to focus on microfinance-adaptation linkages. Consequently, it remains in a theoretical and exploratory state with few empirical studies (Fenton et al., 2015). For instance, the important questions within Table 1 have not yet been addressed from an adaptation perspective. Consequently, many of the proposed mechanisms through which microfinance may facilitate adaptation have not been tested and empirical studies are needed to assess how microfinance influences adaptation in practice (Fenton et al., 2015).

Other reasons exist to justify why further study on microfinance-adaptation linkages is needed. Much of the current microfinance-adaptation literature arose when the basic theory of microfinance was rarely contested. Many quantitative microfinance impact assessments at that time found positive links between microfinance and poverty reduction (e.g. Pitt, 2000; Pitt and Kandker, 2001; Khandker, 2005). Consequently, early debates within the microfinance literature focused on the best way to operationalise the concept rather than questioning its potential (represented by Table 1).

The *theory-driven* view of how microfinance works was used to suggest that microfinance can facilitate adaptation. Proposed mechanisms through which

microfinance can facilitate adaptation can be summarised into two branches: 1) improving ex-post risk recovery by enhancing coping capacity; and 2) improving ex-ante risk reduction by enhancing adaptive capacity (cf. Hammill et al., 2008; Heltberg et al., 2009; Agrawala and Carraro, 2010).

However, much of the early impact assessments have been since criticised for poor quality of data and methods (e.g. Duvendack et al., 2011). Recent systematic reviews of microfinance have only found short-term effects on asset accumulation, while livelihood diversification has not necessarily increased overall income (van Rooyen et al., 2012). Recent randomised controlled trials have found no statistically significant increase in total household income or consumption as a result of membership of microfinance programmes (Banerjee et al., 2013; Banerjee et al., 2015). A growing body of contemporary microfinance literature has a more critical perspective of microfinance (e.g. Bateman, 2010; Dichter and Harper, 2007; Maclean, 2010). Consequently, a more critical investigation of microfinance-adaptation linkages is needed (Fenton et al., 2015). This includes being open to possible linkages between microfinance and maladaptation, representing the outcome where vulnerability reduction efforts inadvertently increase vulnerability (Barnett and O'Neill, 2010).

Furthermore, empirical studies are needed due to the lack of studies which adequately incorporate microfinance, livelihoods, and environmental risk. Within livelihoods research, the role of savings and credit arrangements have received limited attention; while the microfinance literature has rarely dealt with both the issues of livelihoods and of environmental risk (Lont and Hospes, 2004; Fenton et al., 2015).

The current microfinance-adaptation literature has weak conceptualization of both livelihood and adaptation concepts. A clear example of this is the presumed benefits of livelihood diversification (e.g. Hammill et al., 2008). Weak conceptualisation of livelihood diversification has meant that the microfinance literature does not distinguish various forms of diversification such as 'beneficial' versus 'detrimental' and 'deliberate' versus 'involuntary' (Ellis, 2000; Ellis, 1998). For instance, it may be viewed as a 'Faustian bargain' in which greater security in the short term (represented by a

diversified risk strategy) is obtained by sacrificing potential higher economic returns and may ultimately serve as a poverty trap which may lower future adaptive capacity (Wood, 2003). This is unless diversification occurs in response to under-utilisation of factors of production, in which case diversification may be an optimal strategy (Barrett et al., 2001; Morduch and Sharma, 2002; Paavola, 2008). Moreover, empirical studies are needed because even if microfinance facilitates asset accumulation and livelihood diversification or smooths consumption, we do not know whether this directly reduces vulnerability to environmental and climate hazards.

Vulnerability is understood differently across the poverty and adaptation literatures (see Adger, 2006; Eriksen et al., 2007; Eakin and Luers, 2006). Existing microfinance-adaptation literature implicitly adopts an 'adaptation as development' perspective, where microfinance facilitates adaptation by tackling general drivers of vulnerability and not by directing confronting or managing climate risk (see Ayers and Dodman, 2010; McGray et al., 2007). However, the implications of the adoption of this perspective are not sufficiently acknowledged or discussed.

Knowledge is underdeveloped on the issue of whether microfinance can facilitate households to address livelihood risk directly caused by environmental and climate hazards. Empirical studies are needed which adopt an adaptation lens (Fenton et al., 2015). The risk hazard approach adopted within this thesis is suitable for this purpose due to its applicability at the household level at which livelihoods can be observed, and its ability to assess how livelihoods are adapted in response to exposure and sensitivity to hazards (Hulme, 2000; Eakin et al., 2009; Fenton et al., 2016a).

The gaps in knowledge which are pertinent to adaptation involve understanding the role of microfinance in influencing what is adapted and how microfinance influences how risks deriving from environmental and climate hazards are experienced. Additionally, we do not know how microfinance influences who is adapting and its role in influencing adaptation outcomes. Finally, we do not know how microfinance influences how adaptation is occurring, including how it influences livelihood vulnerability to environmental and climate hazards.

Within microfinance-adaptation literature the focus has been on household adaptation. However, there is also a need to consider institutional adaptation to climate change (Fenton et al., 2015). Within the microfinance literature it has been argued that reducing poverty requires long term access to financial services, and thus financially sustainable MFIs (see Woller et al., 1999; Woller and Woodworth, 2001; Morduch, 2000; Bhatt and Tang, 2001). Consequently, it is likely that reducing vulnerability also requires this. However, little is known regarding the vulnerability of MFIs to climate change despite their obvious vulnerability. For example, major flooding in Bangladesh in 1998 resulted in significant reductions of loan repayments which created liquidity problems and required capital injection to keep the sector functioning (Twigg, 2004; Nagarajan and Brown, 2000; World Bank, 1999). Climate hazards increase the demographic, physical environment, and macroeconomic risks facing MFIs (Pantoja, 2002). They are 'risk aggregators', depending on factors such as the number of clients served, their vulnerability, and their geographical dispersion (Pantoja, 2002). Climate hazards increase client vulnerability and thus risks associated with client demographic and socioeconomic profile. This has implications for operational risks (e.g. increased credit risk due to non-payments, resulting in lower portfolio quality), portfolio quality (e.g. portfolio at risk, write off ratio, and risk coverage ratio), and financial management risks (e.g. increased asset and liability risk due to increased liquidity risk) (Pantoja, 2002; Dowla, 2009; Bruett, 2006).

Additionally, it is important to understand how MFIs are adapting their internal and external processes because like other local-level institutions, they influence the adaptation decisions of others by influencing the risks and incentives to adopt adaptation measures and by governing access to resources (Agrawal, 2008). Yet understanding of local-level institutions and their role in adaptation remains underdeveloped, with simplified assumptions often made regarding organisational responses to climate change (Agrawal, 2008; Berkhout, 2012; Berman et al., 2012). This is particularly true of MFIs. The most relevant study of the role of MFIs in adaptation involved only secondary data and studied linkages at the institution level (see Agrawal, 2008) and thus was not able to empirically explore how microfinance

programmes influence clients which would require local-level livelihood studies (Hulme, 2000).

2.3. Summary and justifications for thesis

This thesis has adopted the risk hazard approach to vulnerability research due to its suitability for household level studies, its compatibility with the assessment of microfinance, its relevance for understanding local-level responses to climate change, and understanding how these changes impact on livelihoods and assets. Consequently, linkages between vulnerability to environmental and climate hazards and wider structural vulnerability are recognised but ultimately seen as distinct. However, this thesis has incorporated the concept of equity to assess how adaptation measures might reflect or lead to inequitable outcomes. This is to address limitations posed by privileging of efficiency and effectiveness over equity by the risk hazard approach, a weakness in terms of understanding local-level adaptation within a developing country context.

This thesis focuses attention on autonomous adaptation which is consistent with the focus on the practical implementation of adaptations by the risk hazard approach. Specific attention is given to how households address livelihood risk within the context of environmental and climate hazards, consistent with how households adapt in practice. Thus this research focuses attention to autonomous household livelihood adaptations which reduce vulnerability to environmental and climate hazards. This focus addresses a gap in existing knowledge. Understanding of autonomous adaptation at the local-level remains weak. While the study focuses on autonomous rather than planned adaptation, the findings have benefits for adaptation planning, for which understanding of autonomous adaptation is vital.

This thesis also contributes to the transformation debate, which thus far suffers from few empirical studies, in particular within a developing country context. Particular focus is given to: understanding what is being adapted transformationally and how risk deriving from environmental and climate hazards is experienced; who is adapting transformationally, and the role of livelihood resources in influencing outcomes; and

finally how transformational adaptations are occurring including how these influence vulnerability to environmental and climate hazards and livelihoods. The attention given to transformation also benefits adaptation planning which should be aware of incremental and transformational adaptation patterns, in order to influence households to avoid or adopt certain pathways as climate change impacts worsen.

The main focus of this thesis is microfinance-adaptation linkages. The study of these linkages is important because microfinance is a key source of financial capital in the construction of household livelihoods and thus is likely to be a key ingredient for autonomous adaptation. However, existing knowledge remains in a conjectural state with few empirical studies. The need for empirical study is increased by the recent refutation of microfinance-poverty impact assessments, the limited relevance of wider literatures, and weak conceptualisation of adaptation concepts. Additionally, we know little of the vulnerability of MFIs at the local-level and what adaptations are taking place at this level to reduce aggregated risk.

Consequently, studies are required which adopt an adaptation lens to enhance understanding of microfinance-adaptation linkages (Fenton et al., 2015). Until microfinance-adaptation linkages are further explored, there will be uncertainty regarding this precise relationship, complicating how adaptation planners might use microfinance to facilitate autonomous adaptation. Such concern is necessary because unlike other interventions, microfinance may have a negative impact as it directly places people in financial debt (Duvendack and Maclean, 2015).

Chapter 3. Research Statement

3.1. Aims and objectives

Reflecting on the knowledge gaps identified in Chapter 2 the aim of this thesis is to contribute to the microfinance-adaptation literature by examining conceptual arguments and by exploring empirical data. Specifically this thesis has three objectives:

Objective 1:

Explore features and patterns of autonomous household adaptation to better understand how households are responding to environmental and climate hazards as well as explore implications for planned adaptation.

Objective 2:

Explore how microfinance has influenced household efforts to reduce sensitivity to environmental and climate hazards as well as explore implications for planned adaptation.

Objective 3:

Explore how local-level representatives of microfinance institutions have responded to challenges posed by environmental and climate hazards as well as their ability to foster adaptation in light of their own exposure.

3.2. Justification

Objective 1 is required because systematic understanding of adaptation measures utilised by households in developing countries is needed to identify the constraints they face, and the external interventions or adaptation planning needed to overcome them. Understanding of autonomous household adaptation patterns remains underdeveloped despite its importance to adaptation planning. In particular, little is known about whether households are implementing incremental or transformational adaptation measures as well as the implications of this for adaptation planning. Objective 1 is addressed in Chapter 5.

Objective 2 is required because there is increasing interest in the potential of microfinance to foster adaptation. However, existing literature over-relies upon theoretical arguments rather than empirical evidence, and until now the emphasis has been on potential positive linkages. Empirical studies which utilise an adaptation lens are required to explore whether theoretical linkages hold true in practice. The need for empirical studies can be considered paramount considering many recent studies have questioned the potential for microfinance to reduce poverty. Additionally, there already appears to be a policy shift towards incorporating microfinance into climate change projects; consequently, an empirical study into microfinance-adaptation linkages has timely policy relevance. Before microfinance can be considered for a prominent role in the adaptation finance architecture we need to be able to clarify what influence microfinance may have on adaptation outcomes. This will enable us to understand what its role in the system should be or what the system should do for MFIs. Objective 2 is addressed in Chapter 6.

Objective 3 is required to understand how MFIs are vulnerable to climate change. It is needed to reflect the fact that the literature addresses microfinance-adaptation linkages at both households and institution levels. This objective is needed for much of the same reasons as Objective 2. However, the focus is shifted away from households and autonomous livelihood adaptation and towards MFIs and their processes in mind of their potential position within the climate finance architecture. Objective 3 is addressed in Chapter 7.

Chapter 4. Research Design

4.1. Introduction

This chapter introduces the research design of this thesis. Firstly, the research philosophy, methodology, and strategy are explained, which comprise the foundation of the design. Secondly, the methods used and how data was collected in practice are outlined. Thirdly, the chapter details practical and ethical considerations. Then an overview of the case-study in South-West Bangladesh is provided.

In summary, a pragmatic philosophy, mixed-methods approach, and an abductive strategy using a single case-study was adopted. Methods used include a household survey, semi-structured interviews, and focus group discussions, supplemented by participant observation and informal discussions. The fieldwork was iterative and sequenced to facilitate subsequent research and triangulation.

4.2. Research paradigm

Paradigm is used to refer to ontological and epistemological stances pertaining to assumptions regarding the nature and production of knowledge. The research paradigm of 'pragmatism' was adopted.

Defining pragmatism is difficult due to the plurality of associated approaches (see Johnson et al., 2007; Cherryholmes, 1992). Additionally, its characteristics are incompatible with the typical assumptions underpinning other metaphysical paradigms (Morgan, 2007). It is defined here as a philosophy that combines methods and ideas in a way which best frames, addresses, and provides tentative explanations to research questions (Johnson et al., 2007). An important consideration in the adoption of pragmatism was concern regarding anticipated consequences, values and visions of human action and interaction; and not descriptions, theories, explanations, and narratives as in other research (Cherryholmes, 1992; Morgan, 2007).

Often seen as the middle ground between positivism and constructivism, pragmatism shares the belief that researchers and knowledge are historically and socially situated, but also that knowledge can be generalized (Cherryholmes, 1992). It has been utilised due to the belief that research findings cannot be so unique that they have no implications elsewhere, nor so generalizable that they have implications in every possible historical and cultural setting (Morgan, 2007).

The use of pragmatism means foundationalism is rejected despite the acknowledgement that the world exists independent of consciousness (Cherryholmes, 1992; Rorty, 1991). Instead, this research seeks explanations which are retained or

dismissed based upon whether they produce superior understanding, based upon predicting outcomes with a dose of scepticism (Cherryholmes, 1992).

The adopted strategy was abduction, which has been linked to pragmatism since its classical writings (see Peirce, 1903). The abductive research strategy is based upon a belief that the ability to explain the social world is derived from the accounts that people give of their actions or those of others. This research sought to obtain this knowledge from respondents, and used these accounts to generate more complex technical descriptions and social theories (Blaikie, 2010; Blaikie, 2007). Analytical categorization was then undertaken using an iterative process building on the initial descriptive coding, and drawing upon literature themes to interpret the material.

4.3. Research methodology

A mixed-methods methodology was adopted as is often the case within pragmatism (Denscombe, 2008). Consequently, a combination of elements of qualitative and quantitative viewpoints, data collection, analysis, and inference were used (Johnson et al., 2007). Combining approaches enabled a more comprehensive view than would be gained from using quantitative or qualitative approaches alone (Creswell, 2015).

This research satisfies the core characteristics of mixed-methods research as outlined by Creswell (2014, 2015). Firstly, it involves collection and analysis of quantitative and qualitative data (see Chapters 4.4.1, Chapter 5, Chapter 6, and Chapter 7) to provide answers to stipulated research questions (see Chapter 3.1). Secondly, it adopts rigorous qualitative and quantitative methods (see Chapter 4.5). Finally, the research is designed within established theories derived from academic literature (see Chapter 2).

The approach can be described as a *convergent parallel mixed methods* approach, whereby quantitative and qualitative data are both used to provide a comprehensive analysis of a research problem (Creswell, 2014; Creswell, 2015). The research design can also be described as sequential with three distinct phases which built upon each other (see Chapter 4.5 for full details). The first phase involved the use of qualitative

methods to verify field site suitability and enhance the specificity of subsequent research. In the second phase, quantitative data was collected and analysed, yielding detailed knowledge regarding the case study, which determined participant selection for subsequent qualitative research. In the third phase, qualitative research was collected and combined with quantitative data to address research questions and provide overview conclusions (see Figure 1).

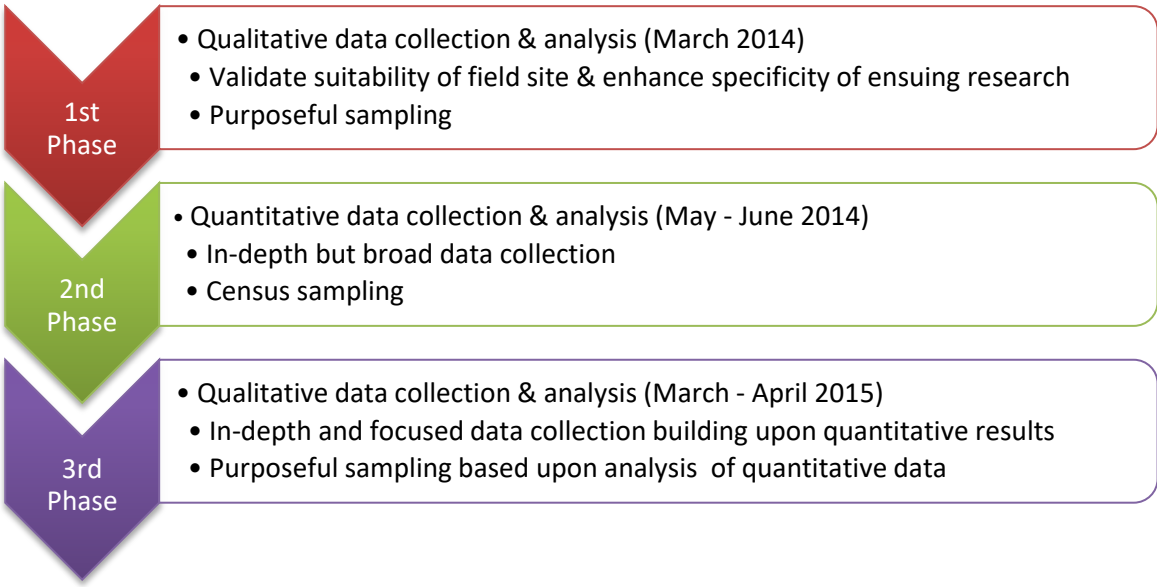

Figure 1: Procedural diagram of research design

The research methodology is not dissimilar to existing studies (e.g. James, 2010; Below et al., 2012). However, whereas previous studies use quantitative techniques to find the links between microfinance and adaptation, this research supplemented quantitative with qualitative techniques.

A qualitative approach was necessary due to the exploratory aims of the research. However, it would have also been difficult to undertake an experimental quantitative investigation. It was impossible to control the context or participants as if it were an experiment. Additionally, scoring adaptations was unnecessary as was measuring relative vulnerabilities. The focus is to explore in-depth the role of microfinance in explaining known occurrences of autonomous adaptation (see Chapter 3).

The qualitative component was necessary because adaptive capacity is difficult to gauge until after its realisation or mobilisation, making the assessment of past events favourable (Adger et al., 2007; Engle, 2011); however, no such historical quantitative data exists. Additionally, adaptive capacity is context specific which arguably can be captured better by qualitative methods than quantitative methods. Furthermore, vulnerability and its determinants are not independent but inter-connected (Smit and Wandel, 2006). These connections are not known and therefore must be abducted from interviewees, favouring qualitative techniques. Finally, a qualitative approach allows the exploration of livelihood dynamics and decision-making that can inform further investigation on a larger scale (Ziervogel et al., 2006).

4.4. Research strategy

The study adopts the case-study method as its research strategy. Multiple authors discuss the case study research strategy, often using similar language but with different meanings (cf. Gerring, 2004; Yin, 2009). In this study the definitions and meanings used by Yin are adopted. Consequently, the case study research strategy is defined here as "an empirical inquiry that investigates a contemporary phenomenon within its real-life context" (Yin, 2003:13-14). The adoption of the case study research strategy has not supposed a particular type of evidence is to be used, nor a particular data collection method (Yin, 1981), nor has it specified the number of cases or the process of generalization (Yin, 2000).

Adopting the case study approach as a research strategy is deemed suitable as its strengths fit the type of research to be conducted. Specifically, that it is in-depth contextual research focusing heavily on contemporary events, processes, and operational links over time; and for which no clear set of outcomes exists (Yin, 2003; Ford et al., 2010). Additionally, a case-study approach is appropriate given that vulnerability and adaptation occurs - and thus must be understood - within its associated unique context (Smithers and Smit, 1997). The adoption of the case-study approach reflects its growing use within vulnerability research (Janssen and Ostrom, 2006; Ford et al., 2010).

It is also deemed suitable as the research objectives outlined in Chapter 3 require exploration of a 'how' research question that seeks to understand the influence of microfinance in adaptation. According to Ford et al. (2010) the use of case studies can help develop further understanding into the determinants of adaptive capacity, how they interact, and discover opportunities to enhance adaptive capacity to current and future climate risks.

The thesis adopts a single case-study (Noapara Village) which can be described as a representative case rather than a critical, unique, or revelatory case (see Yin, 2003). The way in which the case study is representative, and the approach for ascertaining this, is described below in Chapter 4.5.1 and 4.7. More case-studies would have enriched the study. For instance, the potential for generalisations to be made would be enhanced. Additionally, opportunities for spatial data-source triangulation would be increased. In other words, similar or dissimilar cases could be selected to explore whether concepts differ or concur between and across contexts respectively (see Denzin, 2009). However, adopting multiple cases was impractical due to resource constraints, most notably time and money. Being able to understand vulnerability and adaptation within a particular context in sufficient depth was considered essential to achieving the aims and objectives of the research. This required the dedication of limited time and money resources to a single case. Additionally, a prolonged stay in the case-study site was required in order to make proficient use of qualitative tools which comprise research methods. Furthermore, a major benefit of adopting multiple cases – predicting similar or contrasting results - was not necessary for my research according to its aims and objectives. For instance, if the research was aimed at contrasting how microfinance is used between urban and rural contexts, the adopting of multiple cases would be necessary. However, this is not the case with this research.

Substantial emphasis was placed on households as the unit of analysis, thus the research can be described as adopting an embedded approach (see Yin, 2003). This approach is adopted because the embedded unit of analysis (i.e. the household) is central to understanding microfinance, livelihoods, autonomous adaptation, and thus research findings. A holistic approach is avoided because the case (i.e. the 'village') is

not the major focus of the study. The case serves as an appropriate and recognisable boundary which enables the research findings to be validated and contrasted against other studies.

The issue of external validity or generalising from a single case is a common critique of the case study research strategy (Verschuren, 2003). However, this supposed limitation is not relevant within the context of this study. This critique is based on reductionist reasoning and an assumption that reductionist knowledge is to be produced. However, this is not the aim of the study or of the case study research strategy in general (Verschuren, 2003). Additionally, results from a case study are generalizable to theoretical propositions and not populations as is the case with survey type methods (Yin, 2003). Alternatively, it has been argued that too much value is placed on the merits of generalising in the first instance (Flyvbjerg, 2006). This may be particularly true for the study of vulnerability which is context dependent. Furthermore, as the case-study strategy is commonly utilised within vulnerability research, the study can be contrasted against other studies permitting the development of generalised findings (Ford et al., 2010).

4.4.1. Triangulation

Triangulation is seen as an issue of paramount importance in ensuring research quality, and as an ethical obligation to minimise misrepresentation and understanding (Stake, 1995). The triangulation strategy involved more than a simple repetition of data gathering, it represented a constant and deliberative effort to validate the data observed (Stake, 1995).

Five methods of triangulation were used. The first was data source triangulation which involves explicitly searching for as many different data sources as possible which bear upon the events under analysis (Denzin, 2009). Data source triangulation was achieved by historical investigations into livelihood shocks and stresses, autonomous adaptation activities, and vulnerabilities that the unit of analysis has experienced over time. It was also achieved through the targeting of different socioeconomic and livelihood groups.

The second triangulation method was theoretical triangulation, representing the approaching of research design, data collection, interpretation and analysis with multiple perspectives and hypotheses in mind (Denzin, 2009). Such triangulation facilitates movement away from polemical criticisms of particular perspectives, is seen as more in tune with the scientific method, and provides research findings of value to a wider audience (Denzin, 2009). To achieve this all relevant propositions were assembled from relevant literature and considered during analysis. This ensured research findings do not only seek support or evidence that supports a particular viewpoint, but also negative evidence that must be explained before observations can be explained and propositions supported.

The third triangulation method was across-method methodology triangulation, representing the use of different research methods to measure the same observational unit (Denzin, 2009). This was achieved by adopting a mixed-methods approach to the research methodology, resulting in both quantitative (survey) and qualitative (focus group discussions, household interviews, and key informant interviews) methods being adopted.

The fourth triangulation method was investigator triangulation, represented by the use of insights from other researchers to reduce observational or researcher bias (Denzin, 2009). The potential problems associated with researcher bias were minimised through obtaining feedback from doctoral supervisors, presenting work to peers and stakeholders, maintaining a trail of evidence, as well as using existing literature to guide research and analysis. This cannot completely eliminate researcher bias; however, within pragmatism some researcher bias is considered unavoidable and a part of the shaping of research goals and outcomes.

The last form of triangulation used was member checking, which involves the confirmation of data collected from a research subject, with that research subject (Stake, 1995). As a process it transcends the issue of triangulation as it is also a typical process of ensuring high standards of research ethics by ensuring interviewees views are not misrepresented.

4.5. Research methods & research participant selection

This section outlines research methods utilised during data collection. In summary, data collection relied upon a household survey and semi-structured interviews as the main data collection methods; where an interview is deemed to be the conversational sequence of questions and answers between interviewers and interviewees (Wang and Yan, 2012). Interviews were supplemented with personal observations and informal discussions. How the research methods utilised will now be discussed according to the three phases as outlined in Figure 1.

4.5.1. 1st phase

The first field research phase involved two tasks which will be discussed in turn: selecting an appropriate case-study, and obtaining sufficient information to both validate the case-study selection and to facilitate quantitative data gathering in phase two.

1st task

The key objective of the first task was to find an appropriate village in which to situate the research using semi-structured interviews, understood here as interviews consisting of standardised questions but which allow scope for pursuing and probing novel and emergent themes and ideas (Morse, 2012). They were used because knowledge held before interviews was insufficient and there existed no potential to anticipate all responses (Morse, 2012). A purposive approach was adopted involving selecting individuals likely to be particularly knowledgeable regarding a phenomenon at either national or local level (Beitin, 2012). Snowballing sampling was also used, representing the finding of additional representatives to interview from previous interviewees (Beitin, 2012). Consequently, sampling was not pre-determined but unfolded gradually as the research developed.

First, Bangladesh was identified as a suitable country within which to situate the research as it is a least developed country, with vulnerability to climate change, and has a large microfinance industry. Then Tala Upazila, within Satkhira District in the south west of Bangladesh, was identified as a key locality within which to focus the

research as a result of key informant interviews with representatives from academia and non-governmental organisations. Discussion topics ranged from microfinance, livelihoods, adaptation, and vulnerability depending on the interviewee (see Appendix A). Then sub-districts were assessed against the key themes of this thesis as a result of key informant interviews with representatives from local civil society and government. Once a sub-district was selected the same process was applied to potential villages; however, at this stage additional practical factors were considered such as size, accessibility, and research fatigue. It was decided to situate the research in Noapara Village as it was very likely to have microfinance, prolonged exposure to environmental and climate hazards, and potential autonomous adaptations; as well as being a typical size for the area, accessible, and having had no known research conducted there previously which would reduce the likelihood of research fatigue.

2nd Task

The key objective of the second task was to gain understanding of the key topics of the research as they related to the village. Another concern was to obtain sufficient information to ensure specificity of the survey questionnaire. Semi-structured interviews were conducted with a nearby non-governmental organisation and the Female Union Parishad Member. Interview themes included microfinance and livelihoods (income generating activities, strategies, stresses, and shocks).

Additionally, twelve focus group discussions were conducted. These are understood here to be a form of the group interview research technique (Frey and Fontana, 1991). The differentiating feature being the explicit use and importance of group discussion and interaction between members as a way to generate data (Kitzinger, 1994).

Focus group discussions are often used in the exploratory stages of research as they quickly produce research findings and are relatively cost-effective (Morgan, 1998). Additionally, they do not discriminate against those who cannot read or write and encourage participation from those reluctant to be interviewed or who feel they have nothing to contribute (Kitzinger, 1995). Sensitive topics were not discussed as they are not suitable for focus group discussions (Frey and Fontana, 1991; Morgan, 1995; Gibbs,

1997). The information collected during sessions was used to facilitate the generation of the questionnaire, a typical use of focus group discussions (Kitzinger, 1994; Gibbs, 1997).

In total twelve focus group discussions were conducted using three research assistants selected from a local university. These acted as facilitators with each being assigned a group of six village members. In total thirty villagers took part with a stratified random sampling method used (see also Chapter 4.6.4). A senior research assistant from a national university and I ensured focus group discussions functioned properly. All discussions were predesigned and involved constructing calendars, Venn diagrams, rankings, and timelines (for examples see Appendix B). All research assistants were provided trainings and manuals (Appendix B).

4.5.2. 2nd Phase

The second field research phase involved conducting a census household survey to form a quantitative database of household livelihoods and vulnerability. This survey entailed structured household interviews which involve two characteristics: asking the same set of standardised questions to each interviewee; and limiting responses to questions with little scope for probing or deviating from the specified agenda (Fontana and Frey, 1994). No sampling was used as the aim was to interview all village households.

The questionnaire was created in English and then translated into Bangla by a relevant expert (see Appendix C for a copy of the questionnaire). The questionnaire comprised nine sections and took on average ninety minutes to be completed usually with both the female and male head-of-household present. The sections were: introduction and consent, household information, livelihood assets, information and knowledge, innovation, decision making, exposure to environmental and climate hazards, sensitivity to environmental and climate hazards, and finally a closing section. These sections built upon existing frameworks for assessing livelihoods and local-level vulnerability (see Carney, 1998; Jones et al., 2010).

A team of eight enumerators from a local university were selected to carry out the survey. The best enumerator acted as manager to answer enumerator queries and control quality. Enumerators undertook training before field research took place (see Appendix C for training material). The survey was piloted in a nearby village to provide practical experience with the survey and ensure the survey functioned as planned. In total 266 interviews were conducted. Data was inputted and analysed using SPSS.

4.5.3. 3rd Phase

The third field research phase involved two tasks each of which will be discussed in turn below. This phase involved using individual interviews as they are good at generating in-depth data (Beitin, 2012). Additionally, interviewees are less susceptible to holding back or altering information (Beitin, 2012). They are also beneficial as answers provided by respondents to questions within group interviews can be incoherent with their internal selves due to group dynamics (Beitin, 2012). Individual interviewing is of course not without its own issues, such as interviewees embellishing or withholding certain information due to the confidential nature of the research technique (Beitin, 2012). See Chapter 4.6.1 for how this issue was managed.

1st Task

The first task involved using the quantitative database to select households for semi-structured interviews and construct livelihood profiles with which to facilitate these interviews. Livelihood profiles in practice were a summary of the household survey data for a specific household. They focused interviews towards specific topics so that in-depth material could be gained.

The sampling strategy for semi-structured interviews was developed upon two questions. The first question was knowing *what to sample,* concerned with representing the full spectrum of the phenomena of interest (Beitin, 2012). In this regard a purposive approach was adopted, involving selecting cases which exhibited specific characteristics, typically with the aim to achieve representativeness or comparability. The second question was knowing *how much to sample,* demonstrated by the concept of theoretical saturation which represents the point at which no new

information or themes are observed within the data (Guest et al., 2006). In this regard sampling was not pre-determined but unfolded gradually as the research developed, known as sequential sampling within mixed-methods research.

In total thirty-eight household interviews were undertaken using a research assistant who acted as interpreter. Each interview lasted approximately two hours. Two research assistants were used, one female and one male. The female research assistant was used when interviewing women. Specific training was provided to both. A copy of general questions can be found in Appendix D. The homestead of the household was used as the interview location as it best enables interviews to take place confidentially without crowds gathering. Crowds eliminate confidentiality and undermine the household's ability to speak with their own voice. Additionally, as a location, being in the respondent home helps to ensure respondents are as comfortable as possible. It is a place of familiarity, a place over which they have control, and a space with shade and refreshments should respondents want it. Finally, it was the most convenient location for all household members, particularly female members who are often less mobile than male members.

2nd Task

The second task involved using the quantitative database to select financial institutions mentioned by households for semi-structured interviews. Sampling was purposive with financial institutions selected on the basis of their proportion of the total loans disbursed to households.

In total twenty interviews were undertaken with branch managers of banks (4), non-governmental organisations (9), and savings-based credit cooperatives (7). Each interview lasted about 2 hours and was undertaken using a research assistant who acted as interpreter. In total two research assistants were used. Specific training was provided to both. A copy of general questions can be found in the Appendix E. Interviews took place in the relevant branch office. Some interviews with savings-based credit cooperatives took place in the interviewees homestead.

4.6. Practical & ethical considerations

Multiple considerations arose due to the practicalities of collecting primary data. This sub-section will focus on considerations associated with the practicalities of conducting research by collecting primary data.

4.6.1. Positionality

Positionality represents the personal, physical, and social characteristics of the interviewer relative to the interviewee; it is depicted by the outsider-insider continuum (Merriam et al., 2001; Herod, 1999).

I was perceived as an outsider to respondents, as were research assistants despite being relatively local to the area. This was inevitably due to differences in ethnicity and socioeconomic status, and variously by age and gender. There are arguments in favour of being an insider, but it does not itself necessarily result in better knowledge (Herod, 1999). Being an outsider was beneficial as many were honoured by the invitation to talk about their lives and were willing to spend significant amounts of time with me. Additionally, being an outsider allowed me to appear impartial, neutral, and leave respondents with no expectation of future support. There were no problems in terms of access for any interview. To decrease the risk that households would embellish accounts of their lives it was reminded to them that I was from a university, not an NGO, and that no future support would result from the discussion.

However, being an outsider inevitably had disadvantages. For instance, it is perhaps inevitable that some interviewees embellished their accounts. At times branch managers were pained to admit they were facing difficulties collecting repayments. This problem was addressed through logical argument that they must be facing some difficulties due to the implications of flooding, which they would readily admit, as well as by demonstrating my knowledge of household concerns due to my previous research. Other disadvantages such as households potentially embellishing their accounts were also addressed head on when necessary. Some embellishments were ignored when there was no need to challenge what was being said. Others were addressed with logical argument. However, as the research sought to draw accounts

from households, the emotions of the interview were a valid part of the interview data. Importantly, it meant that very sensitive information was not available as these issues would not be discussed to outsiders regardless of how familiar village inhabitants were with the research team. Examples of sensitive information that were unable to be captured relate to precise calculations of household debt. However, this did not substantially influence the research as this was not a key topic regarding the research objectives.

The research design incorporated actions designed to reduce the outsider problem. Key informant interviews were conducted with knowledgeable individuals from neighbouring villages and the International Red Crescent Society which had an office on the border to the village. Additionally, twelve focus group discussions took place exploring village life across a number of issues relevant to the research. These did not resolve problems associated with being an outsider, but enabled a broad understanding of village issues from multiple perspectives.

During the course of research I felt my positionality shifted gradually more towards being less of an outsider[3] with households as familiarity was gained through spending time in the village. This shift was noticeable as throughout data collection the amount of special exaggerated attention, such as staring and standing close by, dwindled.

4.6.2. Language consideration

The language barrier between me and households was an important consideration and was linked to myself being an outsider. An inability to speak fluently the language used in the village inhibited the ability to form relationships with villagers. Additionally, it limited the ability to understand what was being said during the course of interviews. Furthermore, interview transcripts had to be translated from Bangla into English.

To overcome language issues interpreters were used during data collection, including informal interactions with villager members. Additionally, interpreters translated

3 though still obviously an outsider

interview transcript material. This potentially decreased the accuracy of the accounts of research participants.

Several steps were undertaken to reduce problems associated with language. All research assistants undertook prior training involving the: translation of interview questions into Bangla, clarification of key terms, and practicing interviews with simultaneous translation. Additionally, extensive information packs on interview questions and interview guidance were provided (see Appendix). Only two translators were used to conduct qualitative interviews to ensure they were familiar with what was asked of them and that they were familiar to villagers. The translators were from nearby villagers to ensure their dialects and accents were similar to those used in the village.

Interviews were recorded on a discreet audio device (though with permission from interviewees), before being translated and transcribed at a later date. Therefore during interviews the translators did not have to worry about making notes and could focus on the interview and translating to myself verbally in real time.

4.6.3. Other practical concerns

Another set of limitations arose due to unforeseen delays between research phases. Unfortunately the research was delayed due to political instability. This caused delay as security became a concern especially in the south west region. Delaying research was considered expedient due to the difficulties the political instability caused to transport, security, and workable hours which were severely restricted due to the number of nation-wide general strikes. Delay was also caused by unforeseen personal illness which prevented me from working for a period of three months. These delays increased the length of time that research was conducted to approximately one year. However, the delays were beneficial as they enabled sequential analysis of research material, and further downplayed expectations of future support by households. Additionally, the delays were not so long that they had a negative impact on the field research as all material was collected within approximately one calendar year.

4.6.4. Ethical considerations

Focus group discussions

The use of focus group discussions was limited due to ethical concerns. Sensitive topics were not discussed as the need for mutual open disclosure would create the possibility for subsequent disputes between participants; they were also not necessary for answering research questions. Groups were purposefully kept diverse to ensure heterogeneity regarding socioeconomic status4. While potentially resulting in elite capture (Kothari, 2001), homogeneous groups can be comparably unethical. Separating people by socioeconomic status would have made it apparent to them that they were being subjected as '*poor people',* which this research wanted to avoid. Instead, facilitators knew the socioeconomic status of each participant and ensured input from all during discussions. Especially vocal participants restricting input of others were dealt with by informing them privately that they would be interviewed privately later as they were especially informed and thus in the current discussion they should allow others to input.

Compensation

Compensation was made available to those who participated in this research; however, the amount was context specific and not considered coercive[5]. Research participants always were offered snacks and liquid refreshments. Compensation was considered important due to the relative state of poverty of many participants, and the fact that the in-depth interviews took time. The reality was that participation required foregoing work. Compensation was necessary to ensure participation did not adversely impact on their lives. It also enabled all households to be able to participate, rather

4 Particularly highly socioeconomically advantaged households were excluded due to an assumption that power imbalances would prevent others from expressing themselves freely. Although they largely self-excluded themselves due to lack of interest in any case.

5 Fixed at slightly less than the daily wage used in the village.

than have their views represented by others. Compensation was voluntary, and not all households chose to have it.

The drawbacks of compensation are that it could have introduced potential bias by raising expectations of subsequent support (see section below). This was avoided by explaining fully that this was a one-off research exercise with no future support. It was then explained why compensation was provided and what it represented, such as the loss of employment and time due to taking part in the interview. Additionally, it should be noted that providing compensation is not practiced by NGOs, thus this also helped to disassociate myself from these institutions.

Not raising expectations

Much care was taken to ensure participants believed that participation would not result in forthcoming support. It was both an ethical and practical concern, as it could have introduced bias if villagers felt that by providing a particular response they would receive support, for instance, by exaggeration of livelihood problems. This is somewhat problematic as the mere presence of foreigners may alone be enough to raise expectations about provision of support, especially since foreigners visiting the rural areas are often from development NGOs.

To ensure this form of bias was avoided, a village with no prior history of research was chosen. A significant amount of time was spent by the whole research team in getting to know the villagers before any formal research took place. It later transpired that I was the first foreigner most had seen, thus there was no association between interacting with foreigners and obtaining subsequent support. Much of this time took place in the various tea-stalls which act as focal points for social interaction, but also during transect walks through the village. Research assistants were encouraged to attend prayer times at village mosques[6] so villagers could meet and talk with them openly without me being present.

6 All research assistants were Muslims.

A standardised opening preceded every formal interaction. This outlined who we were (i.e. students), why we were there (i.e. to learn about their lives), why we were speaking to them in particular[7], what would happen as a result (i.e. nothing, as this was a one-off research project), why compensation was available (i.e. because no benefit would occur for them, and that they have lost employment by speaking to me).

4.7. Case study selected

The case is that of Noapara Village, which is based in Ward 3, Tentulia Union Parishad, Tala Upazila, Satkhira District, Khulna Division. The village is dissected by the R760 road which runs between Satkhira and Khulna, two major cities of the south west. Four major towns are close by: Tala, Patkhelgata, Paikgachha, and Chuknagar (see Figure 2, Figure 3, and Figure 4).

Noapara Village exists in a floodplain surrounded by the Ganges Floodplain in the north and the Sundarban Mangrove tidal forest to the south. The major river of the area is the Kobadak. The overflowing of this river is responsible for riverine flooding and waterlogging which affects the whole Upazila. Flooding is frequent, over the period 2004-2011 river levels exceeded the danger level every year except 2010 (BWDB, 2011). Flooding is caused by multiple factors of which some can be linked to climate change (ADB, 2007; Tutu, 2005). Applying precise attribution to climate change is beyond the scope of this thesis; however, there is a range of evidence that flooding in Bangladesh will increase in future due to climate change (see IPCC, 2014c).

Noapara Village is representative of many other villages in the area. It is medium sized with 266 households, 94 percent of which are male headed. Homesteads are clustered together and encased with village lands, although villagers own land in other localities. Livelihoods are predominantly agricultural despite the existence of a market place. Historically, households cultivate high yield varieties of rice during winter and cultivate cash crops during summer. Other typical livelihood assets are household ponds,

7 They were informed that their particular village was chosen as it was accessible and was sufficiently small to enable familiarity.

subsistence rearing of cows, goats, and chickens, and subsistence agroforestry. Households live in homesteads raised on plinths, a traditional method of coping with flooding. The representative nature of the village was confirmed through comparing the village with national census data (see GoB, 2010a; GoB, 2010b)

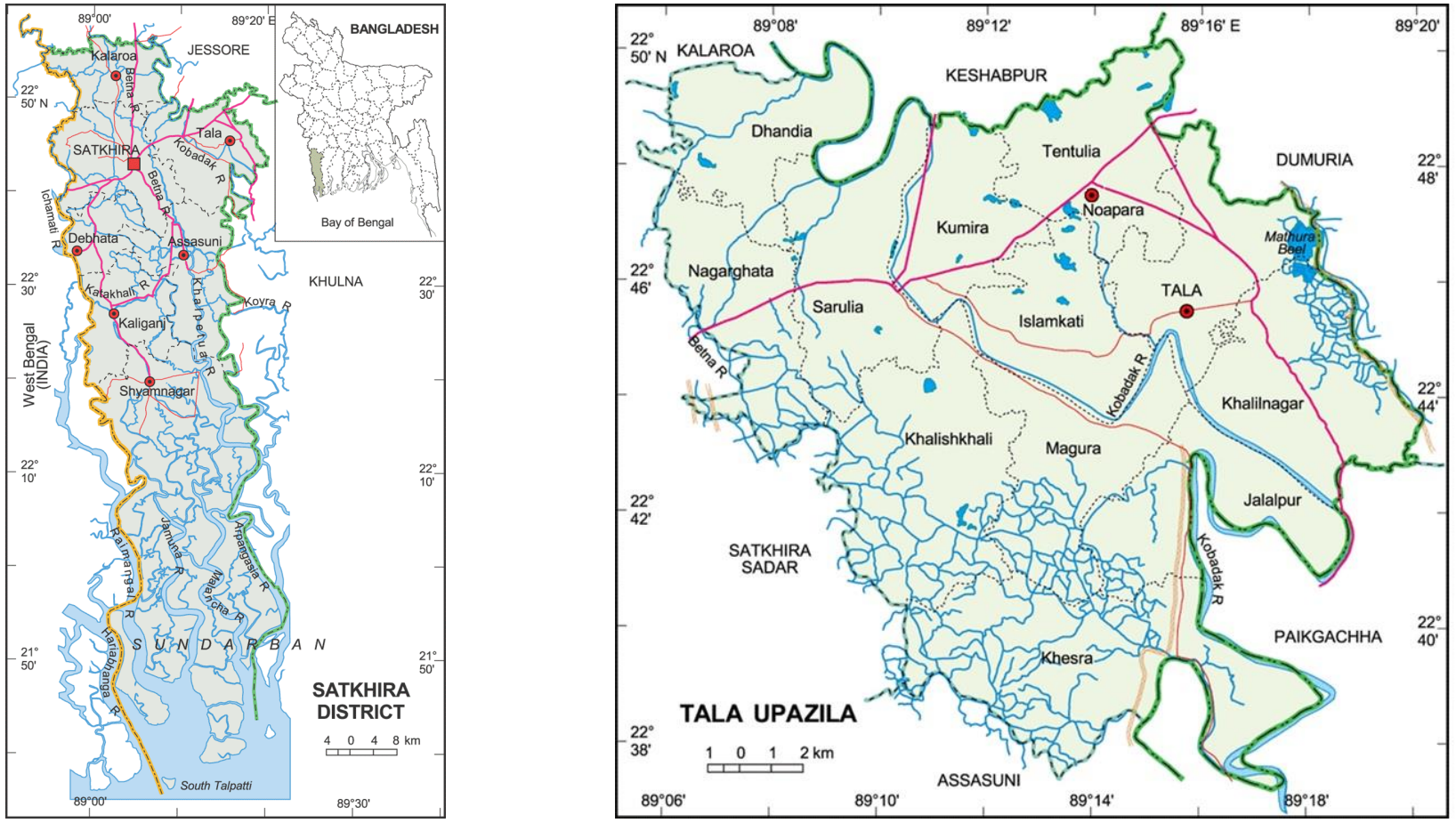

Figure 2: Location of case site.

Left: Map of Satkhira District which is in the south west of Bangladesh; Right: Tala Upazila (right) which is situated in the north of Satkhira district; Noapara Village is situated in the north of Tentulia Union Parishad which is situated in the north of Tala Upazila

Figure 3: Location of Noapara Village

Noapara Village (see black dot) is located on the R760 main road between Patkelghata (bottom left)) and Chuknagar (top right)

Figure 4: Satellite view of Noapara Village

The village has been marked out with a black dot. Housing to the left denotes a neighbouring village.
Land which is pale green indicates flooding (e.g. bottom left, top, and right)

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Chapter 5. Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: implications for adaptation planning

Abstract

Systematic understanding of adaptation measures utilised by households in developing countries is needed to identify the constraints they face, and the external interventions or adaptation planning needed to overcome them. Understanding of autonomous household adaptation patterns remains underdeveloped. In particular little is known regarding whether households are implementing incremental or transformational adaptation measures as well as the implications of this for adaptation planning. We demonstrate the suitability of the risk hazard approach for understanding autonomous household adaptation patterns and discuss the implications for planned adaptation. To achieve this we use an in-depth village case study from an area of Bangladesh particularly vulnerable to climate change, using qualitative semi-structured household interviews as primary material. We find that the risk hazard approach is ideal for exploring autonomous adaptations because of its capacity for understanding how households respond to livelihood risk, and what resources are required for it to be most effective. However, the risk hazard approach overlooks equity and fairness considerations which need to be integrated due to the insufficient emphasis on these concerns.

Keywords

Adaptation, transformation, livelihoods, Bangladesh, climate change

5.1. Introduction

Adaptation to climate change (henceforth 'adaptation') has become a critical issue in developing countries. It is generally accepted that external intervention or adaptation planning is required to help communities within developing countries meet adaptation challenges. External support should be predicated upon knowledge of what autonomous adaptation is taking place, by whom, and how in order to accommodate

and influence community needs and priorities which may not be sufficiently informed by long term considerations (Stern, 2006; Smit et al., 2000; Scoones, 2009; Eriksen et al., 2011; Wise et al., 2016). Autonomous adaptation consists of household perceptions and responses to climate change. It is a continuous process occurring outside of top-down policy support, intervention and constraints, and it typically occurs in response to multiple stimuli rather than to climate stimuli alone (Smit et al., 2000).

Our understanding of autonomous adaptation at the local-level remains weak (Thorn et al., 2015), with much of the local adaptation unnoticed, uncoordinated and unaided by development actors (Christoplos et al., 2009). It is also poorly understood to what extent adaptations remain incremental or are transformational, resulting in something fundamentally new. This distinction is important, as it is increasingly likely that transformational rather than incremental adaptations will be needed. Consequently, adaptation planning will need to identify priority issues and which strategies are most effective (Smith et al., 2011).

This article examines autonomous household adaptation in Satkhira District, Southwest Bangladesh. Bangladesh provides an opportunity for examining household livelihood responses to climate change (Lewis, 2011). It is one of the least developed and among the most vulnerable countries to climate change. A large proportion of its territory is comprised of flat alluvial plains, with 80 percent of land less than 10 meters above sea level (CCC, 2009). Bangladesh has one of the world's largest river systems, transporting the highest sediment load in the world. This contributes to its particularly high exposure to flooding. A quarter of the land area is flooded annually with attendant livelihood and asset losses. Severe floods have affected over half the country around every five years, destroying important household assets, such as agricultural land, and severely disrupting everyday lives (Tutu, 2005; MoEF, 2008). In the changing climate heavy precipitation events are projected to increase and flooding to become more intense and frequent (Kundzewicz et al., 2014).

Our article has four aims. Firstly, we aim to conduct an in-depth qualitative empirical examination of autonomous household adaptation to deem whether adaptations are incremental or transformational. Secondly, we aim to empirically demonstrate the appropriateness of the risk hazard approach for understanding autonomous household adaptation. Thirdly, we aim to demonstrate the benefits to adaptation planning of using the risk hazard approach for systematically understanding autonomous household adaptation, a requirement for successful external intervention. Finally, we aim to empirically demonstrate that unless power and equity concerns are incorporated into the risk hazard approach, there is a danger of exacerbating social inequities.

The article contributes to existing literature by demonstrating why the risk hazard approach is the most suitable one for assessing autonomous household adaptation. By employing this approach, we show how households use a combination of incremental and transformational measures to adapt to flooding. The results highlight how socio-economic status is linked to patterns of transformative adaptation; households with low socioeconomic status do not have equal access to adaptation measures and existing government extension programmes often accentuate inequalities. We conclude that while the risk hazard approach is well-suited to understanding autonomous adaptation, equity and long-term considerations need to be given additional attention.

Conceptualising adaptation and transformation

The need for individual, household, or community adaptation arises due to vulnerability which has different meanings across the three key strands of adaptation research (for overview see Janssen and Ostrom, 2006; Eakin et al., 2009; Eakin and Luers, 2006). The socioecological resilience approach focuses on systems and thresholds, and the ability of a system to adjust and respond over the long term (Folke, 2006). The political ecology approach focuses on power, equity, and capabilities. It is mainly concerned with immediate needs caused by vulnerability, causes of vulnerability, and how vulnerability differs across societal groups (Adger, 2006). The

risk hazard approach focuses on exposure and sensitivity to hazards. It has been primarily concerned with practical implementation of adaptations at the sectoral and community levels (Smit and Wandel, 2006). It focuses on enabling environments and creating decision-support tools to facilitate bottom-up adaptation by private sector, civil society, and local government actors (Eakin and Lemos, 2006).

The three strands of vulnerability research ask different questions, highlight different characteristics as central to vulnerability, and thus have their own strengths and weaknesses. For instance, the risk hazard approach privileges efficiency and effectiveness over equity, whereas the reverse is true for the political ecology approach (Eakin et al., 2009). The approaches have also somewhat different scales of application. The political ecology and risk hazard approaches are well suited to focus on household and community-scales, while the ecological resilience approach is more suited to studying larger socio-ecological systems (Eakin and Luers, 2006). Both the risk hazard and political ecology approaches are compatible with participatory processes involving low capacity stakeholders; however, the ecological resilience approach is somewhat incompatible with these processes (Butler et al., 2016; Butler et al., 2014; Butler et al., 2017).

We adopt the risk hazard approach because it is best placed to ask questions relating to cost, risk, and uncertainty. It is particularly well suited to household level livelihood studies as local responses to climate change are driven by how they impact on livelihoods and assets (Ayers and Forsyth, 2009). Consequently, by the term adaptation we refer to the processes through which households adjust to changing conditions, stresses, hazards, risks, or opportunities (Smit and Wandel, 2006). Adaptation is distinct from ‘coping’ which refers to immediate responses to events: in contrast adaptation prepares households for expected future events (Berman et al., 2012). Adaptive capacity is a measure of the ability to adapt (for overview see Smit and Wandel, 2006). Adaptations are often described by their function: adaptations which retreat from hazards can lead to the abandoning of exposed areas; others accommodate hazards enabling continued occupancy and use of vulnerable areas; lastly adaptations can seek to protect against hazards and thus defend exposed areas,

economic activities, and natural resources (Dronkers et al., 1990). Within this approach, adaptation measures that inadvertently increase vulnerability are considered as maladaptive (Barnett and O'Neill, 2010).

Transformation is becoming an increasingly important adaptation concept as worsening climate change impacts are likely to demand more substantial responses. Small-island and other low-lying states threatened by sea level rise provide an example: transformational changes such as loss of land and statehood may not only occur, but will likely result in subsequent transformational changes such as mass relocations of populations.

The risk hazard approach has only recently started using the term transformation (Klein et al., 2014) but earlier statements such as the need for 'non-marginal change' already suggested it (Rickards and Howden, 2012 citing Stern, 2006). Transformation is emerging as an important topic particularly in research on agriculture (Rickards and Howden, 2012). Here transformation refers instrumentally to the depth or extent of change needed (Leclere et al., 2014; Klein et al., 2014). Three observed types of transformations are actions adopted at greater scales or intensities, actions that are original to a particular region or resource system, and actions that transform places and shift locations (Kates et al., 2012). But deeming what is transformational and what is not remains often difficult to do in practice in all approaches. Rickards and Howden (2012) suggest that this is due to the multiple dimensions through which change can be assessed. Determining whether something is a transformation is therefore somewhat subjective and relative.

The risk hazard approach has an instrumental take on transformation: it may be needed because of extreme vulnerability or severe climate change impacts, which threaten socially negotiated norms and inhibit the ability to fulfil objectives. Without transformation, losses would occur (Dow et al., 2013; Kates et al., 2012). Thus limits and barriers are central to transformation. 'Barriers' can frustrate adaptation but they can be overcome (Barnett et al., 2015). They are distinct from 'limits' that prevent objectives from being realised (Dow et al., 2013; Marshall et al., 2012). 'Hard limits'

prevail when nothing can be done to avoid intolerable risk. Transformations can occur in the face of hard limits but they would entail drastic changes in objectives and associated values (Barnett et al., 2015). In the presence of 'soft limits' intolerable risks can be overcome with new strategies and measures (IPCC, 2013). Transformation can therefore be seen as a way of overcoming soft limits, for instance when efforts to tackle climate change are new to a location (see Kates et al., 2012).

Consequently, we consider transformational adaptations to include those novel livelihood changes that enable households to overcome adaptation limits posed by hazards, and which respond to what is perceived an untenable situation. Incremental adaptations in turn include those household livelihood changes, which manage changing risks posed by hazards. While this creates a simple dichotomy, the linkages between incremental and transformational changes remain an underexplored topic. In practice it is sometimes not easy to make a distinction between the two. For instance, it is becoming clear that incremental change can both facilitate and inhibit transformational change (Rickards and Howden, 2012; Kates et al., 2012; Butler et al., 2016).

5.2. Materials and methods

A single village case study was chosen to enable the in-depth examination of the context specific nature of vulnerability and adaptation. This required the use of qualitative research methods as part of a wider mixed-methods approach, which in turn required a prolonged presence in the field in order to gain familiarity and trust of research participants. This approach is consistent with state of art in the adaptation literature (Janssen and Ostrom, 2006; Ford et al., 2010; Smit and Wandel, 2006).

The research was carried out in the Satkhira District, Khulna Division; one of the poorest areas in Bangladesh where flooding is a common problem (Azam and Imai, 2009; Tutu, 2005). We selected this district in light of key informant interviews with national civil society organisations. Noapara village was selected after key informant interviews with local civil society, government, and community representatives (see Figure 5). Both methodological and pragmatic considerations informed the selection

process. Methodological concerns included the need for the village to be typical for the district, exposed to a prominent hazard for a number of years, and exhibit evidence of adaptation. Pragmatic considerations included accessibility, safety, and absence of research fatigue.

In March 2014, 30 participants (11% of the total households in Noapara village) engaged in focus group discussions involving tools such as seasonal calendars and Venn diagrams to explore village life, confirm the appropriateness of the village for the study, and to plan future research in more detail. Between May and June 2014, 266 households (99%) were surveyed on demography, assets, access to weather and climate information, support networks, innovations, access to improved seed varieties, and exposure and sensitivity to environmental hazards. Between March and April 2015, semi-structured interviews were conducted with heads of 38 households (14%) to explore household responses to environmental changes. Selection of households for interview was informed by livelihood profiles, constructed from survey data, purposefully sampled for socioeconomic status by considering land ownership and education, as well as considering homestead status, and credit usage. Also, 13 short interviews were conducted with market stall owners. Personal observation and informal conversations complemented the above data collection methods.

Focus group findings were interpreted in situ with participants. Survey data was analysed using SPSS and interpreted using literature themes. Semi-structured interviews were coded according to coping mechanisms and household adaptations. Analytical categorisation was undertaken using an iterative process that builds on the initial descriptive coding, drawing themes from the literature to interpret the material.

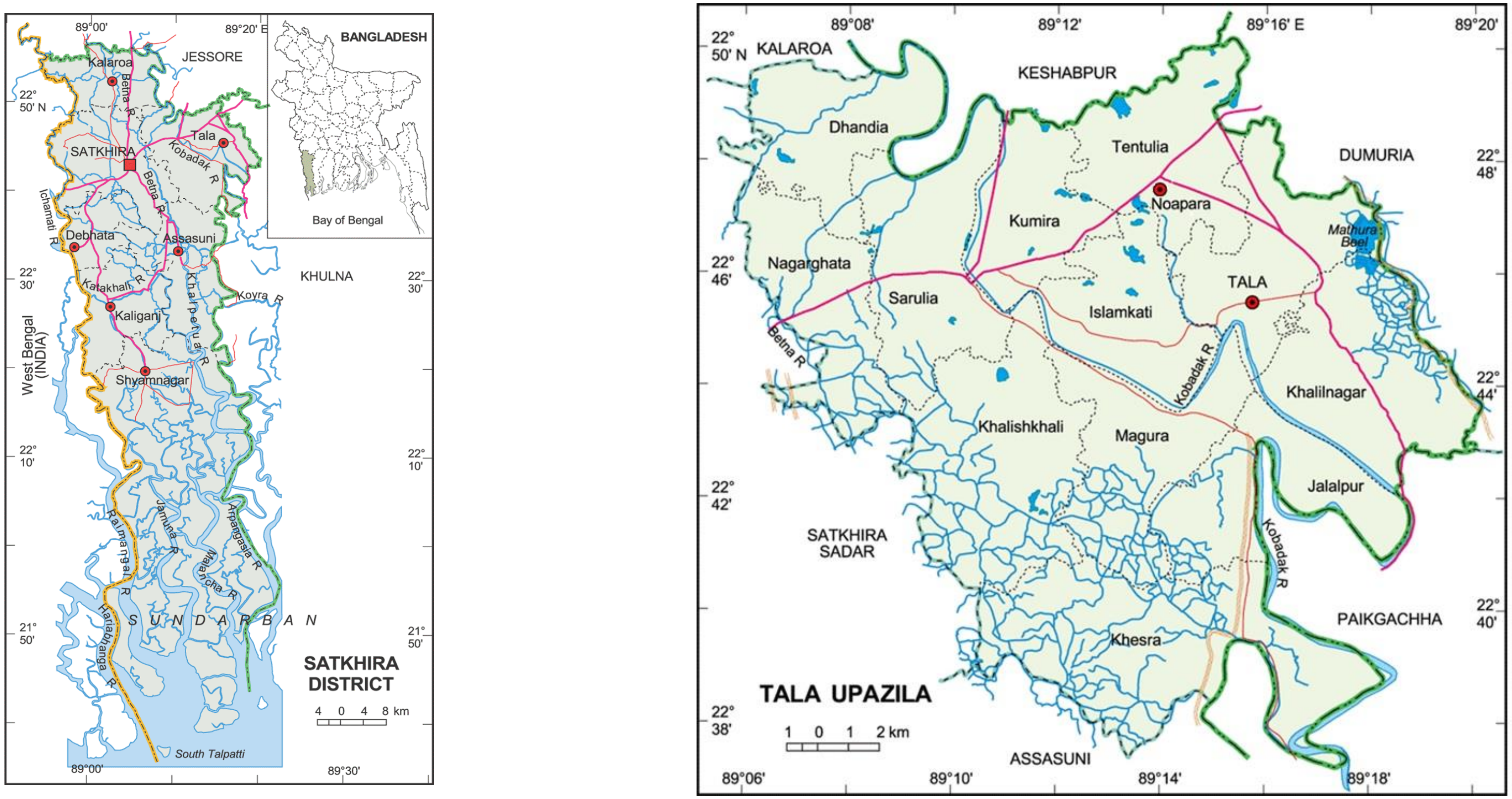

Figure 5: Location of case study

Left: Map of Satkhira District which is in the south west of Bangladesh; Right: Tala Upazila (right) which is situated in the north of Satkhira district. Noapara is represented with a red mark and is situated in Tentulia Union Parishad. The Kobadak River flows through the middle with a connected canal in close proximity to Noapara.

5.3. Case-study

Noapara is surrounded by the Ganges Floodplain in the north and the Sundarban Mangrove tidal forest in the south. It is surrounded by agricultural land and dissected by a major road connecting Satkhira and Khulna and acts as a market village for other villages further away from the road. The nearby towns of Tala, Patkhelgata, and Paikgachha have larger markets and more economic activity. Noapara is home to 267 households, 74% of which have 3-5 members (median=4), and most are male-headed (94%). Agriculture is central to livelihoods, one respondent commenting that "no job means no farming". Agriculture has historically followed a pattern of cash crop cultivation during summer and high-yield rice cultivation in winter. Cash crops provide income, while rice provides food security. Summer cultivation of jute has been vital to livelihoods in recent years: one participant remarked "Oh jute, it had a huge impact on my livelihood, I paid [off land mortgage] with that money… I built this house using that money… I bought cattle and goats selling jute". Small-scale livestock (cattle and goats) and poultry (chicken and ducks) rearing are also common, typically serving household consumption but also serving as investment. Aquaculture of fresh water prawn and fish is practised in ponds, with a few households engaged in larger-scale production for wider markets. Seasonal migration for agricultural labour to nearby Jessore, Khulna, and Satkhira is common. Less common livelihood activities include non-agricultural salaried work, international migration, and business in temporary or permanent premises.

Focus group discussion yielded farmland ownership and educational attainment as key indicators of socioeconomic status. Households of low socioeconomic status (57.7%) are both functionally landless and have illiterate household members. Households of medium socioeconomic status (28.1%) have mostly educated members (with potential to apply for salaried employment) and they are typically small landholders. Households of high socioeconomic status (14.2%) own substantial amount of land or had at least secondary school education. Farmland ownership is an important indicator of wealth in a rural economy. It is highly positively skewed in the village as well as in the Satkhira District as a whole (Government of Bangladesh, 2010). Most households are either functionally landless (64%) or small landholders (27%). Some households (8.6%) own

moderate amounts of land and small number of households (0.4%) own most of the land.

Education is highly regarded; assets such as animals and credit are used to pay school fees. One villager stated “we need education…without education you cannot do anything”. Education is closely linked with poverty reduction. Jute cultivation was brought to the village by a school teacher. Over half of households have at least some illiterate members (55.8%). Only 6.7% of households have members that had at least secondary education. The proliferation of homestead adaptations has reduced the significance of homestead type as an indicator of socioeconomic status. Households either live in basic (earthen), semi-improved (kiln-fired brick), or improved (kiln-fired brick with plaster coating) homesteads. Many households live in semi-improved homesteads (56%), and most homesteads (82%) are on plinths of differing heights and reinforcement status.

All households are exposed to multiple hazards but particularly to riverine flooding. Flooding typically occurs between July and August but it can have adverse impacts for much longer because of poor drainage from flat land of low elevation. Flooding occurs almost every year when water overflows the banks of the Kobadak River, which is elevated above surrounding land (BWDB, 2011). Flooding is a major concern in the area which is less than 3 meters above sea level (Ahmed, 2010). The main cause of flooding is considered to be the Coastal Embankment Project completed in the 1960s. Construction of polders and lack of dredging has restricted tidal flow and prevented sedimentation on surrounding floodplains, leading to sedimentation in rivers and reducing their drainage capacity (ADB, 2007; Tutu, 2005).

Participants indicated that the intensity of flooding has increased dramatically over the last ten years, with major events occurring in 2008 and 2011. Flooding typically lasts for 2-3 months but can continue longer. A local councillor commented that in 2011 flooding lasted for eight months. The survey indicated that most households have been affected by flooding 3-5 times in the past decade depending on homestead and agricultural land elevation, as well as implemented adaptation measures. Conventional

homesteads were not designed for extended flooding and plinths were too low to keep buildings dry: they collapse when unreinforced plinths and walls dissolve in flood water. Only improved homesteads survived flooding in 2011. According to a local councillor, “no one stayed in their homestead… [they all] took shelter on the roads”.

Many assets such as trees, livestock, and poultry have been lost, with one participant reporting that “Nothing is left, nothing is left, I have nothing left. There were big trees over there. There were coconut trees, mango trees and other fruit trees. Trees died because of the flood”. Households cope by selling affected assets at nearby markets, but they often obtain lower prices and returns on their investments. Participants reported higher incidence of disease and snake-bites during floods. Summer cultivation of cash crops often fails during floods. Many households have ceased summer cultivation because flooding which is perceived to be too big risk even with flood-resistant seed varieties. As most agricultural inputs are purchased with credit, debt levels increase when harvests fail. Demand for agricultural labourers also declines when harvests fail or land is left uncultivated. Some households have to sell rice to repay debts, which reduces their food security. Businesses are negatively affected by flood damage to premises and stock, but also due to lower demand for goods and services. Some of them close for the summer for this reason.

5.4. Results

Household interviews brought up numerous and often inter-linked adaptations to flooding such as changing composition of poultry stocks, homestead and plinth improvements, domestic and international migration, conversion of agricultural land for aquaculture, halting of summer cultivation, and salaried labour. These adaptations are all autonomous, despite the multitude of non-governmental organisations and government extension officers in the area. Some government extension services such as the provision of training and financial services have facilitated adaptation, but only serendipitously. Interviews with the local government representatives indicated a lack of formal support for household adaptation to flooding and that engineering solutions such as the dredging of the river were deemed the only solution to address the flooding.

Autonomous adaptations consisted of a mixture of incremental and transformative measures. Increasing duck rearing is an example of incremental adaptation to accommodate flooding. Chickens are vulnerable to snakes and diseases during flooding and need higher ground. Rearing ducks reduces asset loss risk and need for animal housing investments. One interviewee said that “ducks float on water and become less infected by diseases, but chicken face problems as they stay on the ground.” Duck rearing is widespread in all socioeconomic groups. Survey results indicate that ducks now outnumber chicken, reversing the historical pattern.

Homestead and plinth improvements can be considered transformational adaptations which accommodate flooding. These improvements involve using bricks and mortar to construct homesteads and plinths to prevent collapse during flooding. This adaptation attests the importance of a safe living place and has been made possible by the availability of credit. Interviews and survey data suggest that the proportion of households with improved homesteads has increased from 1% to 78% since flooding started. Homestead and plinth reconstruction is a transformational adaptation for households as it meets both the untenable and originality criteria. Most participants considered the risk of building collapse and costs of reconstruction untenable. Improved homesteads help overcome soft limits associated with basic homesteads and flooding.

Moreover, homestead and plinth improvements also enable male members of households to migrate without fear of homestead collapse. One participant living in a traditional homestead explained why he cannot migrate for extended periods: “My father is sick and anything can happen to him anytime. My brothers live [outside the village] and I feel anxiety about the house falling down. I feel afraid to stay outside [of the village]”. The originality criterion is met because for most households constructing buildings of bricks and mortar is a new technology. Previously only the wealthiest households had improved homesteads and plinths as they are much more costly and need the skills of hired labour.

Domestic migration can be considered transformational adaptation and represents a retreat from flooding. Male members of households of low socioeconomic status typically migrate to elsewhere in Khulna Division to harness agricultural labour opportunities. Migration is increasing as summer cultivation of cash crops has decreased dramatically due to flooding, resulting in loss of income and lower demand for agricultural labourers. One participant commented that "earlier I cultivated both rice and jute, now I have leased the land for fish culture. The rent is very small". Migration does not fully compensate for the loss of income, however. One interviewee complained that income earned while migrating was "not a handsome amount. Many people go to Jessore to get job and the daily wage decreases. I bring back a small amount of money". Migration is particularly widespread among households of low socio-economic status. It meets the untenable criterion of transformation because households cannot withstand the loss of income and still fulfil livelihood needs. Domestic migration enables overcoming the hard limits imposed by flooding on crop cultivation. It also meets the originality criterion, as planned migration as a substitute for summer crop cultivation and local agricultural wage labour is a new livelihood strategy.

International migration can be also considered a transformational adaptation and represents a retreat from flooding. Male members of some households migrate overseas to find non-agricultural labour opportunities because they consider that flooding has suppressed the local economy to such an extent that livelihood diversification out of agriculture is not possible. One participant commented: "Yes, I can start a business. However, the interest charged would be more than the profit. If I go [abroad], that amount of money I would be able to make will be sufficient to repay loans." Another participant believed suitable jobs simply were not available for their son: "What he used to earn here was not enough. He has master's degree. We thought that if he could go to abroad he would be able to earn more…it was absolutely the right decision". This adaptation only occurs among households of high socio-economic status. It passes the untenable criterion as the adaptation occurred in response to declining economic activity, which limits livelihood opportunities that are considered viable by households of high socio-economic status. International migration is thus a

way to overcome the hard limits imposed on the economy by flooding. It passes the originality criterion, as it is a new livelihood activity for the households involved.

Conversion of agricultural land for aquaculture can be considered a transformational adaptation accommodating flooding. It involves the cultivation of fresh-water prawn and fish on land previously used for agriculture. This land is usually particularly low-lying and located close to a canal. Thus it often remains flooded for much of the year, which prevents agriculture. Some households have seized the opportunity by renting and combining adjacent plots of land and enclosing them with embankments. Aquaculture is mainly adopted by households of high socioeconomic status, due to its resource requirements. It meets the untenable criterion because the height, duration, and consistency of flooding prevent agricultural activity on the land. The hard limit flooding poses to crop production is overcome by using the land for aquaculture.

Although a reliable source of fresh water is needed for aquaculture, flooding poses a risk for aquaculture as well. One interviewee noted that “during the flood the embankments get damages and the fish flows with the water… I am very worried [there will be a big flood]”. Some households have ceased aquaculture due to the financial losses caused by the breaching of embankments. One over-indebted fish farmer said that: “for three years I tried to cultivate fish but I made loss… After that, I have never tried to do it anymore”. Aquaculture also passes the originality criterion although it is not entirely new in the area. Small-scale aquaculture in household ponds for household consumption is common. Some households also operate fish farms in wetland areas. However, the conversion of agricultural land for aquaculture is a new practice.

5.5. Discussion

Our findings contribute to risk hazard literature by demonstrating the suitability of the approach for assessing autonomous household adaptations in a developing country context, focusing on the characteristics of transformational adaptations and their likely adopters. In contrast, earlier risk hazard literature typically adopted a regional or sectoral approach and a developed country focus when exploring transformation (e.g.

Rickards and Howden, 2012). The identified autonomous adaptations demonstrate that households devise ways for reducing livelihood risk, corroborating arguments that local responses to climate change are driven by its impacts on livelihoods and assets (Ayers and Forsyth, 2009).

The findings also corroborate existing literature, which suggests that the risk hazard approach leads to somewhat ambiguous categorisation of adaptations as transformational (e.g. Kates et al., 2012). The scale of assessment determines whether adaptation measures are novel or part of wider incremental change. For instance, the increasing number of households improving homesteads and plinths can be interpreted as an incremental increase in the uptake of an existing practice at the village or wider scales, but for the households it is a step-change. Similarly, the consideration of the wider livelihood context within which adaptations take place can determine whether they are complex transformations or incremental changes. For instance, domestic migration is incremental when considered in isolation from wider livelihood changes. Our study also contributes to the existing literature by highlighting how perceptions partly determine whether adaptations are incremental or transformational. For instance, household income aspirations determine whether the situation that gave rise to international migration was considered untenable.

5.6. Implications for adaptation planning

We now turn to demonstrating how the use of the risk hazard approach for understanding autonomous adaptation is important for adaptation planning. The findings indicate that households cannot reduce their exposure to flooding, highlighting that providing protection from hazards is an important issue for planning. Many households have modified livelihood assets, such as homesteads and poultry; they have also altered their income generating activities, especially during flooding months. Many households have partially retreated away from flooding through seasonal migration in the absence of protection measures.

From a risk hazard perspective, autonomous adaptations comprised a mixture of incremental and transformational adaptations. Incremental adaptations

accommodated hazards and demanded little resources; for instance, rearing ducks instead of chickens at subsistence level. Transformational adaptations in turn accommodated or helped to retreat from flooding. Two distinct forms of transformational adaptations can be identified. Low cost transformations were often involuntary, uncontrolled, and negative in terms of their outcomes; for instance, substituting cash crop cultivation for agricultural labouring. High cost transformations were typically voluntary, planned, and involved taking advantage of emerging opportunities; for instance, converting agricultural land for aquaculture. Patterns of transformational adaptation were clearly related to household socioeconomic status. Low cost transformations, such as domestic migration, were adopted by households of low socio-economic status. Transformations requiring more resources such as international migration and aquaculture are only adopted by households of high socio-economic status with the necessary resources. Homestead adaptation was an exception: all households adopted it because they had to, and could do so by using credit, mortgaging land and by building very small homesteads to keep costs sufficiently low (Fenton et al., 2016).

In our research most autonomous adaptations could be considered as transformational when viewed through the risk hazard lens. This contrasts with other studies of planned adaptation, which have found that mostly incremental strategies were derived through participatory, multi-stakeholder processes (Butler et al. 2016). One explanation may be that flooding in our study site was so severe that existing livelihood strategies became impossible, forcing transformational responses. This raises the question whether planned adaptation can facilitate transformational or incremental strategies, when households will autonomously decide on either form as they see fit. Adaptation planning should be concerned with patterns of incremental autonomous adaptation. Incremental adaptations can build the necessary capacity for future transformational adaptation; however, they may also represent short-term measures that can potentially create hidden and latent systemic risks (Kates et al. 2012; Matyas & Pelling, 2015). Instead, adaptation planning must facilitate positive transformations, and incentivise households to take advantage of emerging opportunities (see Rickards & Howden, 2012; Howden et al. 2007; Park et al. 2012),

and thus avoid or adopt certain adaptation pathways (Butler et al. 2014, Wise et al. 2016, Butler et al. 2017).

By encouraging cross-scale social networks, trust and innovation, multi-stakeholder adaptation planning provides an opportunity to build the capacity of communities to anticipate and navigate future change (Butler et al. 2015), but it must provide the right incentives and knowledge for autonomous adaptation to occur (Fankhauser, Smith, & Tol, 1999). This may be particularly important for transformational adaptation strategies to occur in developing countries. For instance, in our case study all households needed to modify their homesteads to cope with flooding. But it is possible that the adopted design is not the most efficient or cost-effective. NGOs have promoted a different design across Bangladesh, in which homestead walls are made of matted bamboo rather than brick and mortar.. In another example, households of lower socio-economic status were unable to successfully convert agricultural land to aquaculture due to poor embankment construction. Government extension services could provide households with relevant training and resources to achieve this.

Understanding which transformational strategies to facilitate is likely to be complicated. In the risk hazard approach transformations do not necessarily result in positive outcomes, unlike political ecology (cf. Pelling, O'Brien, & Matyas, 2015; Rickards & Howden, 2012). In the risk hazard approach, transformation merely refers to technical aspects of change rather than the qualities of the change. In our case study, most households of low socio-economic status now migrate because they are unable to cultivate summer cash crops. Migration is a transformational adaptation, reducing vulnerability to flooding, and providing income during the summer months. However, household income still declines due to low agricultural wages in migration hotspots, a common outcome across Bangladesh (Banerjee, 2007). Therefore, whether migration is a positive transformative autonomous adaptation which should be promoted is still debated in academic literature (e.g. Tacoli, 2009; Black et al., 2011; Paul, 2005).

Facilitating transformational adaptation can also pose difficulties because supporting one may negatively impact another group. Climate change may result in winners and losers (O'Brien & Leichenko, 2003). This was also the case in our case study. There was a link between the transformative choice of poorer households to migrate and of wealthier households to convert agricultural land for aquaculture. Land converted for aquaculture is often owned by poorer households. Instead, they rent their land to wealthier households who are able obtain the resources required for conversion. Unable to cultivate their land, poorer households migrate to work as agricultural labourers, earning less income than before. Thus households of high socioeconomic status that have enjoyed increased incomes, have mainly been able to do so by using the land of the households of low socioeconomic status. Aquaculture also reduces local employment opportunities as it requires less labour than agriculture (Paul & Vogel, 2011). Consequently, adaptation planning will need to decide whether such outcomes are socially acceptable or not. The risk hazard approach provide limited utility for adaptation planning as it does not give sufficient consideration and emphasis to equity and fairness, because of its focus on risks and risk mitigation measures (Eakin & Luers, 2006; Eakin, Tompkins, Nelson, & Anderies, 2009).

Furthermore, adaptation planning will need to understand how government extension programmes can inadvertently contribute to unequal outcomes. In our case study, households who transitioned into aquaculture did so in part because they obtained free training and large amounts of inexpensive credit from government extension programmes. According to our survey, the average loan from banks was significantly larger than that from NGOs. Only 13.5% of households obtained credit from banks. Poorer households are typically unable to access credit from government banks which require formal documentation that they do not possess and thus cannot access the credit required to transition into aquaculture (Fenton et al., 2016).

5.7. Conclusions

Our study contributes to debates on autonomous and transformative adaptation by demonstrating the utility of the risk hazard approach in understanding the phenomena, as well as by drawing lessons for adaptation planning in developing countries.

Considering that local responses to climate change are driven by the impacts of those changes on livelihoods and assets, the risk hazard approach is best suited for investigating how households are adapting autonomously. In this approach, transformation refers to a depth of change: untenable situations call for novel solutions, which overcome limits to adaptation. Our results indicate that a considerable amount of autonomous adaptation to flooding in Bangladesh is occurring. Observable adaptations include both incremental and transformative measures, although the categorisation of measures is influenced by the scale or unit of assessment and the wider context within which adaptation occurs. The results also indicate that household perceptions can partly determine whether adaptations are incremental or transformative.

Our results identified two distinct forms of transformational adaptations. Low cost transformations were often involuntary, uncontrolled, and negative in their consequences. High cost transformations were in turn voluntary, planned, and helped to take advantage of emerging opportunities. Each type of transformational adaptation was closely associated with the socio-economic status of households. Poorer households adopt low cost transformations such as domestic migration while wealthier households adopt costlier transformations such as international migration and aquaculture. Adaptation planning needs to mitigate the causes of negative transformations whenever possible, facilitate positive transformations and incentivise households to take advantage of emerging opportunities.

While the article demonstrates the value of the risk hazard approach in understanding autonomous adaptation and its patterns, it also highlights its limitations such as omission of equity and fairness considerations. It contributes to the risk hazard

literature by highlighting how there is a need to give equity considerations additional attention to ensure fair adaptation plans and outcomes are generated. Some progress has been made in this regard (e.g. Reed et al., 2013; Butler et al., 2017); however, a widely accepted and unified approach has not yet been applied into adaptation planning.

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Chapter 6. The Role of Microfinance in Household Livelihood Adaptation in Satkhira District, Southwest Bangladesh

Abstract

There is increasing interest in the potential of microfinance to foster climate change adaptation. However, existing literature over-relies upon theoretical arguments rather than empirical evidence, and until now the emphasis has been on potential positive linkages. We address these weaknesses by empirically examining the role of microfinance in adaptation, drawing from household-level quantitative and qualitative data gathered from Satkhira District, Southwest Bangladesh. We find evidence that microfinance facilitates coping by reducing sensitivity to environmental and climate hazards. Credit is especially important because its availability is uncorrelated with the occurrence of flooding, unlike many other traditional coping responses. We also find evidence that microfinance facilitates adaptation by helping households to overcome financial barriers of adopting adaptation options which reduce exposure or sensitivity. However, credit limits are likely to restrict its role to incremental adaptations, which may not meaningfully reduce vulnerability. Transformational adaptations at times required access to bank credit which the poorest cannot access. This restricts their ability to effectively adapt and they are penalized financially by having to obtain loans to cope. We also find evidence that microfinance can lead to maladaptation when used in non-profit generating activities as income streams are not produced to help repay associated costs. Almost a fifth of all loans were obtained for repaying existing loans. Thus microfinance may undermine longer term adaptive capacity.

Keywords

Bangladesh, climate change, adaptation, flooding, microfinance, microcredit

6.1. Introduction

Climate change poses a particular threat to developing countries that lack the resources necessary to cope with the increasing climate variability and hazards it

exacerbates (IPCC, 2014b). Climate change will have many negative consequences which will particularly impact on low-income and otherwise disadvantaged groups if no appropriate measures are taken. Consequently, adaptation to climate change (henceforth adaptation) is an important policy issue for developing countries. Three broad approaches to adaptation have emerged among practitioners: standalone adaptation, adaptation plus development, and adaptation as development (Ayers & Dodman, 2010). Each approach has implications for how adaptation is understood and operationalized. The standalone approach only tackles the additional anthropogenic aspect of climate change (see Hulme et al., 2011). 'Adaptation plus development' considers the two activities as distinct but sees that adaptation requires mainstreaming into development (see Sperling, 2003). 'Adaptation as development' considers the two activities as synonymous with 'good development', as is the case with community-based adaptation (see Forsyth, 2013).

Adaptation can take place in a top-down manner through planned measures undertaken by the public sector; and through autonomous bottom-up measures by households, businesses and other organizations. A combination of the two approaches is also possible (Smit et al., 2001). Increasing flows of international and national finance are available to support adaptation. Much of these financial flows have been devoted to top-down adaptation efforts: only a small portion reaches the local-level and even less is available to support autonomous household adaptation (Fenton et al., 2015).

There is growing interest in the potential of private finance to support autonomous adaptation. However, much uncertainty exists regarding its role, despite it being widely used for mitigation. Microfinance is one key way of mobilizing private finance (and channelling public finance) for autonomous household adaptation (for overview see Fenton et al., 2015). Microfinance has been an important international development tool for over three decades, but little evidence exists beyond conceptual arguments on microfinance-adaptation linkages. Empirical studies adopting an adaptation lens are needed to address this evidence gap (Fenton et al., 2015). This article seeks to contribute in this regard.

By microfinance we refer to formalized financial services to low-income and otherwise disadvantaged households that are not served by the conventional banking sector. We distinguish between formal and informal finance. Formal finance consists of financial exchanges between a legally recognized institution and individuals. Informal finance in turn consists of financial exchanges between individuals. Many approaches to microfinance exist in terms of the type of financial services offered, whether non-financial services are offered, the legal status of provider, ownership and management structures, source of funds, lending mechanisms, and borrower liability (de Aghion & Morduch, 2005; Dunford, 2001; Matin et al., 1999; Rutherford, 1996; Staschen, 1999).

We examine autonomous household adaptation and how microfinance influences livelihood outcomes in Satkhira District in Southwest Bangladesh. Bangladesh is a good location to examine the linkages between microfinance and household adaptation. It has a vibrant microfinance sector and is one of the most vulnerable countries to climate change. It is exposed to multiple environmental and climate hazards, particularly flooding which affects large parts of the country (MoEF, 2008). The findings indicate that microfinance can facilitate adaptation by enhancing coping capacity and by enhancing adaptive capacity. However, microfinance can also lead to maladaptive outcomes via over-indebtedness. We conclude that better product design and integrating microfinance with wider top-down adaptation efforts would help microfinance to achieve its potential for adaptation.

In what follows, we outline the analytical framework and identify the pathways through which microfinance can influence adaptation. The materials and methods used to describe the case study site in terms of livelihoods, environmental and climate hazards and financial institutions operating in the area are then outlined. The findings are then reported and related back to the literature and conclusions made.

6.2. Analytical Framework

There are three strands of adaptation literature (Eakin & Luers, 2006; Eakin et al., 2009; Janssen, 2007). The ecological resilience approach originates from ecology and focuses on feedback loops and thresholds in socio-ecological systems (Folke, 2006).

The political ecology approach originates from the poverty and geography literatures and focuses on concepts such as poverty, equity, and capabilities (see Adger, 2006). The risk-hazard approach originates from the natural hazards literature and focuses on practical risk reduction efforts which reduce exposure and sensitivity to environmental and climate hazards (Smit & Wandel, 2006).

We adopt the risk-hazard approach due to its greater compatibility for examining autonomous household adaptation. This approach has the premise that risk reduction efforts lessen future climate risks and contribute to ensuring the sustainability of future development (see Ayers & Dodman, 2010; Schipper, 2007). Consequently, while it recognizes linkages between vulnerability to environmental and climate hazards and wider vulnerability caused by structural causes it ultimately sees these as distinct. It is highly compatible with understanding autonomous adaptation by households that are likely to adapt through managing and reducing livelihood risk (Ayers & Forsyth, 2009; Fenton et al., 2016). It is also compatible with the assessment of microfinance for which households, livelihoods, and risk are important concepts. However, we seek to integrate the complementary insights provided by the political ecology approach on equity in the discussion section to compensate for the insufficient emphasis on equity considerations within the risk-hazard approach (Fenton et al., 2016).

In the risk-hazard approach, household adaptation is the process through which households adjust to changing conditions, hazards, risks, and opportunities posed by climate change (Smit & Wandel, 2006). The need to adapt stems from vulnerability to environmental and climate hazards (henceforth vulnerability). We understand vulnerability as a function of exposure, sensitivity, and adaptive capacity (IPCC, 2014a). Exposure refers to the potential of assets, livelihoods, and environmental resources to be adversely affected by climate hazards and the likelihood of harm occurring (IPCC, 2014a). Sensitivity refers to the extent to which they can be affected by climate hazards (IPCC, 2014a). Adaptive capacity refers to the tangible and intangible factors enabling a household to adapt (Grothmann & Patt, 2005; Jones et al., 2010; Smit & Wandel, 2006; Williams et al., 2015). It is affected by how wider social, cultural, political and economic forces are locally manifested (Smit & Wandel, 2006). The

frequency by which hazards occur can influence adaptive capacity by depleting resources needed for future adaptation (Smit & Wandel, 2006). However, adaptive capacity does not necessarily lead to adaptation, reasons for which are insufficiently understood (Brown & Westaway, 2011; Grothmann & Patt, 2005).

The ways in which households can reduce vulnerability are known as adaptation options, while factors restricting the feasibility of adaptation options are known as adaptation barriers. The factors which limit the number of adaptation options available are referred to as adaptation limits (IPCC, 2014a). Adaptations can be characterized by the degree of change they entail. Adaptations that enable limits to be overcome can be deemed transformational; and those that manage changing risks posed by hazards are deemed incremental (Fenton et al., 2016; Park et al., 2012). Maladaptation occurs if adaptation measures inadvertently increase vulnerability (Barnett & O'Neill, 2010). Within the adaptation framing we utilize, maladaptation occurs if exposure or sensitivity to natural hazards and stresses is inadvertently increased or adaptive capacity reduced.

Adaptation is distinct from coping, which refers to immediate household responses to environmental and climate hazards when they occur, such as obtaining credit or selling assets (Berman et al., 2012). Coping strategies often maintain current livelihoods when possible. Actions detrimental to future livelihoods are avoided if possible, but are taken as a last resort (Ellis, 2000). In contrast, adaptation consists of anticipatory or reactive changes which alter livelihoods and reduce long-term vulnerability (Vincent et al., 2013). However, it has been noted that the categorization of an action as coping or adaptation can be context and scale dependent (Vincent et al., 2013). Despite being distinct entities, coping and adaptation are linked in that coping capacity is a prerequisite for adaptive capacity (Berman et al., 2012). Additionally, they are determined by the same context, resources, and exposure to hazards which underpin adaptive capacity (Smit & Wandel, 2006). Furthermore, the frequency by which hazards occur can deplete resources needed for both future coping and adaptation (Smit & Wandel, 2006).

Microfinance has been proposed to facilitate adaptation by (1) improving ex-post risk recovery by enhancing coping capacity (Heltberg et al., 2009); and (2) improving ex-ante risk reduction by enhancing adaptive capacity (Agrawala & Carraro, 2010; Hammill et al., 2008). Additionally, concerns have also been raised about possible links with maladaptation (Hammill et al., 2008). There is a need for empirical evidence to substantiate these links in light of recent literature that questions the links between microfinance and poverty reduction (Duvendack et al., 2011; van Rooyen et al., 2012). We seek to contribute to filling this gap by examining the microfinance-adaptation linkages at household-level in the Satkhira District in Southwest Bangladesh.

6.3. Materials and Methods

The research was conducted in Noapara village in the Satkhira District of Southwest Bangladesh. The site was chosen on the basis of key informant interviews conducted with national and local non-governmental organizations (NGOs) and community representatives. Noapara village was selected as typical of the area: it is exposed to flooding, served by multiple financial institutions, accessible and secure, and at a low risk of research fatigue. A single case was adopted to achieve an in-depth examination of the context-specific nature of vulnerability and adaptation. This required qualitative methods and a prolonged presence to gain familiarity and trust of research participants.

A mixed-methods strategy enabled the triangulation of participant experiences. In March 2014, 30 participants (11% of the population) engaged in focus group discussions to explore village life and its appropriateness for the study. Between May and June 2014, 266 households (99% of the population) were surveyed on topics such as assets and exposure to environmental hazards. A particular focus was on access to financial institutions.

Between March and April 2015, semi-structured interviews were conducted with 38 household heads (14% of the population) to explore household adaptation and the influence of microfinance. The interviews were informed by livelihood profiles, constructed from survey data. Interviewees were purposefully sampled in terms of

land ownership, education, homestead quality, and credit usage. Additionally, short interviews were conducted with market stall owners regarding their experiences with credit (72% of the market stalls). Personal observation and informal conversations complemented the above data collection methods. Semi-structured interviews (20) were also undertaken with branch managers from institutions serving the village with financial services, including banks (4), NGOs (9), and savings-based credit cooperatives (SCOs) (7).

Examining microfinance-adaptation and microfinance-maladaptation linkages is challenging because observing adaptive capacity is difficult before it has been manifested (Adger et al., 2007; Engle, 2011). Additionally, there is insufficient understanding of when adaptive capacity results in adaptations (Brown & Westaway, 2011; Grothmann & Patt, 2005). We focus on past instances of known autonomous household adaptations identified during exploratory research and hence reductions in sensitivity rather than increases in adaptive capacity. We sampled participants on the basis of survey data, snowballing and participant observation. Focus group findings were interpreted in situ with participants. Survey data were analysed using SPSS and interpreted using literature. Semi-structured interviews were coded according to the types of coping mechanisms and household adaptations. Analytical categorization was then undertaken using an iterative process building on the initial descriptive coding, and drawing upon literature themes to interpret the material.

6.4. Case-study

Noapara Village has 267 households, 74% of which have 3–5 members, and 94% of which are male-headed. Livelihoods have been historically agricultural: cash crops are cultivated during summer and rice during winter. Livelihood activities also commonly include small-scale livestock, poultry, and aquaculture; and seasonal migration in search of agricultural wage labour opportunities. Less common activities include non-agricultural salaried work, international migration as well as seasonal and permanent businesses. All common livelihood activities involve use of credit. For instance, most agricultural inputs are purchased on credit and debts traditionally repaid post-harvest at a festival known as Halkhata.

Riverine flooding, which affects much of south-west Bangladesh, is a key hazard in Noapara village (MoEF, 2008). Overflowing of the Kobadak River banks directly causes the flooding. It in turn has been linked to earlier top-down flood management programs, such as the Coastal Embankment Project (see Wesselink et al., 2015) which have induced subsidence in surrounding lands and focused sedimentation in rivers inadvertently elevating them above the floodplain. There is some evidence that flooding hazards in Bangladesh are increasing due to climate change (e.g., Kundzewicz et al., 2014). The interviews suggest that the intensity and frequency of flooding has increased substantially, major events occurring in 2008 and 2011. Flooding occurs from June to October and lasts 2–3 months due to poor drainage. A local councillor commented that in 2011 flooding lasted for 8 months. Survey results indicate that most households have been significantly affected 3–5 times in the past decade.

Flooding severely disrupts the livelihoods of the inhabitants of Noapara. Many households have abandoned cash-crop cultivation, a vital activity linked to savings, debt repayment and investment. Local demand for agricultural labourers has declined, forcing many to migrate for longer periods. Income earned from wages does not offset the income earned through cash-crop cultivation. In related studies, agricultural wages in migration destinations have been shown to be low due to excess supply and low demand (Banerjee, 2007). Natural assets such as trees are sensitive to flooding and have mostly perished. Businesses are also sensitive to flooding due to damage to premises and stock, and low demand for goods and services.

Financial institutions serving Noapara households include externally established and managed institutions (banks and NGOs) regulated by government; and community-initiated and managed semi-formal institutions (SCOs), which are not regulated by the government (see Table 2). NGOs, SCOs, and some banks are privately owned. The important banks are government-owned and controlled. Banks and NGOs provide external funds – typically from the government – whereas SCOs circulate community resources. All financial institutions use a mixture of individual lending and liability mechanisms, although NGOs still bundle borrowers into groups for mutual support.

Table 2: Breakdown of financial providers by breadth of outreach (2014)

	Traditional providers	MFIs		Informal Providers			
	Bank	NGOs	SCOs	Friends	Family	Shop	Money-lender
Number of institutions	7	15	9	N/A	N/A	N/A	N/A
Total loans issued	36	215	131	82	98	63	4
% households with loans	12.78%	53.00%	35.71%	30.83%	36.84%	23.60%	1.50%
% of total loans	5.72%	34.18%	20.83%	13.04%	15.58%	10.02%	0.64%
Average loan size	43,611	22,116	13,996	30,948	12,026	14,757	6,500
Total credit issued	1,570,000	4,755,000	1,833,500	2,537,700	1,178,500	929,660	26,000
% of credit issued	12.24%	37.06	14.29%	19.78%	9.19%	7.25%	0.20%
Average loan size and total credit offered reported in local currency, Bangladesh Taka, (BDT).							

Banks are traditional providers of financial services that have minimum credit limits, complex procedures, and formalized repayment structures. NGOs and SCOs (both considered MFIs) have maximum credit limits, simplified procedures, and formalized repayment structures. Informal credit is also available from market stalls, friends, and extended family. Informal credit is characterized by idiosyncratic credit limits and lack of formal procedures and repayment structures. Credit from market stalls is relatively inexpensive compared to formal institutions. Credit from friends and family is interest free due to Islamic principles.

About half (55.01%) of outstanding loans in Noapara are provided by MFIs (see Table 2). Interviews indicated preference for MFI loans because of accessibility, convenience, and trusted procedures. MFIs providing non-financial benefits such as aid during floods were preferred. Informal sources accounted for much of outstanding credit (39.28%). Interviews suggest the preference for informal credit is due to greater flexibility and low costs. Banks provided few loans (5.72%) despite their relative accessibility and low interest rates. Interviews suggest bank loans are not preferred due to lengthy and complex application procedures, inability to obtain required documentation, inconvenience of traveling to branches, and a belief that bribes are required.

Formalized saving in banks, NGOs, and SCOs is common among households. But only socioeconomically advantaged households have bank deposit accounts. They are particularly important for households that have family members working overseas, as they enable remittance transfers. Many NGOs require clients (typically female) to open a savings account, though saving is subsequently voluntary. Savings are formalized and their use by NGOs is regulated by the government. SCOs enable members to save but access is inflexible. Members can only save a fixed amount, equal to other members, during the initial capital accumulation phase to ensure equal ownership.

6.5. Results

In this section we first report the results regarding microfinance and coping and then discuss the results regarding microfinance and adaptation. In the end we discuss results regarding microfinance and maladaptation.

6.5.1. Microfinance and coping

The survey elicited the main purposes for which credit was obtained, although attributing credit for different activities is not straightforward because of the fungibility problem: credit is often not used as originally indicated to the lender (Hulme, 2000). Households also face the recall problem: they do not remember exactly how they spent credit. We focus on the main purposes for which households obtained credit as a proxy for how credit was used.

Table 3 summarizes the number of times different purposes were listed as reasons for obtaining loans by each source of loan. Specific purposes are aggregated to three categories: consumption, the use of credit to maintain current wellbeing; investment, the use of credit for future wellbeing; and repayment, the use of credit to repay existing debt obligations. Investment was the most commonly cited reason for obtaining loans (45.86%) but consumption (34.22%) and repayment (19.91%) were also common reasons. The majority of loans for investment and repayment were obtained from MFIs as expected, as they are the largest providers of loans. However, consumption loans were most often obtained from informal sources.

Consumption loans were used for purchasing food (65%) or medicine (30%) at times of livelihood shocks. Therefore, they are a suitable proxy for loans obtained by households to cope with livelihood shocks. This means that informal sources of credit are more important than MFIs for coping with livelihood shocks. To explore this connection in more detail we disaggregated loans into those obtained during months when flooding commonly occurs (henceforth 'flooding months'), and those obtained during months when flooding does not usually occur (henceforth 'non-flooding months'). Consumption loans obtained during flooding months can be used as proxy for obtaining loans to cope with flooding. We found that consumption becomes a three times more common reason (8.14 vs 25; see Table 4) for obtaining loans during flood months.

Table 3: Breakdown of purposes to obtain loans

General Purpose	Specific Purpose	Financial provider approached											
		Bank			MFIs			Informal			Specific Total		General Total	
		Cite count	% of all related specific cite counts	% of all purposes of loans from provider type	Cite count	% of all related specific cite counts	% of all purposes of loans from provider type	Cite count	% of all related specific cite counts	% of all purposes of loans from provider type	Cite count	% of all specific purposes	Cite count	% of all general purposes
Consumption purposes	Purchase food	4	2.33%	9.76%	53	30.81%	13.38%	115	66.86%	41.67%	172	24.12%	244	34.22%
	Purchase medicine	1	1.79%	2.44%	30	53.57%	7.58%	25	44.64%	9.06%	56	7.85%		
	Wedding costs	1	6.25%	2.44%	11	68.75%	2.78%	4	25.00%	1.45%	16	2.24%		
Investment purposes	Purchase agricultural inputs	6	6.59%	14.63%	51	56.04%	12.88%	34	37.36%	12.32%	91	12.76%	327	45.86%
	Purchase equipment	4	21.05%	9.76%	12	63.16%	3.03%	3	15.79%	1.09%	19	2.66%		
	Purchase aquaculture inputs	3	25.00%	7.32%	7	58.33%	1.77%	2	16.67%	0.72%	12	1.68%		
	Purchase livestock inputs	2	6.67%	4.88%	22	73.33%	5.56%	6	20.00%	2.17%	30	4.21%		
	Purchase business inputs	2	2.60%	4.88%	58	75.32%	14.65%	17	22.08%	6.16%	77	10.80%		
	Education costs	3	11.54%	7.32%	14	53.85%	3.54%	9	34.62%	3.26%	26	3.65%		
	Build or repair homestead	3	5.56%	7.32%	36	66.67%	9.09%	15	27.78%	5.43%	54	7.57%		
	Build shop	1	8.33%	2.44%	7	58.33%	1.77%	4	33.33%	1.45%	12	1.68%		
	For a job	0	0.00%	0.00%	0	0.00%	0.00%	1	100.00%	0.36%	1	0.14%		
	Take credit to go broad	0	0.00%	0.00%	1	20.00%	0.25%	4	80.00%	1.45%	5	0.70%		
Repayment	Repay existing loan	11	7.75%	26.83%	94	66.20%	23.74%	37	26.06%	13.41%	142	19.92%	142	19.91%

Table 4: Different types of loans by flood and non-flooding months

	Banks	MFIs		Informal	Total
		NGO	SCO		
Across the year					
Amount of times consumption purposes listed as a major reason for obtaining a loan	6	52	42	82	182
Amount of times investment purposes listed as a major reason for obtaining a loan	24	133	75	95	327
Amount of times repayment purposes listed as a major reason for obtaining a loan	11	58	36	37	142
Average number of times per month consumption purposes listed as a major reason for obtaining a loan	0.50	4.33	3.50	6.83	15.17
Average number of times per month investment purposes listed as a major reason for obtaining a loan.	2.00	11.08	6.25	7.92	27.25
Average number of times per month repayment purposes listed as a major reason for obtaining a loan.	0.92	4.83	3.00	3.08	11.83
During flooding months					
Amount of times consumption purposes listed as a major reason for obtaining a loan	2	26	33	64	125
Amount of times investment purposes listed as a major reason for obtaining a loan	9	38	28	52	127
Amount of times repayment purposes listed as a major reason for obtaining a loan	3	16	18	12	49
Average number of times per month consumption purposes listed as a major reason for obtaining a loan	0.40	5.20	6.60	12.80	25.00
Average number of times per month investment purposes listed as a major reason for obtaining a loan	1.80	7.60	5.60	10.40	25.40
Average number of times per month repayment purposes listed as a major reason for obtaining a loan	0.60	3.20	3.60	2.40	9.80
Proportion of times consumption purposes listed as a major reason for obtaining a loan during flooding months	1.60%	20.80%	26.40%	51.20%	
During non-flooding months					
Amount of times consumption purposes listed as a major reason for obtaining a loan	4	26	9	18	57
Amount of times investment purposes listed as a major reason for obtaining a loan	15	95	47	43	200
Amount of times repayment purposes listed as a major reason for obtaining a loan	8	42	18	25	93
Average number of times per month consumption purposes listed as a major reason for obtaining a loan	0.57	3.71	1.29	2.57	8.14
Average number of times per month investment purposes listed as a major reason for obtaining a loan	2.14	13.57	6.71	6.14	28.57
Average number of times per month repayment purposes listed as a major reason for obtaining a loan	1.14	6.00	2.57	3.57	13.29
Proportion of times consumption purposes listed as a major reason for obtaining a loan during non-flooding months	7.02%	45.61%	15.79%	31.58%	

To understand why obtaining credit during flooding months is so important we asked households how they respond to livelihood deficits in each month. Few households used savings as a coping response, which was surprising as many households do have savings. Interviews suggest members of SCOs have very limited access to their savings because SCOs do not hold reserve capital and all of their capital is used to disburse new loans. The problem is compounded when households are temporarily unable to repay their loans during and after flooding. Additionally, withdrawal of savings results in membership cancelation: this deters households from withdrawals as membership ensures priority for future loans. Furthermore, many households felt that governing bodies of SCOs would not allow them to withdraw savings and did not try to do so. Finally, many households do not know how much savings they have: many interviewees felt that governing bodies of SCOs withheld this information from them. Many households have also savings with NGOs that they should be able to withdraw when in need. However, households also reported difficulty withdrawing funds from NGOs, claiming that NGO field officers steer members to keep savings for future emergencies. NGOs denied that this is the case.

Field research indicated that accessing credit was the most important way to cope with flooding. Credit is important because few alternative responses are available during flood months. Traditional coping responses, such as finding agricultural wage labour opportunities, are in short supply due to the abandonment of cash-crop cultivation. Credit is so important for coping because its availability is uncorrelated with the occurrence of flooding. In contrast, traditional coping responses are built around traditional livelihood practices that are inversely correlated with flooding. For instance, access to agricultural labour opportunities depends on the existence of local agricultural activity, but when flooding occurs, agricultural activities and thus many traditional coping responses are limited. The problem is compounded by the covariate nature of flooding which affects large areas rather than isolated farms.

During flood months, consumption loans are most often obtained from informal sources, and informal loans account for half of all loans obtained for consumption during flood months. Consumption becomes four times more common a reason for

obtaining informal loans in flood months compared to non-flood months. MFIs provide most of the remaining loans for consumption. Similarly, loans obtained from MFIs for consumption almost double compared to non-flood months.

NGOs and SCOs have less important role as providers of consumption loans during flood months, although their consumption loans also increase in flood months by 20% and 90%, respectively. That SCOs and informal providers play a bigger role than NGOs during flood months for consumption loans is unexpected, because the covariate risk of flooding should reduce the ability of localized financial institutions to provide support, as well as the ability of social support networks to provide mutual support (Bhattamishra & Barrett, 2010). There can be several reasons for the unexpected finding. First, NGOs often provide food and blankets to members as substitutes to credit during flooding. Second, government regulations discourage provision of loans for consumption purposes (see MRA, 2011). Third, NGOs often provide only one loan to a household; borrowers with outstanding loans would need to obtain additional loans from alternative lenders. SCOs and informal providers are the most obvious sources as unlike with NGOs, prior membership is not necessary.

6.5.2. Microfinance and adaptation

Household interviews found no autonomous agricultural adaptations to flooding. A few households tried flood resistant crop varieties but they were not workable. No agricultural adaptation options existed due to limits imposed by the severity and duration of the hazard and the sensitivity of livelihoods to the hazard. Microfinance did not enable households to overcome limits as they were biophysical, not financial (see Klein et al., 2014). The implication is that microfinance can only facilitate adaptation when feasible options exist. Also, microfinance facilitates adaptation only when financial services can help overcome barriers and limits. In the absence of agricultural adaptation options, households either migrated or converted land for aquaculture. We will discuss the links between these adaptations and microfinance below.

Domestic and international migrations are adaptations that help to retreat from flooding (see Dronkers et al., 1990). They are adaptations because they consist of

livelihood changes to reduce long-term vulnerability. Both are transformational as they involve abandonment of traditional cash-crop cultivation (see Fenton et al., 2016). Many male members of households migrate domestically to find agricultural employment from elsewhere. Migration is a low-cost adaptation that mainly entails expenditure for transport and accommodation. Remittance services enable migrants to regularly and securely send earnings to local household members. Male members of households also migrate overseas to work. International migration is available only to socioeconomically advantaged households due to its high cost. Access to bank deposit services, remittance services, and substantial amounts of credit are needed.

SCOs and informal providers are key sources of credit for international migration, as banks and NGOs will not fund this activity. One NGO branch manager noted: ‘‘if the member migrates after the loan distribution then how can I recover this loan?” International migration takes place because flooding suppresses the local economy and prevents livelihood diversification. One household interviewee noted: ‘‘I can start a business; however, the interest charged would be more than the profit. If I go [abroad], that amount of money I would be able to make will be sufficient to repay loans.” Credit enables the financial barriers to international migration to be overcome.

However, credit limits and usage restrictions imposed by banks and NGOs make them a less useful source of credit. Use of credit imposes the challenge for households of obtaining financial benefits greater than the cost of capital to overcome financial barriers. Formal financial institutions may also be unwilling to provide credit for migration due to governance and institutional constraints.

While many households migrated some remained and converted agricultural land for freshwater fish and prawn aquaculture. This is an adaptation because it changes a livelihood to reduce long-term vulnerability. This often involved renting flood-prone land from other households. The function of this adaptation was to accommodate flooding and was exclusive to socioeconomically advantaged households due to the relatively large financial resources required. It is also transformational because it is original to the village and enables households to overcome the limits associated with

agriculture and flooding (see Fenton et al., 2016). Credit is vital due to large upfront costs of converting land and purchasing aquaculture inputs. Households obtained credit from banks as the needed amounts exceeded credit limits of MFIs. Here credit enables the financial barriers of adaptation to be overcome. Not only are MFIs less able than banks to support this adaptation due to their credit limits, bank credit can also actually be obtained at lower cost.

All households have faced the decision of whether to rebuild higher traditional earth homesteads or build improved brick and mortar homesteads. They are adaptations because they seek to reduce long-term vulnerability. Improved homesteads are widespread but can be considered transformational as for many households this is a new way of construction with new materials and skilled labour (see Fenton et al., 2016). It is an adaptation to accommodate flooding and to enable male household members to migrate for longer periods of time without a fear that the homestead will collapse on family members. Homestead reconstruction requires relatively large financial resources. Many households have adopted this adaptation despite its cost as it is considered an adaptation priority. Its widespread adoption depended on access to credit, which many households do by securing loans from multiple credit providers. Credit enables the financial barriers of homestead improvement to be overcome. However, the ability of MFIs to support adaptation is restricted due to their credit limitations, and new specialized products would need to be developed to foster adaptation.

6.5.3. Microfinance and maladaptation

While microfinance can facilitate adaptation by enhancing coping and adaptive capacity as evidenced above, sometimes it has unintended consequences which increase vulnerability via over-indebtedness. Over-indebtedness results from the use of credit to cope with flooding. Coping with credit does not produce income streams, which would assist households to repay loans. The abandonment of cash-crop cultivation and migration reduce income and thus ability to repay debts. Yet households prefer over-indebtedness to the sale of assets such as land. Over-indebtedness caused by the use of credit to cope can increase future vulnerability

when further credit is needed to repay debts, because this prevents the use of credit for coping with hazards or for adapting. External intervention is needed to reduce the frequency at which hazards occur, as reliance on credit to cope with frequent severe climate hazards may contribute to over-indebtedness and greater vulnerability.

Over-indebtedness is also linked to the financing of adaptation options with credit, particularly of homestead improvement, which yields no income. One over-indebted household noted ‘‘to build this house we took loans, and to repay the loans we borrowed money from another place, and to repay the second loan we borrow money from yet another place”. Such accounts were common because the numerous lenders are unaware that they are lending to the same household (called overlapping). Financing adaptations that do not produce income streams with credit can increase future vulnerability if households are unable to meet repayments and consequently become over-indebted. Such adaptation options would require new products to facilitate adoption without the risk of over-indebtedness. Additionally, adaptation planners cannot rely on autonomous adoption, as there remains a danger of increased vulnerability because of over-indebtedness.

6.6. Discussion

The aim of this research was to empirically assess previously proposed linkages between microfinance and coping, adaptation, and maladaptation. We now discuss the research findings in relation to these proposed linkages in order before drawing conclusions.

6.6.1. Microfinance and coping

The findings show that credit acts as an ex-post source of capital when environmental and climate hazards occur. This finding resonates with previous studies suggesting such a link (e.g., Heltberg et al., 2009); and resonates with arguments of the microfinance literature according to which credit is an important coping mechanism more generally (e.g., Banerjee et al., 2015; Collins et al., 2009; Osbahr et al., 2008).

In addition, the findings highlight the important role of both informal and formal credit in coping with environmental and climate hazards. The role of informal credit is an important finding considering the high number of financial institutions serving the village (effectively 1 per 11 households). Traditional theory suggests that formal credit replaces informal credit (de Aghion & Morduch, 2005; Ledgerwood, 1999). However, this was not the case in Noapara. Existing microfinance-adaptation literature has hitherto not sufficiently acknowledged the role of informal credit in supporting livelihoods and coping capacity.

Furthermore, the results highlight the role of social support networks in coping with environmental and climate hazards, and shows that resources flow through these networks despite covariate risks. Easy access, flexibility, and low costs were key reasons why informal credit is popular during flood months. The implication is that formal credit products may need to be made more flexible, cheaper, and be easier to access during times of flooding to meet household needs.

This research distinguished between two forms of MFIs which support coping capacity, externally managed NGOs and community initiated and managed SCOs. In many studies SCOs are not considered MFIs and their role in supporting coping capacity has not been sufficiently acknowledged in existing literature. NGOs were found to play a smaller role than previously assumed, accounting for only approximately 25% of consumption loans during flooding months, further downplaying the role of formalized credit in coping with environmental and climate hazards. Government regulation regarding credit usage, number of loans per borrower, and limits on the number of institutions borrowers can obtain credit from, as well as NGO preferences for providing other forms of support during flooding, could explain why NGOs have a smaller than expected role in supporting coping capacity.

6.6.2. Microfinance and adaptation

The results partly corroborate existing literature, which has suggested that microfinance can support adaptation by enhancing adaptive capacity through the accumulation of assets and diversification of livelihoods (Agrawala & Carraro, 2010;

Hammill et al., 2008; Heltberg et al., 2009). However, whether this necessarily leads to vulnerability reduction depends on how adaptation is both conceptualized and operationalized. Much of the existing literature implicitly adopts an 'adaptation as development' perspective (e.g., Hammill et al., 2008). Within this approach the accumulation and diversification of assets and livelihoods is interpreted as vulnerability reduction. However, from an 'adaptation plus development' perspective the accumulation and diversification of assets and livelihoods only reduces vulnerability if it directly confronts or manages climate risk (see Ayers & Dodman, 2010; McGray et al., 2007).

We adopted the latter perspective and found fewer examples of credit facilitating adaptation. For instance, household livelihood diversification into business does not reduce vulnerability, as businesses are also sensitive to flooding. Most businesses stop operating during flooding due to inundation, risk of damage to stock, and low demand for goods. Many food shops have closed due to the need to sell much of their goods on credit. A former shop owner commented: ''I had to always give credit, so I couldn't make profit and I decided to stop the business". Only when assets accumulated or diversified livelihoods reduce exposure or sensitivity can they result in vulnerability reduction. When this occurs the result could be described as 'climate-resilient' or 'climate compatible' microfinance (Fenton et al., 2015).

Moreover, microfinance cannot always facilitate adaptation through livelihood diversification because there may not be feasible activities into which households can diversify, especially when training is not coupled into financial services (Caretta, 2014). In Noapara the most widespread adaptation was seasonal migration due to lack of viable in-situ alternatives. Migration has proved less lucrative than cash crop cultivation according to households and it appears that if they could cultivate cash crops then they would adapt back into this activity. If microfinance could be relied upon to enable adaptation through livelihood diversification, then lower levels of migration would have occurred.

Even when adaptation options exist, they may not reduce vulnerability. For instance, credit was used for rearing ducks instead of chickens to reduce sensitivity to floods. However, the reduction in vulnerability was not sufficient to offset the ongoing effects of flooding on their homesteads and agricultural land, the most important livelihood assets.

Also, when adaptation options do exist, credit limits of MFIs may not enable financial adaptation barriers to be overcome. For instance a major barrier to the adoption of aquaculture is the inability to acquire sufficient capital to construct necessary embankments and purchase necessary aquaculture inputs. Although households could access credit from MFIs, credit limits prevented them from acquiring sufficient capital to adapt into aquaculture. Thus this adaptation option was only feasible to socioeconomically advantaged households which could access bank credit. Furthermore, the terms and conditions associated with credit may prevent financial barriers associated with adaptation options from being overcome. Banks and NGOs did not finance overseas migration as they feared not being able to collect repayments. The cost of credit may also act as a financial barrier, making adaptation options economically unviable. It was commented by some households that it was not possible to profit from livestock purchased using credit due to the costs of meeting loan repayments.

6.6.3. Microfinance and maladaptation

The results corroborate earlier microfinance-adaptation literature which proposed microfinance may increase vulnerability and lead to maladaptive outcomes (Hammill et al., 2008). The most evident example of microfinance causing maladaptation is through a reduction of adaptive capacity. Almost one fifth of all loans in the village were obtained for repayment of existing loans. We interpret this as over-indebtedness, although no authoritative definition of it exists in the literature (Schicks, 2013). Over-indebtedness refers to an inability to meet repayment deadlines, which results in costly actions and increased indebtedness.

To date there has been little research on the impact of climate change on the drivers of over-indebtedness. Drivers for over-indebtedness have been grouped into external factors, lender behaviour, and borrower behaviour (Schicks, 2013). However, very little has been said about the relative importance of these drivers, or the relative influence of environmental and climate hazards upon them. Much of the emerging literature focuses on borrower behaviour, such as the use of credit for non-productive purposes or activities with low financial returns (e.g., Schicks, 2014; Taylor, 2012). However, this research highlights that climate change can also potentially contribute to over-indebtedness by exacerbating external factors such as flooding, altering borrower behaviour, and limiting the ability of households to build up assets. Historical accounts of village life indicate that earlier flooding was less significant and more infrequent, allowing household livelihoods to recover. Households reported that flooding is now much more frequent and severe, frustrating livelihood recovery. Borrower behaviour has changed, as households have been forced to invest in activities that do not produce a financial return. Households also reported abandoning cash-crop cultivation due to risk of harvest loss. This reduces their ability to generate income, accumulate assets, save, and repay debts; and gradually erodes their asset base and leads to over-indebtedness.

The over-indebtedness and its links to credit use for coping and adapting can be said to present a Faustian bargain. This evocative term has been used in other studies such as Wood (2003), who uses it to describe the actions by poor households for the pursuit of short-term security at the cost of longer term prospects for livelihood improvement. The phenomenon was manifest in the case study in the form of use of credit to cope with livelihood shocks caused by climatic hazards and the use multiple microfinance loans to finance homestead improvements. Current loan products are ill-designed for these purposes: they are short-term products with short repayment schedules which do not work well with adaptations that do not generate income in the short term. Households know this yet are pushed into such arrangements due to the need for secure shelter. This has contributed toward many households becoming over-indebted. One respondent crystallized this problem when commenting: ‘‘If you can use

it in a productive way then it is helpful. As we cannot use it in a productive way it is not helpful, even sometimes it is a burden".

The research also highlights that accumulation of assets can increase vulnerability by increasing exposure and sensitivity when assets are not resilient to or do not reduce sensitivity to environmental and climate hazards. An example is households using credit to convert agricultural land for aquaculture. The accumulation of flood-prone landholdings increases exposure. Sensitivity does not necessarily decrease. If embankments are inadequate flooding can overwhelm embankments and lead to loss of fish stock. Some households lost income and became over-indebted in this way, and one household was taken to court for unpaid debts. Risk-transfer mechanisms (e.g., insurance) may be required to reduce risks associated with certain adaptation options.

6.6.4. Insights from an equity perspective

In order to address the restricted ability of the risk-hazard approach to incorporate equity considerations, we integrate equity considerations into the discussion. From an equity perspective, the survey data demonstrate how poorer households are much less able to cope with flooding than more advantaged households with access to traditional banks. Very few bank loans were obtained for consumption by wealthier households. Household interviews indicated that this may be the case because wealthier households had greater access to bank loans or government extension services that enabled them to transform their income-generating activities to deal with flooding. Hence they have less need to obtain loans to maintain consumption during flooding months. The use of credit to cope with flooding can be seen as an extra burden for poorer households, leading to a vicious cycle where it is even harder for them to adapt because they need to use limited resources to pay off existing debt.

An equity perspective highlights the inequity of adaptation outcomes, notably due to international migration and conversion of agricultural land for aquaculture. These were the main transformational adaptations to flooding risk undertaken only by socioeconomically advantaged households. These households were able to obtain significant amounts of credit from SCOs to migrate overseas because of their higher

social status, whereas socioeconomically disadvantaged households obtained credit from SCOs mainly to cope with flooding. The ability of socioeconomically advantaged households to access credit from banks enabled them to take advantage of aquaculture. This occurred at the direct expense of socioeconomically disadvantaged households who, without access to sufficient levels of credit, were forced to rent land and migrate in search of agricultural wage labour. Therefore despite the evident benefits of microfinance services, if socioeconomically disadvantaged households cannot gain access to credit services similar to socioeconomically advantaged households, there is a danger of two-tier adaptation outcome, where those unable to access larger amount of credit are disadvantaged.

6.7. Conclusion

This article examined the role of microfinance in climate change adaptation in Noapara village, situated in Satkhira District, Southwest Bangladesh. We adopted a risk-hazard approach to the study of vulnerability, focusing on the role of microfinance in coping capacity and adaptive capacity. To compensate for its weakness regarding equity, we integrated equity concerns from the political-ecology approach.

The results indicate that credit can play an important role in improving coping capacity, reducing ex-post sensitivity to flooding, corroborating existing literature. Credit was found to be especially important because its availability is less correlated to the occurrence of flooding, unlike many other traditional coping responses. While many previous studies have downplayed the role of informal credit, this research found that both informal and formal credit is important for coping. Easy access, flexibility, and very low costs are key factors explaining why informal credit is particularly important to coping with flooding.

With regard to adaptive capacity, the results indicate that credit can improve adaptive capacity reducing ex-ante sensitivity to flooding, corroborating existing literature. However, caution is needed regarding the ability of microfinance to facilitate adaptation. It can only do so when feasible adaptation options exist. Adaptation options must also reduce vulnerability to environmental and climate hazards. For

instance, there is much enthusiasm for microfinance to facilitate adaptation by instigating livelihood diversification, such as microenterprise. However, we found enterprises were also sensitive to flooding. Only when livelihood diversification reduces exposure and sensitivity to environmental and climate hazards will it reduce vulnerability. Also, microfinance facilitates adaptation only when access to financial services can help overcome barriers and limits associated with potential adaptation options. Even if it does facilitate adaptation, credit limits imposed by MFIs may limit its role to incremental adaptations. Incremental adaptations facilitated by access to microfinance were not sufficient to offset the ongoing effects of flooding on agriculture, the most important household income generating activity.

Also, lack of access to credit is not in itself an adaptation barrier: lack of financial resources is. Credit and appropriately designed loan products are simply ways to gain access to financial resources. There is a need to distinguish between access to 'credit' and 'microcredit' when referring to lack of financial resources as a barrier to adaptation. The conversion of agricultural land for aquaculture was only feasible for those households who could access credit from banks. We found transformational adaptations often require access to substantial amounts of credit, significantly more than MFIs are willing to lend. If credit limits continue and socioeconomically disadvantaged households cannot gain access to government extension programmes and banks, there is a risk of a two-tier adaptation scenario in which the poorest will continue to be disadvantaged in terms of not being able to effectively adapt and being financially penalized by having to obtain loans to cope.

The results indicate that credit can lead to maladaptation through over-indebtedness. Almost one-fifth of all loans were obtained for repaying existing loans. Climate change can contribute to over-indebtedness by exacerbating external factors such as flooding, altering borrower behaviour, and limiting the ability of households to build up assets. We found over-indebtedness to be linked to both the use of credit as a coping response and its use in financing adaptation options. This was due to the use of credit to finance activities which did not produce income streams which assist households to repay associated costs.

To conclude, the study found empirical evidence to both corroborate and contradict proposed linkages between microfinance and adaptation. While the article has made a start in filling the evidence gap, there is a need to re-orientate the discussion to better understanding the contexts within which microfinance supports autonomous household adaptation, as well as leads to maladaptation to be able to better inform adaptation planning and policy.

6.8. References

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Chapter 7. Vulnerability of microfinance institutions to climate risk in the Satkhira District, Southwest Bangladesh

Abstract

This article explores how microfinance institutions are affected by and are responding to flooding by examining a case study in Satkhira District, Southwest Bangladesh. We develop a framework for understanding how microfinance institutions can reduce their vulnerability to climate risks and use the framework to empirically assess local-level practices, drawing from semi-structured interviews with households and local branch managers as well as household survey data. While microfinance institutions are directly vulnerable to flooding, their main exposure arises from the exposure and sensitivity of client livelihoods and their lack of adaptive capacity. Branch managers are unable to screen clients for climate risk for ethical, practical, and financial sustainability reasons. Branch managers have also limited capacity to manage aggregated risk. We argue that efforts should instead focus on reducing client vulnerability, tackling the problem at its source. While much potential exists for microfinance institutions to do so, it is not actively and explicitly being achieved. Loan product innovation could facilitate clients' adaptation to relevant climate hazards. This requires empirical understanding of autonomous household adaptation to incorporate client knowledge of adaptation needs, options, and associated barriers. Our results indicate that homestead loans, disaster management loans, and loans for alternative income-generating activities would help reduce client vulnerability. Integrating non-financial services could also contribute to addressing non-financial barriers to adaptation.

Key words

Microfinance, institutions, Bangladesh, climate change, adaptation

7.1. Introduction

Adaptation to climate change is an increasingly important policy issue in developing countries. We regard adaptation to climate change (henceforth adaptation) as the process through which actors adjust to changing conditions, hazards, risks, and opportunities posed by climate change (Smit & Wandel, 2006). In autonomous adaptation actors such as households and businesses independently respond to changing conditions, hazards, risks, and opportunities posed by multiple stimuli (Smit et al., 2001; UNFCCC, 2009). In planned adaptation actors such as development institutions undertake top-down measures in anticipation of climate change, often to facilitate autonomous adaptation.

Planned adaptation is based on a view that autonomous adaptation will be insufficient without external intervention. But understanding which interventions are needed can only be gained by understanding how local-level actors are adapting autonomously. Understanding how local-level organisations are responding to environmental and climate risks (henceforth climate risks) is important, as they influence the adaptation decisions of others by influencing the risks and incentives to adopt adaptation measures and by governing access to resources (Agrawal, 2008). Yet understanding of local-level institutions and their role in adaptation remains underdeveloped, with simplified assumptions often made regarding organisational responses to climate change (Agrawal, 2008; Berkhout, 2012; Berman et al., 2012). Microfinance institutions (MFIs) are examples of organisations that play an important role in the autonomous adaptation of other actors. Microfinance refers to the financial services provided to low-income and disadvantaged households, who are not served by the conventional banking sector. We use the term MFI to refer to any organisation offering these financial services, including non-governmental organisations (NGOs) and savings-based credit cooperatives (SCOs).

There is growing interest in the potential of MFIs to support autonomous household adaptation (e.g. Agrawala & Carraro, 2010). However, we know little about how these institutions themselves are responding to the impacts of climate change (Fenton et al., 2015). This article seeks to contribute to filling this gap in evidence. We explore how

SCOs and NGOs are affected by and are responding to flooding in the Satkhira District, Southwest Bangladesh by drawing from semi-structured interviews with households and local branch managers as well as household survey data. We focus on Bangladesh because the country has a vibrant microfinance sector and is one of the most vulnerable countries to climate change. It is exposed to multiple climate hazards, including flooding, which regularly affects large parts of the country (MoEF, 2008). The microfinance sector has thus experienced significant losses due to major flooding events.

We find that local MFIs are vulnerable to flooding as it reduces the ability of their clients to repay loans. Branch managers are unable to screen out climate risk and have few other options than to delay repayment collections. Because they cannot screen out climatic risks, MFIs can only adapt by reducing or managing them. We find that SCOs attempt neither alternative, which should be a concern for adaptation planners and development practitioners alike. Some NGOs do attempt to reduce risks by either providing specialised loan products, renegotiating existing loans, or disbursing additional loans, and by using liquidity and contingency funds, but they need to do more to ensure specialised loan products provide the relevant capacities to reduce sensitivity.

In what follows, we first review what is known about the climate risks MFIs face and how they can respond to them. We then outline the materials and methods used and describe the case study we examine in the article. We then examine how MFIs are affected by flooding and to what extent they have pursued options to reduce or manage climate risks. Finally, we relate our findings back to the literature to draw conclusions and policy implications.

7.2. Literature review

The need to adapt arises from vulnerability to climate change impacts (henceforth 'vulnerability'), which is understood differently in the risk-hazard, political ecology, and ecological resilience literatures (see Eakin & Luers, 2006; Eriksen & O'Brien, 2007). Political ecology emphasises wider structural causes of vulnerability (Eakin & Luers,

2006). While it may be suited to local-level studies, it is less suited to answering the questions posed by this research (see Eakin et al., 2009). Ecological resilience in turn experiences difficulty when exploring local phenomena over shorter terms as it focuses on socio-ecological systems and their changes over longer time spans (Eakin & Luers, 2006).

We adopt the risk-hazard approach due to its applicability for local-level analysis, its compatibility with the assessment of microfinance, and its relevance for understanding local-level responses to climate change as well as understanding how these changes impact on livelihoods and assets. Vulnerability is considered to be determined by exposure and sensitivity to climate hazards and the capacity to adapt (Eakin & Luers, 2006; Smit & Wandel, 2006). Exposure refers to the existence of assets which can be adversely affected by climate hazards, and the likelihood of the adverse effects occurring (IPCC, 2014). Sensitivity refers to the extent to which assets are adversely affected (IPCC, 2014). Adaptive capacity is the ability to undertake measures that reduce exposure and sensitivity. It is comprised of specific and general capacities (Eakin et al., 2014) and it is determined by many factors that vary across actors. For instance, national adaptive capacity is underpinned by different factors than adaptive capacity at the local-level (cf. Adger & Vincent, 2005; Brooks et al., 2005; Grothmann & Patt, 2005; Jones et al., 2010). Adaptation consists of the processes through which actors adjust to the stresses, risks, and opportunities associated with hazards (Smit & Wandel, 2006). The measures through which this is achieved are referred to as adaptation options, and the factors inhibiting their implementation are adaptation barriers (IPCC, 2014). Maladaptation occurs when measures inadvertently increase vulnerability (Barnett & O'Neill, 2010).

We make a distinction between coping and adaptation. Coping refers to immediate responses to events without changing current practices and norms, whereas adaptation changes them in order to reduce vulnerability to anticipated future events (Berman et al., 2012).

It has been argued that reducing poverty requires long term access to financial services, and thus financially sustainable MFIs (see Bhatt & Tang, 2001; Morduch, 2000; Woller et al., 1999; Woller & Woodworth, 2001). The suggestion that MFIs can play an important role in facilitating autonomous household adaptation builds upon this reasoning as it is also a long term process (see Agrawala & Carraro, 2010; Hammill et al., 2008; Heltberg et al., 2009).

However, little existing literature explores how climate hazards influence the financial sustainability of MFIs and their adaptation options. Their financial sustainability is undoubtedly affected by climate hazards. For example, major flooding in Bangladesh in 1998 resulted in a significant reduction of loan repayments which created liquidity problems and required capital injection to keep the sector functioning (Nagarajan & Brown, 2000; Twigg, 2004; World Bank, 1999).

Risks deriving from climate hazards increase the demographic, physical environment, and macroeconomic risks facing MFIs (see Pantoja, 2002). They are 'risk aggregators', depending on factors such as the number of clients served, their vulnerability, and their geographical dispersion (Pantoja, 2002). Climate hazards increase client vulnerability and thus risks associated with client demographic and socioeconomic profile. This has implications for operational risks (e.g. increased credit risk due to non-payments, resulting in lower portfolio quality), portfolio quality (e.g. portfolio at risk, write-off ratio, and risk coverage ratio), and financial management risks (e.g. increased asset and liability risk due to increased liquidity risk) (see Bruett, 2006; Dowla, 2009; Pantoja, 2002).

We propose that there are three distinct ways in which MFIs can reduce their vulnerability. These include 1) screening out vulnerable clients; 2) reducing client vulnerability; and 3) managing aggregated vulnerability at the MFI level. We discuss each approach below in more detail.

Screening out vulnerable clients is theoretically the first option to reduce MFI vulnerability, achievable by changing breadth (number of clients) or depth (degree of

vulnerability of clients) of outreach (see Navajas et al., 2000). Increasing breadth of outreach is unlikely to reduce MFI vulnerability. Climate hazards pose covariate risks affecting entire localities (Miranda & Farrin, 2012). A geographically dispersed client base could in theory reduce vulnerability if climate hazards in different localities are uncorrelated (Meze-Hausken et al., 2009). However, in reality this may seldom occur. Climatic hazards such as cyclones often impact whole countries, most notably small-island states (IPCC, 2014). Climate hazards are also often insufficiently uncorrelated across localities. For example, in Bangladesh coastal flooding coincides with other hazards affecting the rest of the country (CCC, 2007).

Decreasing depth of outreach is also unlikely to reduce MFI vulnerability. Climate hazards affect both poor and non-poor groups as well as those with different livelihood profiles. For instance, rural households with non-agricultural livelihoods are affected by flooding as much as households with agricultural livelihoods in the same locality (Fenton et al., 2016). Additionally, serving wealthier clients could prove maladaptive by increasing the vulnerability of potential clients and accentuating inequities. Furthermore, no widely applicable metric exists for vulnerability because of its context specific nature (see Barnett et al., 2008; Smit & Wandel, 2006).

Reducing client vulnerability is the second option for MFIs to reduce their vulnerability. Existing literature focuses on the ability of existing loan products to facilitate adaptation (e.g. Agrawala & Carraro, 2010), adopting the 'adaptation as development' position (see Ayers & Dodman, 2010). Loan products are presumed to foster adaptation because they can contribute to poverty reduction. But these studies apply a meso or macro lens and are not based on local empirical evidence. Consequently, it remains unknown whether existing loan products reduce vulnerability to climate hazards or not. Development of loan products requires knowledge on feasible adaptation options within a locality, the specific capabilities required for their implementation, and their associated barriers to implementation. This is likely to require extra technical support and training for MFI staff (Miamidian et al., 2005). It may be challenging to identify adaptation options that can be supported with microcredit. For instance, microenterprises can be highly vulnerable to flooding and

overcoming adaptation barriers may entail costs surpassing credit limits (Fenton et al., 2017). Existing loan products can also be adapted to support vulnerability reduction. Contract conditions and behavioural clauses can be used to incentivise clients to adopt risk reduction measures (see Huybrechs et al., 2015). For instance, clients could receive lower interest rates if they cultivate flood tolerant crop varieties. However, while evidence is slowly emerging on the potential of contract conditions and clauses to reduce risks, their use is scant. Index-based insurance can help transfer risks to a third party, and also in theory incentivise risk reduction behaviour among clients (Heltberg et al., 2009; Linnerooth-Bayer & Mechler, 2006). However, despite its theoretical benefits, many pilot projects have failed to scale up creating concerns about its effectiveness in practice (Binswanger-Mkhize, 2012).

Non-financial services can also be supplied to help overcome non-financial adaptation barriers. This is a fairly common microfinance practice, the basis of which is that non-financial services should be supplied to reflect the multiple constraints inhibiting poverty reduction (Woller & Woodworth, 2001). However, it has been argued by some that MFIs should only provide financial services, not to dismiss such concerns, but due to the belief that MFIs are not best placed to provide these services (see Bhatt & Tang, 2001; Dunford, 2001; Woller & Woodworth, 2001). Many non-financial services from book-keeping advice to health and education programmes have been integrated with financial services (see Dunford, 2001; Sievers & Vandenberg, 2007). Under a graduation model they are supplied at different times as client well-being increases (see Huda & Simanowitz, 2009; Matin & Hulme, 2003; WFP-Oxfam, 2015). However, we know little about how these services can facilitate autonomous adaptation.

Managing aggregated vulnerability at the MFI level by creating and adapting internal processes and policies is the third option to reduce MFI vulnerability. This is needed in the financial services sector in general (Dlugodecki & Lafeld, 2005) and the options for MFIs are similar to those of the rest of the sector: contingency funds, altering liquidity levels, staff training and the use of guarantee funds (Bastiaenen & Van Rooij, 1997; Dlugodecki & Lafeld, 2005; Miamidian et al., 2005). Contingency funds are important as the lack of liquidity is typically the biggest financial risk after a disaster. Donors have

contributed to the initial capitalization of contingency funds (Goldberg & Palladini, 2009). These funds can reduce MFI sensitivity to climate hazards by alleviating the consequence of mass deposit withdrawals, default, and late repayments while also providing capital for additional loan provision after disasters occur. Interest in meso-index insurance is growing, which avoids some problems associated with household level index-insurance (see Barnett et al., 2008; Miranda & Farrin, 2012; Miranda & Gonzalez-Vega, 2011). However, widespread development of this product has not yet occurred (see Miranda & Farrin, 2012).

To conclude, insufficient attention has been paid to the vulnerability of MFIs and how they can address climate risk. We suggest that reducing client vulnerability and managing it within MFIs are the most promising avenues. The existing literature acknowledges this potential at the meso and macro-level but has not evidenced it at the local-level. Thus it is not well placed to understand the livelihood implications of current MFI practices, which require household level studies (Hulme, 2000). There is also little evidence on how local level representatives of MFIs are affected by and are responding to climate hazards. If this was known there would be greater understanding of the vulnerability of MFIs and their potential role in adaptation planning both as project implementers and as project beneficiaries.

7.3. Methods and materials

Our research was conducted in Noapara Village in the Satkhira District of Southwest Bangladesh. The site was chosen on the basis of key informant interviews which indicated it was typical of the area, exposed to flooding, served by multiple financial institutions, accessible and secure, and respondents were at a low risk of research fatigue. A single case-study was adopted to achieve an in-depth examination of the context-specific nature of vulnerability and adaptation. This required qualitative methods and a prolonged presence in the locality to gain the familiarity and trust of research participants.

Fieldwork gathered both qualitative and quantitative materials. A mixed-methods strategy enabled the triangulation of participant experiences. In March 2014, 30

participants (11% of the population) engaged in focus group discussions to explore village livelihoods and history and validate the appropriateness of the case-study. Between May and June 2014, 266 households (99% of the population) were surveyed on their livelihoods, land ownership, social support networks, assets, exposure to environmental hazards, and credit usage, with a particular focus on access to financial institutions.

We conducted field research between March and April 2015, involving semi-structured interviews with 38 household heads (14% of the population) to explore household vulnerability and microfinance access. Additionally, short interviews were conducted with market stall owners (72% of market stalls) regarding their experiences with credit. Personal observation and informal conversations complemented the data collection methods. Key informant interviews were also conducted with key national level stakeholders and NGO head office representatives where possible and relevant.

Village-level research was used to construct an overview of MFI coverage. Institutions which had distributed the most loans to households were selected for interviews. Semi-structured interviews (20) were undertaken with branch managers from NGOs (9), and SCOs (7) regarding their personal experiences and the problems faced by their branch. Interview topics ranged from external risks, performance management, factors used to screen loan applications, to internal and external climate-proofing efforts.

Focus group findings were interpreted in situ with participants. Survey data was analysed using SPSS and interpreted with reference to the literature. Semi-structured interviews were coded according to interview themes. Analytical categorisation was then undertaken using an iterative process building on the initial descriptive coding, and drawing upon literature themes to interpret the material.

7.4. Case-study

Noapara Village has 267 households, 74% of which have 3-5 members, and 94% of which are male-headed. The common livelihood is to cultivate high-yield varieties of rice in winter and migrate seasonally in search of agricultural wage labour during the

remainder of the year. Subsistence livestock, poultry, and aquaculture are widespread livelihood activities. Less common activities include non-agricultural salaried work, international migration, and finally seasonal and permanent businesses. All common livelihood activities involve credit. For instance, most agricultural inputs are purchased on credit and debts repaid at a post-harvest festival known as Halkhata.

The village is affected by riverine flooding which also affects much of south-west Bangladesh (MoEF, 2008). Flooding results from water overflowing the banks of the Kobadak River. Top-down flood management programmes are typically considered as the main root cause of flooding (see Wesselink et al., 2015). Over time these programmes have inadvertently led to river sedimentation, reduced river outflow, elevation of rivers, and prompted subsidence in surrounding lands. The risk of flooding is significant, over the period 2004-2011 river levels exceeded the danger level every year except 2010 (BWDB, 2011).

According to the local councillor, the intensity and frequency of flooding has recently increased with major events occurring in 2008 and 2011. Flooding occurs from June to October, typically lasting 2-3 months due to poor drainage. However, major events last longer with flooding in 2011 lasting for approximately 8 months. Survey results indicate that most households have been significantly affected by flooding 3-5 times in the past decade.

Many financial institutions serve Noapara Village (effectively 1 institution per 11 households), ranging from formal banks, national and regional NGOs, and community-initiated and managed SCOs (see Table 1). NGOs were Bangladeshi microfinance NGOs such as BRAC, and not international NGOs such as Oxfam8. We consider SCOs and

8 Grameen Bank is considered a microfinance NGO such as BRAC due to similarities in how they operate. It is not easily categorised because 1) it is technically a parastatal agency operating under a special ordinance and is thus not regulated by the Microcredit Regulatory Authority. Additionally, it is owned mostly by its clients with

NGOs to be MFIs and focus our analysis on them. NGOs provide external funds, typically from the government, whereas SCOs circulate community resources. NGOs use a combination of individual and group lending and liability mechanisms. The SCOs use only individual lending and liability mechanisms. NGOs and SCOs have maximum credit limits, simplified procedures and formalised repayment structures. NGOs offer a range of current and fixed deposit savings services while SCOs only offer the opportunity to save in the initial capital accumulation phase. Their members are unable to withdraw savings without cancelling membership. NGO branches have a manager and a small team of field officers who visit microfinance groups to provide support and collect repayments. SCOs have governing committees which meet monthly, typically comprising a chairman, vice-chairman, secretary, cashier, and group members representing each village neighbourhood. Credit is also available from informal sources such as market stalls, friends, and extended family. This credit is characterised by idiosyncratic maximum credit limits and an absence of formal procedures or repayment structures. Credit from market stalls is relatively inexpensive compared to formal institutions, as peer-to-peer lending for interest is considered morally unjust under Islamic principles. Credit from friends and family is interest free for the same reason.

Survey data recorded household outstanding loans to finance providers (see Table 5). MFIs account for over half of disbursed loans (55.01%). Households prefer MFI loans because of accessibility, convenience, and trusted procedures. Informal sources account for much of the remaining disbursed loans (39.28%). Households prefer informal credit above formal credit due to its greater flexibility and low costs. Banks disbursed few loans (5.72%). Households cite lengthy and complex application procedures, an inability to obtain required documentation, the inconvenience of travelling to branches, and corruption as reasons for why they rarely attempt to access loans from these institutions.

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the Government of Bangladesh being a minority shareholder. Consequently, there are grounds to categorise it as a cooperative, NGO, and a government bank.

Table 5: Breakdown of financial providers by breadth of outreach

	Traditional providers	MFIs		Informal Providers			
	Bank	NGOs	SCOs	Friends	Family	Shop	Money-lender
Number of institutions	7	15	9	N/A	N/A	N/A	N/A
Total loans issued	36	215	131	82	98	63	4
% households with loans	12.78%	53.00%	35.71%	30.83%	36.84%	23.60%	1.50%
% of total loans	5.72%	34.18%	20.83%	13.04%	15.58%	10.02%	0.64%
Average loan size	43,611	22,116	13,996	30,948	12,026	14,757	6,500
Total credit issued	1,570,000	4,755,000	1,833,500	2,537,700	1,178,500	929,660	26,000
% of credit issued	12.24%	37.06%	14.29%	19.78%	9.19%	7.25%	0.20%
Average loan size and total credit offered reported in local currency, Bangladesh Taka, (BDT).							

7.5. Results

7.5.1. How MFIs were vulnerable to flooding

MFI representatives indicated that they experience vulnerability to flooding both directly and indirectly. SCOs are directly exposed as offices are situated in flood prone areas. Flooding inundates offices causing damage to property, assets, and records. Few options exist to reduce direct sensitivity other than moving documents and assets to safer locations when required. One SCO had constructed an office on a raised plot of land to reduce sensitivity; however, it had to be demolished as its proximity to a main road violated planning laws, indicating a lack of knowledge of these issues. NGO representatives reported no damage or changes in practices due to flooding as offices are located in towns with higher land elevation. Field staff mobility is reduced by flooding but field officers can access villages using boats.

All MFIs reported being indirectly vulnerable to flooding through their clients. According to key informant and household interviews, regular flooding has been detrimental to client livelihoods (see Fenton et al., 2016, Fenton et al., 2017). Prolonged flooding causes severe erosion to traditional earthen homesteads which can then collapse. A local councillor commented that only brick and mortar homesteads and plinths survived one period of especially bad flooding. Summer cultivation of cash crops, previously an important traditional livelihood component, has been largely abandoned as it coincides with flooding. Proceeds from this activity were used to generate income for debt repayment, asset investment, and savings accumulation. Local demand for labour has significantly reduced, previously an important regular income source. Instead, household members migrate seasonally in search of agricultural wage labour opportunities. Incomes have consequently reduced for many households. One household commented that "many people go to get a job and the daily wage decreases, I only bring back a small amount of money". Microenterprises are also struggling due to stock damage, low demand for goods and services, and selling a higher proportion of goods on credit. Flooding has suppressed the local economy; as one branch manager explained, "If there is flood, it affects everyone more or less, if all people are affected, obviously it affects others, they cannot escape from it".

Additionally, flooding has changed the way households use credit, with significant levels devoted to non-productive purposes contributing to household over-indebtedness (see Fenton et al., 2017). Survey data indicate that a third of current outstanding loans were obtained to smooth consumption, notably for purchasing food and medicine. Homestead reconstruction has depended on households accessing loans over time to cover reconstruction costs. One over-indebted household noted ''to build this house we took loans, and to repay the loans we borrowed money from another place, and to repay the second loan we borrow money from yet another place". Survey data showed that a fifth of current outstanding loans were obtained simply to repay existing loans, a key indicator of client over-indebtedness (see Schicks, 2014).

7.5.2. How MFI representatives have responded to flooding

All MFI representatives reported halting repayment collections during flooding. However, the non-disclosure of relevant financial data eliminates the possibility of quantitative assessment. Many NGO branch managers reported that flooding impairs the achievement of loan repayment and disbursement targets. Repeated failure to meet targets threatens job security, although most stressed that superiors understood their situation. Household interviews corroborated the inability of clients to meet repayments, which has at times resulted in community friction due to liability mechanisms. Community friction was found to be especially prevalent with respect to SCOs. Some households believed the actions of SCOs to be "un-Islamic". Some felt uncomfortable forcefully collecting repayments from those unable to repay. One explained why he wanted to cancel his SCO membership: "I don't want to collect money from anyone who can't repay for my personal interest, why should I misbehave regarding this issue".

According to MFI interviews, the screening of clients and loan applications for climate risk does not occur. The only mentioned activities that are unsupportable are salt-water shrimp production and illegal activities. Assessment of applications is largely subjective, based on personal judgement of managers, fellow group members, and the views of neighbours. Branch managers believed that clients would simply not pass such a screening process. An NGO branch manager explained: "if you consider this fact then we will not have any members". Some branch managers also explained that it is their job to provide support to vulnerable households.

A few MFIs sought to directly reduce flooding. SCOs lobbied district government officials but without result. District officials suggested there is little to be done regarding flooding because of a lack of resources. One NGO and SCO claimed to have made efforts to reduce flooding by organising people together to clear canals of vegetation. This does not prevent flooding but reduces its duration by increasing the flow of water away from the village. These efforts do not have a significant effect on flooding.

Interviews with SCO representatives indicated that they do not attempt to reduce client vulnerability through the creation of specialised products. They only offer generic loan products which vary in duration and size. Some branch managers of NGOs reported offering specialised loan products, which may reduce client vulnerability. However, the majority of loans issued by NGOs were generic according to household interviews. Specialised loans required clients to satisfy socioeconomic criteria, use credit for a particular purpose, or provide financial collateral. In contrast, generic NGO loans are general purpose, non-exclusive, and require no financial collateral. Specialised products are available to 'ultra-poor' households to raise cattle or start microenterprises; and to 'middle-class' households to start businesses such as chicken farms. Specialised products also include 'disaster management loans' of very low interest rates, which are designed to facilitate coping with climate hazards. However, despite the frequency of flooding these loans were uncovered in only one household interview. It also appeared to be misused. The household commented that "the loans [are distributed] among members by rotation. I got the loan this year, next year someone else will get the loan". Some branch managers highlighted that homestead construction loans were offered previously but that they have now been discontinued for reasons unknown to them.

Several NGO and SCO branch managers claimed to disseminate adaptation knowledge among clients. They do this by directly soliciting support from external institutions, disseminating information on training possibilities, and by identifying members to receive support from government programmes. Additionally, microfinance groups and group meetings are generally used by government extension officers as conduits through which they provide support as they congregate many households together at predefined times. NGO representatives say they specifically disseminate vulnerability reduction information regarding flooding, ranging from duck rearing to rebuilding homesteads. NGOs generally rely on microfinance field officers although some have specialised departments. One even had a disasters and climate change team; however, they operated in a different area than the microfinance programme. Additionally, NGOs showcase vulnerability reduction techniques with pilot model examples ranging from raised vegetable gardens to homestead construction. In our case study, many

low-income households benefited from financially subsidised homestead models as part of the 'National Alliance for Risk Reduction and Response Initiative' (NARRI). SCOs generally relied upon informal information diffusion among members. A particular SCO was set-up with the explicit intention that aquaculture knowledge would disseminate across members9.

The most common way in which MFI representatives have reacted to flooding has been to halt loan repayment collection. SCOs have no procedures for this and rely on informal channels to determine whether households are unable to repay. Most NGO branch managers said that they require permission from superiors, though none highlighted difficulty in obtaining this. Although when severe events have occurred they mentioned that the order to stop collecting repayments can be actually given by the Microcredit Regulatory Authority, or the Palli Karma-Sahayak Foundation.

SCOs on occasion forgave interest repayments, according to branch managers. This response is possible because of the simple repayment schedules involving monthly interest repayments, and annual principal repayments. Thus the two debt elements are easily distinguishable. However, this practice was a last resort and used only when attempts to make clients repay had failed. Branch managers had commented that entire debts have been forgiven. However, such claims were not corroborated by household interviews. Households which have defaulted have had their membership cancelled and their savings confiscated to repay debts. Moreover, one household was forced by SCO leaders to sell land.

We did not find similar or comparable practices in NGOs who have more complex debt repayment systems that involve combined monthly repayments of interest and principal debt elements. However, defaulting on NGO loans also appears difficult. One household reported having to personally contact the Chief Executive Officer of a regional NGO to justify his need to default. Some NGOs allow households to obtain a

9 However, household interviews did not particularly indicate that this initiative was successful.

second loan, so that if clients used the new loan productively then they would be able to repay both loans. This is done in two ways. First, existing loans are re-negotiated or a second additional loan is disbursed. SCOs do not make this possible. No evidence of risk transfer, such as insurance, was found at branch level.

7.6. Discussion

Existing literature has not discussed the screening of MFI clients for climate risk exposure, and we are doubtful about its value for reducing MFI vulnerability. Branch managers did not or did not feel able to screen clients for both practical and ethical reasons. Screening may even increase MFI vulnerability by substantially reducing breadth of outreach, decreasing other elements of financial sustainability such as operating and personnel expenses relative to loan portfolio, and cost per borrower (see Bruett, 2006). Furthermore, restricting the client base will increase the vulnerability of potential clients, as credit is an important element of coping capacity, and a prerequisite for adaptive capacity (Berman et al., 2012; Collins et al., 2009; Fenton et al., 2017). Targeting households is also frustrated by difficulties associated with producing vulnerability metrics and because the covariate risk associated with climate hazards is pervasive across regions and thus socioeconomic groups (Barnett et al., 2008; Fenton et al., 2016; Miranda & Farrin, 2012).

Adaptive capacity is an aspect of vulnerability which varies across socioeconomic groups. MFIs could in theory start serving socioeconomically advantaged households who have greater capacity to adapt in ways that reduce sensitivity. For instance, in our case study socioeconomically advantaged households adapted from agriculture into aquaculture to reduce their vulnerability to flooding. This could cross-subsidise the risk associated with socioeconomically disadvantaged households. This resonates with the arguments in the microfinance literature according to which serving non-poor groups allows for cross-subsidisation of services to poorer groups (see Wright & Dondo, 2001). However, higher adaptive capacity does not guarantee that adaptation will occur. Adaptation triggers are underexplored and need further study (Brown & Westaway, 2011; Grothmann & Patt, 2005). Also, wealthy households preferred bank credit because banks offer higher volumes of credit at lower cost, which limits the potential

for cross-subsidisation. MFIs could of course screen socioeconomically disadvantaged households for adaptive capacity. However, most of their clients have inherently low adaptive capacity.

Thus screening has limited potential in reducing MFI vulnerability. This leaves reducing client vulnerability and managing aggregated risk at institution-level as the two remaining options for reducing MFI vulnerability. The potential for both of these will be discussed in turn.

Reducing client vulnerability tackles the problem at its source. Existing literature only partly addresses this issue from the perspective of disaster management at meso or macro-level rather than from the local-level (e.g. Pantoja, 2002), and often simply as a prelude to discussing insurance (e.g. Pierro & Desai, 2008). In our case study there were no climate-related insurance products on offer, as loans were the main product available.

The literature has only briefly discussed the benefits to MFIs of loan product innovation within the context of natural disasters and institutional sustainability (e.g. Miamidian et al., 2005). Emerging evidence indicates that 43% of MFI programmes in Bangladesh are potentially synergistic with adaptation (Agrawala & Carraro, 2010). However, because this study was not situated at the local-level we know little about the 'synergies' in practice. Local-level studies have found generic loan products ill-suited for vulnerability reduction and adaptation. Their instant repayment schedules and low credit limits often fail to overcome financial barriers associated with adaptation options (Fenton et al., 2017). They are also ill-suited for coping. Non-productive credit use contributes to client over-indebtedness, a situation where credit is obtained to repay existing debt obligations (see Schicks, 2014). Over-indebtedness increases MFI vulnerability as it erodes adaptive capacity of clients. NGOs could offer disaster management loans, which would reduce the likelihood of over-indebtedness. However, households in our case study were rarely provided these loans: they used generic loans to smooth consumption, despite frequent and severe flooding over a decade. Improving the availability of these loans would reduce both over-indebtedness

and MFI vulnerability. Further research is needed on the availability of disaster management loans to establish whether this finding is case study specific or part of a wider phenomenon.

Advocates of microfinance highlight its potential for facilitating livelihood diversification (e.g. Heltberg et al., 2009). In our case-study, we identified some specialised loan products that could facilitate livelihood diversification. However, they were inappropriate for reducing client vulnerability and often incentivised investment in climate-sensitive sectors. For instance, specialised livestock loans do not necessarily reduce vulnerability to flooding. During flooding, households often sold cattle due to lack of fodder and livestock illness, and frequently reported losses due to the low livestock prices caused by large supply and low demand. Similarly, specialised poultry loans providing clients with poultry health information and capital to build poultry sheds and purchase needed inputs do not necessarily reduce vulnerability to flooding. Despite chicken farms being relatively successful, many have made losses due to disease outbreaks during flooding which can result in excessive debt accumulation. Climate-proofing of loan products is necessary to ensure that loans do not encourage clients to invest in ways that increase their exposure or sensitivity. Paradoxically, some NGOs promote chicken farms through specialised loans, while simultaneously promoting duck instead of chicken rearing to clients to reduce their sensitivity to flooding.

Loan product innovation should be linked to autonomous household adaptation to take advantage of local knowledge (see Eriksen et al., 2011). Our case-study indicated that households were often aware of major income-generating activities into which they could adapt to reduce their vulnerability to flooding, such as aquaculture; along with the associated adaptation barriers, such as knowledge and capital. If branch managers were able to enable clients to respond to locally available opportunities by providing the relevant products and services required then vulnerability reduction should occur for both client and institution. As autonomous adaptation will be context-specific branch managers will need to adapt processes accordingly to respond to local circumstances.

Facilitating alternative and comparable income-generating activities should be a high priority for MFIs. In our case-study, an inability to adapt into aquaculture resulted in households relying upon seasonal migration to counteract the inability to cultivate cash crops. This led to a loss of income and an important source of money used by households to save, invest, and repay loans. Decreasing household income threatens the MFIs' social mission to reduce poverty and increases MFI vulnerability. MFIs have been critiqued for serving wealthier clients to improve their financial sustainability (Woller et al., 1999). Thus, client income reduction is likely to decrease MFI financial sustainability. Only those households that can access larger bank loans could adapt, leading them to consolidate land from those unable to adapt. Loan products enabling clients or even groups of clients to adopt aquaculture would have been instrumental in reducing both client and MFI vulnerability. This research area could be advanced by piloting and evaluating collective loan products to facilitate collective adaptation.

Understanding autonomous household adaptation might reduce the fungibility problem, where credit is used for purposes unrelated to those stated during the application process (see Zeller et al., 2001). Our case-study found households often diverted credit away from income generating activities to help finance homestead reconstruction and adaptation costs due to its importance to household wellbeing. This contributed to over-indebtedness as no income streams were generated (Fenton et al., 2017). Specialised homestead loans would arguably have reduced such practices, enabling households to use generic credit for income-generating activities. Homestead loans are frequently cited as important for client and MFI vulnerability reduction (e.g. Miamidian et al., 2005). However, in our case-study, relevant branch managers stated these products were terminated at institution level. We believe that the importance given to adapting homesteads by households, along with its importance for reducing both client and MFI vulnerability, makes understanding how to up-scale homestead loans an important future research topic, especially as safe housing is a key component of the Bangladesh Climate Change Strategy and Action Plan (see MoEF, 2008).

Integrating non-financial services should theoretically contribute to client vulnerability reduction as non-financial adaptation barriers can also be addressed. The classic

example would be to disseminate adaptation knowledge, argued to be a fundamental element of adaptive capacity (Williams et al., 2015). In our case-study both NGOs and SCOs were found to disburse information; however, NGOs tended to be more proactive. NGOs disburse information on various development topics with varying relevance to vulnerability reduction. For instance, the importance of hygiene for maintaining health is relevant to adaptive capacity in a general sense; whereas advising clients to build raised homestead vegetable gardens reduces sensitivity to flooding. However, it was unclear whether advice which would have the effect of reducing vulnerability was specially designed for the local context or whether the link was serendipitous as has been found in other studies (see Agrawala & Carraro, 2010).

When locally situated information was evident its value was often questionable, such as advising clients to rebuild homesteads on higher plinths and ground when higher ground is scarce and plinths are a traditional adaptation to flooding. At times the advice was simply erroneous. Prolonged flooding erodes earthen plinths unless encased with brick and mortar. Households already knew this because only homesteads constructed in this manner were left standing during severe flooding. One NGO branch manager indeed admitted that "[clients] actually have more knowledge than us". Households also frequently prefer peer-to-peer learning over using NGO homestead adaptation models, represented in our case-study by the NARRI homestead model commonly built by NGOs throughout Bangladesh. Innovation dissemination among homesteads and the role of MFIs in it remains an under-explored area for research.

While local-level staff clearly had limited capacities regarding adaptation knowledge, it is perhaps churlish to criticise them for it. Their main job is to disburse loans and collect repayments, expecting them to be experts across multiple development and adaptation topics appears unreasonable. Consequently, a linked or parallel approach may be needed where a client receives microfinance services and adaptation knowledge from different staff from either the same or different organisations respectively (see Dunford, 2001). As hiring relevant staff with sufficient expertise may be difficult for MFIs due to associated costs, the parallel approach may be best which

can also take advantage of existing government extension programmes. It remains to be seen how knowledge on autonomous household adaptation practices, MFIs, and adaptation knowledge providers can coordinate their activities together. However, approaches are emerging both within the development sector and adaptation sector demonstrating how this can be achieved (see Matin & Hulme, 2003; WFP-Oxfam, 2015).

Consequently, while much potential exists to reduce client vulnerability in order to reduce MFI vulnerability, this potential is not realised in practice. The only alternative is to manage aggregated risk at the MFI level. Existing literature has argued that flexible internal systems are necessary to enable MFIs to respond to natural disasters (Miamidian et al., 2005; Shoji, 2007). In our case study, delaying collection of repayments was the most common way for branch managers to manage the impact of flooding on client livelihoods. But delaying repayment collection is a weak response to managing client vulnerability. If clients cannot repay loans the best response over longer term for ensuring institutional sustainability cannot be not to collect loan repayments. Collection of repayments was stopped simply because clients could not repay. As one NGO representative commented “the main duty of field officers when visiting flood affected villages is to find out where our clients are staying and how we can collect money from them, since they cannot earn during floods”. Only a few MFIs allow the re-negotiation of existing debt or provide additional loans. Not allowing households to obtain additional loans appears impractical. Survey data indicates that households simply seek additional loans from alternative sources when necessary. Individual MFIs cannot track this due to asymmetric information between them and their clients. Consequently, it might be more practical to allow additional loans to be disbursed so debt levels of clients can be better monitored.

The most important solutions for managing client vulnerability currently are taken centrally in MFIs. NGOs are required to create reserve and liquidity funds by clauses 20 and 34 of the MRA 2010 Act, respectively (MRA, 2011). The reserve fund clause requires at least 10% of annual profits to be deposited into a bank account to cover losses due to natural hazards, with permission from that organisations’ Council of

Directors. The liquidity fund requires 15% of compulsory, voluntary, and fixed term deposits to be held as savings in a scheduled bank. This act only applies to NGOs; SCOs are not subject to nor have comparable provisions. One NGO explained that they have exceeded the regulation requirements, commenting that although liquidity problems have disappeared at the MFI level, major events still cause problems at branch level. Further research is needed on the effectiveness and implications of reserve and liquidity funds across institutions.

7.7. Conclusion

This article explored MFI vulnerability to flooding in Bangladesh using a local-level case-study. We adopted a risk-hazard framework for understanding how MFIs can reduce their vulnerability to climate risks. We empirically assessed local-level practices in relation to this framework.

We found that MFIs cannot screen clients for climate risk for ethical, practical, and financial sustainability reasons. Much potential exists for MFIs to instead actively reduce client vulnerability. However, this potential is not currently realised. Specialised loans need climate proofing, access to disaster management loans was almost missing entirely, adaptation knowledge dissemination was inadequate, and efforts to reduce exposure to flooding were ineffective. We also find that branch managers have limited capacity to manage aggregated risk. Most simply stop collecting repayments during flooding. Many regard this as them being flexible and responsive to client needs. However, it is more likely because most clients simply cannot repay. NGOs have created centralised contingency funds in line with regulatory requirements. Further research is needed to explore how these affect MFI vulnerability. SCOs lack comparable reserve funds, an important issue considering the proportion of household wealth held in these institutions.

In light of the inability to screen out climate risk and the lack of options for branch managers to manage aggregated risk, we argue MFIs should seek to reduce their vulnerability by reducing client vulnerability, the source of the problem. We propose loan product innovation should be central to these efforts. We argue a locally-situated

and contextually relevant understanding of autonomous household adaptation is required to build upon client knowledge of adaptation needs, options, and associated barriers. We found that introducing homestead loans and upscaling supply of disaster management loans would reduce vulnerability and fungibility, arguably representing the mismatch between microfinance supply and client needs. We also argue that incorporating relevant adaptation knowledge and training will also reduce client vulnerability in order to address non-financial barriers. We propose that a parallel integrated approach is best due to the dual need for low costs and adaptation expertise. Thus MFIs need to form effective partnerships with clients and adaptation-relevant institutions such as government extension services. External support could come from Bangladesh's National Adaptation Plan; however, it is currently unknown to what extent MFIs will be involved in adaptation planning, either as recipients or as implementers. Support could also come from international climate finance institutions.

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Chapter 8. Discussion

8.1. Introduction

The aim of this thesis was to contribute to the microfinance-adaptation debate by examining previous conjectural arguments and providing empirical evidence on proposed linkages between microfinance and adaptation at both household and institution levels. To achieve this aim three objectives were established which framed the subsequent enquiry.

This chapter discusses the research findings associated with each objective in turn, outlining the most significant contributions to knowledge and how these findings relate to and progress the academic literature. Additionally, the chapter discusses their implications for adaptation planning according to each objective. This brings this thesis back to the original issue raised in the introduction, which argued that a greater understanding of the degree to which households are adapting and how these adaptations are financed is crucial for adaptation planning (see Chapter 1). It also addresses the need for this research to be concerned with its practical relevance for human action, which underpins research conducted under a pragmatic philosophy.

8.2. Overview of objectives

The first research objective was to explore features and patterns of autonomous adaptation to better understand priorities for planned adaptation (see Chapter 5). The need for adaptation planning is often predicated upon autonomous adaptation being insufficient. This situation is likely within a developing country context where access to development and adaptation resources is constrained. Consequently, adaptation planning needs to understand if, how, and why autonomous efforts are insufficient. However, existing understanding of autonomous adaptation at the local-level remains weak.

The second research objective was to explore how microfinance influences autonomous adaptation. Existing literature remains in an exploratory phase and many proposed linkages have not been empirically tested at the local-level (see Hammill et al., 2008; Heltberg et al., 2009; Agrawala and Carraro, 2010). Studying these linkages is

important because microfinance is a key livelihood resource and thus is likely to strongly influence autonomous adaptation. The need for empirical study is increased by recent literature questioning linkages between microfinance and poverty reduction. This is important because it was these linkages which initially built interest in potential microfinance-adaptation linkages. Additionally, the study of microfinance-adaptation linkages has been made difficult by the lack of wider literature which gives sufficient attention to microfinance, livelihoods, and environmental and climate hazards. Consequently, there is a need for empirical studies which combine these topics under an adaptation lens (Fenton et al., 2015).

The third research objective was to explore the ability of MFIs to foster adaptation in light of their own exposure to climate change impacts due to their clients. This represents a knowledge gap, with this issue only explored in grey literature with insufficient consideration of the evidence (e.g. Agrawala and Carraro, 2010; Dowla, 2009; Pantoja, 2002). Exploring this issue is important because MFIs support the construction of household livelihoods and influence adaptation decisions by influencing the risks and incentives to adapt and by governing access to resources (Agrawal, 2008). However, understanding of local-level institutions and their role in adaptation remains underdeveloped (Agrawal, 2008).

8.3. Overview of methodology

This thesis sought to contribute towards existing knowledge by exploring autonomous adaptation and the influence of microfinance upon it using a case-study within a developing country context. The unit of analysis was the 'household' and the object of analysis was household livelihoods. The exploration of the influence of microfinance on autonomous adaptations was designed so that both positive and negative linkages could be assessed.

The risk hazard approach to vulnerability research was used to explore autonomous adaptations and the influence of microfinance. This approach was argued to be suitable for household level studies, compatible with the assessment of microfinance, and relevant for understanding local-level responses to climate change as well as

understanding how these changes impact on livelihoods and assets. Linkages between vulnerability to environmental and climate hazards and wider structural vulnerability were recognised but ultimately seen as distinct (see Ayers and Dodman, 2010; McGray et al., 2007). This marks an important difference between this thesis and existing literature which has conceptually conflated poverty reduction with vulnerability reduction (e.g. Hammill et al., 2008). The concept of equity was incorporated to assess how adaptation measures might reflect or lead to inequitable outcomes. This is to address limitations posed by the privileging of efficiency and effectiveness over equity in the risk hazard approach (Eakin and Luers, 2006), a weakness in terms of understanding local-level adaptation within a developing country context.

Field research was based around establishing current household livelihoods, exposure to environmental and climate hazards, livelihood sensitivity to these hazards, adaptations undertaken to reduce this sensitivity, and how these adaptations were financed, and the role of microfinance in influencing responses. Additionally, the research sought to ascertain how these had changed over time. Options available to local-level MFI representatives to reduce risk and what actions representatives take in practice were explored to develop insights into MFI vulnerability.

Interview material was coded according to coping and adaptation measures. Analytical categorisation was then undertaken using an iterative process with themes drawn from the literature to interpret the material. Credit was the main financial service utilised by households, influencing the focus of the research accordingly.

8.4. Summary of key research findings and contributions

8.4.1. Contributions to autonomous adaptation knowledge

This thesis has contributed to the autonomous adaptation and transformation literature by providing an exploration of autonomous household adaptation as well as their transformative potential within a developing country context from a risk hazard approach. Much of previous literature, particularly that covered by the IPCC, has either failed to sufficiently explore the transformative element of autonomous adaptation, or has done so within a developed country context (cf. IPCC, 2001; IPCC, 2007; IPCC,

2014b). Additionally, studies assessing autonomous adaptation within a developing country context have typically only been able to study incremental adaptations, rather than studying transformational adaptations (e.g. Butler et al., 2016).

The research design of the thesis has provided the foundation to contribute to knowledge regarding the classification of transformation. Using a single case-study with households as the unit of analysis (or embedded cases) facilitated the research finding that the scale of assessment influences whether adaptation measures are seen as transformational adaptations to household livelihoods or simply part of wider incremental change at the village level. The qualitative approach enabled the research to find that considering the wider livelihood context within which change occurs influences whether something is categorised as transformational or incremental, by determining whether drivers of adaptation are considered. For instance, households have historically migrated to supplement livelihoods. Consequently, increases in household migration appear incremental when considered in isolation from what drives contemporary migration – the loss and subsequent need for alternative income-generating activities and the subsequent need to dramatically expand the geographical scope of livelihoods. Finally, the abductive research strategy demonstrated how participant perceptions influence whether adaptation measures should be classified as transformational, most notably when determining whether the context within which change occurs is untenable (see Walker et al., 2004).

The thesis highlights the potential inevitability of transformation, in contrast to existing literature which often frames transformation as a normative phenomenon to be encouraged (e.g. Klein et al., 2014; Kates et al., 2012). Within the case-study, flooding inflicted adaptation limits, eliminating traditional livelihood activities. The imperative to fulfil household needs forced households to adopt transformational changes to livelihoods.

The thesis demonstrated that both socioeconomically advantaged and disadvantaged households can transformationally adapt. Additionally, it demonstrates that transformational adaptation patterns and characteristics have clear links with

socioeconomic status. This extends the view that autonomous adaptation strategies depend on the associated level of poverty of its instigators (Tanner and Mitchell, 2008). Socioeconomically advantaged households were associated with transformations which could be described as having positive consequences. For instance, these households were associated with converting agricultural land for aquaculture which can potentially lead to increases in income. In comparison, socioeconomically disadvantaged households were associated with transformations which had negative consequences. For instance, they commonly abandoned cash crop agriculture during summer months and instead migrated for longer periods of time in search of agricultural labour. However, this transformation led to a reduction of income and wealth as well as livelihood risk.

In this respect this thesis echoes views from the traditional livelihoods literature where adaptations are not necessarily seen as positive (see Davies and Hossain, 1997). Additionally, it contributes to the wider literature by demonstrating that residual losses may occur even with the adoption of transformational adaptations (see Huq et al., 2013). It also adds weight to the claim that there must be sufficient resources, knowledge, and skills for autonomous adaptation to be *effective* (Fankhauser et al., 1999). Finally, this thesis corroborates the view that transformational adaptors can be those pro-actively taking advantage of emerging opportunities, but it questions the idea that this characterisation represents all transformational adaptors (see Rickards and Howden, 2012).

8.4.2. Contributions to microfinance-adaptation literature

The key research findings relate to microfinance-adaptation linkages as these are the main focus of the thesis. The first set of contributions relate to the influence of microfinance on coping capacity and adaptive capacity. These links have been the focus of existing literature (Fenton et al., 2015). The second set of contributions relate to the influence of microfinance on over-indebtedness and equity concerns regarding the use of microfinance in adaptation. The second set of contributions represents more original contributions to the microfinance-adaptation literature as these have not been discussed in detail. These contributions will be discussed in turn below.

Coping capacity

The thesis has empirically demonstrated a link between microfinance and adaptation through coping capacity, which had only previously been theorised (see Fenton et al., 2015). Many qualitative and quantitative microfinance studies (e.g. Collins et al., 2009; Banerjee et al., 2015) and other studies (e.g. Kelkar et al., 2008; Osbahr et al., 2008) have explored the role of credit within livelihood shocks. However, they have not focused on environmental and climate hazards or the connection between microfinance and adaptation from an adaptation lens.

The research design of the thesis provided the foundation to contribute to knowledge in this regard. The abductive research strategy enabled the exploration into why credit is important to household coping capacity. It was uncovered that the importance of credit stemmed from a lack of alternative coping options during flooding months.

The empirical approach which incorporated qualitative methods also enabled the thesis to recognise and explore the important role of informal credit in household coping capacity. Existing literature implicitly fails to recognise the role of informal credit and thus social support networks, instead limiting its attention to formal credit (see Hammill et al., 2008; Agrawala and Carraro, 2010; Heltberg et al., 2009). This research also enabled the recognition and exploration of the role of SCOs, which the existing literature again fails to recognise.

Recognising and exploring the role of informal credit was important within the case-study. The research found that informal credit had a greater role in coping than formal credit; while SCOs in turn had a greater role than NGOs. This finding is particularly relevant as many formal MFIs (i.e. NGOs) served the village. Households often utilised both forms of credit. Consequently, the importance of informal credit and SCOs cannot be associated with an inability to access formal MFIs. This finding has wider implications for microfinance theory which has proposed formal credit would displace informal credit and institutions (see de Aghion and Morduch, 2005; Ledgerwood, 1999). Additionally, the prominent role of SCOs question the view that covariate risks

reduce the ability of localised financial institutions to support coping capacity (Bhattamishra and Barrett, 2010).

Adaptive capacity

The thesis has empirically demonstrated a link between microfinance and adaptation through adaptive capacity, which had only previously been theorised (see Fenton et al., 2015). Wider literature has supported this link by finding an inability to access credit is often an adaptation barrier (Bryan et al., 2009). However, such studies have not placed sufficient focus on finance, livelihoods, and environmental change from an adaptation lens.

The research design of the thesis provided the foundation to contribute to knowledge in this regard. The empirical approach, abductive research strategy, and qualitative methods enabled the exploration into how and why livelihoods had changed over time and how microfinance had influenced this change. Empirical findings broadly support the view that credit supports adaptive capacity by improving access to financial capital which can be used to implement adaptation options. However, this finding is not itself especially significant. Credit is a type of financial capital which is a determinant of adaptive capacity within many frameworks (e.g. Bebbington, 1999; Moser and Satterthwaite, 2008; Carney, 1998). Additionally, microcredit is a key source of financial capital in the construction of household livelihoods and thus is likely to be a key ingredient for autonomous adaptation which largely depends on private resources (Vernon, 2008; Fankhauser et al., 1999).

Adopting an adaptation lens has enabled this thesis to explore microfinance-adaptation linkages which would have been difficult to explore from a microfinance lens. Microfinance-adaptation literature previously assumed vulnerability would be reduced by the use of microfinance for livelihood diversification (e.g. Hammill et al., 2008). Adopting the risk hazard approach enabled this thesis to demonstrate that while microfinance can facilitate livelihood diversification, vulnerability may not be reduced if the activities into which livelihoods are diversified are also vulnerable to environmental and climate hazards.

Additionally, adopting an adaptation lens combined with the risk-hazard approach enabled insight regarding why the research findings of this thesis contradicted theorised linkages within existing literature. Existing literature conflates poverty reduction with vulnerability reduction. Such thinking has validity, as many adaptation projects tackle underlying drivers of vulnerability which are typically associated with poverty (McGray et al., 2007). This approach has been labelled the 'adaptation as development' approach (Ayers and Dodman, 2010). However, the adoption of the risk hazard approach within this thesis promoted an 'adaptation plus development' understanding of vulnerability. Consequently, risks associated with environmental and climate hazards and those caused by poverty are recognised but ultimately seen as distinct. Consequently, understanding when vulnerability reduction has occurred is more related to reducing sensitivity to environmental and climate hazards, rather than merely increasing adaptive capacity, as it is under the adaptation as development approach.

Furthermore, adopting this approach enabled this thesis to assess the transformative potential of microfinance, something not attempted by existing literature. Within the case-study, microfinance was unable to support the diversification of income generating activities in a way which enabled households to overcome limits to adaptation. Households dependent on microfinance seasonally migrated as agricultural labourers due to being unable to overcome adaptation limits associated with agriculture. Only households able to access credit from banks could transform income generating activities in situ by converting agricultural land for aquaculture. Consequently, credit limits associated with microfinance restrict its potential to enable households to overcome financial barriers associated with potential transformational adaptation.

Over-indebtedness

The research also identifies and explores the concept of over-indebtedness within the context of microfinance–adaptation linkages. The research has empirically demonstrated how microfinance can inhibit adaptation through reducing coping and adaptive capacity. Existing literature did not always recognise this link (e.g. Heltberg et

al., 2009) or has only briefly alluded to it and consequently not given it adequate attention (e.g. Hammill et al., 2008).

The research design of this thesis provided the foundation to contribute to knowledge in this regard. The empirical approach, abductive research strategy, and qualitative methods enabled the exploration of microfinance-adaptation linkages from the perspective of households without presupposing what these linkages may be. This research has outlined and empirically demonstrated how microfinance can reduce both coping and adaptive capacity via over-indebtedness, a significant problem with almost one-fifth of loans obtained predominantly for repaying existing loans. Consequently, while credit has a clear role in coping and adapting to environmental and climate hazards, there should be caution regarding its use within adaptation planning (see Chapter 8.5).

Within existing microfinance-over-indebtedness literature there has been insufficient attention on the relative influence of environmental and climate hazards on drivers of over-indebtedness (see Schicks, 2014; Taylor, 2012). This mirrors the general lack of attention microfinance literature has historically given to environmental and climate hazards. This thesis has contributed to this literature by demonstrating how environmental and climate hazards can contribute towards over-indebtedness by altering borrower behaviour and limiting the ability of households to build up assets.

Equity

Identifying and exploring the concept of equity within the context of microfinance–adaptation linkages represents another contribution to the literature. Existing literature has not questioned why households should rely upon microfinance to cope and adapt to environmental and climate hazards (e.g. Hammill et al., 2008). This reflects the dominant narrative that microfinance is an innovative development tool through which the failure of traditional financial services to reach low-income and otherwise disadvantaged groups has been addressed (see Table 1). This thesis integrated equity considerations to compensate for the weakness of the risk hazard

approach in assessing these issues. Such equity issues are not yet sufficiently considered in the microfinance-adaptation literature.

The thesis highlights how a difference in the inability of households across socioeconomic groups to access government extension services has contributed towards a two-tier adaptation outcome. Socioeconomically advantaged households are more able to access training and lower cost credit services from government controlled banks which were vital resources in implementing adaptation options to reduce sensitivity to flooding. Not only did this lead to a reduction in vulnerability, but also less need to use credit to cope with livelihood shocks caused by flooding. Socioeconomically disadvantaged households comparatively lack access to these services. Consequently, they have been less able to reduce their vulnerability, but also instead need to use available credit to cope rather than adapt. This situation is made worse due to the relatively higher cost socioeconomically disadvantaged households pay for credit. Additionally, socioeconomically advantaged households have been able to gain control of SCOs and use much of the finance held by these institutions to finance their transformational adaptations. Once again, socioeconomically disadvantaged households have been left with only sufficient access to cope with livelihood shocks caused by flooding.

The equity issues raised in this thesis highlights how autonomous adaptation patterns are influenced by the way government distributes resources across socioeconomic groups, and this has implications regarding the role of credit in adaptation planning (see Chapter 8.5).

8.4.3. Contributions to literature: institutional vulnerability

The thesis has contributed to the microfinance-adaptation literature by providing an exploration of the ability of MFIs to foster adaptation in light of their own exposure to climate change impacts due to their clients.

The research design of the thesis provided the foundation to contribute to knowledge in this regard. In contrast with existing grey literature, this research adopted an

empirical approach (e.g. Agrawala and Carraro, 2010). The focus was on the local-level, where institutions interact with clients. This contrasts with existing literature which has typically focused at higher scales, either at industry or institutional level (Dowla, 2009). This approach along with an abductive research strategy and qualitative methods meant this thesis was able to explore the experiences of local-level MFI representatives.

To facilitate analysis, a framework was created enabling an understanding into how MFIs can reduce their vulnerability which focused on screening out climate risk, reducing climate risk at source, and managing aggregated risk at institution level. The use of this framework has expanded knowledge regarding both the options and constraints facing local-level MFI representatives. The imperative of MFIs to address institutional risk emanating from environmental and climate hazards was outlined as was their potential to do so. It was demonstrated that currently MFIs are doing little to address their vulnerability with few options available to local-level representatives to reduce or manage this risk. Furthermore, the research findings question the current ability of local-level MFI representatives to provide clients with the holistic support they need to adapt. This finding has implications for the nature of the role of MFIs in adaptation planning (see Chapter 8.5).

The thesis has implications for the institutionalist-welfarist debate within the microfinance literature, which explores the mission of the microfinance movement. It has been proposed that the goal of microfinance should be immediate poverty alleviation (Tendler, 1989; Woller et al., 1999). This thesis adds a new perspective to this debate, demonstrating how the goal of poverty alleviation may be threatened if the influence of environmental and climate hazards is not considered. Consequently, there is a need to ensure the mission of the microfinance movement to alleviate poverty is safeguarded against climate change by ensuring these efforts are climate-resilient (see Mitchell and Maxwell, 2010). Alternatively, others propose the goal should be the creation of financially secure institutions. This thesis again adds a new perspective, demonstrating environmental and climate hazards threatens the financial sustainability of MFIs by exacerbating risks associated with client demographic and

socioeconomic profile, with negative implications for operational risks, portfolio quality, and financial management risks (Dowla, 2009; Pantoja, 2002). Consequently, both sides of the debate need to address the negative impacts of climate change.

This thesis also has implications for the integrated-minimalist debate within the microfinance literature which explores what services MFIs should provide clients. It has been proposed that MFIs should offer both non-financial and financial services to tackle the variety of poverty drivers which exist; however, others have proposed only financial services should be offered to keep operational costs low (cf. Dunford, 2001; Woller and Woodworth, 2001). This thesis adds new perspective to this debate, demonstrating a need for clients to receive both forms of services to tackle adaptation needs regardless of who provides them. It was argued that a parallel approach to non-financial service delivery may be best. This would see microfinance and adaptation knowledge combined using expert staff from different organisations (see Dunford, 2001). In this way clients are more likely to receive the technical support they need and MFIs can keep operational costs low which improves their financial sustainability (Rhyne and Otero, 1992).

8.5. Implications with regards to planned adaptation

When is external intervention necessary?

Within the risk hazard approach the need for external intervention to reinforce autonomous adaptation is often centred around the belief that households will not always undertake 'optimum' or 'sufficient' levels of autonomous adaptation (e.g. Füssel, 2007; Smit et al., 2001). This thesis questions the practical value of such an approach.

Deciding when an 'optimum' or 'sufficient' level of adaptation has been achieved and how this can be objectively determined has not been made clear (cf. IPCC, 2001; IPCC, 2007; IPCC, 2014b). Typically it is abstractly depicted as the point at which coping capacity has been enlarged so that the negative impacts of environmental and climate hazards do not exceed a households coping range (Füssel, 2007). This thesis has

demonstrated that such an approach may be inadequate, especially within a developing country context.

Within the case-study, most households can be said to have sufficiently adapted livelihoods from this perspective. Consequently, it may appear unnecessary for adaptation planners to intervene and provide support. However, when the ability of livelihoods to fulfil household needs and wants is compared before and after adaptations have occurred, the need for external intervention becomes clear. For instance, the adoption of extended migration patterns in response to flooding increased household livelihood coping ranges. However, it also substantially reduced incomes as cash crop cultivation is more lucrative than agricultural labouring.

Consequently, while the research findings corroborate the belief that autonomous adaptation will be 'insufficient' (see Forsyth and Evans, 2013; Smit and Pilofosova, 2001; Vernon, 2008), they question whether the need for external intervention should be predicated upon the concept of livelihood coping ranges. Concepts such as livelihoods and poverty are also important when determining the need for external intervention. This is particularly likely within a developing country context, where adaptation and development issues co-exist. This requires both issues to be considered when determining whether external intervention is required to support autonomous adaptation.

Autonomous adaptation and migration

The thesis has important relevance for debates regarding adaptation planning and migration, an important theme within the case-study. The research findings corroborate existing literature by finding migration to be a likely response to environmental and climate hazards; and that migration patterns are influenced by the interaction between environmental factors and adaptive capacity (see McLeman and Hunter, 2010). Many have argued that adaptation planning should support and accommodate migration; however, policy makers have at times perceived migration to be a negative phenomenon to be discouraged (e.g. Tacoli, 2009; Black et al., 2011). In

Bangladesh, disaster relief has been used to reduce migration related to environmental and climate hazards (Paul, 2005).

This thesis contributes to this debate in a different manner, with implications regarding the entire framing of the relationship between autonomous and planned adaptation. Within the case-study, migration was due to adaptation limits restricting the ability of households to adapt livelihoods in situ. Alternative household livelihood adaptation options existed; however, the inability to access sufficient resources to transform livelihoods often meant migration was the only viable adaptation option available to flooding. The ability of microfinance to improve coping and adaptive capacity may mean microfinance could be a potentially used to reduce the need for migration. However, this would require further research.

Should there be a focus on autonomous or planned adaptation

This thesis raises important questions regarding autonomous and planned adaptation linkages. Flooding can be traced to many factors such as shallow slope of the southwest region, upstream river flows and accompanying sediment content, upstream deforestation, and the construction of the Farakka Dam in India (ADB, 2007; Ahmad and Ahmed, 2003; Ali, 2007; Mirza et al., 2003; Gain and Giupponi, 2014). However, two major factors stand out. Firstly, the Coastal Embankment Project, which involved the construction of polders in the 1960s; and secondly, inadequate river management, specifically a lack of river dredging. This has restricted tidal flow and prevented sedimentation on surrounding lands, focusing sedimentation in peripheral rivers and reducing drainage capacity (ADB, 2007; Tutu, 2005; Wesselink et al., 2015).

The inability of government departments to adequately manage flooding and rivers is contributing to the need for households to adapt livelihoods. This has implications for future adaptation planning. For instance, is more focus required on reducing environmental and climate hazards to halt ecological change; or should ecological change be accepted as inevitable and thus more focus placed on improving household adaptive capacity to meet these changes? Value may exist in breaching polders to restore flood plains (van Staveren et al., 2014). However, this is a complex issue with

implications reaching beyond the scope of this thesis. Future research could assess the positive and negative implications of breaching polders across different livelihood activities and socioeconomic groups (see Tutu, 2005).

Currently, the Kobadak River is being excavated to reduce flooding (see Figure 6). This should benefit farmers; however, the implications for those who have converted agricultural land for aquaculture are unclear. This demonstrates that planned adaptation measures by government may undermine previous autonomous adaptations by households; however, further research is needed to explore this issue.

Figure 6: Excavation of Kobadak River in Tala

<u>Facilitating autonomous adaptation through enhanced access to microfinance</u>

Interest in microfinance-adaptation linkages can be attributed to three factors. The first is the need for there to be sufficient levels of private incentives, knowledge, resources, skills, and a lack of market failures and barriers for sufficient levels of autonomous adaptation to occur (Vernon, 2008; Fankhauser et al., 1999; Smit et al., 2001; Tanner and Mitchell, 2008). Secondly, because microfinance is a key source of financial capital for low-income and otherwise disadvantaged groups. Thirdly, because microfinance has been the main tool through which the failure of traditional financial services to reach these groups has been addressed.

This thesis has corroborated each of these factors indicating that microfinance has a clear role in adaptation planning. Within the case-study, credit was an important

component of coping capacity, a prerequisite for adaptive capacity. However, this does not necessarily mean adaptation planning should increase access to credit to enable households to cope with environmental and climate hazards. Bangladesh currently distributes financial disaster relief in two forms: low cost disaster management loans, and cash transfers (see Paul, 2005). A comparative analysis on the benefits of each approach has not been conducted.

Additionally, credit was also an important component of adaptive capacity. Some of those who could access greater volumes of credit from banks took advantage of flooding and transformed livelihoods in situ by converting agricultural land into aquaculture and thus didn't need to migrate. If households could access greater volumes of credit then this would have improved their ability to adopt the same transformational livelihood adaptation. However, this does not necessarily mean adaptation planning should increase access to credit to enable households to adapt to environmental and climate hazards. Many other barriers inhibited transformation into aquaculture such as land ownership patterns, distrust among neighbouring land owners, and lack of training. Furthermore, credit was merely the way a lack of capital was overcome. Cash transfers would also enable households to overcome financial barriers. Further research is needed regarding which is a better option for improving household coping and adaptive capacity.

However, within the case-study, access to credit from MFIs was generally unable to facilitate autonomous adaptation in a way which left livelihoods equally able to meet household needs and wants. Additionally, while credit has been demonstrated to improve both coping and adaptive capacity, it also has been demonstrated to contribute towards unsustainable debt levels growing over time. Within the case-study, households financed livelihoods with credit. Consequently, when livelihood shocks to income-generating activities occurred, the ability of households to repay debts was instantly diminished. When they use credit to cope with the consequences of such events they become even more indebted. When they use credit to adapt to environmental and climate hazards they become even more indebted.

Consequently, while microfinance has benefits for both coping and adaptive capacity, it can also represent a Faustian bargain (see Wood, 2003). This represents a scenario in which the use of microcredit to cope and adapt can potentially sacrifice longer term prospects for livelihood improvement for short-term security. This especially seemed to occur when it was channelled towards actions which did not generate financial returns, which contributed towards unsustainable debt levels growing over time. Thus microfinance can lead to a maladaptive outcome (Barnett and O'Neill, 2010). This suggests that planned adaptation may need to consider debt relief as much as credit disbursement to facilitate autonomous adaptation. Interestingly, in Bangladesh the central bank has issued orders to government controlled banks to institute debt relief policies, in part due to flooding. However, it has not issued the same orders to MFIs and thus most socioeconomically disadvantaged households have not been able to benefit from these policies.

MFIs within adaptation planning

Interest in the role of MFIs within adaptation planning is currently underdeveloped. This thesis has indicated that MFIs will inevitably be a vital stakeholder in supporting autonomous adaptation; but also that they are unlikely to be able to provide the variety of support households need to overcome adaptation barriers and limits. All barriers and limits associated with adaptation options need to be addressed to enable their successful adoption. However, this thesis has raised doubts as to whether MFIs should be the institutions to provide these services. This thesis has demonstrated that field staff utilised by MFIs to collect repayments lack the technical expertise necessary to provide clients with necessary adaptation knowledge. Instead MFIs should perhaps partner with specialised non-financial service providers so that clients receive the holistic support they require.

The research findings indicate that mainstreaming climate change concerns into the practices of MFIs should be a concern for adaptation planning. This thesis had uncovered few instances of relevant actions in this regard. The most relevant was the demand for the creation of contingency funds by the regulator. Consequently, this area remains a major knowledge gap and a promising area for future research.

Previously this thesis has argued that planned adaptation should be built on a solid understanding of autonomous adaptation. The same can be argued for efforts to reduce vulnerability at institutional level. Households were often aware of adaptation options to reduce their vulnerability to flooding, such as converting into aquaculture, along with the associated adaptation barriers, such as knowledge and capital. If branch managers were able to respond to client needs by providing the relevant credit and training required, then vulnerability reduction should occur for both client and institution.

8.6. Reflections

8.6.1. Implication of theoretical choices

The adoption of the risk hazard approach to vulnerability research affected the entire nature of the thesis. The risk hazard approach was chosen because of its relevance to the exploration of how households deal with environmental and climate risk. Additionally, it is suited to assessing concepts relevant to both adaptation and microfinance such as livelihoods and assets. It also enabled this research to build upon existing literature, which can be readily understood using this approach. It adopted a qualitative approach due to the research aims and objectives (see Chapter 3), which necessitated in-depth research, a prolonged presence to gain the trust of research participants, and the exploration of the causes-of-effects within known individual cases of adaptation embedded within their unique context (see Mahoney and Goertz, 2006).

8.6.2. Implications if alternative theoretical choices were made

The study could have adopted either a political ecology or ecological resilience approach; however, this would have required substantial changes to the methodology used, research questions asked, definitions of key concepts, and scale of analysis.

A political ecology study would have focused more on the underlying drivers of vulnerability. If this research had been conducted through a political ecology approach to vulnerability the research questions would likely need to be more based around how power, equity, and capabilities influence vulnerability and how microfinance influence these. The aim and objectives of the study would be to explore immediate

needs caused by vulnerability, causes of vulnerability, and how vulnerability differs across societal groups (O'Brien, 2012; Eriksen et al., 2015). It would be well suited to local-level analyses but would have to place more emphasis on how power, equity, and capabilities are influenced across international, national, and regional scales. Key concepts would have to be redefined, fundamentally altering research findings. Transformation within this approach refers to overcoming "*structural or root causes of vulnerability*", with an explicit reference to "*social, cultural and economic relationships, and power hierarchies*" (Pelling et al., 2015:114). Such is the focus on society that transformation does not need to occur in response to an environmental change (Manuel-Navarrete and Pelling, 2015). Additionally, observable adaptation is insufficient for transformation to have occurred within this approach (O'Brien, 2012). Additionally, over-indebtedness would involve more than simply financial phenomena.

An ecological resilience approach would radically alter this research. It would have greater difficulty with local-level analysis such as the one adopted in this research because it would put greater emphasis on system-level effects and configurations. The aim and objectives of the study could be to explore the role of microfinance in enabling a social-ecological system as a whole to change in response to new conditions and needs. Research questions could be based around feedback loops and thresholds, the ability of a system to adjust and respond over the long term, and the role of microfinance in enabling social-ecological systems to adapt to new conditions and needs. Empirical examples of such research are scarce among the literature, though theoretical attempts have been made (e.g. Marincioni et al., 2013). Key concepts would be redefined, altering research findings. Most importantly, transformation would not be considered a subset of adaptation, but understood as referring to a regime change of a social-ecological system to a more desirable configuration once thresholds have been surpassed. Adaptation would itself refer to incremental changes through which the socio-ecological system would not be fundamentally altered (Olsson et al., 2014; Folke, 2006).

8.6.3. Implications of methodological choices

The choice of theory had implications for the methodological approach adopted. The risk hazard allows the use of both quantitative and qualitative methodology. Conversely, political ecology or ecological resilience would have strongly favoured qualitative or quantitative methodology respectively. The choice and use of methods was greatly influenced by there being no historical data for the village. Census data was either too old or at too high scale to be useful other than aiding exploratory research and triangulating the representativeness of the case-study. Thus the collection of primary data was required. The exploratory nature of the research which required in-depth contextual research also had methodological implications. It made broader quantitative analysis inappropriate as this is more suited for large case analysis. Additionally, it would require knowledge of known instances of autonomous adaptation which were unknown (see Mahoney and Goertz, 2006).

During the data analysis phase this thesis predominantly used qualitative, rather than, quantitative data. This was due to the need to use qualitative data to explore past cases of autonomous adaptation and the influence of microfinance upon it. It was also due to the inability to collect precise quantitative data, such as household credit usage, ownership of livestock which fluctuates across the year, and financial performance data for microfinance institutions. The presentation of qualitative research findings is also due to the type of thesis submitted which focused on three published articles, which happened to be qualitative papers.

8.6.4. How subsequent research can build upon this thesis

Subsequent research can build upon this thesis in many ways as it was exploratory. Complex livelihood trajectory analysis was not possible as no historical qualitative or quantitative data was available. Follow-up studies to this research would be able to use its qualitative and quantitative data to conduct more complex livelihood trajectory analysis to explore in greater detail how livelihoods are changing across time.

Firstly, additional research could be conducted on elements of microfinance not present in the case-study. Climate insurance is one notable example, as in Bangladesh

a climate insurance industry has not yet developed. For instance, the benefits of risk transfer mechanisms to vulnerability reduction at both household and institution level could be assessed. Green microfinance is another notable example, as it can potentially explicitly incentivise vulnerability reduction behaviour (see Huybrechs et al., 2015). The topic of disaster management loans is another notable area of future research, especially with regards to top-down efforts to improve household coping capacity.

Alternatively, the representative nature of the utilised case-study and mixed methods could provide the basis of a larger quantitative study. This study could seek to estimate the average effect of microfinance upon autonomous adaptation. This is possible because the qualitative aspect of this research has uncovered autonomous adaptations. However, such studies would first need to validate that similar autonomous household adaptations have occurred in the surrounding area. For instance, a large quantitative study could assess to what extent access to microfinance in terms of volume is associated with more household livelihood adaptations.

Additionally, this thesis could provide the basis of an intra-household level study which could focus on exploring intra-household issues with respect to microfinance-adaptation linkages. This thesis was unable to explore these issues due to the selection of the household as the unit of analysis. Subsequent studies could explore how individual household members are affected differently by flooding or the role of different household members in contributing to household adaptation decision making. This could also involve an exploration regarding how microfinance influences intra-household decision-making and vulnerability. Such an approach is likely to provide useful insights as within the case-study NGO credit is predominantly delivered to females and SCO credit to males. Additionally, such research could explore the impact of adaptations on household members, particularly with respect to migration.

Chapter 9. Conclusion

9.1. Introduction

This conclusion starts with a recap of the importance of this topic along with the aim and research questions of this thesis. A synthesis of the research findings is then provided in relation to each research question, before presenting the theoretical and policy implications of the research findings. Recommendations for future research are then outlined along with why these are important. Finally, the chapter ends with a summary statement.

Climate change is one of the biggest environmental problems facing humanity. Developing countries and their citizens are more exposed to negative climate change impacts and disadvantaged in terms of their adaptive capacity. If people are to adapt there must be sufficient levels of private incentives, knowledge, resources, skills, and an absence of market failures and barriers that discourage adaptation.

Within this context, understanding the linkages between microfinance and autonomous adaptation is important. Microfinance is globally one of the most replicated development tools, providing financial services to those unable to access traditional financial markets. Unfortunately, few empirical studies have adequately incorporated microfinance, livelihoods, and environmental risk. These studies are needed to assess how microfinance influences adaptation in practice.

The aim of this thesis has been to contribute to microfinance-adaptation literature by examining conceptual arguments and by exploring empirical data. Three objectives were outlined.

The first was to explore features and patterns of autonomous adaptation to better understand how households are responding to environmental and climate hazards as well as exploring implications for planned adaptation. Understanding of autonomous household adaptation patterns remains underdeveloped, including understanding whether households are implementing incremental or transformational adaptation measures, as well as the implications of this for adaptation planning.

The second was to explore how microfinance has influenced household efforts to reduce sensitivity to environmental and climate hazards as well as implications for planned adaptation. Understanding of microfinance-adaptation linkages remains underdeveloped. Existing literature has not given sufficient attention to adaptation literature, remains overly conjectural, and is biased towards potential positive linkages.

The third was to explore how local-level representatives of microfinance institutions have responded to the challenges posed by environmental and climate hazards as well as their ability to foster adaptation in light of their own exposure. Understanding how MFIs are adapting internal and external processes is underdeveloped, yet is vital as MFIs influence household adaptation decisions and govern access to resources. Additionally, we know little regarding how climate hazards influence the financial sustainability of MFIs.

A novel research design and approach was adopted. An empirical household level approach enabled an understanding of the livelihood effects of microfinance in relation to autonomous adaptation. An abductive approach enabled people and local-level MFI representatives to present their understandings of their actions and for these to be interpreted with literature themes. This is in contrast with much of the risk hazard literature which has orientated research towards the regional or industry level. Additionally, this thesis is novel in its adaptation-orientated approach to the study of microfinance-adaptation linkages. Current literature has adopted a poverty orientated approach. The difference between the approaches is significant. Within the adaptation approach, reductions in poverty do not necessarily result in reductions in vulnerability, unlike within poverty orientated approach. This provided a more nuanced analysis which has deepened understanding of adaptation-microfinance linkages.

9.2. Synthesis of empirical findings

In relation to the first research objective, most households were found to have implemented autonomous adaptations. These adaptations demonstrated that households are likely to implement reactive adaptation measures which reduce

livelihood risk. Both transformational and incremental adaptations were observed. It was demonstrated that both socioeconomically advantaged and disadvantaged households can transformationally adapt when required. Furthermore, it was demonstrated that the autonomous adaptation strategies employed by households are strongly influenced by the associated socioeconomic status of their instigators. Without access to relevant resources households may resort to implementing transformative measures which lead to increases in poverty.

In relation to the second research objective, it was demonstrated that obtaining credit is an important coping response when environmental and climate hazards occur and that its importance stemmed from a lack of alternative coping options during flooding months. Additionally, the role of informal credit was recognised and explored. This highlighted that informal credit was more important than formal credit for coping capacity. Furthermore, the role of community initiated and managed SCOs in coping capacity was outlined and explored. It was found that these informal MFIs have a greater role in coping strategies than externally initiated and managed MFIs.

The research findings have also demonstrated that credit is an important ingredient in household adaptive capacity and has been used to finance adaptation options which have reduced sensitivity to environmental and climate hazards. Additionally, it was demonstrated that the way poverty-orientated literature has proposed microfinance can facilitate adaptation, such as through livelihood diversification, may not necessarily reduce vulnerability. For livelihood diversification to reduce sensitivity, the activities into which livelihoods are diversified must be less sensitive than previous livelihood activities. Within the case study this was often not the case, particular those activities most associated with microfinance and livelihood diversification such as micro-enterprises.

The research findings have demonstrated that credit may also lead to over-indebtedness when used to cope and adapt which itself leads to a loss of coping and adaptive capacity and greater sensitivity to environmental and climate hazards. Additionally, it has demonstrated how environmental and climate hazards can

contribute towards over-indebtedness by altering borrower behaviour and limiting the ability of households to build up assets.

Equity considerations were integrated into the discussion of research findings to compensate for the weakness of the risk-hazard approach to assess these issues. It was found that the inability of households across socioeconomic groups to access government extension services has contributed towards a two-tier adaptation outcome. Socioeconomically advantaged households have much greater access to these services which provide resources necessary to adopt transformative vulnerability reduction measures. Additionally, these households were able to gain greater control of SCO resources. This left socioeconomically disadvantaged households with few resources available to adopt transformative measures which reduce both poverty and vulnerability.

In relation to the third research objective, it was demonstrated that MFIs are both directly and indirectly vulnerable to environmental and climate hazards. Formal MFIs (NGOs) had located offices in areas less sensitive to flooding. However, informal MFIs (SCOs) had few feasible options to reduce direct vulnerability to flooding. For instance, SCOs needed to be based in the village where members lived.

All MFIs were unable to screen clients regarding their vulnerability to environmental and climate hazards. In other words MFIs are risk aggregators, resulting from both the financial and pragmatic consequences of dealing with low-income and otherwise disadvantaged groups. It was reasoned that MFIs are thus only able to reduce environmental and climate risk at client level or manage it at institution level. It was found that while much promise exists to reduce vulnerability, this promise is not being realised. Loan products incentivised investment in livelihood activities sensitive to environmental and climate hazards. Staff lacked the technical capacity to advise clients regarding risk reduction behaviour. Interestingly, branch managers were not connecting flood-affected households with disaster management loans - low-cost loans financed by the government to help disaster-affected households to rebuild

livelihoods. Branch managers had few ways to manage aggregated risk. Many resorted to simply delaying repayment collections, with few able to distribute secondary loans.

9.3. Theoretical and policy implications

This research has made several contributions to the existing literature. It has demonstrated the benefits of adopting an abductive local-level mixed-methods approach to both the exploration of autonomous adaptation and the influence of microfinance on autonomous adaptation.

It demonstrates how the risk hazard approach can be used to facilitate understanding of autonomous adaptation for the benefit of adaptation planning. However, it also demonstrates several weaknesses of the risk hazard approach, most notably with regards to facilitating equitable outcomes. It has highlighted that transformation can be inevitable, in contrast to existing literature which often frames transformation as a normative phenomenon to be encouraged. Additionally, it highlights the limitations of the normative framing of adaptation within the adaptation literature, and suggests that the interpretation of adaptation within the livelihoods literature has greater utility because it does not assume that adaptation is necessarily positive.

It demonstrates that the whole premise used within existing literature regarding microfinance and adaptation is somewhat misplaced. Microfinance was not something additional to livelihoods which could be used to facilitate adaptation. Microfinance, whether formal or informal, was a pre-existing ingredient in livelihood construction which has had historical implications for livelihoods and adaptation, itself a continuous process of change. It demonstrates that the role of informal credit, institutions, and social support networks cannot be ignored as it currently is in much of microfinance, adaptation, and microfinance-adaptation literature.

While microfinance has demonstrable benefits for both coping and adaptive capacity, it can also represent a Faustian bargain (see Wood, 2003). The use of microcredit to cope and adapt can potentially sacrifice longer term prospects for livelihood improvement for short-term security. This was particularly likely when channelled

towards actions which did not generate financial returns, which contributed towards unsustainable debt levels growing over time.

As a result, adaptation planners cannot rely upon the microfinance system to facilitate sufficient levels of adaptation. Additionally, the microfinance system was found to be inadequate with regards to providing the non-financial resources households needed to adapt.

Consequently, the microfinance system can benefit as much from adaptation planning as adaptation can benefit from microfinance. Microfinance programmes will need climate proofing, so that investment patterns incentivised by microfinance are 'climate-compatible'. Additionally, partnerships between MFIs and other development actors are needed to ensure households receive the holistic support they need to implement desirable adaptation options. This support can be livelihoods training but there are apparent roles for other information such as weather and seasonal forecasts. The adoption of transformative adaptation measures such as the conversion of agricultural land for aquaculture had negative consequences when flood levels were too high. Presumably, it will also have negative consequences if flood management programmes manage to eliminate flooding altogether.

This leads to the final implication of this thesis for adaptation planning, specifically its link with autonomous adaptation. It was argued that adaptation planning should re-orientate its support towards autonomous adaptation as well as understand its existing patterns and characteristics. Moreover, it will also need to consider the implications for autonomous adaptation of top-down adaptation efforts by government. Currently, the government is excavating the Kobadak River in order to reduce waterlogging in the district. Once this is complete, many households should be able to return to cash crop cultivation as long as they can access the required resources to do so. However, it is likely to have negative consequences for those households who have converted agricultural land for aquaculture, as they have come to depend on high river levels.

9.4. Summary statement

Existing literature relating to microfinance and adaptation linkages is in its early stages. Literature is predominantly conjectural or has relied upon secondary data. It has also relied upon a development perspective of vulnerability with insufficient consideration of the adaptation literature. Additionally, it has arguably given insufficient consideration to the wider livelihoods and microfinance literature. Consequently, it often forms an overly simplistic view of the potential linkages between microfinance and adaptation.

This study has attempted to contribute to this literature by providing a more nuanced study. It has produced a different type of data, employed a different approach to data collection, utilised a different approach to data interpretation, and allowed the research to explore both positive and negative linkages. This thesis arguably represents the first empirical study of microfinance-adaptation linkages using an adaptation lens. Several important research findings were uncovered which show signs of promise, but also of concern.

As international efforts to reduce vulnerability gather pace, the incorporation of microfinance into adaptation programmes financed under the international climate finance system has arguably moved well ahead of our understanding of their linkages. Future research can build upon this thesis, exploring microfinance-adaptation linkages at greater or lower scales using alternate approaches to adaptation research. This research can deepen our understanding of how and under what conditions microfinance can facilitate household efforts to reduce vulnerability.

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Appendices

Appendix A

Consent form: Key informant interviews

University of Leeds

The role of microfinance in autonomous adaptation to climate change

Name of Researcher: _Adrian Fenton_____

Initial the box if you agree with the statement to the left

1 I confirm that I have read and understand the information sheet dated June 2011 explaining the above research project and I have had the opportunity to ask questions about the project.	☐
2 I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.	☐
3 I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.	☐
4 I agree for the data collected from me to be used in future research	☐
5 I agree to take part in the above research project and will inform the principal investigator should my contact details change.	☐

_____ _____ _____

Name of participant (or legal representative) | Date | Signature

_____ _____ _____

Name of person taking consent (if different from lead researcher) | Date | Signature

To be signed and dated in presence of the participant

Copies:

Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, the letter/pre-written script/information sheet and any other written information provided to the participants. A copy of the signed and dated consent form should be kept with the project's main documents which must be kept in a secure location.

Sample interview questions

Union Parishad member - General/Demographic information

- How many households exist in the village?
- How long has the village existed?
- How far is the village from Tala, and easy is it to get to the village?
- How spatially distributed is the village?
- Have there been many changes to the village during the last 10 years?
- Has there been much research conducted in the village?
- How connected is the village to urban areas?

Union Parishad member - Socio-economic information

- Who are the important and influential people within the village?
- What is the distribution of poor and wealthy households?
- What are the major sources of income for households in this village?
- Is the economy informal or formal?
- Have there been many changes to the above during the last 10 years?
- Are remittances an important source of income of households?
- What are the major health issues that households encounter?
- What level of education exists in the village, formal education and those provided by NGOs?
- What proportion of agricultural land is rented and owned?

Local MFI representatives – financial services

- What savings products do you offer
- What insurance products do you offer
- What credit products do you offer
- What informal rural finance activities exist?
- Do you know of any other finance providers working in the same geographical area as you?

Applicable to all - Livelihood stresses and shocks

- What are the main livelihood groups/strategies within the proximate area?
- What are the main climate-related hazards/variability/change that affect livelihood groups within the proximate area?
- Are there resulting consequences and impacts of any observed climate-related changes on livelihoods practices/strategies?
- Are there certain livelihood/social groups that are particularly vulnerable to the impacts of climate hazards/variability/change in comparison with the wider community? If any differences in impact, for what reasons?
- Have any observable changes occurred with regards to climate within the proximate area, in comparison to a generation ago?
- What evidence is there that indicates/reflects/demonstrates/corroborates any observed changes in climate?

- Are there any impacts of observed climate variability/hazards/change on conflict at both household and community levels? e.g. conflict over scarce resources, increase tribal/community conflict over access to water resources, Migration (temporary and permanent) etc.
- Have any climate-related changes been beneficial to livelihoods groups? e.g. opportunities to cultivate different crop types, increased in agricultural/livestock productivity etc.
- Which livelihood/social groups are most at risk of climate-related variability/hazard/change impacting upon their livelihood assets, compared with the wider community?
- Do all livelihoods/social groups have equitable access to key assets needed to prevent, cope with, and recover from the impacts of climate hazard/variability/change in comparison with the wider community? If unequal, for what reasons? E.g. Social/political/financial etc.
- Have local institutions and informal organisations themselves been affected by climate-related changes?
- Are there social/livelihood groups that are more heavily dependent on outside support from local institutions and informal organisations during times of climate stress and shock in comparison with the surrounding community? e.g. women farmers, young pastoralists, fishers. If so, for what reasons?
- Are there social/livelihoods groups that lack equitable access to key resources during times of climate variability/hazard/change? If so, where do the constraints arise from? E.g. political/economic/social causes?
- What are the key local institutions for support during times of climate shock and stress, and how are different livelihood / social groups represented these local institutions? e.g. local councils, farmers collectives, water user groups

National level NGOs representatives and adaptation experts: Livelihood adaptation

- What structural constraints do households face in reducing their vulnerability to climate change?
- In what ways do any observed changes and adaptation strategies relate to non-climatic shocks and stresses? e.g. conflict, population increase, urbanisation, degrading land use practices etc.
- What measures, if any, have livelihood groups taken in-order to adapt to any observed climate-related changes? e.g. diversify crop varieties, adopting new livelihood practices, migration; If no adaptation occurring, what are the barriers to change?
- What roles do local institutions and informal organisations play in informing/supporting/determining adaptation strategies for livelihood groups in response to climate variability/hazard/change? e.g. local farmer collectives informing farmers on suitable crop varieties or livestock.
- Are there local rules and norms that prevent certain livelihood/social groups from undergoing adaptation strategies in light of climate variability/hazard/change? e.g. women/youth unable to perform certain livelihood activities due to local customs, traditional/cultural restrictions on certain adaptation options.

- Are suggested adaptation strategies widely adopted within livelihood groups? Have changes been successful? Is there resistance to change amongst livelihood groups? If no changes made, for what reasons?
- Have local institutions and informal organisations undergone any changes/transformations in-order to accommodate for observed climate-related changes? e.g. changes in support/advice/structure.
- Are livelihood groups provided with knowledge and information on appropriate adaptation strategies relevant to their livelihood and region? e.g. climate change impacts and adaptation strategies for pastoral herders relevant to region/livelihood.
- Are individuals acting on advised adaptation strategies? If not, for what reasons?
- To what extent have any noticeable climate-related changes led to the adoption of new practices within each livelihood group? e.g. adoption of drought resilient crops, alteration in planting seasons, change in livestock herd composition
- If no new practices observed, why not?
- Have any climate-related changes led to the adoption/switching of new livelihood strategies? e.g. switching partially or fully to another livelihood.
- What shifts are being seen in livelihoods, e.g. crops being sown, livestock raised, is off-farm income increasing?
- To what extent are changes in livelihoods attributable or affected by national policies, free trade agreements, domestic and international trade?
- Are there new successful opportunities/practices that were not viable in the past?
- What effects have any new practices had on livelihood, both positive and negative? e.g. household income, natural resource base, social relations etc.
- What factors assist/hinder local populations in adopting new practices.
- How able and willing are different livelihood groups to adapt and adjust to climate- related changes? e.g. some groups unable/reluctant to change traditional practices. If certain groups more willing to adopt new practices and implement changes, for what reasons?
- Are livelihood groups within the community taking risks and exploiting new opportunities presented by any climate-related changes? e.g. are farmers attempting to plant a range of crops and varieties during both good and bad years? If no risks taken, why not?
- Do livelihood groups have access to new and improved technology needed to cope with climate-related changes? e.g. more efficient irrigation system, solar/wind technology etc.
- Do climate-related hazards/variability/change influence the risks taken within each livelihood group? e.g. risks taken after the impacts of flood or drought events- trying new livelihood options/strategies, sale of assets etc.
- Are there mechanisms in place to accommodate for, and promote the sharing of risk and innovation within livelihood groups and the wider community? e.g. farmer insurance schemes, collective innovation and risk taking, local support

systems If none in place, which interventions would best support the sharing of risk?

- What are the ideal conditions needed in-order to foster innovative action, diversification, and try new practices within each livelihood? e.g. no conflict, local farmer networks and indigenous knowledge sharing of suitable crop/livestock varieties?

Upazila Chairman – Information

- What kinds of systems are in place for data gathering, information analysis and dissemination in relation to climate hazards/variability/change relevant for the area? e.g. weather data, flood early warning systems, information on climate change impacts.

- Is traditional climate information held in higher regard than formal information and knowledge?

- What climate-related information, both formal and informal, do individuals use to guide their livelihood practices? e.g. indigenous farmer knowledge of rainfall timing/seasonality, radio broadcasts of weather patterns, flood early warning systems.

- Are formal means of climate information trusted and acted upon? If not, for what reasons?

- What livelihood groups are using climate related information and knowledge (formal and informal) in their decision-making processes? Does this change at the collective and local level.

- Is relevant climate-related data reaching key stakeholders in the appropriate form so that it can be used in a timely and appropriate manner? (e.g. accessible dissemination of drought early warnings to farmers prior to planting)

- If climate information not used in decision processes, for what reasons?

- Is information being translated into positive and effective action? If not, for what reasons?

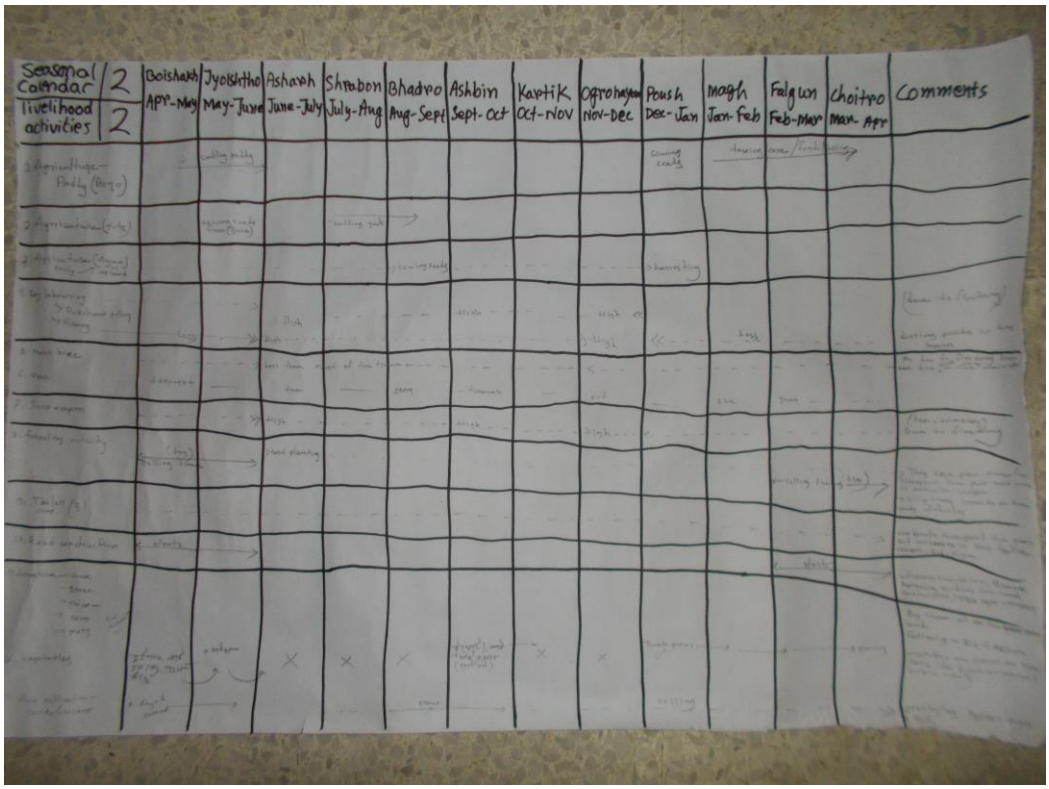
- What additional information relating to climate variability/hazard/change is needed to help guide livelihood groups to adapt to climate-related changes?

Upazila Chairman and Union Parishad chairman - External support

- What Union Parishads, Wards, Villages were covered in the RVCC program?
- What existing government policies and programmes exist in the area that influence livelihoods?
- What relief programmes operate in the area?
- What planning and policy making processes exist that affect the area, how can households influence this?
- What economic development and welfare policies?
- Do government and local agency provide support local communities to adapting to any observed changes in the climate?
- Which formal organisations are associated with the preparing for, coping with, and recovery of individual climate-related vulnerability/hazard/change by livelihood groups? e.g. NGOs and government agencies associated with coping with flood events, which for drought etc.
- To what extent do formal organisations communicate, interact, and share information and knowledge with local informal organisations/institutions over issues of climate variability/hazard/change? e.g. Government and NGO interaction and knowledge sharing with local farmer/pastoral collectives. If no platforms for interaction, why not? Is institutional interaction deemed necessary?
- Do local organisations, as a collective, have the flexibility and capacity to deal with a range of climate-related shocks and stresses? e.g. from drought to flood, landslides to soil erosion. If not, for what reasons?
- Do formal organisations have access to relevant climate information and knowledge in guiding policy and decision-making? e.g. early warning systems, knowledge of relevant adaptation strategies
- In what ways/do formal organisations take into account projected/likely climate-related changes and incorporate them within their plans and decision-making processes? e.g. using climate projections to guide district DRR planning What are the barriers to implementing new policy and decision-making processes?

Appendix B

Examples of focus group discussion material



Contents of Training Manual: Focus group discussions

Training Material for research assistants

Contents

Appendix C

Household survey consent form

PhD Household Level Survey Questionnaire

Introduction and consent by main respondent

Before the beginning of the interview read through the introduction letter with the head of household. Allow the household some time to think through whether they would like to participate and arrange a time and date when you will return.

If the household has received the introductory letter and consents to being part of the research, then check whether the respondent agrees to the statements below.

- I confirm that I have read and understand the information sheet explaining the above research project and I have had the opportunity to ask questions about the project.
- I understand that my participation is voluntary and that I am free to withdraw at any time without reason and without negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.
- I understand that my responses will be kept strictly confidential and not disclosed to any other party.
- I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.
- I agree for the data collected from me to be used in future research.
- I agree to take part in the above research project and answer questions truthfully.

Respondent has given consent and agrees with the above statements? [__ __] CONSENT
(01=Yes, 00=No)

_____	_____	_____
Name of participant (or legal representative)	Date	Signature

_____	_____	_____
Name of interviewer	Date	Signature

Name of the para: .....

Once this has been signed by all parties the participant should receive a copy of the participant consent form and the information sheet.

Household survey

PhD Household Level Survey Questionnaire

Section I: Household Respondent & Type

Ideal respondent: household head and/or spouse. Be sensitive about the way you gather this information.

1. Name of household head			
a. First name (more than 1 if needed)	HHHFN	✎_____	
b. Last name	HHHLN	✎_____	
2. Name of main respondent			
a. First name (more than 1 if needed)	HHRFN	✎_____	
b. Last name	HHRLN	✎_____	
3. Sex of the respondent *(01=Male, 02=Female)*	HHRSEX		[__ __]
4. What is the relationship of main respondent to household head	HHRRH		[__ __]
(00=Head, 01=Spouse, 02=Parent, 03=Child, 04=Grandchild, 05=Nephew/Niece, 06=Son/daughter-in-law, 07=Brother/sister, 96= Other related (specify) 97=Other unrelated (specify)	SPECREL	✎_____	
5. Household type *01=Male headed, with a wife or wives, 02=Male headed, divorced, single or widowed, 03=Female headed, divorced, single or widowed, 04=Female headed, husband away, husband makes most household/agricultural decisions, 05=Female headed, husband away, wife makes most household/agricultural decisions, 96=Other, specify*	HHTYPE		[__ __]
	SPECTYPE		
		✎_____	
6. Total number of the HH member	HHMEMNUM		
7. Time spent living in village (years)	HHTIME	[__ __]	

PhD Household Level Survey Questionnaire

Section II: Livelihood Assets

Physical assets

Q. Which of the following items does your household own at the present time?

(01=Yes, 00=No)

Radio	ASRADIO	[__ __]
Television	ASTV	[__ __]
Cell phone	ASCELL	[__ __]
Motorcycle	ASMBIKE	[__ __]
Van	ASVAN	[__ __]
Car or truck	ASCAR	[__ __]
Boat	ASBOAT	[__ __]
Water pump/Treadle pump	ASPUMP	[__ __]
Mechanical plough	ASMECHPL	[__ __]
Thresher	ASTHRESH	[__ __]
Connected to electricity grid	ASGRID	[__ __]
Generator (electric or diesel)	ASMOTOR	[__ __]
Battery (large, e.g. car battery for power)	ASBAT	[__ __]
Improved housing (1=kutcha 2=semi-pukka 3= pukka)	ASIMPH	[__ __]
Housing raised on plinth	ASHPLI	[__ __]
Separate housing for farm animals	ASHOUFA	[__ __]

Human assets

Details of HH:

Member (m/f)	Education qualification	Occupation	Skill

PhD Household Level Survey Questionnaire

Q: What is the level of academic qualification that best describes the education level of your household? LAHAAC [__ __]

1 = No household members literate, no specialised work.
2 = Some members literate and/or specialised work skills.
3 = Some high school education and or specialised work skills that require special training.
4 = Most household members educated. Potential exists to apply for salaried employment.
5 = Education levels of household members beyond higher secondary education. Technical training obtained.
6 = Household member has a bachelor's or master's degree and the potential exists for professional career.

Q: How many of days in the past 12 months have your family members been unable to carry out livelihood activities due to health reasons? LAHAHE [__ __]

01=Less than one week,
02=More than one week but less than two weeks,
03=More than two weeks, but less than one month,
04=More than one month, but less than two months,
05=More than two months, but less than four months,
96=Other, specify

Q: Of the adults in your household, how many adults are of workable age? LAHAWA [__ __]

Q: Of the children in your household, how many children are in full time education. LAHACE [__ __]

Q: Of the adults in your household, how many are not contributing to household livelihood activities and household chores. LAHAAD [__ __]

Natural assets

Q. Which of the following assets does your household own at the present time?
(01=Yes, 00=No)

Non-farm land holdings	LANANF	[__ __]
Farm land holdings owned (IN KATA)	LANALO	[__ __]
Farm land holdings rented (IN KATA)	LANALR	[__ __]
Trees (WRITE NUMBER OF TREES)	LANATR	[__ __]
Pond	LANAPO	[__ __]
Who they share pond with		_____
		_____
		_____

Financial assets

Q. Which of the following assets does your household own at the present time?
(01=Yes, 00=No)

Cattle & buffaloes	LAFACB	[__ __]
Goats & sheep	LAFAGS	[__ __]

Fowls,	LAFAFD	[__ __]
Ducks and geese	LAFADG	[__ __]

PhD Household Level Survey Questionnaire

Credit

Read the following question as an introduction to the questioning. Once in the table, go row by row. Note: If answer to 1 is 'yes' then ask 2, 3, 4, and 5, otherwise ask 6

Q: During the last 12 months did the household obtain credit through any of the following means.

Codes for question 2: 1=January, 2=February, 3=March, 4=April, 5=May, 6=June, 7=July, 8=August, 9=September, 10=October, 11=November, 12=December

*Codes for question 3: 1 = Purchase food, 2 = Purchase agricultural inputs, 3 = Purchase equipment, 4 = Purchase medicine, 5 = Wedding costs, 6 = Purchase aquaculture inputs, 7 = Purchase livestock inputs, 8 = Purchase business inputs, **9 = for education purpose, 10= to repay previous loan, 11= to build or repair house, 12= others , specify***

Source of credit		1. Any credit during the last 12 months? **If Yes, go to 2,3,4, and 5, If No, go to 6** CODE *(01=Yes, 00=No)*	2. If Yes, what month did you access credit from this source? CODE	3. If Yes, why did you obtain credit from this source?	4. If Yes, how much credit did you obtain? CODE *(01=Yes, 00=No)*	5. If Yes, was this a new source which you did not use previously? CODE *(01=Yes, 00=No)*	6. If No, did you receive credit from this source at any time in the past? CODE *(01=Yes, 00=No)*
Sonali Bank	MFCBSO	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Krishi Bank	MFCBKH	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
BRAC	MFCNBR	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
ASA	MFCNAS	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Grameen Bank	MFCNGB	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Uttaran	MFCNUT	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Narri Unnayan	MFCNNU	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Shushilan	MFCNSH	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
SAS	MFCNSA	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Baste Shiqhas	MFCNBS	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Shetu	MFCNSH	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Jagarani Chakkra	MFCNJC	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Progoti	MFCCP	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Krishi Unnayan	MFCCK	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Mosto Samati	MFCCM	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Agrogami	MFCCAG	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Abodan	MFCCAD	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]
Jubo Unnayan	MFCCJU	[__ __]	[__ __]	[__ __]	৳_____	[__ __]	[__ __]

Anser VDB	MFCCAV	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]
Sanshan VDB	MFCCS	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]
Moneylenders	MFCML	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]
Friends	MFCFR	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]
Family	MFCFA	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]
Other, specify: ⇘_____	OTHE (SPECCRE)	[__ __]	[__ __]	[__ __]	⇘_____	[__ __]	[__ __]

PhD Household Level Survey Questionnaire

Social assets

1. Do you, or any other household member, currently belong to a group or groups doing the following activities?

Answer 01=Yes or 00=No for each activity

a.	Tree nursery/tree planting	GRPTREE	[__ __]
b.	Fish/shrimp/prawn ponds	GRPFISH	[__ __]
c.	Fishing	GRPFING	[__ __]
d.	Forest product collection	GRPFORET	[__ __]
e.	Water catchment management	GRPWATER	[__ __]
f.	Soil improvement activities	GRPSOIL	[__ __]
g.	Crop introduction/substitution	GRPCROP	[__ __]
h.	Irrigation	GRPIRRIG	[__ __]
i.	Savings and/or credit	GRPCRED	[__ __]
j.	Marketing agricultural products (i.e. livestock, crops, tree or fish)	GRPMARK	[__ __]
k.	Productivity enhancement (i.e. livestock, crops, trees or fish)	GRPPROD	[__ __]
l.	Seed production	GRPSDPRD	[__ __]
m.	Vegetable production	GRPVGPRD	[__ __]
n.	Others **not mentioned above** related to soil, land or water management	GRPOTHE	[__ __]
	(please specify) SPECGRP ✎_____		

Resources obtained through group memberships

Read the following question as an introduction to the questioning. Once in the table, go row by row.

Q: What other non-financial resources did you receive from these options over the last 12 months?

Answer 01=Yes or 00=No for each activity

Source of credit		Education CODE (01=Yes, 00=No)	Health services CODE *(01=Yes, 00=No)*	information and technology transfer CODE *(01=Yes, 00=No)*	Employment generating activities CODE *(01=Yes, 00=No)*	Water and sanitation CODE *(01=Yes, 00=No)*	Agriculture, livestock, aquaculture CODE *(01=Yes, 00=No)*	Other non-financial service. CODE *(01=Yes, 00=No)*
Financial Cooperatives	LASAMF	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Banks	LASABA	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
NGOs	LASANG	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Government programs	LASAGP	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
CBOs	LASACB	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Moneylenders	LASAMO	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Friends	LASAFR	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Family	LASAFA	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____
Other, specify: ✎_____	OTHE (SPECCRE)	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	✎_____

PhD Household Level Survey Questionnaire

Support Networks

Read the following question as an introduction to the questioning. Once in the table, go row by row.

Q: In times of need, who would you go to for support?

Codes for 1: 01=Family, including extended family; 02=Friend; 03=Acquaintance; 04=SHG member; 05=Financial cooperative, 6=NGO extension worker, 07=Elected member of government, 08=Bank worker, 09=Other, specify
Codes for 2: 01=Credit, 02=Information on farming opportunities; 03=Influence; 04=Information about non-farm employment opportunities, **05=Relief , 06=Information/Advice, 07= Other, specify**

	1. How would you describe your connection to this household	2. If Yes, what resources do you receive?
Forename and Surname / or Organisation	CODE	CODE
✍_____	[__ __]	[__ __] [__ __] [__ __] [__ __]

Q. After your family who is your closest in the village ?
 # It can be friend/neighbour/relative of the respondent
Codes: *Codes for 1: 01=Family, including extended family; 02=Friend; 03=Acquaintance; 04=SHG member; 05=Financial cooperative, 6=NGO extension worker, 07=Elected member of government, 08=Bank worker, 09=Other, specify*

	1. How would you describe your connection to this household
Forename and Surname / or Organisation	CODE
✍_____	[__ __]

Q. Whom do you depend on for livelihood?
Example: From whom the respondent take lease of lands, do they go to UP members?
Codes for 1: 01=Family, including extended family; 02=Friend; 03=Acquaintance; 04=SHG member; 05=Financial cooperative, 6=NGO extension worker, 07=Elected member of government, 08=Bank worker, 09=Other, specify

Codes for 2: 1= take lease of lands, 2= agriculture labor 3= access to aid, e.g. cattle, rice, pulse, 4= access to govt. program/training – e.g. food for work

	1. How would you describe your connection to this household	2. If Yes, what resources do you receive?
Forename and Surname / or Organisation	CODE	CODE
✍_____	[__ __]	[__ __] [__ __] [__ __] [__ __]

Section III: Information and knowledge

Weather and Seasonal Information

Q: Have you received any official weather information during the last 12 months?

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Codes for 2: 01=Family member, 2=Friend,3=NGO, 4=Government representative, Radio, TV
Codes for 6: 01=Crop, 2=Seed variety, 3=Planting cycle, 4=Harvest cycle, **6=Spray pesticides , 7= *others, specify***

		1. Did you receive any information?	2. From whom or how did you receive the information?	3. Who received the information in the household?	4. Did it include advice on how to use the information in your farming?	5. Were you able to use the advice?	6. What aspects of farming did you change as a result of this information?
Type of information		*(01=Yes, 00=No)* **If No, go to next row.**		*01=Men, 02=Women, 03=Both*	*(01=Yes, 00=No* **If No, go to next row.**	*(01=Yes, 00=No)* **If No, go to next row**	*(you can choose up to 3)*
		RECE	MSN1, MSN2, MSN3	WHO	INAD	USAD	ASP1, ASP2, ASP3
Forecast of drought or, flood	IWSF DF	[__ __]	[__ __] [__ __] [__ __]	[__ __]	[__ __]	[__ __]	[__ __] [__ __] [__ __]
Forecast of pest or disease outbreak	IWSF PD	[__ __]	[__ __] [__ __] [__ __]	[__ __]	[__ __]	[__ __]	[__ __] [__ __] [__ __]
Forecast of the start of the rains	IWSF RA	[__ __]	[__ __] [__ __] [__ __]	[__ __]	[__ __]	[__ __]	[__ __] [__ __] [__ __]
Seasonal forecast of the weather for the following 2-3 months	IWSF SF	[__ __]	[__ __] [__ __] [__ __]	[__ __]	[__ __]	[__ __]	[__ __] [__ __] [__ __]
Weather forecast of the weather for today, 24 hours and/or next 2-3 days	IWSF WF	[__ __]	[__ __] [__ __] [__ __]	[__ __]	[__ __]	[__ __]	[__ __] [__ __] [__ __]

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Section IV: Innovation

Sources of resources

Read the following question as an introduction to the questioning. Once in the table, go row by row. Note: If answer to 1 is 'yes' then ask 2, if "no" then ask 3

Q: During the last 10 years did any resources come to the household through any of the following means?

Source of resources		1. Any resources gained during the last 10years ? **If Yes, go to 2 If No, go to 3** CODE *(01=Yes, 00=No)*	2. If Yes, was this a new source which you did not have previously? CODE *(01=Yes, 00=No, -8=N/A)*	3. If No, did you receive cash from this source at any time in the past? CODE *(01=Yes, 00=No, -8=N/A)*
Staple crops (rice, wheat)	SOISC	[__ __]	[__ __]	[__ __]
Cash crops (Jute, Cotton, Sugarcane)	SOICC	[__ __]	[__ __]	[__ __]
Fruit	SOIFR	[__ __]	[__ __]	[__ __]
Vegetables	SOIVEG	[__ __]	[__ __]	[__ __]
Timber/fuel wood	SOITFW	[__ __]	[__ __]	[__ __]
Large livestock	SOILL	[__ __]	[__ __]	[__ __]
Small livestock	SOISL	[__ __]	[__ __]	[__ __]
Diary products	SOIDP	[__ __]	[__ __]	[__ __]
Poultry	SOIP	[__ __]	[__ __]	[__ __]
Poultry products	SOIPP	[__ __]	[__ __]	[__ __]
Shrimp/prawn farming	SOISF	[__ __]	[__ __]	[__ __]
Fishing	SOIFI	[__ __]	[__ __]	[__ __]
Employment on another farm	SOIEAF	[__ __]	[__ __]	[__ __]
Employment on NGO/government work programmes	SOIWPR	[__ __]	[__ __]	[__ __]
Other paid employment (e.g. salary)	SOIOPE	[__ __]	[__ __]	[__ __]
Business (other than farm products)	SOIBUS	[__ __]	[__ __]	[__ __]
Remittances	SOIREM	[__ __]	[__ __]	[__ __]
Payments for environmental services	SOIPES	[__ __]	[__ __]	[__ __]
Other payment from projects/ government including benefits in kind (e.g. pensions, aid, subsidies, etc.)	SOIOPA	[__ __]	[__ __]	[__ __]
Renting out your farm machinery (e.g. tractor, thresher, pump, etc.) or animals for traction	SOIRFM	[__ __]	[__ __]	[__ __]
Renting out your own land	SOIRFL	[__ __]	[__ __]	[__ __]
Other, specify: _____	OTHE (SPECINC)	[__ __]	[__ __]	[__ __]

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Section V: Flexible forward-looking decision-making and governance

Q: Do you have access to and use drought resistant crop varieties when appropriate? *(01=Yes, 00=No)* If NO to USE, then ask the following qus Why do not you use? (Code: 01= Cost, 02= Lack of communication gap, 03= Lack of management , 04= Other, specify)	FFDDRC	[__ __] [__ __]
Q: Do you have access to and use flood resistant crop varieties when appropriate? *(01=Yes, 00=No)* If NO to USE, then ask the following qus Why do not you use? (Code: 01= Cost, 02= Lack of communication gap, 03= Lack of management , 04= Other, specify)	FFDFRC	[__ __] [__ __]
Q: Do you have access to and use early yielding crop varieties when appropriate? *(01=Yes, 00=No)* If NO to USE, then ask the following qus Why do not you use? (Code: 01= Cost, 02= Lack of communication gap, 03= Lack of management , 04= Other, specify)	FFDEYC	[__ __] [__ __]
Q: Do you have an alternative livelihood plan in case of excessive water logging or other livelihood shock? *(01=Yes, 00=No)* If NO to USE, then ask the following qus Why do not you use? (Code: 01= Cost, 02= Lack of communication gap, 03= Lack of management , 04= Other, specify)	FFDALP	[__ __] [__ __]
Q: Has any member of your household contributed to local development plans? *(01=Yes, 00=No)*If NO to USE, then ask the following qus Why do not you use? (Code: 01= Cost, 02= Lack of communication gap, 03= Lack of management , 04= Other, specify)	FFDLDP	[__ __] [__ __]

Section VI: Exposure

Environmental and climate hazards

Q: How many times have you been affected by waterlogging during the period 2001–2014?	EXPWLG	[__ __]
Q: How many times have you been affected by drought during the period 2001-2014	EXPDRT	[__ __]

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Q: How many times have you been affected by erosion during the period 2001-2014	EXPERO	[__ __]
Q: How many times have you been affected by a major storm or cyclone during the period 2001-2014	EXPSCY	[__ __]

~~Section VII: Sensitivity~~

Physical asset security

Q: Is your homestead adequately raised on a plinth that protects it against damages caused by waterlogging or storms? *(01=Yes, 00=No)* SPSHST [__ __]

Q: Do you have access to sanitation which has been raised on a plinth which you can use during parts of the year affected by waterlogging or storms? *(01=Yes, 00=No)* SPSSAN [__ __]

Q: Do you have access to a water pump which has been raised on a plinth which you can use during parts of the year affected by waterlogging or storms? *(01=Yes, 00=No)* SPSWPP [__ __]

Income Security

Q: For each month say whether your income is secure or unsecure. In addition, which months do you find you have insufficient income to fulfil needs.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Income	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
ISECI	*Codes for Q1: 1=Surplus, 2=Sufficient to meet needs, 3=Deficit, 4=Severe Deficit, 5=* **Not applicable**											
2. How do you meet any deficit	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]	[_____]
ISECDE	*Codes for Q2: 1=Reduce consumption, 2=Sell assets, 3=Obtain loan, 4=Beg, 5= work more,* **6= not appliicable** *, 7 = other, specify*											
3. what percentage of your income do you spend on food	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
ISECFO	*Codes for Q3: 1=Less than 10%, 2=Approximately 25%s, 3=Approximately 33%, 4=Approximately 50%, 5=Approximately 75%, 6=Greater than 75%*											

Food security

Q: For each month say whether the food you consume is mainly from your own farm or from other sources. In addition, which months if any you tend to find you do not have enough food to eat for your family.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Source of rice												
	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
SFSSOF	*Codes for Q1: 1=Mainly from own farm, 2=Mainly from off farm (purchase/aid/other)*											
2. Shortage / struggle to feed the family	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
SFSSFF	*Codes for Q2: 1=Shortage, 0=No shortage*											

Water Security

Q: For each month say, which months if any you tend to find you do not have enough water to maintain your livelihood

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1. Source of water												
	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
SWSSOW	*Codes for Q1: 1=sufficient, 2=insufficient 3=struggle, 4= not applicable*											
2. Shortage / struggle to satisfy the family with sweet water	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
SWSSWF	*Codes for Q2: 1=Shortage, 0=No shortage*											

Health security

Q: For each month say how long does it take you to travel to the nearest health facility.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Number of hours	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]
HSCHLF	*Codes: 1 = Less than one hour, 2 = More than one hour but less than two, 3 = More than two hours but less than four, 4 = Greater than four hours*											

Q: For each month estimate how many days your family is likely to miss work or school due to illness?

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Number of days	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]	[__]

HSCILL

Codes: 01=Less than one week, 02=More than one week but less than two weeks, 03=More than two weeks, but less than one month, 04=More than one month, but less than two months, 05=More than two months, but less than four months, 96=Other, specify

Q: For each month estimate what percentage of your income do you spend on medical treatment (transport and medicine).

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Percentage of income	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]	[__ __]

HSCMED

Codes for Q3: 1=Less than 10%, 2=Approximately 25%s,3=Approximately 33%, 4=Approximately 50%, 5=Approximately 75%, 6=Greater than 75%

PhD Household Level Survey Questionnaire

Section VIII: Closing up

Q. Is there anything you would like to add to what you have shared with us today in relation to the topic we discussed?

After the interview has ended, read out the following paragraph

Thank you for taking the time to answer our questions. You have given us very important information that will allow us to better understand livelihood issues in your area that can be shared with different people that are interested.

Were answers discussed with other family member? CLOTFM [__ __]
(answered by enumerator at end of survey) (1=Yes, 0=No)

For enumerator: Please note what, if anything, went differently from the plan in this particular interview (concerns, observations). Please note any points that you want to highlight as important for this interview – include also specific household characteristics that seem worth mentioning.

Training Manual: Task 3

Training Manual for Enumerators

The Role and Conduct of Enumerators and the Reporting Structure

Task and responsibilities of the field enumerators

The following are the tasks and responsibilities to be carried out by field enumerators hired to carry-out data collection in the field:

- Participate in and complete a two-day training that will include an examination of how much they have understood;
- Review and familiarise themselves with the questionnaire that will be used;
- Complete the relevant questionnaires to a high degree of quality and integrity;
- Verify all questionnaires have been filled in correctly, coherently and legibly completed prior to departure from the individual sites visited;
- Return all completed questionnaires to lead researcher or a supervisor on time;
- Compile legible notes on any issues encountered, and will provide feedback on any issues raised by respondents regarding the survey;
- Participate in daily group debriefing sessions;
- Remain available for clarification of any issues related to the data collection he/she will have carried out, as might be needed.

Ethics

The issue of ethics in research concerns the morals and values within the process of research, from inception, recruitment, conduct, data storage, process, outcomes reporting and data storage (after completion of research) .

Informed Consent

Informed consent is where a prospective participant, prior to participating in research, is fully informed about all aspects of the research project, in which s/he is considering participating, that might reasonably be expected to influence his/her willingness to participate. The researcher should normally explain all other aspects of the research about which the prospective participants enquire. Such aspects will include some or all of the following:

- the nature and objectives of the project.
- the methodology of the project and how it is to be conducted.
- who is undertaking and who is sponsoring the project.
- the potential risks and inconveniences that may arise.
- the potential benefits that may result.
- why the prospective participant has been approached.
- what participation in the research will require.
- how confidentiality will be protected.
- who to contact if something goes wrong.
- what is expected of the participants.

Do no harm' Principle

- The most important principle for research ethics is the 'do no harm principle' and many other principles stem from this principle.
- Many definitions exist e. g. "That which adversely affects the interests or welfare of an individual or a group" or "unusual discomfort or other negative consequences in the prospective participant's future life".
- As a general rule, people participating in research should not be exposed to risks that are greater than or additional to those they encounter in their normal lifestyles.
- Ensure that interviewees can stop at any time if they become distressed.
- Be aware of where interviewees can go for professional support, and don't offer it yourself unless you are trained e. g. you are not a councillor, do not attempt to be one, to do so is considered cavalier.

Things to consider:

- Know the proper conduct for the area you are traveling to.
- Avoid travelling during the evening and night.
- Ensure your personal safety.
- Protect yourself from attack and false accusations. Never hold interviews in a personal place e. g. bedroom away from public view.

Actions:

- Create a 'lone researcher' action plan.
- Ensure people (family, supervisor and host) know where you are and how you can be contacted at all times.
- Create a communication plan of action.

Practical Support

Structure

The questionnaire contains a number of modules which are denoted by headings e.g. "Weather and Seasonal information". Questions within each module are listed in **bold type** with a "**Q**" bullet point. Some questions have multiple parts (e.g., multiple rows or columns) where the enumerator is expect to proceed column by column. This is demonstrated below with an example.

Weather and Seasonal Information

Q: Have you received any official weather information during the last 12 months?

Codes for 2: 01=Family member, 2=Friend,3=NGO, 4=Government representative
Codes for 6: 01=Crop, 2=Seed variety, 3=Planting cycle, 4=Harvest cycle

		1. Did you receive any information?	2. From whom or how did you receive the information?	3. Who received the information in the household?	4. Did it include advice on how to use the information in your farming?	5. Were you able to use the advice?	6. What aspects of farming did you change as a result of this information?
Type of information		*(01=Yes, 00=No)* **If No, go to next row.**		*01=Men, 02=Women, 03=Both*	*(01=Yes, 00=No* **If No, go to next row.**	*(01=Yes, 00=No)* **If No, go to next row**	*(you can choose up to 3)*
		RECE	MSN1, MSN2, MSN3	WHO	INAD	USAD	ASP1, ASP2, ASP3
Forecast of drought or, flood	IWSP DF	[___]	[___] [___] [___]	[___]	[___]	[___]	[___] [___] [___]
Forecast of pest or disease outbreak	IWSP PD	[___]	[___] [___] [___]	[___]	[___]	[___]	[___] [___] [___]
Forecast of tha start of the rains	IWSF RA	[___]	[___] [___] [___]	[___]	[___]	[___]	[___] [___] [___]
Seasonal forecast of tha weather for the following 2-3 months	IWSP SF	[___]	[___] [___] [___]	[___]	[___]	[___]	[___] [___] [___]
Weather forecast of tha weather for today, 24 hours and/or next 2-3 days	IWSF WF	[___]	[___] [___] [___]	[___]	[___]	[___]	[___] [___] [___]

Good Enumerator Habits

Good interviewing means asking the questions properly and recording the answers accurately. Responses should be recorded during the interview. Experience has shown that the only accurate way to reproduce the responses is to record them during the time of the interview. Relevant information will most certainly be lost if recording is left until the interview has been completed.

The enumerators are expected to ask all questions, to ask them in the order presented and to make no unauthorized variations in the wording. If enumerators do not all interpret questions and responses in the same way, and in the way intended, they will each collect different data. Inconsistent data will not meet the needs of the research and it will fail to accomplish its objectives.

The training process is to ensure enumerators have detailed knowledge and experience of the questionnaire. to help translate the instruments into the local language(s). If all enumerators actively engage in this process, they will develop the understanding necessary to be effective interviewers and data collectors.

Five key general habits are listed below:

1. Prepare for the interview. Be intimately familiar with the data collection technique or instrument. Review any background materials in advance to prepare for the interview.
2. Be on time to all data collection sessions.
3. Be respectful and courteous to respondents.
4. Communicate with your supervisor.
5. Turn in assignments that are accurate, complete, and on time.

The enumerator should control the interview. Quite often respondents will avoid certain questions by trying to direct the discussion to other topics in the course of the interview. Some questions are necessary and unavoidable on the census questionnaires. The respondents may become tired of responding and need re-stimulation. On other occasions, they may be engaging in irrelevant accounts of how they happened to use a particular rice variety. Raising a well-timed question will put the interview on its proper course.

When introducing yourself to beneficiaries:

- Give your name, location of origin and some background on yourself (e.g. Student at Khulna University).
- Explain the purpose of your visit, i.e. that you are here to ask them some questions as part of academic research into rural finance institutions.
- Explain that you will be interested in speaking with both men and women in the household, possibly together or separately.
- They identities need to be collected for administrative purposes but will be anonymised during analysis and reporting.
- Explain that you are not government or NGO staff, and that you have been hired externally to assist in the large data collection exercise.
- Explain that you have no authority to make any promises or make any changes that may ameliorate any problems they face.
- Explain that as a result of this research, no NGO or government programme will be started that will help them in any way.
- To compensate them for their time, a payment of 100 taka will be made (non-negotiable).

The interviews seek detailed information and will be demanding for both enumerators and respondents. An enumerator who does not succeed in establishing rapport with the respondent, stumbles through the interview, and does not understand the instruments well enough to probe effectively, will not collect good data. Extensive practice is required so that interviewers develop the skills and comfort with the instruments to be effective.

The enumerator should help the respondents feel at ease and ready to talk. To achieve this, the enumerators should also be at ease. They can demonstrate to the respondents their confidence by using an informal and natural (conversational) manner of speaking. They should begin with a conversation on items of mutual interest, such as the weather. They should carry on such a conversation to allow the respondents a little time to get accustomed to the situation. However, this conversation should not be prolonged as the respondents' time is valuable.

Effective Data Collection Techniques for the Structured Interview

The key skills needed by the enumerator to conduct a structured interview include:

- Ensuring that biases do not affect the data collection process (cultural, social, economic, ethic, religious, and/or gender), and
- Being a good listener and recording what is being said.

Tips for enumerators to consider when conducting structured interviews include:

1. Introduction: The enumerator begins the interview by introducing himself or herself and the WFP study. The introduction begins the process of building a positive rapport with the respondent. The introductory statement is presented in the beginning of the data collection instrument. The enumerator should:

- Conduct the interview in a semi-private area where the respondent will be comfortable answering questions;
- Identify himself/herself, WFP, the purpose of data collection, the use of the information, and the interview process;
- Tell the respondent that he/she has a right to anonymity and confidentiality, a right to choose not to participate in the data collection process, and a right to refuse to answer any particular question;
- Ask the respondent if he/she has any questions before beginning the interview.

2. Building rapport: Rapport is the feeling of being comfortable with someone and trusting them. The enumerator should work to put the respondent at ease by: (1) being an active listener and (2) watching and responding in kind to the respondent's body language and physiology, including facial expressions, gestures, and the quality and type of movements.

3. Asking the questions:

- Follow the data collection protocol exactly: even slight variations in wording may affect responses.
- Ask all questions.
- Ask questions exactly as worded.
- Never assume or anticipate responses.
- Be patient and let the respondent finish.
- Ask all questions in a positive manner.

4. Listening to and encourage the respondent to talk. This means:

- Giving space for long answers, making encouraging noises.
- Not answering back when a respondent is provocative, but accepting what they say.
- Not making verbal judgments about what people tell you.
- Recording answers even if you think they are incorrect.
- Responding to questions (if asked) at the end of the interview.

- Continuing to listen even if you don't understand (ask for clarification during a break in the conversation using wording such as "could you please tell me more about…").
- Probing that indicates engagement with what the respondent is saying and encourages the respondent to explain their answer in more detail.
- Downplaying status differences verbally as well as through body language.
- Using body language that does not appear judgmental or exposes any negative feelings (for example, don't cross your arms).
- Using body language that signals interest (focus on the interviewee, maintain eye contact if culturally appropriate, nod, smile, sit upright, stay alert, and engage).
- Although the enumerators should encourage the respondent to talk, there needs to be a careful balance with moving the interview along in a timely manner.

5. Recording the answers: Ask and record answers to all questions. Use insightful probing when necessary to identify the appropriate pre-coded responses or, in the case of open-ended questions, write the exact wording used by the respondent.

6. Prompting: Follow the data collection protocol for each question such as suggesting possible answers, showing cards, or using proportional piling.

7. Ending the interview by:

- Thanking the respondent for his or her time.
- Asking if the respondent has any questions.
- Addressing any questions raised.

8. Review: Upon leaving the respondent, locate a place where you can review the questionnaire to ensure that you have not missed anything. If you missed a question or are uncertain of a response, return and complete or correct the instrument immediately. If this is not possible, tell your supervisor immediately.

Probing to Draw Information from Respondents

Effective enumerators need to be proficient at probing. Probing is not a data collection technique per se. Instead, it is a technique for drawing information from respondents in an indirect way during interviews. For example, a respondent may not be able to immediately recall the quantity of maize produced in the last season. Probing is the act of asking additional questions designed to lead the respondent through a thought process in order to discover the answer to the question. In this example, these questions might probe about how much land the respondent planted with maize, how many bags they filled at harvest, etc.

Some of the key elements and points of effective probing include:

1. Probing augments other data collection techniques such as in-depth interviews, group discussions, or structured interviews.
2. Understand what information you require from the respondent before you begin probing.

3. Develop a probing strategy for each question. This will help guide a respondent to provide the desired information.
4. Common probing techniques include:
    - Restate what the respondent just said. Encourage talking by nodding your head, etc. In many cases, your goal is to let the respondent 'tell the story" about information you require. This technique is often used for in-depth interviews or open-ended questions.
    - Alternatively, a series of sub-questions are asked to assist or guide the respondent through the process of remembering or calculating the desired information. In this case, the senior researcher will often suggest the appropriate sub-questions. However, researchers cannot anticipate every situation and enumerators will have to be familiar enough with the questions and the subject matter to determine effective probing strategies in unanticipated situations.
5. Typical questions requiring probing include: recalling the quantity of a particular crop produced in the last season or recalling the amount of fertilizer or pesticide used last season. Another common set of questions that may require probing are those that asking a respondent to rank or rate response.

If the respondent has concerns about confidentiality

All information collected in the census will be treated as strictly confidential by the CSO and will be used only for statistical purposes. No Government Department or Agency or NGOs or individual will have access to information collected. The confidentiality of all information collected is guaranteed by University ethical code of practice, and the penalty for any breach of confidentiality is immediate termination of employment.

If the respondent wants to know what will happen with information gathered

The information will be used as part of research which seeks to understand the role between rural financial institutions and livelihoods. The research will ultimately result in research findings that will not name any household. These research findings will be collected to produce a book which can be used to teach other students regarding how financial institutions affect livelihoods in a rural setting.

If the respondent wants to know why he should cooperate

Inform the respondent that everyone else in the village is participating in the study. Although participating will involve time, he will be compensated with 100 taka. Inform the respondent that participating in the survey will improve the knowledge of students and academia as a whole.

When interviewees go off-topic

If during the interview the respondent answers questions that deviate from the question sheet or want to discuss other topics:

- Explain you are willing and interested to listen to their problems, but you would rather cover them after you finish your questionnaire.
- When you have finished, re-iterate that you are not NGO or government staff and that you have no authority or ability to change or address any issues that might arise. Additionally,

remind them that no help will come to them as a result of them discussing their problems with you.

Missing Values

It is impossible for a person other than the enumerator (for example, a person entering or analyzing data) to know how to interpret a blank (i.e., unfilled) response. Possible interpretations include: (1) the respondent could not answer the question, (2) the enumerator forgot to fill in the answer or forgot to ask the question, (3) the respondent answered "0", or (4) the enumerator legitimately skipped the question because it was not relevant for the respondent. To avoid confusion about how to interpret blank fields, enumerators should always enter either a valid response or a missing value code in every field. Unless otherwise noted, if a respondent does not answer a question for any reason, the enumerator should enter "-9" (the missing value code) in the field. One exception to this rule is when administering the questionnaire on paper and the enumerator legitimately skips a question because of a skip pattern, then the field may be left blank or unfilled. In this case, the status of the question is obvious from the skip pattern and can be filled with the missing value code automatically during analysis.

Closing the interview process

- As you close the conversation with beneficiaries, make an effort to clarify any doubts you may have immediately. Having doubts is ok, not clarifying them is not.
- Thank the beneficiaries for their time and explain that the information you have collected will be very useful to the academic study that you are helping.
- Give them the 100 taka payment.

Dealing with refusals

We look to you to gain the household's confidence and encourage their participation. If someone refuses to accept a form, be courteous and explain that:

- The information is important for the PhD research that is being carried out and that everyone else in the village is also participating in the research;
- The form should not take too long to complete and if necessary, you can come back another time that is more convenient for them;
- Remind them that they will be compensated for their time, 100 taka;
- Inform the head of household that if it makes it easier on them, some of the more basic and less important questions can be asked to other household members;
- Inform them that most of the questions just require a yes or no answer;
- Inform them that all information is confidential and is used for academic purposes only;
- Do not cause any antagonism. Suggest the possibility of giving a brief overview of the questions in the questionnaire so that they can understand the topics being covered.

If the householder still refuses:

- Record the date of the interview and the name of the household;
- Summarise your interaction with the householder on the last page of the questionnaire and record the time of your call.
- Notify your field supervisor of the refusal.

Appendix D

Consent form: Household interviews

University of Leeds

The role of microfinance in autonomous adaptation to climate change

Name of Researcher: _Adrian Fenton_____

Initial the box if you agree with the statement to the left

1 I confirm that I have read and understand the information sheet dated June 2011 explaining the above research project and I have had the opportunity to ask questions about the project.	☐
2 I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.	☐
3 I understand that my responses will be kept strictly confidential. I give permission for members of the research team to have access to my anonymised responses. I understand that my name will not be linked with the research materials, and I will not be identified or identifiable in the report or reports that result from the research.	☐
4 I agree for the data collected from me to be used in future research	☐
5 I agree to take part in the above research project and will inform the principal investigator should my contact details change.	☐

_____ _____ _____

Name of participant (or legal representative) | Date | Signature

_____ _____ _____

Name of person taking consent (if different from lead researcher) | Date | Signature

To be signed and dated in presence of the participant

Copies:

Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form, the letter/pre-written script/information sheet and any other written information provided to the participants. A copy of the signed and dated consent form should be kept with the project's main documents which must be kept in a secure location.

Interview question sheet

1st Research question

What influence is microfinance having on household adaptation?

Introduction

1. Hello my name is Adrian Fenton, I work for a University in England (SHOW BUSINESS CARD). My colleague here works for Khulna University, she is acting as translator between us.
2. I want to talk to you today about your livelihood here and your experience living in this village. This is to write books in order to teach younger students about the problems facing households in rural Bangladesh.
3. You will have already have spoken to another assistant of mine called (CROSS REFERENCE NAME). We are here today to talk more in-depth about your life and give you more of a chance to talk.
4. We'd like to speak to the female and male head of the house. Please do not feel as if you have to talk to us, you have every right to turn us down or ask us to come back at a different time.
5. Your participation will entail answering questions for about 2 hours. The information will not be given to anyone and will be confidential between us. Like last time we will compensate you with 200 taka if you wish to be part of the interview.
6. I must stress at this point that we are not representatives from charities so please do not feel that you need to present a presubscribed agenda. It is important that what we gain from you is the truth. We will not be able to offer you any support with any issue that you may have, as this is academic work for a university all we can offer you is compensation for your immediate time.

Interview questions

Focus area: environmental/climate events affecting household

Initial interview question

- What flooding, drought, and storm events have affected you over the last 10 years?

Potential prompting questions

- Were you affected by major flooding events in 2004 and 2010?
- E.g. Were you affected by cyclones in 2007 (Sidr) and 2009 (Aila)?
- Have you been affected by any other livelihood shock in the last 10 years?
  - E.g. Drought or disease outbreak damaging crops and livestock

Focus area: effect of environmental/climate events on livelihoods

Key definitions

- Livelihood: income activities, resources, and strategies used by households to maintain their consumption, cope with uncertainty, and respond to new opportunities that may arise.

Initial interview question

- How has flooding affected your livelihood?
- How has drought affected your livelihood?
- How have storms affected your livelihood?

Potential prompting questions

- How have they affected any land owned or farmed/ ponds owned/ trees owned (natural assets)?
- How have they affected family illnesses, injury, food security, education (human assets)?
- How have they affected material possessions (e.g. television, cell phone, transport, agricultural equipment) and homestead (physical assets)?
- How have they affected livestock (bovine, ovine, fowl), savings, debt (financial assets)?
- How have they affected group membership and support networks – both structures and dynamics (social assets)?
- How has it affected the relationship between you and your livelihood patron?
- How has it affected your interactions with other community members?
- How has it affected your livelihood plan and strategies?
- How has it affected household wage labour opportunities?
- How has it affected living costs?

Focus area: risk management perspective

Key definitions

- Prevention: the measures adopted to avoid or reduce the probability (Becker 2009), intensity and frequency of disaster events.
- Preparation: the measures adopted and capacities developed to establish efficient and effective 'response' and 'recovery'.
- Response: the activation of plans and provision of emergency services, designed to deal with the adverse impacts caused by a disaster in the 'during' and 'after' phases.
- Recovery: the restoration and improvement of facilities, livelihoods and living conditions of those affected by disasters during the 'after' phase of a disaster.

1st Initial interview question

- What do you do to prevent these events from happening?

Potential follow-up questions

- What prevention options do you have to for events?
  - What is the most important prevention option you have?
- What facilitates your efforts to prevent these events?
  - What is the most important factor which facilitates your prevention of these events?
- What inhibits your efforts to prevent these events?
  - What is the most important factor which inhibits your prevention of these events?
- Has your ability to prevent these events changed over time, if so how?

2nd Initial interview question

- What do you do in order to prepare for these events?

Potential follow-up questions

- What preparation options do you have to these events?
  - What is the most important preparation option you have?
- What facilitates your preparation for these events?
  - What is the most important factor which facilitates your preparation for these events?
- What inhibits your preparation for these events?
  - What is the most important factor which inhibits your preparation from these events?
- Has your ability to prepare for these events changed over time, if so how?

3rd Initial interview question

- What do you do to respond to these events?

Potential follow-up questions

- What response options do you have to these events?
  - What is the most important response option you have?
- What facilitates your response to these events?
  - What is the most important factor which facilitates your response to these events?
- What inhibits your response to these events?
  - What is the most important factor which inhibits your response to these events?
- Has your ability to respond for these events changed over time, if so how?

4th Initial interview question

- What do you do to recover from these events?

Potential follow-up questions

- What recovery options do you have to these events?
  - What is the most important recovery option you have?
- What facilitates your recovery from these events?
  - What is the most important factor which facilitates your recovery from these events?
- What inhibits your recovery from these events?
  - What is the most important factor which inhibits your recovery from these events?
- Do you consider yourself as still recovering?
- Has your ability to prepare for these events changed over time, if so how?

Potential prompts

- E.g. joint community efforts (e.g. drainage groups), expenditure saving activities (gathering fuel, fodder etc), changes in diet (cheaper foods), reduce consumption (eating less), periodic migration, call in small informal debts from kin and neighbours, use up cash savings, pledging future labour in return for advanced wages or loans, take cash or kind loans from kin and neighbours, taking cash or kind loans from moneylenders and shopkeepers, mortgaging or pawn assets (utensils, jewellery, land, etc.), sale of non-productive assets, sale of working capital at knock-down prices (e.g. paddy stocks), sale of productive assets (small

animals, livestock, tools etc), pull children out of school to work, leave a microfinance program.

Focus area: attempted livelihood adaptations

Key definitions

- Livelihood: income activities, resources, and strategies used by households to maintain their consumption, cope with uncertainty, and respond to new opportunities that may arise.
- Livelihood adaptation: the ways in which livelihoods have and are changing which empower them to plan and cope with current climate variability and future anticipated change.

Initial interview question

- What changes have you made to your livelihood in order to reduce the impact of these events?

Potential follow-up questions

- What has been the most important change to your livelihood, and why?
- What has facilitated your efforts to change your livelihood?
  - Which has been the most important factor which facilitates your efforts to change your livelihood?
  - What role has microfinance had in facilitating adaptation actions?
  - Has access to microfinance expanded the range of adaptation options available to you?
- What has constrained your efforts to change your livelihood?
  - What role has restricted access to finance had in constraining adaptation efforts?
  - What is the most important factor which inhibits your efforts to change your livelihood?
  - NEED PROMPTS FOR: Physical, economic, financial, technology, social, cultural, institutional, knowledge, awareness, human, and governance constraints.
- Has your ability to make changes to your livelihood changed over time, if so how?

Initial interview question

- What has been the effect of the changes to your livelihood?

Potential follow-up questions

- Has it affected your ability to plan with regards to environmental change, if so how?
- Has it affected your ability to cope with environmental change, if so how?
- Has it affected your ability to plan with regards to future anticipated environmental change, if so how?
- Has it affected your ability to cope with regards to future anticipated environmental change, if so how?

Initial interview question

- What other changes to your livelihood have occurred over the last ten years?

Potential follow-up questions

- Have you made any changes to livestock?
- Have you made any changes to aquaculture?

- Have you started any businesses?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Focus area: microfinance - drivers of vulnerability

Key definitions

- Microfinance: the provision of small-scale financial products (savings, credit, insurance) to low-income groups.
- Livelihood intensification: increasing of average units of labour or capital by households in income generating activities for the purpose of increasing value of output.
- Livelihood diversification: the process of households constructing a more diverse portfolio of activities and social support capabilities in order to maintain their consumption, cope with uncertainty, and respond to new opportunities that may arise which empower them to plan and cope with current climate variability and future anticipated change.

Initial interview question

- What agricultural inputs do you use on your land (pesticides, fertiliser, and insecticides)?

Potential follow-up questions

- Has your usage of agricultural inputs changed over time, if so how?
- What has been the effect of using more agricultural inputs?
- What has been the effect of using more agricultural inputs on household consumption?
- What has been the effect of using more agricultural inputs on the way in which you cope with uncertainty?
- What role has savings had in your usage of agricultural inputs?
- What role has credit had in your usage of agricultural inputs?
- What role have MFIs had in your usage of agricultural inputs?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What different activities have you diversified into ~~in order to meet household needs~~?

Potential prompts

- E.g Staple crops (rice, wheat), cash crops (Jute, Cotton, Sugarcane), fruit, vegetables, timber/fuel wood, large livestock, small livestock, dairy products, poultry and poultry products, shrimp/prawn farming, fishing, employment on another farm, employment on NGO/government work programmes, other paid employment (e.g. salary), business (other than farm products), remittances, payments for environmental services, other payment from projects/ government including benefits in kind (e.g. pensions, aid, subsidies, etc.), renting out your farm machinery (e.g. tractor, thresher, pump, etc.) or animals for traction, renting out your own land.

Potential follow-up questions

- What has been the most important activity you have diversified into?
- What facilitated your efforts to diversify your livelihood?
  - What is the most important factor which facilitates your efforts to diversify your livelihood?
- What inhibits your efforts to diversify your livelihood?
  - What is the most important factor which inhibits your efforts to diversify your livelihood?
- Has your ability to diversify your livelihood changed over time, if so how?
- What has been the effect of having a more diversified livelihood?
- What has been the effect of a more diversified livelihood on household consumption?
- What has been the effect of a more diversified livelihood on the way in which you cope with uncertainty?
- What role have savings had in diversifying your livelihood?
- What role has credit had in diversifying your livelihood?
- What role have MFIs had in diversifying your livelihood?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What changes or repairs have you made to your homestead (quality and plinth) over the last ten years?

Potential follow-up questions

- What facilitated your efforts to improve or make repairs to your homestead?
  - What is the most important factor which facilitates your efforts to improve or make repairs to your homestead?
- What inhibits your efforts to improve or make repairs to your homestead?
  - What is the most important factor which inhibits your efforts to improve or make repairs to your homestead?
- Have your efforts to improve or repair your homestead helped to protect it against storms and flooding?
- What role have savings had in changing or making repairs to your homestead?
- What role has credit had in changing or making repairs to your homestead?
- What role have MFIs had in changing or making repairs to your homestead?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What do you do when you are in need of external support?

Potential follow-up questions

- Who do you go to when in need of support?
  - Friends and extend family (obtain names).
  - Patrons
  - Elected Government Officials
  - Financial cooperatives
  - NGOs
  - Banks
- Does who you go to change depending on the type of support needed, if so how?
- What role have MFIs had in providing you with support?
  - What support have you received?
- What effect has MFIs and the services they offer had in enabling you to improve your support networks, social prestige, trust with fellow community members, and cooperation with fellow community members?

Initial interview question

- How has your ability to access financial services changed over the last 10 years?

Potential follow-up questions

- Are you better able to obtain credit?
- Are you better able to formally save?
- Is credit cheaper?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What effect have providers of microfinance had on your ability to access education services (including financial management), skills training, health services, and natural resource management training?

Focus area: microfinance – response capacity

Initial interview question

- In what way is meeting debt repayments affecting your livelihood

Potential follow-up questions

- How have your physical assets been affected?
- How has your consumption levels been affected?
- How has your ability to save been affected?
- How has your ability to obtain loans been affected?
- How have you met reduced any subsequent consumption and expenditure levels?
- Has there been any effect on your social standing within the village?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What coping mechanisms do you have in order to cope with environmental and climate events?

Potential follow-up questions

- What effect has microfinance on your coping mechanisms for these environmental/climate events?

Potential prompts

- E.g. joint community efforts (e.g. drainage groups), expenditure saving activities (gathering fuel, fodder etc), changes in diet (cheaper foods), reduce consumption (eating less), periodic migration, call in small informal debts from kin and neighbours, use up cash savings, pledging future labour in return for advanced wages or loans, take cash or kind loans from kin and neighbours, taking cash or kind loans from moneylenders and shopkeepers, mortgaging or pawn assets (utensils, jewellery, land, etc.), sale of non-productive assets, sale of working capital at knock-down prices (e.g. paddy stocks), sale of productive assets (small animals, livestock, tools etc), pull children out of school to work, leave a microfinance program.

Focus area: microfinance – managing climate risk

Initial interview question

- What drought or flood resistant crops do you use?

Potential follow-up questions

- What has been the effect of using these crops varieties?
- What facilitated your efforts to purchase these crop varieties?
  - What is the most important factor which facilitates your efforts to purchase these crop varieties?
- What inhibits your efforts to purchase these crop varieties?
  - What is the most important factor which inhibits your efforts to purchase these crop varieties?
- What role has microfinance had in obtaining drought or flood resistant crops?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- What have you done to protect your homestead against storms and flooding?

Potential follow-up questions

- How successful have these attempts been?
- What facilitated your efforts to protect your homestead against storms and flooding?
  - What is the most important factor which facilitates your efforts to protect your homestead against storms and flooding?
- What inhibits your efforts to protect your homestead against storms and flooding?

    - What is the most important factor which inhibits your efforts to protect your homestead against storms and flooding?
- What role has microfinance had in improving your homestead to better withstand flooding and storms?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?
-

Initial interview question

- What have you done to protect your livelihood against climate and environmental events and risks?

Potential follow-up questions

- How successful have these attempts been?
- What facilitated your efforts to protect your livelihood against climate and environmental events and risks?
    - What is the most important factor which facilitates your efforts to protect your livelihood against climate and environmental events and risks?
- What inhibits your efforts to protect your livelihood against climate and environmental events and risks?
    - What is the most important factor which inhibits your efforts to protect your livelihood against climate and environmental events and risks?
- What role has microfinance had in protecting your livelihood against climate and environmental events and risks?
- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Initial interview question

- Has access to credit and MFIs helped you to stabilize your livelihood and income flows from the effects of environmental and climate events?

Potential prompts

- E.g. Gain or shift from on-farm to off-farm labour, take a loan, refinance debt, diversify income sources (including regular and low-risk economic activities), start a microenterprise, purchase assets which generate stable rental income.

Potential follow-up questions

- How have these changes affected your ability to cope with flooding, drought, and storms?
- How have these changes affected your sensitivity to flooding, drought, and storms?
- How have these changes affected your exposure to flooding, drought, and storms?

Appendix E

Interview question sheet: MFI representative interviews

2nd Research question

How are MFIs incorporating climate change into programs and performance review?

Interview questions for Branch Manager

External risks

Initial interview question

- What kind of external risks does your organisation face?
  - For instance: competition, lack of information on applicants, risks relating from profile of clients, environmental disasters risk.

Potential prompting questions

- How does your organisation perceive climate change risks?
- Do you consider it a short term or long term risk?
- Do you consider them less important than the other risks that you face?

Initial interview question

- What major environmental /climate events have affected your work (here in Nowapara Village)?

Potential prompting questions

- How was your work affected?
- Have environmental or climate hazards lead ever to the destruction of offices and records?
- Were you affected by cyclones in 2007 and 2009?
- Were you affected by major flooding events in 1998, 2004 and 2010?

Performance management

Initial interview question

- How is your financial performance affected by environmental/climate events?

Potential prompting questions

- Do environmental or climate hazards result in increases in default rates, repayment issues, increased insurance claims, or mass deposit withdrawals?
- How is portfolio quality' (Portfolio at risk > 30, Write Off Ratio, Risk Coverage Ratio) affected by environmental/climate events?
- How is 'profitability and sustainability' (profit margin, return on assets, return on equity), affected by environmental/climate events?
- How is 'asset and liability management' (yield on gross portfolio, gross loan portfolio to assets, debt to equity), affected by environmental/climate events?

- How is 'efficiency and productivity' (operating expense/loan portfolio, personnel expense/loan portfolio, cost per borrower, average loan balance per borrower) affected by environmental/climate events?

Initial interview question

- Do you measure the impact of your work on the lives of your beneficiaries (social performance management)?

Potential prompting questions

- How do you feel environmental and climate events are affecting the livelihoods of the people you are helping?
- What impact do you think climate and environmental events are having on the lives of your beneficiaries?

Process of accepting applications

Initial interview question

- What factors do you consider when deciding to accept an application for a loan?

Potential prompting questions

- Do you have any environmental or social safeguards?
- Do you consider the purpose of the loan and how it will affect others? (maladaptation)
- Do you take into account the level of wealth of an applicant when deciding whether to accept an application for a loan or membership?
- Do you take into account the sensitivity of an applicant's livelihood to environment and climate hazards?
- What happens when an application fails to meet these safeguards?

Internal climate proofing efforts

Initial interview question

- What steps has your organisation taken to climate proof your internal operations in order to reduce the environmental and climate risks to which you are exposed?

Potential prompting questions

- Have there been any changes with respect to internal policies and procedures due to environmental/climate related events?
- Have you made any plan or attempt to develop contingency plans?
- Do you use any specific tool or framework to evaluate the environmental risks of clients' activities (categorizing clients per level of risk using sectorial factsheet, surveys, exclusion list, etc.)?
- Has any training been provided to field officers on how to evaluate the environmental risks of their clients' activities?
- Have you made any plan or attempt to diversify clientele geographically or economically?
- Have you planned or attempted to make repayment schedules more flexible in times of environmental/climate events (or any other events)?

- Do you attempt to limit the proportion of environmentally-risky activities in your loan portfolio?
- What constraints do you face in attempting to do so? i.e. adaptation contraints definition
- What opportunities do you have in attempting to do so? i.e. adaptation opportunity definition

External climate proofing efforts

Initial interview question

- What efforts have been made to reduce your exposure to climate risks through your beneficiaries?

Potential prompting questions

- Have there been any changes with respect to product and service design due to environmental/climate related events?
- Do clients who borrow money to rebuild their homes have to build climate resilient homesteads (that incorporates concrete pillars and corrugated sheets).
- Includes clauses in the contract requiring clients to improve environmental practices / mitigate environmental risks
- What constraints do you face in attempting to do so? i.e. adaptation contraints definition
- What opportunities do you have in attempting to do so? i.e. adaptation opportunity definition
- Could alliances with other development actors such as NGOs help you provide more holistic products?