

**IMPACTS OF STRUCTURAL MITIGATION
MEASURES ON PERCEPTIONS OF
COMMUNITY FLOOD RESILIENCE:
EXPERIENCES FROM *HAOR* COMMUNITIES
OF BANGLADESH**

Submitted in fulfillment of the requirements of the degree of Doctor of Philosophy

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Bangladesh, Community Participation, Community Resilience, Community Vulnerability, Dependency Theory, Development, Disaster Risk Reduction (DRR), Flood Mitigation, Freedom, *Haor* Region, Incrementalism, Non-Governmental Organization (NGO), Participatory Planning, Perceptions, Rational Planning and Structural Mitigation Measures.

Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

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Abstract

Community perceptions of flood resilience hinge upon the translation of their impressions of events in the built environment, which influence that community's ability to resist, cope with and recover from the adverse impacts of flooding. Any change in the built environment with structural mitigation measures, moderates community perceptions of resilience. These structures may be constructed from local or imported materials and may involve indigenous or non-traditional methods. Particularly in developing countries, non-governmental organizations (NGO)- often in collaboration with communities - design and fund nontraditional structural measures (e.g. brick walls, concrete blocks revetments) to enhance community resilience. Considering the impacts of these measures upon communities, exploration of community reactions towards these measures and their consequences is essential. This research explores perceptions of community flood resilience amongst adults from *haor* communities in Bangladesh's *Haor* region from a perspective of change in the surrounding environment, with structural mitigation measures as an outcome of development planning activities. This is challenged with the dilemma of rational and participatory planning paradigms.

The *Haor* region is a mosaic of wetlands and seasonally inundated lands and is transformed during the annual monsoon season into a shallow inland sea. Here, communities live on constructed islands, reinforced by indigenous or non-traditional structural measures, where unmitigated wave activity places communities at significant risk.

This grounded theory research employs the explanatory single-context but multiple case-study approach in a post-positivist way. In situ data collection from case study communities includes focus group discussions, historical timeline preparations, SWOT analyses, pair-wise comparison and ranking along with a major focus on cognitive mapping, in a participatory way. Besides involvement with community members, relevant key informants are interviewed, and documents are reviewed to collect diversified data on the same issues from multiple sources.

This research provides empirical pieces of evidence to understand the process of constructing community perceptions of flood resilience, especially in a scenario where the built environment has been changing because of NGOs' interventions. It highlights eight factors that exacerbate community flood vulnerability, (i.e., unmitigated wave activity, inappropriate

mitigation structure, risky location of settlements, lack of knowledge and skills for building houses and settlements, communal disagreement, inexperience, financial incapability and harmful decisions made by NGOs) and twelve factors that enhance community flood resilience (i.e., vegetation for mitigating waves, appropriate mitigation structure, favorable location for settlements, knowledge and skills for building houses and settlements, communal unity, self-financial capacity, interdependability, awareness, local leadership, external financial support and external organizational support). The comparative ranking of these factors provides the evidence for proving communities' dependency on NGO support.

The relationship between two dynamic forces, community capacities and NGOs' involvement, is investigated to evaluate the nexus of rational and participatory planning paradigms in externally supported development activities. The practice of community participation in most of the cases is discovered as ritualistic, where communities find themselves in a captive condition, to be coerced to agree with pre-decided development goals and means of achieving those goals. Involvement of NGOs for an extended period has entrapped communities in a dependency cycle through establishing a patron-client relationship between NGOs and communities and creating expectations in these communities that they will receive better support in the future. This research introduces the theory of support dependency, which explains the reasons behind the prolonged and underdeveloped condition of marginalized communities and the relationship of this condition with external support that the communities receive from NGOs. NGOs' involvement as the external support is dominated by the top-down process, where the 'upward accountability' controls development initiatives and ignores community concerns and priorities. NGOs' involvement for an extended period with support that is not as per community concern, entraps the community into a cycle of support dependency, whereas the prioritization of community concerns through active community participation can assist them to get free from this dependency cycle. This research proposes to practice a mixed approach of linear and nonlinear process for having incremental adaptation, considering the need to accommodate community concerns and priorities into the dogmatic format of rational planning.

This research explains perceived resilience as the freedom of choice, which is desired to be achieved through eliminating all factors of vulnerability. Each vulnerability factor as a source of 'unfreedom' hinders the possibility to enjoy the desired level of freedom. Freedom is desired to be achieved through the expansion of community capabilities to lead the kind of lives they value. In the nexus of two radically opposite planning paradigms, rational planning and participatory planning, this research introduces the concept of an incremental planning

paradigm for incremental adaptation, considering the reality of limited information, changed scenario and uncertainties associated with hazard events. Conceptually, it allows the admission of all potential failures and to grow incrementally, by accommodating input from active community participation in a timely manner. The concept of incremental adaptation, as a post-positivist paradigm within the field of disaster mitigation planning, significantly contributes to allowing flexibility within the rational planning approach for having effective anticipatory and responsive adaptation.

This research lays the empirical evidences to articulate better understanding of community resilience from the perspective of development. Through discovering the reasons of support dependency of marginalized communities, this research proves the necessity of practicing community participation at a meaningful level and prioritizing community concerns and demands in the planning process. This discovery contributes to inform decision makers' understanding of NGOs and their ways of practice.

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List of Abbreviations

CAP	Community Action Plan
CBA	Community Based Adaptation
CDoT	Colorado Department of Transportation
COG	Core Occupational Groups
CVCA	Community Vulnerability and Community Analysis
DHHS	Department of Health and Human Services
DMB	Disaster Management Bureau
DRM	Disaster Risk Management
EKATA	Empowerment, Knowledge and Transformative Action
FEMA	Federal Emergency Management Agency
FSUP-H	Food Security for Ultra Poor - <i>Haor</i>
GO	Governmental Organization
GoB	Government of Bangladesh
GMP	Growth Monitoring and Promotion
HISAL	<i>Haor</i> Initiatives for Sustainable Alternative Livelihood
ICWE	International Conference on Water and Environment
IFAD	International Fund for Agricultural Development
IPCC	Intergovernmental Panel on Climate Change
MoEF	Ministry of Environment and Forest
MoWR	Ministry of Water Resources
NAPA	National Adaptation Programme of Action
NGO	Non-Governmental Organization
POPI	People's Oriented Program Implementation
PRA	Participatory Rural Appraisal
PUA	Participatory Urban Appraisal
SHOUHARDO	Strengthening Household Abilities for Responding to Development Opportunities
SWOT	Strength Weakness Opportunity Threat
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNISDR	United Nations Office for Disaster Risk Reduction
USAID	The United States Agency for International Development
VDC	Village Development Committee

WMO

World Meteorological Organization

Chapter 1 Introductory Statement

Enhancing community resilience is a prime objective for contemporary disaster risk management planning (Schelfaut et al, 2011; Klein et al, 2003; Geis, 2000). It is also a critical aspect of flood risk management, which requires a systematic process of capacity building through incorporating both structural and non-structural flood mitigation measures (Bosher et al, 2007) so that a community can return to its usual state without external assistance, following a flood incident. Community flood resilience is the combination of capacities, skills and knowledge that allows a community to recover from a flood incident. Enhancing community resilience is necessary to eliminate the risk factors, which define community vulnerability, but scholars have different opinions about defining the properties of community resilience and ways of developing or enhancing community resilience to deal with any kind of disaster incident. Communities also perceive the status and properties of their flood resilience, in the process by which people translate sensory impressions into a coherent and unified view of the world around them. Perceptions guide behaviors and Schelfaut and his colleagues (2011) indicate that for enhancing resilience, it is necessary to know communities' risk perception. A community, living with a condition of experiencing a disaster, obviously perceives risk and practices some ways and follows specific behaviors to deal with it. For discovering the perception of community resilience, some authors (Luthar & Cichetti, 2000; Kuhlicke, 2013) prioritize the understanding and analysis of individual community members' behaviors and mindsets. Hence, social and physical environments are central to the functioning of individuals. The physical environment refers to the built environment which can be altered or modified with structural flood mitigation measures (e.g: embankments, wave protection walls, seawalls) Every change in the built environment triggers a change in an individual's behavior and collective changes of a group of individuals denote the change in communal behavior. Flood and any kind of venture (like, having structural mitigation measures) related to flood, those that make any change in and of the surrounding environment, provide a context to the community to construct a perception about flood resilience.

As the process of adaptation, the adoption of structural mitigation measures and non-structural measures (e.g. land-use zoning, early warning, evacuation, education, lifestyle adaptation) aids in the mitigation of flood losses. The development policies of governmental, non-

governmental and donor organizations often target developing adaptive capacities (or community resilience) among the vulnerable communities of less-developed countries (Cannon & Muller-Mahn, 2010). Though the popular discourse of development always includes economic growth, in the context of resilience, this ‘development’ may integrate the process of adaptation.

In the development context, the trend of partnership among government organizations, nongovernment organizations and donors is widely practiced to address unsolvable challenges of marginalized communities (Brinkerhoff, 2003). This kind of external involvement for developments often focuses on standard practices, applying a top-down, technocratic rational paradigm. The rational paradigm asks the experts or planners to identify and define a problem, to fix goals, and objectives, to prepare a list of all possible ways to solve the problem, to find all possible consequences for each policy alternative with a probability of occurrence, to compare consequences and finally to select the ‘best’ solution (Berke & Beatley, 1992). Understanding all risks adequately, predicting all events reliably and evaluating responses objectively using accurate assessments of costs and benefits is hard to achieve (Heazel et al, 2013). Moreover, the rational paradigm generates dependency on prescribed measures as well as actions taken by authorities (or external bodies). Enhancing community resilience demands local community participating in the bottom-up process and owning the power of decision making to incorporate their views, ideas and concerns according to their perceptions. The bottom-up process of participatory planning as an important means to expand democracy and improve the quality of decision-making (Monno & Khakee, 2012) can engage local communities, where communities take responsibility for their own welfare and develop a capacity to contribute to individual as well as community development (Oakley & Marsden, 1987). Communities have perceptions about flood resilience and these perceptions might facilitate the generation of a different set of priorities and concerns to those of external bodies who want to help to develop their communities with or without structural flood mitigation measures. Where decision-making power is shared in a participatory way, community perceptions about flood resilience may inform selection of locally appropriate measures, incorporating local priorities and concerns.

This research aims to investigate community perceptions about community flood resilience along with its association with structural mitigation measures. It considers the dilemma of participatory versus rational planning paradigms, while introducing structural mitigation measures for mitigating flood losses as a part of externally supported development activities.

Through evaluating the planning process, it will aid in developing a better understanding of the local level planning frameworks for enhancing community flood resilience, identifying an appropriate balance between top-down and bottom-up approaches.

The research focuses on regularly flood-affected *haor* communities in Bangladesh. These communities experience annual floods, the adverse impacts of which have been sought to be reduced through external technical and financial support from non-governmental organizations (NGO). These are for building structural flood mitigation measures, along with other development initiatives. The *haor* communities are similarly named as the *Haor* region of north-eastern Bangladesh. The region of over 24,000 km² (Alam & Hassan, 2010), is a mosaic of wetlands and seasonally inundated lands (MoWR, 2010) which annually turns into an extensive yet relatively shallow (depth 1.8 m to more than 3 m) (MoEF, 2005) waterbody. The settlements within the Haor region accommodate over 19 million people (MoWR, 2010) in artificially elevated and isolated islands, comprising 12% of the whole area (Alam & Hassan, 2010). This research employs multiple lines of inquiry, which include case study, document review, focus group discussion, cognitive mapping, in-depth semi-structured interview, historical timeline preparation and pair-wise comparison, mostly in a participatory appraisal manner to get data about the planning process in the Haor region and flood experiences of selected *haor* communities.

This research will improve decision-makers' understanding of community flood resilience, enabling the creation of local plans that address uncertainties associated with community capacity to respond to flood risk. Further, it will explore the consequences of structural flood mitigation activities on community perceptions of risk, allowing for the development of more meaningful definitions of community flood resilience and a more nuanced understanding of community adaptation to ongoing risk. Finally, the research will contribute to discussions of the nexus of rational and participatory planning paradigms in the resolution of technically and administratively complex problems, particularly in developing countries.

1.1. Research Problem

Planning approaches for structural flood mitigation measures generally incorporate a top down, professional-driven rational paradigm that generates dependency on those measures and on the technocrats, themselves (Heazel et al, 2013). These structural mitigation measures as new technologies may be opposed to the traditional system of communities. Often, these structural mitigation measures as a part of development activities are introduced by external

bodies, such as NGOs. Conflicts arise when development decisions, made by external bodies, do not match with community priorities and concerns, based on community perceptions. In contrast to the top-down process, bottom-up processes of participatory planning promise to improve the quality of decision making through engaging local communities (Monno & Khakee, 2012), wherein communities undertake responsibilities for their own welfare and develop capacities to contribute to individuals as well as community development (Oakley & Marsden, 1987). As such, a community's divergent view or ideas about community flood resilience and community members' priorities and concerns may be reflected in the decisions that affect them. Where decision-making power is shared in a participatory way, community perceptions about community flood resilience may result in the selection of locally appropriate measures, incorporating community priorities and concerns.

1.1.1. Research Scope

This research addresses the need of reducing disaster risks within the field of development planning through investigating community perceptions about community flood resilience, in a context where the externally supported development activities are implemented for mitigating flood risks. Planning processes for externally supported development activities are analyzed in terms of community participation in decision making and incorporation of community concerns and priorities. The research focusses on flood-prone communities of the *Haor* region of Bangladesh, specifically examining community experiences to explore relationships between community flood resilience and structural mitigation measures in a development context. Case selection processes are explained in section 4.6.1.

1.1.2. Research Aim

The aim of this research is to explore community perceptions of community flood resilience and its association with structural flood mitigation measures. Considering the dilemma of participatory versus rational planning paradigms, and external support versus community concern, this research also aims to identify the scopes of incorporating community concerns and proprieties while planning and implementing development activities for mitigating flood adversities.

1.1.3. Research Questions

This research examines the following questions:

- a) How do structural flood mitigation measures impact on community perceptions of community flood resilience?
- b) How are community concerns and priorities (based on community perceptions) incorporated in the selection and implementation of externally supported development activities for mitigating flood adversities?

1.1.4. Research Objectives

Achievement of the following objectives helps to address the research questions:

- a) Determine properties of community flood resilience, as perceived by the community;
- b) Clarify understanding of community awareness about positive and negative impacts of structural flood mitigation measures;
- c) Identify the relationship between structural flood mitigation measures and perceptions of community flood resilience;
- d) Explore information selection and power sharing in the planning process of externally supported development activities for mitigating flood adversities; and
- e) Unpack the impacts of including community concerns and priorities (based on community perceptions) in the planning processes.

This qualitative research employs case study approach to study selected *haor* communities. Data collection from the communities includes focus group discussion, cognitive mapping and in-depth semi-structured interviews. For enhancing the level of reliability, it also includes reviewing relevant documents and interviewing selected officials who are/were involved in the development activities, conducted in the *Haor* region. The content analysis method is employed for analysis of data collected in different forms and from different sources. Chapter 4 contains elaborate explanations for designing the research method of this research. Figure 1-1 shows the research process of this research.

1.3. Dissertation Outline

This dissertation is compiled of nine chapters.

Chapter 2: Literature Review reviews existing relevant literature on community flood resilience, structural flood mitigation measures and development planning and identifies the gap that frames this research.

Chapter 3: Context: The Haor Region provides context for the selected cases, drawing on a range of sources to clarify issues faced by rural, naturally vulnerable communities in the *Haor* region of Bangladesh.

Chapter 4: Research Methods and Design proposes a multi-modal research approach that includes case study, document review, cognitive mapping, semi-structured in-depth interview and other participatory appraisal tools. The whole research design is explained including the description of the data collection process. The content analysis method is chosen as the main data analysis method and the chapter provides its process of analyzing data collected not only from different sources but also in different form.

Based on the data, provided by the research participants from three selected case study communities, **Chapter 5: Settlement Development Profile** compiles the settlement development histories and consequences of significant modifications in the built environment regarding the communities' flood experiences.

Chapter 6: Community Perception about Flood Resilience and its Association with Structural Mitigation Measures addresses the first research question. It explores the data and provides the insight into community perceptions on flood resilience. It also focuses upon the impacts of structural flood mitigation measures on community perceptions and evaluates their conditions with the current structural measures for mitigating flood adversities.

Chapter 7: Community Participation in the Planning Process for Flood Mitigation addresses the second research question. It investigates the planning approaches of externally supported development activities and identifies the scope of community participation in the planning process.

Chapter 8: Major Findings states the major findings of this research and these key findings are summed up in four sections: 'resilience as freedom in the context of development as adaptation', 'external supports and support dependency', 'levels of community participation' and 'incremental planning approach for incremental adaptation'.

Chapter 9: Conclusion summarizes the thesis, by providing an overview of the findings and implications, discussing them along with identifying significant contributions of this research and the scope for future research.

Impacts of Structural Mitigation Measures on Perceptions of Community Flood Resilience: Experiences From Haor Communities of Bangladesh

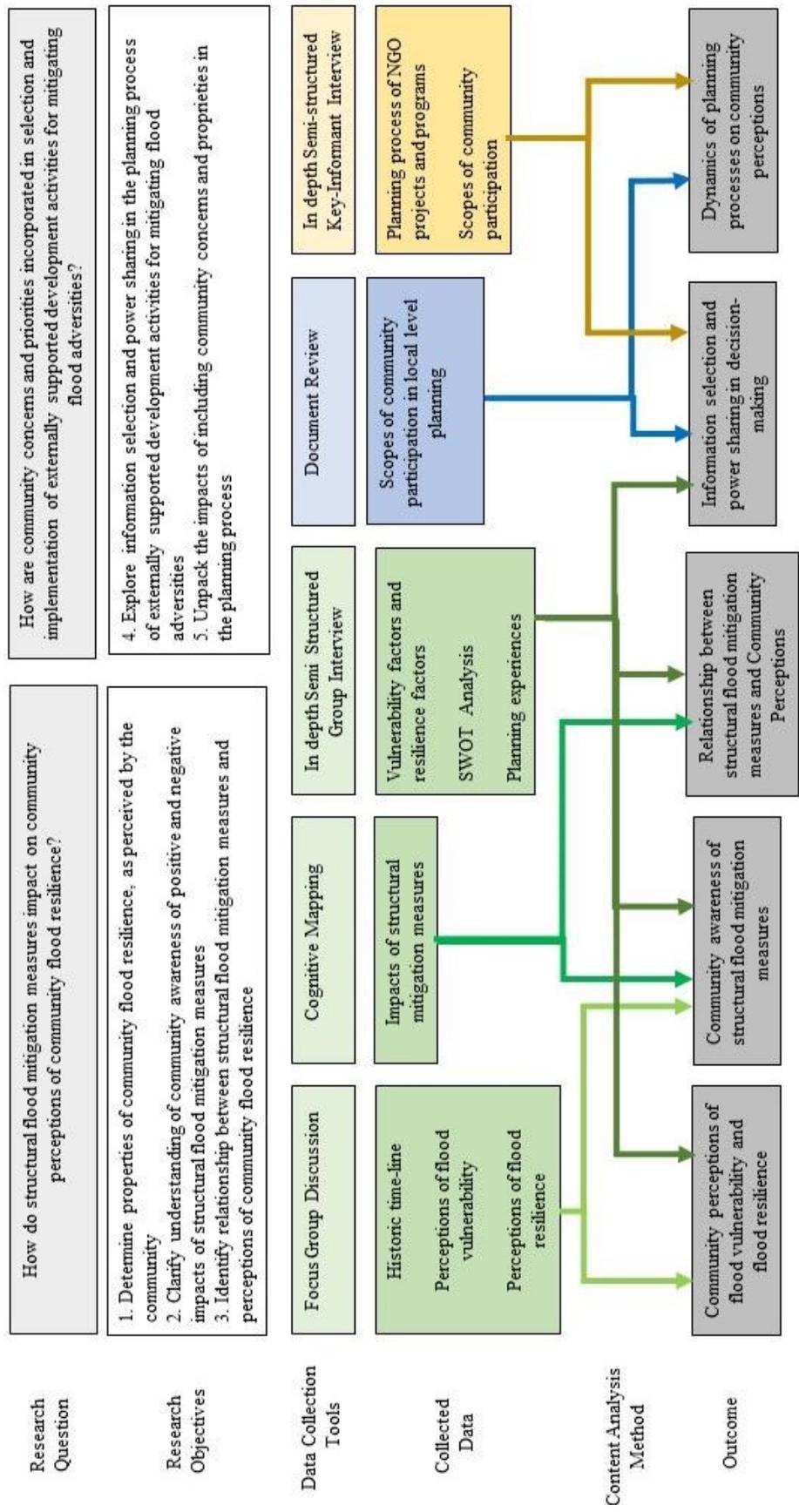


Figure 1-1 Research Process

Chapter 2 : Literature Review

This research on community flood resilience and structural mitigation measures and synthesizes literature within three themes: Resilience and community flood resilience; Consequences of structural flood mitigation measure; and Planning paradigms for developing activities to manage disaster risks.

2.1. Resilience and Community Flood Resilience

Resilience, more specifically community flood resilience, is the key theme for this research. At the beginning, this section will comparatively discuss ‘resilience’ from the perspective of selected disciplines. Then it clarifies the concept of community resilience, followed by a discussion on disaster situations, focusing on community perceptions about resilience.

2.1.1. Concepts of Resilience in Selected Disciplines

In general, resilience is identified as a system’s capacity to adapt to or respond to singular, unique and most often radically surprising events (Kuhlicke, 2013). In various fields, the term ‘resilience’ is interpreted in various ways. Table 2-1 compiles concepts of resilience from some selected disciplines.

Most definitions identify resilience as an ability or capacity for recovering from and/or adapting to disturbance, stress or adversity. Whereas in physics, resilience is referred to as the ability to get back to the original state, other disciplines conceptualize it as adaptability, which allows for many possible desirable states (Gunderson 2000), rather than as stability. In fact, in some circumstances, stability (or failure to change) could point to a lack of resilience (Norris et al, 2008). Sociology as a discipline deals with social units, which can be an individual within a social system or can be a group of individuals acting as a community. Whereas for an individual human being, resilience is identified as ‘the capacity of that person for successful adaptation, positive functioning, or competence to deal with high-risk status, chronic stress, or following prolonged or severe trauma (Egeland et al, 1993)’, community resilience is the capacity of that community to take collective actions to recover from any kind of problem (Pfefferbaum et al, 2005).

Table 2-1 Concepts of resilience in selected disciplines

Discipline	Concept
Physics	speed of return to equilibrium after displacement, irrespective of how many oscillations are required (Bodin & Wiman, 2004)
	ability to store strain energy and deflect elastically under a load without breaking or being deformed (Gordon, 1978)
Ecology and Environmental Sciences	ability to absorb changes without fundamentally altering its structure or function (Walker et al, 2004) or transform to an entirely new one (Buikstra et al, 2010)
	capacity to tolerate disturbance without collapsing into a qualitatively different state controlled by a different set of processes (Resilience Alliance, 2010)
Psychology and Mental Health Science	possession of innovative strengths to enhance psychological ‘wellnesses’ in the face of adversity (Buikstra et al, 2010)
Sociology	added capacity to anticipate and plan for future (Resilience Alliance, 2010).
	ability to mitigate hazards, contain effects of disasters when they occur, and carry out recovery activities in ways that minimize disruption and mitigate effects of future events (Bruneau et al, 2003)
Urban Planning	capacity to manage extreme events during disasters; to survive and function under extreme stress (Godschalk, 2003)

2.1.2. Defining Community Resilience

Communities are composed of built, natural, social, and economic environments that influence one another in complex ways and typically, they are entities that have geographic boundaries and shared fate (Norris et al, 2008). A community also can be identified as ‘communities of place’ (Flora, 1998) where the interface between social capital and the environment occurs (Dale et al, 2010). Based on social capital of a community and its surrounding environment a community works as a social unit. Pfefferbaum and colleagues (2005) identify community as a social unit and its resilience refers to its all kinds of abilities to take collective actions to remedy the impacts of any kind of problem or adverse condition, including the ability to interpret the environment, intervene, and move on. Ganor and Ben-Lavy (2003) more specifically identify ‘community resilience’ as a combination of two kinds of abilities; one is the individual ability and other is the communal ability to deal with a state of long-term stress. There is always a necessity to enhance the qualities of these abilities to deal with the situations in better way. For enhancing community resilience to deal with any adverse condition, Ahmed et al (2004) propose to improve material, physical, sociopolitical, socio-cultural, and psychological resources of a community. Ganor and Ben-Lavy (2003) put stress on discovering and improving unknown inner strengths of a community for enhancing resilience. Before discovering these inner strength or abilities, it is necessary to identify the conditions for which it is desired to enhance resilience.

Multiple scholars, including Schelfaut and colleagues (2011), Coles and Buckle (2004) and Godschalk (2003) define natural hazards or disasters as problems or adverse conditions for which we need to enhance resilience so that a community can deal with the situation in a better way in future. Schelfaut et al (2011) posit community resilience as a non-tangible property, which enables a community (which is exposed to hazards) to resist, absorb, accommodate and recover from the adverse impacts of hazards. Coles and Buckle (2004) argue community resilience as the combination of a community's capacities, skills, and knowledge that allows it to participate fully in recovery from disasters. Godschalk (2003) identifies it as a sustainable network of physical systems and human communities that can manage extreme events like disasters in an urban system and because of having community resilience, during any disaster, both physical systems and human communities must be able to survive and function.

The United Nation's office for disaster risk reduction (UNISDR, 2009) offers a clear definition of resilience, which is more related to disaster risk management. Resilience exists as:

(t)he ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions. p.24

To have further elaboration on community resilience in a disaster context, it is necessary to understand the concept of community vulnerability, which is closely associated with the concept of community resilience and the following section serves the purpose.

2.1.3. Hazard, Disaster, Community Vulnerability and Community Resilience

The concept of 'disaster' is associated with the term 'hazard'. The term 'hazard' captures the notion that, to the extent people co-exist with powerful natural and man-made processes and there is a probability that the variation in these processes will produce extreme events with some negative consequences (Burton et al, 1993; Cutter, 2001). A hazard turns into a disaster when a vulnerable community is severely affected by it and cannot then recover without external assistance (Shaw et al, 2013). Hazards (mostly natural hazards) are probabilistic events that, while expected, are cannot be manipulated. While disaster cannot be possible without hazard, without vulnerability, hazard is also nil (Blaikie,1994).

Cannon and Muller-Mahn (2010) posit that disasters are socially constructed events: the product of the impact of a natural hazard on people whose vulnerability has been created by

social, economic and political conditions. UNISDR (2009) defines vulnerability, as ‘characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard’, contrasts it with resilience and embodies its complexity. People’s socio-economic condition acts as a key factor for their vulnerability and it is the result of the socio-economic system that puts people at risk of hazards (Wisner et al, 2004; Bankoff et al. 2004; Cannon, 2008). Community resilience and community vulnerability are inversely related. Geis (2000) ideally defines a disaster-resilient or disaster-resistant community as ‘the safest possible community that we have the knowledge to design and build in a natural hazard context’ through minimizing its vulnerability. Hence, Blaikie’s (1994) analysis of causality and disaster prevention focuses on vulnerability assessment and reduction while taking hazard to be a condition outside of the equation of redress.

Instead of the term ‘vulnerability’, Borreo and his colleagues (2013) and Masten and Reed (2002) associate the term ‘risk’ with ‘resilience’. Borrero and his colleagues (2013) claim that resilience depends on two factors: risk factors and protective factors. Risk factors are characteristics among a group of individuals or their situation that predict a higher probability of a specific negative outcome (Masten & Reed, 2002). Protective factors offset risk factors and make it possible to have positive adaptation in the face of adversity.

Two types of views: risk-hazard view and social constructivist view, are popular for analyzing vulnerability (Füssel & Klein, 2006; O’Brien et al, 2007, Cardona et al, 2012). Risk-hazard view as the positivist (or realist) school defines risk as a tangible consequence of occurring natural and social processes, which can be traced and measured using available knowledge and technology (Jasanoff, 1999). The realist view, based on traced and measured scenarios of future asks to investigate the best direction for taking actions to response to future climatic events and this approach will lead to achieve a sustainable world (Ikeda, 2011). This approach views people as vulnerable to hazards, locates risk in the hazard itself and, as scholars have argued, inadequately incorporates the social dimensions of risk (Watts & Bohle, 1993; Ribot, 1995). The ‘adaptation’ and ‘resilience’ literatures are primarily concerned with vulnerability reduction through engineering and managing of changes. Fussel and Klein (2006) characterize vulnerability as having an external dimension, represented by the exposure to risks and an internal dimension, which comprises its sensitivity and its adaptive capacity to these risks (Füssel & Klein, 2006). Impacts of a hazard on a community is also conditioned by its underlying social conditions. The social-constructivist approach while identifies vulnerability in the term of capacities of a community, it intends to build enough capacities to adapt, resist

or rebound, leading towards the causal analysis, which asks to find out the socio-economic and socio-cultural causes of vulnerability. Vulnerability literature often relies mostly on the 'realism' of the natural science, ignoring the social constructivist view that asks to analyze society through lenses shaped by history, politics and culture, along with relying on natural reality (Jasanoff, 1999). Concerns for underlying social and communities' physical conditions lead scholars to define properties of community resilience and to investigate ways of developing or enhancing community resilience to deal with any kind of disaster incident. Norris et al. (2008) explain 'resilience' as the disaster readiness and, to achieve this resilience, a community will reduce exposures to risk (threats of hazards) and resource inequities, engage local people in mitigation, create organizational linkages, and increase and protect social support based on an overall plan.

After studying an Australian flood-prone rural town, Boon (2014) finds that repeated exposure to natural disasters foster stronger connections between neighbors through local community programs, and that makes people more resilient. Objectives of any policy-oriented resilience analysis for disaster condition are to identify who is vulnerable, why are they vulnerable and how they can be resilient. Knowing why leads to find out what to achieve or what to modify to enhance resilience. Sen (1981, 1984) defines analyzing causes as 'entitlements', means a total set of rights and opportunities with which a household can command or through which they are legally 'entitled' to obtain commodities. In development context, Sen (1984) argues 'entitlement' as freedom that allow to 'be' and 'do', to 'function' and to 'achieve' desirable outcomes. Similarly, access theory, provides broader empirical analytic of what people can obtain and use through investigating the ability of people to benefit from things (Ribot & Peluso, 2003). Community resilience can be identified as a community's 'entitlements' or 'accessibility' to 'be' and 'do', to 'function', to achieve desirable outcomes (Downing, 1991; Watts & Bohle, 1993; Chambers, 1989).

Besides Sen (1980, 1984), other scholars have established causal chains for identifying entitlements. Household-based social models illustrate how important it is that assets are sufficient to cope with or adjust to natural adversities (hazards) so that a community's lives and livelihoods are not undermined (Blaikie, 1985). Berkes (2007) identifies four important factors contributing to building resilience in socio-ecological systems threatened with natural hazards: (1) learning to live with changes and uncertainties, (2) nurturing diversity in its various forms, (3) combining different types of knowledge for learning and (4) creating opportunity for self-organization and cross-scale linkages. This widened explanation provides clear advantage in the operational ground. These specifically identified factors as a forward-

looking concept may help to explore policy options for dealing with uncertainties and changes (Berkes, 2007). These factors help to facilitate communication between and across different disciplines (Brand & Jax, 2007) and hence contributes to the stimulation of discussions between different communities (e.g. between climate change and the natural hazards community) (Klein et al, 2003). This plan requires flexibility, decision-making skills of locals and trusted sources of information to deal with unknown situations. These qualities of a community facilitate to innovate and to deal with unknown situations. This innovation includes social ingenuity with old institutions and social arrangement reform into a new one, along with technical ingenuity of new technology (Homer-Dixon, 2000). Innovations occur on many scales. Smaller scale innovations as small refinements occur relatively continuously (Dale et al, 2010). This trend of innovation can be fostered with repeated experiences of disasters.

Both realist and social constructivist view explore operational ways of developing or enhancing community resilience without focusing on a community's own ideas, views or perceptions about risk or vulnerability and resilience.

2.1.4. Perceptions of Community Flood Resilience

Routine active theory, proposed by Cohen and Felson (1979), identifies vulnerability because of predictable and repetitive routine activities or lifestyle patterns. Risky lifestyles, combined with likely incidents (like, natural hazards) and an absence of capable guardians make a community vulnerable to those incidents. On the other hand, social learning theory (Akers, 1973; Sutherland, 1947) identifies behaviors as adopted results of reinforcement, imitation, and conditioning, where members of a particular group transmit attitudes and engage in behaviors that are learned and modeled by others. Behaviors, which elicit good response, are usually rewarded and individuals learn that certain behaviors are acceptable, and others are not. These acceptable behaviors can be entitled as resilience that allow to 'be' and 'do', to 'function' and to 'achieve' desirable outcomes. Behaviors are guided by perceptions and Schelfaut and his colleagues (2011) indicate that for enhancing resilience, it is necessary to know communities' risk perception. The Aristotelian approach to perception defines perception as a natural process or activity, whereby the perceiver comes to acquire knowledge of things in the world in which the perceiver is situated (Barry, 2003). Community risk perception implies how individuals perceive the risk. Schelfaut and his colleagues (2011) argued to know communities' awareness about possible risks and possible consequences of their actions. A community, living with a condition of experiencing a disaster, obviously

perceives risk and practices some ways or behaviors to deal with it. Borreoro et al. (2013) emphasize identification of risk factors and protective factors and both factors vary, according to the cultural context of different communities. Boon (2014) puts stress on repeated experiences of disasters for achieving resilience. To describe the sense-making of resilience, Kuhlicke (2013, p.61) introduces a concept of the ‘myth of resilience, which not only considers the functional aspects of resilience (i.e. actors, capacities) but also how actors make retrospective sense of the radically surprising discovery of something entirely unknown’.

Kulig and his colleagues (2009), along with other properties of community resilience, discover it as a mentality/ outlook of a community. For discovering the perception of community resilience, some authors (Luthar & Cicchetti, 2000; Kuhlicke, 2013) prioritize the understanding and analysis of individual community members’ behaviors and mindsets. It is essential to know life circumstances and everyday ecologies of an individual for designing any intervention to enhance resilience (Luthar & Cicchetti, 2000). Hence, social and physical environments are central to the functioning of individuals. The physical environment refers to the built environment which can be altered or modified based on the realist approach of vulnerability reduction. Every change in the built environment triggers a change in an individual’s behavior and collective changes of a group of individuals influence to change communal behaviors. These connections between individual and community resilience are synergistic and can serve to strengthen communities as well as providing support for individuals within them. Instead of analyzing actual behaviors before, during and after a crisis, Kuhlicke (2013) proposes to inspect how community members construct a relationship between their experiences and the resultant sense-making of these experiences. Specific factors, such as social, familial, and academic interactions are critical in the process of developing resilience (Ainsworth, 1989), but there is a lack of understanding regarding the ways in which these factors interact with each other in a built environment which is already altered or modified. To explain perception about resilience, Graybill (2012) emphasizes discovery of emotions as parts of the human experience, since human beings live through emotions within natural environments. Emotions about environment matter, because these are intractable and intangible aspects of our everyday lives (Davidson & Bondi, 2004), informing how we feel, think and act regarding our environments. Casey (2009) identifies that knowledge and emotions about a place are the ‘ingredients’ of perceptions about places.

In his research on children’s perceptions of resilience, Grotberg (1995) discovers three sources of resilience: “I have”, “I am”, and “I can”. “I have” reflects the support, values, role

models, and limits afforded to a child. “I am” presents inner strength that includes self-esteem, empathy, autonomy, altruism, responsibility, and hope. The child here is respectful of himself/herself and its surrounding environment and is willing to be responsible for whatever he/she does. “I can” is thought of in terms of skill mastery, especially in communication, problem-solving, and behavioral control (Grotberg, 1995). A community in a flood context, similarly, might have ideas about “we have”, “we are” and “we can” and which is constantly changing based on changes in its environment. The lived experiences of people in places provide embodied context for perceptions of change, in and of the environment. Flood and any kind of venture (like, having structural mitigation measures) related to flood, those that make any change in and of the surrounding environment, provide a context to the community to construct a perception about flood resilience and which is yet to discover fully.

As communities are composed of built, natural, social, and economic environments, it is necessary to evaluate these environments in terms of flood vulnerability and importantly, how community members perceive their environment and their resilience as an inner strength to intervene and interact with their surroundings. Community flood resilience is not only combinations of tangible properties, but also includes intangible properties like, knowledge, skills and experiences as well as socio-political, socio-cultural, and psychological aspects and which are constantly changing due to changes in built environment. There is scope to address the complexity of perception of community flood resilience and especially its association with the changes in their surrounding environment after external venture have been imposed an intention to mitigate flood-losses.

2.2. Various Methods of Structural Mitigation Measures and their Consequences

Floods in various forms are widely experienced natural hydrological hazards and these often turn into disasters in various parts of the world. Green (2010) considers flood as a function of the meteorological system as it interacts with the landform; the consequence of that interaction is somewhat open to modification by the way that land is used. If the land is used for dense development of infrastructure and human habitat, then obviously the chances of heavy losses are there. This section presents selected scholars’ concerns about the negative consequences of having structural flood mitigation measures and alternative options of those measures. It also reviews available pieces of literature on flood mitigation of the case study area (the *Haor* region of Bangladesh) of this research.

2.2.1. Consequences of Structural Flood Mitigation Measures

To save human lives, properties, productions and to minimize all sorts of economic losses, some mitigation measures are usually carried out. Large-scale flood infrastructures, built to save a naturally vulnerable area from flooding, are considered as structural flood mitigation measures (Schelfaut et al, 2011), e.g. embankments, wave protection walls, sea walls.

Alam (2000) posits that implementation of any flood mitigation scheme has four basic aims: to reduce flooding; to reduce damage; to save lives; and to save properties. An engineered infrastructure may meet these four targets. In developed areas where adequate space is not available, or land is very expensive, concrete or masonry flood walls (including ring bands and town protection works) are adopted as popular methods of flood protection (Alam, 2000). Similarly, sea walls or coastal protection works are constructed to prevent flooding erosion in coastal areas (NDMA, 2008). Klein et al (2001), as the broadest possible sense, define the technology as equipment, techniques, practical knowledge or skills for performing a particular activity. Technology in its various forms has been instrumental in reducing community vulnerability to ever-present hazards (Klein et al, 2001). There are three basic strategies to reduce hazard vulnerability and for each of these, a range of technological options are available. The three basic strategies, explained as ‘protect’, ‘retreat’ and ‘accommodate’, respectively, are:

- to reduce the risk of the event by decreasing its probability of occurrence;
- to reduce the risk of the event by limiting its potential effects;
- to increase community capacities to cope with the effects of the event (IPCC CZMS, 1990; Bijlsma et al., 1996 & Klein et al, 2001).

Though structural flood mitigation measures are implemented to reduce hazard vulnerabilities as well as to enhance community flood resilience, scholars have discovered several examples where these kinds of ventures ended up with negative impacts on communities and the environment. In the United States, until 1965, structural measures (e.g., dams, reservoirs, embankments/ levees, stream channel modifications, and high flow diversions) as flood control initiatives were very popular (Katyal & Petrisor, 2011). The nation’s first Federal Disaster Act was enacted in 1950. According to FEMA (1992a & 1992b), due to unplanned developments with engineered infrastructures in the floodplains, the flood losses and cost of emergency relief kept on rising and after realizing it, the emphasis shifted towards comprehensive river basin flood management supported by non-structural measures such as

floodplain zoning and improved land use regulations, weather forecasting/warning, and government purchase of flood-prone property. With hydrological data and perception of the respondents, collected through the rapid rural appraisal (RRA) method, Choudhury et al (2004) discovered that the severity of flood had been increased after constructing embankments in 1991 in the coastal area of Bangladesh. Its main causes are limited research on long-term impacts on nature, faulty design and planning of embankments, cross dams and sluice gates and mismanagement of the whole process. Most of the time, structural measures fail to understand the complex and dynamic nature of floodplains and those oversimplify the river corridors by controlling their shape, modifying features such as sediment bars and river islands, and by separating river channels from their floodplains (WMO, 2006).

Usually, structural mitigation measures are built for having protection from the hazards. These measures provide a sense of security to encourage people to settle in protected areas; however, if a failure occurs, the loss of life and property are high, and these structures can transfer flooding risks spatially along the floodplain, causing conflicts (Katyal & Petrisor, 2011). Schanze et al. (2008) posit that ‘absolute protection’ against the negative impacts of floods is ‘unachievable and unsustainable because of high costs and inherent uncertainties’. Here, unsustainable means not going with the basic idea of sustainability, of aiming at harmonizing social and economic objectives with ecologically sound management (UNFPA, 1995). Sustainable development requires that we do better than we have done in the past, by changing and learning from mistakes (Green, 2010). Just like Schanze et al. (2008), Katyal and Petrisor (2011) also argue that having complete control of floods and being absolutely free from flooding risk is neither physically and financially feasible nor socioeconomically sustainable. With concerns about negative connotations of sole reliance on technological infrastructures, Klein et al. (2001) detected that technology by itself is not a panacea. Technologies or structural measures can be seen as adaptive answers to problems (Rammel & Van Den Bergh, 2003) with the consideration that there might be inherent uncertainties in the predicted outcomes of innovation (Buenstorf, 2000).

2.2.2. Alternatives to Structural Mitigation Measures

There are searches for alternative options of sole dependence on structural flood mitigation measures. Through evaluating alternative options, Meyer et al. (2012) draw the conclusion that, planned structural measures are might be effective with regard to the protection goal but not efficient, especially due to its high costs. In contrast, the effectiveness of non-structural

measures (local warning system warning systems, land-use planning, awareness building, etc) is low, but it seems to be likely that it could be economically efficient, at least if all possible effects are included. Apart from structural mitigation measures, the current trend of Integrated Flood Management (IFM) involves a mix of structural and non-structural initiatives (ICWE, 1992; WMO, 2006) where non-structural means include floodplain zoning and improved land use regulations, weather forecasting/warning, government purchase of flood-prone property (Katyal & Petrisor, 2011) and building flood shelters (Brammer,1990). Green (2010) promotes the concept of the Integrated Water Resource Management (IWRM) that prioritizes the management of water holistically across its natural hydrological units, across different functions, and recognizes the strong interactions between land and water. Here, the risk of flooding is addressed neither as an isolated function, nor as a local problem. Instead, a catchment is considered as a dynamic system, both temporarily and spatially, where constant interchanging is happening between land, and both surface water and groundwater (Green, 2010). Seasonal floodplain inundation and stream flow variability are essential to maintaining a diversified river corridor with longitudinal, lateral, and vertical ecological or morphological connectivity to adjacent ecosystems-terrestrial and underlying groundwater systems (WMO, 2006). While floods are primarily a product of meteorology interacting with landforms, CIFOR (2005) claims that it is only land use for which we have any scope for modifying to our advantage, and then only to a limited extent. But, changing land use might not be possible for all contexts and in those cases, structural measures can be adopted, considering the fact of uncertain risk. Haigh and Amaratunga (2011) believe that the risk of structural measures can be minimized by use of hazard resilient designs, specifications, construction methods, materials and technologies; construction of protective infrastructure and by protecting critical infrastructure; and by reviewing land-use planning policy. However, Zhou et al. (2012) advise applying diversified options to reduce the probabilities of extreme flood losses under several scenarios, including climate change, where diversification may include enforcement dykes, multiple compartments, resilience improved residences and upstream retention areas.

2.2.2. Structural Flood Mitigation Measures in the Haor Region of Bangladesh (Case Study Area)

Despite the concerns about structural flood mitigation measures held by other researchers, Anik and Khan (2012) identify that the wave protection walls (structural mitigation measures in forms of masonry walls) along the edges of artificially elevated, island-like habitats built by NGOs, are an effective but expensive solution to control the erosion of base ground in the

Haor region of Bangladesh. A comparative study between traditional slope protection (fortification) with geo-textile materials and NGO-supported slope protection (fortification) with cement concrete blocks (wave protection walls) for protecting habitats of the *Haor* region from wave attacks, Alam and Hasan (2010) identify the latter option as more cost effective, environmentally safe and socially acceptable method to prevent loss of lives and properties.

The general concept of ‘fighting with floods’ is replaced with ‘living with floods’ (Katyal & Petrisor, 2011) in the current trend of flood management. ‘Fighting with floods’ means sole dependency on structural measures and ‘living with floods’ incorporates both structural and non-structural measures. Available works of literature on the *Haor* region in Bangladesh do not provide conclusive ideas, whether these wave protection walls are considered as measures of ‘fighting with floods’ or measures of ‘living with floods’, of how these fortifications help to meet the perception of community flood resilience of the *Haor* region. There is scope to investigate reactions of beneficiary groups, especially perceptions of the community about these flood-infrastructures.

2.3. Development Planning for Disaster Risk Reduction

Addressing the risk of disasters in any national planning agenda has become a global commitment. The Hyogo Framework for Action (HFA) 2005–2015 (UNISDR, 2005), adopted by 168 nations and international organizations, highlighted the mainstreaming of disaster risk reduction (Khailani & Perera, 2013). Similarly, the Sendai Framework of Disaster Risk Reduction 2015-2030, aims to prevent

new and reduce existing disaster risk through the implementation of integrated and inclusive economic, structural, legal, social, health, cultural, educational, environmental, technological, political and institutional measures that prevent and reduce hazard exposure and vulnerability to disaster, increase preparedness for response and recovery, and thus strengthen resilience. (UNISDR, 2015, p. 12).

This means considering all possibilities of disasters in every development policy, planning and project, so that the chances of disasters can be reduced and at the same time, community resilience can be enhanced. This research is focused on discovering the community perception about community flood resilience and its association with development projects with structural flood mitigation measures. This section reviews pieces of literature on ‘development’ and ‘planning paradigms’, where various types of planning paradigms are evaluated to discover their nature of application in the development field. The nature and

goals of ‘development’ in a disaster context are investigated in existing pieces of literature with a focus on incorporating community perceptions in the planning process of development activities for mitigating disasters.

2.3.1. Development and Adaptation

Development is essentially about change: not just any change, but a definite improvement, a change for the better (Slim, 1995). The term “development” has been used in many ways, and there are numerous interpretations of the concept (Pearce, 1989). For a disaster context, Cannon & Muller-Mahn (2010) identify a connection between ‘development’ and ‘adaptation’. Adaptation, a common term in disaster-based literature, is considered as the effective strategy for any kind of disaster risk management. For the context of climatic events or hazards, it can be defined as a process by which strategies to moderate, cope with and take advantage of the consequences of climatic events are enhanced, developed, and implemented. (Levina & Tirpak, 2006). Adaptation is a continuous process of changing status to live with risks or threats. UNISDR (2009) provides a more elaborated definition where adaptation is identified as adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, and it helps to lessen the adverse impacts of that climatic stimuli; capacity is the combination of all strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals. Ghimire and colleagues (2010) identify it as the ability of people to cope with or adjust to the changing context and is explained by socioeconomic indicators. But, abilities (Pfefferbaum et al., 2005) as well as capacities, along with skills and knowledge (Coles & Buckle, 2004) to deal with adversities, are identified as ‘resilience’. Resilience is comprised of capacities to absorb stress or destructive forces through resistance or adaptation; capacities to manage, or maintain certain basic functions and structures, during disastrous events; and capacities to recover or ‘bounce back’ after any negative event (Udu-gama, 2007). If adaptation to any natural hazard is the target, necessary capacities or abilities are required to be built within a community, which can make it resilient to that particular hazard. For avoiding the confusion, this research prefers to identify ‘adaptation’ as a process of achieving resilience, instead of ‘the ability of people’.

Tanner and Mitchell (2008), classify the whole process of adaptation in two categories-responsive adaptation and anticipatory adaptation. The responsive adaptation is spontaneous and basically what people always do in everyday practice, and the anticipatory adaptation

takes on the challenges of involving a high degree of risk, because conditions to which an adaptation is sought are more or less unknown (Cannon & Muller-Mahn, 2010; Tanner & Mitchell, 2008). Usually, in a disaster context, these anticipated adaptations are expected through providing structural mitigation measures, which are highly engineered infrastructures. External experts or planners suggest the anticipated adaptation, based on their knowledge and the empirical data and along with the community, these planners also remain uncertain about their long-term outcome or effects on the community as well as on the environment. Although Cannon and Muller-Mahn (2010) believe that success of any kind of adaptation (both responsive and anticipated) cannot be guaranteed as there are always possibilities for uncertainties and surprises, this research takes the stance that chances of uncertainties and surprises are more in case of anticipated adaptation, as the conditions to which an anticipated adaptation is applied are ‘more or less unknown’ (Cannon & MullerMahn, 2010). Moreover, responsive adaptation, as the spontaneous everyday practice of any community, may reveal community perceptions as the expression of its priorities for dealing with potential or regularly experienced disasters. Either anticipated or responsive adaptation brings changes to the life of a community and its surrounding environment.

To develop adaptive capacities (or community resilience) among vulnerable communities, necessary developments undertaken in less developed countries are involved with the adaptation process, as the objective of development policies for many non-governmental organizations, government organizations and donors (Cannon & Muller-Mahn, 2010). It is therefore impossible to separate adaptation from ‘development’. But, the popular discourse on development is always round economic growth, which is very necessary for poverty reduction and most of the time it is led by actors whose goal is not to improve peoples’ lives, but predominately to seek profits for private gain. Slim (1995) argues that genuine development is much more than a matter of economics and economic growth, with a universal goal for all societies. Tanner and Mitchell (2008) posit that what the connections between adaptation and development mean is not yet sufficiently clear. For example, ‘is adaptation a type of development, or is it more than just socio-economic development? Does development facilitate adaptation as well as achieving resilience (Tanner & Mitchell, 2008)?’ Cannon and Muller-Mahn (2010) identify that in the context of resilience, ‘development’ should be purposeful in the sense that its goal directly improves people’s lives and it is carried out by actors who have this as their principal goal. ‘Development’ is always an external actor’s initiative, which creates an adaptation for achieving resilience (Cannon & Muller-Mahn,

2010). This kind of external actor's initiative usually comes as a form of anticipated adaptation for enhancing community resilience and it is very logical to discover the community perception about the planning approach of development activities and their impacts on community resilience.

2.3.2. Planning Paradigms for Developing Activities to Manage Disaster Risks

Planning theory has often been systemically rather than interactively focused; behavioral rather than phenomenological (Leo & Forester, 2017, p. 204)

The systematic and practiced approaches of planning considers all types of disaster as uncertain events and planning for natural disasters is broadly defined as 'planning under uncertainty' (Christensen, 1985) or 'planning for uncertainty' (Kartez & Lindell, 1987). Christensen (1985) defines this as an effective planning task to discover, assess, and address uncertainty by confronting the problem at hand and assessing conditions of uncertainty, rather than misapplying theories and methods without regard to problem conditions. Christensen's (1985) concept is still valid for planning for disaster risk management, where planning offers a chance to overcome, or at least reduce uncertainty, by matching planning processes to problem characteristics. It is not enough to assess 'what planners do', it requires an articulation of a rich political and inter-subjective analysis of planners' deliberative practices.

Until 1970, planning was used to follow the rational paradigm that asks experts or planners to identify and define a problem, to fix goals, and objectives, to prepare lists of all possible ways to solve the problem, to find all possible consequences for each policy alternative with a probability of occurrence, to compare consequences and finally to select the 'best' solution (Berke & Beatley, 1992). Kartez and Lindell (1987) define it as a good planning process to find out the best 'choice' for addressing any uncertain event like a disaster, considering community experiences as information for future planning. Improved disaster preparation results from both experience with disasters and from commitment to a good planning process (Kartez & Lindell, 1987). However, for managing disasters as uncertain events, Mileti (1999) proposes a five-step strategy: assessing hazard vulnerabilities; examining possible adjustments; determining the human perception and estimating of the hazards; analyzing the decision-making process; and identifying the best adjustments, along with evaluating their effectiveness. This strategy is organized conceptually around the four-stage-cycle of disaster risk management: Prevent, Prepare, Response and Recover (PPRR). It is notable that Mileti (1999), suggests determining the human perception as a step for planning for development activities to manage disaster risks.

The rational paradigm, also referred to as a rational comprehensive model of planning, is criticized on the grounds of thought process and reasoning of application (e.g., Heazle et al, 2013; Birkmann & Teichman, 2010; Hostovsky, 2006; Campbell & Fainstrin, 2003; Sandercock, 1997; Baum, 1996; Innes, 1996; Alexander 1992; Forester 1989; Faludi 1973, Altshuler 1965a, 1965b). For example, Altshuler (1965a, 1965b) argues that comprehensive planning is not practically feasible, nor politically viable and comprehensive planners pose limited role, power and knowledge to prepare an effective comprehensive plan. Sandercock (1997) identifies that the rational comprehensive model of planning appears with the heroic nature of giving correct decisions in every aspect but fails to ask who is in control and with what consequences. Her concerns are that planners appear as ‘the knower’ with their best solutions for the public (Sandercock, 1997). The rational paradigm is not only heroic in nature, but also it requires such a level of knowledge, analysis and organizational coordination that it is impossibly complex (Campbell & Fainstein, 2003). It requires more knowledge than any individual can grasp. Hostovsky (2006) argues that only theoretically the rational paradigm may provide the ‘best’ solution for any planning problem, considering the widest variety of variables, but practically it is overly complex, redundant, time-consuming, and expensive. Moreover, Baum (1996) posits that the rational paradigm analyses situations abstractly, narrowly, and superficially and likely fails to understand what social conditions mean to the people who live with those conditions. A community has the perception that includes information, ideas and interests for addressing any community problem. Without organizing people, the paradigm only encourages planners to organize information logically, as if the world consists of information only, without human beings. As a result, rationalist planners may recommend interventions that do not fit the social conditions and harm people who might be helped (Baum, 1996). Compatibly, Heazle et al. (2013) claim that a rational approach in disaster risk management expects accurate and sufficient information to successfully ‘prevent’ the disaster and ‘prepare’ for disaster, yet information is often missing or cannot be provided with the degree of certainty. Moreover, the ‘predict and act’ process of rational paradigm creates heavy dependency on hard empirical data of how, when, where and on what scale natural disasters are likely to occur and engineering solutions for them, and as a result it limits the scope for practicing adaptive institutional learning and nurturing other flexible alternatives (Heazle et al., 2013). Correspondingly, Birkmann and Teichman (2010) dispute that high expectations of resolving or reducing uncertainty issues to a low order, removes incentives to explore alternative approaches that seek to manage rather than reduce uncertainties.

2.3.3. Community Participation and Empowerment in Development Planning Process for Disaster Risk Management

With the rise of the neoliberal ideas¹ at the end of 1970s and during the 1980s (Duménil & Lévy, 2004) and the subsequent shift towards market-led urban development (Campbell & Marshall, 2000), the entire concept of a large-scale, top-down, professionally oriented rational planning approach was replaced by its opposite: bottom-up planning through local community groups, in which the planner was the servant of the public (Hall, 2014a). It is commonly identified as participatory planning (Monno & Khakee, 2012; Hostovsky, 2006) as an important means to expand democracy and improve the quality of decision making (Monno & Khakee, 2012) to value community perceptions and their concerns. With the perspectives of agonistic-democracy² and social mobilization³, the radical/insurgent model of participating advocates to empower the marginalized groups and to make the ‘participatory structures able to work with conflict in productive ways’ (Aylett, 2010).

Scholars appreciate the concept of participatory planning for community development in any sector including disaster risk management. Holcombe et al. (2004) distinguish ‘development’ as an expanding choice and for empowering the community through building their capacities, it is required to be driven by the demand of those for whom development is the goal. It means development should be planned according to the demand (or priorities) of community in a participatory way. In a slightly different way, Thomas (1999) suggests that development should be managed with the intention to develop the capacities of any community to do future tasks and to learn from experiences. With a similar goal for local development, Forsyth (2013) promotes the idea of Community-Based Adaptation (CBA), where local people determine objectives and means of adaptation practices along with deliberation of different sources of knowledge for more successful outcomes. The success of CBA is difficult to achieve as the marginalized people cannot communicate in all required arenas; to overcome this problem, Forsyth (2013) advises the use of participatory techniques for getting more

¹ Neoliberal ideas, associated with economic liberalism, support extensive economic liberalization, free trade, and reductions in government spending in order to enhance the role of the private sector in the economy (Boas & Gans-Morse, 2009).

² Agonistic democracy emphasizes the inevitability of conflict in political life, and the impossibility of identifying final, rational and neutral decision procedures, because of the ubiquity of power and the plurality of values (Crowder, 2006).

³ Social mobilization is defined as the mass movement to engage people's participation in a process and is used by grassroots and political organizations to achieve a common goal.

successful outcomes. In the same way, Alkire et al. (2001) recommend Community-driven Development (CDD), which gives the control of decisions and resources to community groups. Norris et al. (2008) prioritize the enhancement of community resilience based on an overall plan that incorporates decision-making skills of locals to deal with an unknown situation. In an analysis of hundreds of vulnerability assessments carried out to inform disaster reduction measures by many national societies of the Red Cross and Red Crescent, Cannon (2008) discovers a clear pattern that communities have different sets of priorities to those of outsiders, who want to help to protect them from extreme risks. Involvement of beneficiaries and wider communities in the process of development leads to more sustainable outcomes. They can feel ownership of the development process and can carry out the process later (Lawther, 2009). This develops community capacities as members' ability to take meaningful, deliberate, collective action to solve problems, interpret environment, intervene in the environment and move on (Pfefferbaum et al., 2005). Similarly, Oakley and Marsden (1987) define community participation as the process by which individuals, families, or communities undertake responsibilities for their own welfare and develop a capacity to contribute to their own and their community's development. Ghimire et al. (2010) do not support the trend of portraying poor people as victims. With the right support, they can take responsibilities to find out solutions. Science may help them to understand themselves as part of the problems and as part of the solution (Ghimire et al., 2010). Participation of community members in the planning process, especially in the decision-making process, is the key concept of a bottom-up approach of participatory planning and it promises to reflect the community perception about community resilience in any disaster risk management planning activity.

There are criticisms about the participatory planning paradigm. Rose (1996) and Hostovsky (2006) identify the participatory planning practice as time consuming, expensive, simple rhetoric or as a matter of 'government through community' (Rose, 1996) or as depoliticizing a new oppression reproducing dominant hierarchies of power embedded in a wide variety of neoliberal political agendas (Kesby, 2005). Most of the time, people are reluctant to participate in issues of more general nature but are interested to actively influence issues of close concern (Hibbing & Theiss-Morse, 2002). These criticisms constrain the idea of applying the participatory planning approach for disaster risk management.

Along with the radical/insurgent model of the participatory planning paradigm, there are other forms of participatory paradigms, which intend to overcome their criticism, such as

communicative or collaborative planning, that engages different stakeholders to engage in dialogue to discover goals and objectives in a collaborative way (Healey, 2008; Healey, 1992). Based on the actual decision-making power, Arnstein (1969) proposes the classic and influential 'Ladder of Citizen Participation', where manipulation and therapy are marked as degrees of non-participation, informing, consultation, and placation as degrees of tokenism, and partnership, delegated power and citizen control as degrees of citizen power. The communicative or collaborative approach (Healey, 2008; Healey, 1992) falls into the second category of participation, which is nothing but a token of participation. Sandercock (1997) discusses the equity planning model, which is close to a communicative or collaborative participatory approach. Within a society at large, values of democracy, equality, and efficiency clash and these conflicts are reflected in the choices of planners. The equity planning model encourages planners to reconcile the conflicting goals of economic development, social justice, and environmental protection (Sandercock, 1997). The advocacy movement of the 1970s resulted in numerous approaches to increase participation of disadvantaged groups (Monno & Khakee, 2012). The advocacy and equity model and the social learning and communicative action model were evolved to have lessons direct from the beneficiary groups. Friedman (1987) argues that various ways of engaging beneficiary groups (community members / disadvantaged groups / marginalized groups) in the planning tradition intends to have social learning to overcome the constrains between theory and practice or knowing and acting. He also supports the idea of social mobilization as an ideology of the dispossession of power, with the goal to empower those who have been systematically disempowered. Empowerment is the final stage of participation; inclusion of community in development process ultimately empowers them. The concept of empowerment is regarded as the central theme in development studies and practice. The emergence of the concept in the 1970s is attributed to the need for strengthening local capacities to promote 'people-centered' development, which is a resultant consequence of the failure of top-down state-centric development approaches adopted in third world countries during the 1960s (Moniruzzaman, 2011). The World Bank (2002) has defined empowerment as 'the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives.' McWhirter (1991) thinks that such a definition clearly indicates the type of power that poor people lack. First, poor people face limitation of assets. Second, they lack the capability to participate in the decision-making process of social and political institutions. And finally, they have little or no influence or control over those institutions that affect their economic, social and political lives. Thus, empowerment means

the development of poor people's capacities that enable them to enter the 'power dynamics at work in the life context' (McWhirter, 1991). Correspondingly, Holcombe et al. (2004) think that development should be done with goals of empowerment and capacity building, whereas power of decision making is a capacity. This power of decision making, originally belonging to planners or experts (in a top-down planning approach), needs to be transferred (Moniruzzan, 2011) to the community people. In the late sixties, Arnstein (1969) identified tokenistic participation – informing and consultation – which can lead towards empowerment if there is a two-way flow of information with proper channels for feedback, power for negotiation and assurance that citizen concerns and ideas will be considered. Arnstein (1969) notes that information is often a one-way flow from planners to citizens, people are primarily perceived as statistical abstractions and consultation remains just a window-dressing ritual. But it is necessary to incorporate citizen concerns and ideas, as Arnstein (1969) mentioned, in the process of any development planning including flood risk management.

2.3.4. Post-positivist Concepts of Planning

Theorists will find the attention to practice too mundane, too apparently limited, too disordered and messy. Practitioners will find the theorists more pious than insightful, more abstract than acute, more inclined to hide in generalities than to face difficult questions. Glimpsing but not yet exploring new areas of practice, theorists will hope that the evocative language alone of “transformative” or “insurgent” relationships will somehow promote new social relations in the face of conflict; practitioners will hope that new methods might inspire new data collection that might yet solve some important problem (Forester, 2011, p. 325).

In the era of neo-liberalism, planning is expected to provide justice to everyone (Forester 2011; Leo & Forester, 2017) in a given condition, where social, political, cultural and economic differences matter in terms of power-relationships. Because of the static condition in power-relationship, MirafTab (2009) finds that, even after more than two decades, participatory planning is no longer considered as a transformative practice to empower and emancipate the marginalized. On the other hand, the rational paradigm is still not completely abandoned because of the presence of professionals, their formal education system and the presence of institutions and their ways of practice (Baum, 1996; Dalton, 1986). Rationality supports professionalization by helping to define the field of knowledge - how it is investigated and bounded – and the way in which planners interact with others (Dalton, 1986). Baum (1996) argues that institutes feel social pressure to incorporate a rational model, and that many planners choose to concur with this for psychological reasons unrelated to its ostensive focus on solving practical problems. The rational model is portrayed as the tacit

model of social relationships of hierarchy and it offers a ready, unconscious defense against the diversity and messiness of the real world (Baum, 1996). According to Innes (1996), because of availability of consensus building, as a new set of theoretical and practical foundations, a meaningful and influential version of comprehensive rational planning is possible. The concept of consensus building is close to the idea of ‘communicative rationally’ (Habermas, 1984; Dryzek, 1990; Innes, 1995) that asks to involve all stakeholders.

...where all are equally empowered and fully informed, and where the conditions of ideal speech are met...For these processes to be truly communicatively rational, they must also reflect emancipatory knowledge, or knowledge of the deeper reality hidden behind popular myths, scientific theories, and the arguments and rationalizations in common use (Innes, 1996, p. 461)

Consensus building, as a method of group deliberation, ensures an environment where all are heard, and all concerns are taken seriously for making decisions that approximate the public interest (Fulton, 1989; Innes, 1992; Wheeler, 1993). Collaborative rationally (Innes, 2016), as another interpretation of communicative rationally (Habermas, 1984; Dryzek, 1990; Innes, 1995), is growing as a practice to ensure collaborations among agencies, between government officials and community members, among members of different interests and to seek ways to satisfy the significant concerns of each member, based on both expert knowledge and community knowledge (Innes, 2016). Leo and Forester (2017) define it as a ‘practice-focused’ method where experts and citizens shares their knowledge, practicing a mutual respect to each other. The dichotomy of ‘top-down’ and ‘bottom-up’ planning is blurred here because of mutual dependency and empowered positions of all stakeholders. This deliberative practice promises to overcome the precariousness and vulnerabilities of trust and relationship building, through anticipating and responding to every stakeholder’s interpretations, biases, ideologies, and presumptions (Leo & Forester, 2017). But it requires a balanced power-relationship among stakeholders and does not provide enough practical ideas to practice these concepts (consensus building, collaborative planning, communicative rationally) where stakeholders are not having equal power to make significant changes in decision and at some level where it is not possible to include the actual beneficiaries of any decision.

With due respect to the two radical opposite paradigms, rational and participatory planning, the post-positivist concept posits that planners act like fallible advisors and operate like everybody else, in a complex world where there are no ‘answers’, only diverse and indeterminate options, and this critique leads to the concept of incremental planning

(Allmendinger, 2002). Incrementalism as a concept, was introduced by the American political scientist Charles E. Lindblom, in the 1950s for proposing public policies to accommodate real-life situations where prescribed static procedure cannot be followed because of various reasons, like lack of information, changed scenario, unforeseen conditions etc. (Fernandez et al, 2007). Incrementalism as a concept allows the plan to admit all its potential failures and to grow incrementally by adding contingency branches to avoid those failures (E-Martin et al., 2015; Dearden et al., 2003).

Hostovsky (2006) finds that the waste management literature expresses positive reactions for alternative planning models, such as incrementalism, and its model is tied with public relations, whereas planning literature is preoccupied with rational and participatory models. One of the beauties of incrementalism is that opportunities can be seized as they arise (Hostovsky, 2006). The incremental process of planning invokes Lindblom's (1979) concept of the need to abandon the quest for 'synoptic' or complete knowledge as the basis of policy and instead to accept planners' inability to know all about complex issues. Sarewitz (2004) more specifically calls it 'incremental approaches to decision making' based on consensus being achieved, not on scientific or knowledge disputes but on values and interests. In reality, the process of problem definition and solution development do not occur in sequence (Alesh & Petak, 1986; Cohen et al, 1992). Butler et al (2016) argued for low regrets incrementalism in the case of climate change adaptation, proposing a set of conditions to move away from vague 'watch and see' and 'take into account' policies to the more generous commitments of political and financial capital required for risk-reducing adaptation actions and legally binding policies.

In post-positivist understanding, planning is characterized by (among other factors) fragmentation, plurality, subjectivity and interpretation (Allmendinger, 2002). Incrementalism, then, provides a pragmatic policy response to high uncertainty issues by shifting the focus to developing consensus on how to proceed, as opposed to holding out for consensus on possible futures, as the main criterion for legitimate policy action. As Allmendinger (2002) says:

There is now a much more eclectic 'pick and mix' basis to theory development and planning practice that is better seen as relating to issues, time and space in a linear and non-linear manner. p. 84.

In the development context, the growing trend of partnership among government organizations (GO), non-government organizations (NGO) and donors successfully addresses

seemingly unsolvable challenges of development (Brinkerhoff, 2003). A community is not always in a condition to solve its own problems, especially with the changing nature of disasters. Local governmental organizations of developing countries also usually face difficulties in dealing with disasters in general, due to inadequate knowledge and capabilities (Kusumasari et al., 2010). Their capacity is limited by financial and human resource scarcity (Pelling, 2003). In that case, NGOs can fill the gap of public service with their experts' knowledge and experiences, into particularly politically and socially difficult communities and regions (Brinkerhoff, 2003). Holcombe et al. (2004), claim that in developing countries, NGOs are much better than government departments at reaching communities and delivering programs to people. Niekerk (2007), argues for an effective disaster risk management that requires the participation of various sectors and disciplines of governance, the private sector, civil society, non-governmental organizations, community-based organizations, research institutions and institutions of higher learning. The involvement of NGOs with their donor funded and government-supported projects for flood risk management promises to enhance community flood resilience and community participation and empowerment is ideally advised to be incorporated in the whole process of development, which ultimately brings a change in the life of a community and its surrounding environment.

Sandercock (1997) regards planning theory as a theory of good practice. In a disaster context, the good practice for development planning is to be behaving like adaptation, with the goal of enhancing community resilience through incorporating community concerns, ideas and demands in the planning process. Forsyth (2013), Ghimire et al. (2010), Lawther (2009), Cannon (2008), Pfefferbaum et al. (2005), Holcombe et al. (2004), Alkire (2001), Thomas (1999) and Oakley and Marsden (1987), promote the idea of a community's involvement in making major decisions for its own development and 'decision making is the major power which is needed to be transferred to the community' (Moniruzzaman, 2011). The partnership among various sectors promises better development (Brinkerhoff, 2003) and the involvement of NGOs gains an appreciation for their success in supporting the local government (Kusumasari et al, 2010; Pelling, 2003; Brinkerhoff, 2003). This partnership also includes local community people and their involvement along with external knowledge, and the concept of empowerment creates grounds to examine the outcome of managing any disaster risk in a development context in an incremental way. Examples of literature, specifically focused towards development planning that can allow to incorporate community perceptions in a top-down planning process in an incremental way, are rare. This research from the

perspective of changes in perceptions due to changes in built environment, capacity building, empowerment and partnership in the development context, will examine the development planning conducted in the flood prone Haor region of Bangladesh to investigate community concerns and reactions about the process and outcome of development projects, for providing protection against floods.

2.4. Research Gap

The *Sendai Framework for Disaster Risk Reduction: 2015-2030*, enforces strengthening of disaster resilience (UNISDR, 2015). Disaster risk management can more effectively cope with the uncertainties and challenges if its practices and planning become more focused on mainstream resilience-enhancing strategies and priorities. Still, disaster risk management poses complex challenges for communities around the world (Field et al, 2012; Mechler, 2004). In the case of flood risk management, development planning requires enhancement of community flood resilience under conditions of high uncertainty, unequal power dynamics, limitations of rational and participatory planning paradigms and prospects of adaptation, community participation, empowerment and partnership among various groups (NGO, donors, GO and local people).

Enhancing community resilience is necessary to eliminate the vulnerability of risk factors, but scholars have different opinions about defining the properties of community resilience and ways of developing or enhancing community resilience to deal with any kind of disaster incident. At the same time, a community has its own perception of risk or vulnerability and resilience and which is constantly changing due to changes in surrounding environment because of development activities, following various planning approaches. The lived experiences of people in places provides an embodied context for generating perceptions of change in and of the environment. Potential hazards and ventures (like development with structural mitigation measures) to mitigate, making changes in and of the surrounding environment, provide a context to perceive community resilience. Both the views: risk-hazard views and social constructivist view, fail to incorporate this dynamism of community perceptions about resilience towards any natural hazard, whereas resilience is a socio-economically constructed phenomenon. As communities are composed of built, natural, social, and economic environments, it is necessary to evaluate their built, natural, social and economic environments in terms of any hazard vulnerability and importantly, how

community members perceive their environment and their resilience as an inner strength to intervene and interact with their surroundings.

Community resilience is not only combinations of tangible properties, but also includes intangible properties, like knowledge, skills and experiences as well as socio-political, socio-cultural, and psychological aspects. A community in a disaster context, with their tangible and intangible vulnerabilities, might have ideas about 'we have', 'we are' and 'we can', where 'we have' presents their ideas about their resources, 'we are' presents the inner strength that includes self-esteem, responsiveness, self-sufficiency, and responsibility, as well as limitations, obligations and problems and 'we can' portrays their belief in their abilities or inabilities to deal with adversities. The concepts of 'we have', 'we are' and 'we can' change along with changes in their surrounding environment. Development activities as an outcome of development planning change the environment in multiple ways. Along with getting the new dimension in their perceptions about community resilience, a community also gets an idea about how this change in the environment affects its resilience. In a flood context, various mitigation measures, including infrastructural solutions as outcome of development process make significant changes in the built environment. The consequences (either positive or negative) of these interventions are associated with approaches or paradigms, followed in the planning process. In search of the suitable planning paradigms, Hall (2014b) finds that, the nature and extent of the 'theory/practice divide' have filled numerous planning books and journals, most lately increasing concern that planning is in a state of crisis with much of its theory having little to do with the work of most planners.

The rational planning paradigm with a realist view considers the flood as something that may happen in the future and detailed information about this future event can be availed easily. The structured planning curriculum, formed with both higher education and professional development forums, follows the top-down, knowledge-based rational model with a determination of managing the whole scenario with suitable structural (engineered infrastructures) and nonstructural (land-use and zoning regulations, early warning system etc.) measures of mitigation. Because of the limitation of hard empirical data of how, when, where and on what scale floods are likely to occur, and over-expectation about the performance level of engineered infrastructures and ignorance about their negative impacts on nature, this approach may indulge the population and thus expose them to great risk. Moreover, the high expectations of reducing hazard impacts or eliminating the chance of flood make the local

people dependent on the authority or external bodies and more vulnerable, with fewer self-defense mechanisms.

The participatory planning paradigm attempts to include the local people into the planning process, as the local people have practical experiences of dealing with previous flood events and they are the ultimate beneficiaries of the planning outcome. Godschalk (2003), Wamsler (2004) and Ernstson et al. (2010) have pointed out the importance of a community participatory approach in planning and the utilization of community perceptions for enhancing inherent resilience towards adversities. The scholars have various observations about the level of inclusion or community participation, especially with transferring power from the professionals to the local (Moniruzzaman, 2011). Ideally, this framework aims to empower the marginalized groups, so that they can make decisions according to their priorities about their own future and move on. But, in practice, it is hard for the institute and professionals to operate in such a way where actual decision-making power transfers to locals and when we are talking about transferring, it means the power originally belongs to the professionals. In some cases, the professionals may provide a niche for the local people to convey some opinions, or professionals may provide some alternatives (along with their knowledge-based pros and cons) and local people may get chance to select one. How the local people make decisions for their own welfare is also a big question. The professionals go through a structured academic process, follow prescribed guidelines, get ideas from empirical data and compare events to make any decision. If these professionals work as facilitators to facilitate the locals to make their decisions, there might be a chance of manipulation and influence. Moreover, local people fail to consider the issues beyond their local interest and may face difficulties to perceive the bigger picture of planning for national growth or reducing negative environmental impacts.

Although the idea of ‘bottom up’ denies the rational paradigm, its persistence puzzles the planners (Rocha, 1997; Hoch, 1994; Dalton, 1986). To express the core of the dilemma, Baum (1996) says:

Planners continue to endorse at least the spirit of the rational analytic model, not only because it supports claims of professional status, but also because it emphasizes the fundamental principles of guiding actions by knowledge. p.133

The post-positivist paradigms, like incrementalism, give up the quest for complete knowledge as the basis of planning and will accept planners’ as well as beneficiaries’ inability to know

all about complex issues. It demands to practice a rational mix of multiple paradigms; Heazel and colleagues (2013) proposes to deal with disaster risk management in such a way that will

(i) Explicitly recognize uncertainties; (ii) Address questions about what we realistically can or do know about current and future hazards; and (iii) Explore the available options for progressively enhancing resilience over the short to medium term. An adaptive approach, therefore, should seek to learn about priorities and vulnerabilities progressively with each new event in order to incrementally enhance resilience. p.169

Community resilience is linked to improved adaptive capacities of a community or a process that is linked to dynamic changes over time, associated with community learning and the willingness of communities to take responsibilities and the control of their development pathways (Wilson, 2010). Re-conceptualizing the community perception shifts pedagogical debates towards a direct and present engagement with the rich multiplicity of planning practices, with enhancing community resilience as the core agenda and overarching meta theme driving top-down versus bottom-up, professionals' knowledge versus traditional knowledge, and structural versus non-structural mitigation measures.

Community flood resilience, from physical and socio-cultural perspectives, is complex. Development planning with structural mitigation measures has shown the promise to enhance community resilience. Despite having negative connotations of sole dependency on physical modifications with technical infrastructures, the *haor* communities receive various types of structural mitigation measures as outcomes of development planning and their perceptions about flood resilience get shapes due to these planning interventions. Through investigating the impacts of these structural mitigation measures on the perception of risk and resilience of communities and their process of development, this research will attempt to outline the factors of enhancing community flood resilience, where the issues of adaptation, capacity building, community participation, empowerment and partnership will be counted. With an exhaustive knowledge of how and why the natural phenomena of flood becomes a 'disaster', how communities get perceptions about risk and resilience and how planning processes work, the proposed research will address the gap of understanding community flood resilience. The whole synthesis has been summarized in Table 2-2.

Table 2-2 Summarized synthesis of literature

Literature	Research Gaps		Scope to address research gaps
Resilience and community flood resilience,	The realist, as well as socio-constructivist view of vulnerability and resilience analysis lacks to sufficiently incorporate the community perceptions of flood resilience, since a community’s perceived resilience is dynamically associated with the changes of their surrounding environment due to new ventures to mitigate flood-losses.	➔	Exploring the perception of community flood resilience, from a perspective of change in surrounding environment with structural mitigation measures as an outcome of development planning which is consumed with the dilemma of rational comprehensive and participatory planning paradigms.
Varying methods of structural flood mitigation measures and their consequences	Literature has limitation to evaluate impacts of structural mitigation measures from the perspective of beneficiary groups, especially in the context of the Haor region in Bangladesh, where the nature of constructed flood mitigation measures is barely explored.	➔	
Development planning for disaster risk management	Planning literature expresses the crisis and the need to adopt an appropriate paradigm that can incorporate community perceptions for enhancing flood community resilience, considering the limitations of current planning practices (broadly rational comprehensive and participatory planning paradigms) in the development context.	➔	

2.5. Theoretical Framework

Primarily three theories – Critical Theory, Social Disruption Theory and Political Ecology were chosen to have a comparative analysis to select the most suitable one for using as the analytical lenses of this research. Hence, a review of these selected theories has been made in the following sections.

2.5.1. Critical Theory

A simple or precise definition of critical theory may undermine the intent of some researchers who would use critical theory as a tool to question the larger system that would define it (Kincheloe & McLaren, 1994). It is vastly an amalgam of philosophical and social-scientific techniques that had wide-ranging applications (Sim & Van Loon, 2001). Critical theory gives researchers license to question assumed reality, what Foucault would refer to as ‘social regularities’ (Foucault, 1973; Scheurich, 1997, p. 99). The critical theory tradition draws on Marxist scholarship to illuminate the ways in which people accept as normal a world characterized by massive inequities and the systemic exploitation of the many by the few (Brookfield, 2015). As a mechanism to an end, it intimately relates to practices (Schwandt, 2007). Schwandt (2007) explains, critical theory

is a kind of theory that employs the method of immanent critique, working from within categories of existing thought in order to radicalize those categories, reveal their internal contradictions and shortcomings, and demonstrate their unrecognized possibilities (p. 55).

Marx's (1961) notion of alienation is a central concept in critical theory. It intends to analyze the society that allow people to live collectively in ways that may encourage the free exercise of their creativity without foreclosing that of others (Brookfield, 2015) and the social systems which may disadvantage, exclude, or otherwise harm its people (Phillips,2014).

Critical theorists argue that critical thought is suppressed in society by the mass media and other institutions (e.g., corporations, education, politics), which instead extend a controlling instrumental or strategic rationality into all domains of society. According to Brookfield, (2014) critical theory's two most important analytical constructs are power and ideology. Power, as framed by Marx and Engels (1970), intends to study how the dominant class exercised its power to universalize its own ideology so that it became the "common sense" of the day. Ideological state apparatuses, such as schools, media, and cultural organizations broadcast dominant ideologies (Althusser, 1969 &1971). People learn ideology in families (Tool & Garrioch, 1989), schools (Apple, 2004), and through popular media such as TV soap operas (Mumford, 1995), comics (McAllister et al, 2001), and films (Vighi, 2014) and these apparatuses establishes ideologies as common sense and forms an unequal, racist, and sexist society, where there will be no or very little oppositional thoughts. As Fromm (1968) puts it,

ideologies are readymade thought-commodities spread by the press, the orators, the ideologists in order to manipulate the mass of people for purposes which have nothing to do with the ideology ,and are very often exactly the opposite (p. 153).

In their book, 'The German Ideology', Marx and Engels's (1970) wrote,

the ideas of the ruling class are in every epoch the ruling ideas: i.e. the class which is the ruling material force of society is at the same time its ruling intellectual force . . . the class which has the means of material production at its disposal, has control at the same time over the means of mental production. (p. 64)

Critical theorists advocate that individuals should engage in a systematic critique of the ways in which society is organized and of the goals served (Dillon, 2014). Horkheimer, Adorno, Marcuse and Habermas as the 'critical theorists' Each maintained that although all knowledge is historically conditioned, truth claims can be rationally adjudicated independently of immediate social interests. They defended the possibility of an independent moment of criticism. They also all attempted to justify critical theory on a non-objectivistic and materialistic foundation (Held, 1980). This wide perspective of critical theory has allowed

scholars to formulate various other theories: Feminist theory (Beauvoir, 1952; Butler, 1990), critical race theory (Bell, 1980; Crenshaw et al, 1995; Harris, 1993), queer theory (Butler, 1990; Jagose, 1996; Smith, 2003), disability theory (Oliver, 2009; Pothier & Devlin, 2006), and border theory (Anzaldúa, 1987; Castronovo, 1997; Hicks, 1991). For each of the theorists, the motivation appears similar; the aim being to lay the foundation for an exploration, in an interdisciplinary research context, of questions concerning the conditions which make possible the reproduction and transformation of society, the meaning of culture, and the relation between the individual, society and nature. While there are differences in the way they formulate questions, the critical theorists believe that through an examination of contemporary social and political issues they could contribute to a critique of ideology and to the development of a non-authoritarian and non-bureaucratic politics (Held, 1980).

2.5.2. Social Disruption Theory

Social disruption theory states that, communities, experiencing rapid growth, lead to an array of social problems which are indicative of overall community disorganization (Greider et al, 1991). This disorganization affects communities, as well as individuals, whose behaving patterns, social relationships and networks get affected (England & Albrecht, 1984). Social disruption theory also asserts that rapid changes in a community, resulting due to population increases, lead to an array of social problems indicative of generating crisis and losing traditional routines and attitudes (England & Albrecht, 1984; Greider et al, 1991).

One of the approaches of social disruption theory developed in urban sociology which explains the causal relations of social disruption of urban communities. In the early 20th century, the rapid growth in urban population started to generate rural–urban crisis resulting from rural-urban migration and heavy concentrations of people living in existing metropolitan areas (Wirth, 1938). The new urbanism as a “new way of life,” was considered as changed in social behaviors due to increases in the population size and density of human communities (Kasarda & Janowitz, 1974).

Rural sociologists attempt to explain disruptions in rural communities, based on two contexts of economic development (Summers & Branch, 1984). One is rural industrialization; the other is boomtown development, a term that refers to rapid growth through resource exploitation (Cortese & Jones, 1977; Gilmore, 1976; Kohrs, 1974). The rapid and extreme growth of population in communities around some sort of industrial process, either in the form of large-scale extraction of minerals or the conversion of energy to power, is referred to as ‘boomtowns’ (Cortese & Jones, 1977; England & Albrecht, 1984). Rural sociologists have traced the effects

of boomtown changes using a variety of social indicators, including the mental health of longtime residents as well as newcomers to the area (Bacigalupi & Freudenburg, 1983; Freudenburg et al, 1982); effects on local organizations and community services (Cortese, 1982); residents' social and personal well-being (Albrecht, 1982; Freudenburg, 1982; Krannich & Greider, 1984); child abuse and neglect (Camasso & Wilkinson, 1990); and community social interactions (Freudenburg, 1981; Greider & Krannich, 1985).

According to social disruption theory, rapid growth is likely to produce disproportionate increases in crisis beyond population increases. The validity of social disruption hypothesis has been questioned on grounds that the basic assumptions and evidence for disruption are flawed (Wilkinson et al, 1982). Based on empirical evidence, England & Albrecht (1984) argues that the changes that occur in any society present a complex pattern; some areas of community life are disrupted while others are benefited and still others remain largely unchanged.

2.5.3. Political Ecology

The phrase 'political ecology' combines the concerns of ecology and a broadly defined political economy. Together these encompasses the constantly shifting dialectic between societies and land-based resources, and also within classes and groups within society itself. (Blaikie & Brookfield, 1987, p. 17)

Political ecology as an interdisciplinary concept, seeks to understand human societies and their relationship to nature. Considering environmental issues as increasingly prominent in local struggles, national debates and international policies and programs, political ecologists pay more attention to conventional local and global politics, as well as to more broadly defined relations of power and differences in the interactions between human groups and their bio-physical environments. The term 'political ecology' has been widely used in the context of human geography and human ecology since long but with no real systematic definition (Simsik, 2007) until Wolf's (1972) work. In 1970s a variety of different intellectuals-journalist Alexander Cockburn, anthropologist Eric Wolf and environmental scientist Grahame Beakhusht conceptualized the idea to explain the relations between political economy and nature in the context of an increasing environmental concerns (Keil & Faucett, 1998; Watts 1983). It generated questions about the roles of politics in environmental scholarship. However, the term can be traced back to have been used in 1935 by Frank Thone (Thone, 1935).

Political ecology has been developed as an interdisciplinary approach to investigate complex human environment interactions, especially those related to economic development of the third world. It applies the basic toolkit of political economy that questions about the social relations of production and about access and control over resources, to understand forms of environmental disturbance and degradation and to develop models for environmental rehabilitation, conservation, and environmentally sustainable alternatives (Paulson et al, 2003). A primary objective of political ecology has been to understand the underlying causes of human and environmental crises and identify ways to ameliorate or eliminate them (Simsik, 2007). The concept of environment includes not only bio-physical phenomena, but also human knowledge and practice. Concerns for marginal social groups and issues of social justice (Pett & Watt 1996; Martinez-Alier, 2002) lead the basic amalgamation of political economy and cultural ecology through research, analysis and practice across disciplines including anthropology, biology, geography and political sciences (Paulson et al, 2003). Robbins (2004) identifies important differences in emphasis after carefully reviewing the term ‘political ecology’ since its known early use till the most recent. Despite the differences, Robbins (2004) underscores a set of common elements in political ecology, one of which is that it works from a common set of assumptions and that it employs a reasonable consistent mode of explanation. Political ecology research has demonstrated or attempted to demonstrate four general theses as elaborated in the table below (Robbins, 2004).

Table 2-3 Political ecology’s attempts to explain things.

Thesis	What is explained	Relevance
Degradation and marginalization	Environmental change: why and how?	Land degradation, long blamed on marginal people, is put in its larger political and economic context
Environmental conflict	Environmental access: who and why	Environmental conflicts are shown to be part of larger gendered, classed, and raced struggles and vice versa
Conservation and control	Conservation failures and political/economic exclusion: why and how?	Usually viewed as benign, efforts at environmental conservation are shown to have pernicious effects, and sometimes fail as a result
Environmental identity and social movement	Social upheaval: who, where, and how	Political and social struggles are shown to be linked to basic issues of livelihood and environmental protection
Source: Robbins, 2004, p. 14		

Early studies of political ecologies, focused on the "land manager" considering its relationship with nature in a "historical, political and economic context" (Blaikie & Brookfield, 1987, p. 239). Gradually, a variety of political ecology approaches were evolved around a shared set

of concepts. Local political ecology, for recognizing the context, sharply focus towards local decision-making (Warren et al, 2000). Ecological anthropology, as a stream of political ecology, proposed by anthropologist Julian Steward (1972), that introduced new possibilities for comparative analysis of the relationships between human and environment, through explaining cultural similarities considering similar environments, subsistent patterns and economic arrangement. Ecosystems-cybernetics, closely linked to cultural ecology, stems from important connections between community ecology and new explorations of cybernetics and system theories, which derived from the theory of machines and from artificial intelligence developed particularly during second world war (Odum, 1971; Bateson, 1972). Another approach led scholars to realize that disaster prevention, preparations for it, and response to it were highly political. During the post war development phase, sociologists and geographers conducted survey research, cognitive studies and behavioral investigations to understand why individual misperceived, ignored or responded in diverse ways to environmental threats- tornadoes, earthquakes, floods and other kinds of natural hazards. (Watts, 2002). Much of this work, drew on organic analogies of adaptation and response, but it was also sensitive to cultural perceptions and to questions of organizational capacity and access and availability of information. Since 1990s, issues like, ethnic identities, gender roles and relations, involvement of institutions, governance apparatuses, political involvement, and other social factors have been started to consider within the scope of political ecology for developing knowledge and analyzing decisions and actions (Paulson et al, 2003).

2.5.4. Synthesis

While these theories are capable to provide a theoretical framework to explain any social phenomena, the scope of critical theory will be broad to apply to this study, as critical theory as a tool questions the larger system that would define it and demands extended philosophical and social discussion. Unlike critical theory, the social disruption hypothesis is a narrow approach followed to explain social alteration and disruptions due to rapid population increase and concentration. Social disruption is also criticized as a vague and multi-dimensional concept, as we always do not expect to see evidence of disruption across all possible measurable dimensions of the concept, as well as we do not expect that all groups within rapid growth communities will experience similar disruptions and will conceive similar perceptions (Park & Stokowaski, 2009). Moreover, it is not a good fit as a theory to cover issues including disaster vulnerability, built environment and development. Rather, Political Ecology has much to offer as a theory in the context of this research.

Being an interdisciplinary academic field, political ecology is a powerful tool that can link social changes with environment and development. Especially one of its approaches responses to disaster as a highly political issue. It shows how disasters are neither natural nor neutral (Huben et al, 2017). Emphasizing the social part of a disaster, it demands a discourse on the co-production of society and nature that needs to look closer at how disparities of power and knowledge shape this socio-natural nexus (Nixon 2014). It allows to understand why individual misperceived, ignored or responded in diverse ways to environmental threats-tornadoes, earthquakes, floods and other kinds of natural hazards. (Watts, 2002).

The intrinsic elements of political ecology have the potential to integrate the components of identified research gaps as mentioned in table 2.2. This theoretical framework will be utilized for gathering data and then categories and analyze them. The diagram shown in figure 2-1 illustrates the simplified process adopted for this research. From available concepts of community resilience and community perceptions of resilience and various planning paradigms discussed earlier, it is obvious that resilience and planning has a significant social dimension along with environmental ones. The interconnectedness of these social and environmental dimensions can be better explained through political ecology given its scope as a theory overarching political, social and ecological aspects. Hence this study adopts political ecology as the theoretical framework.

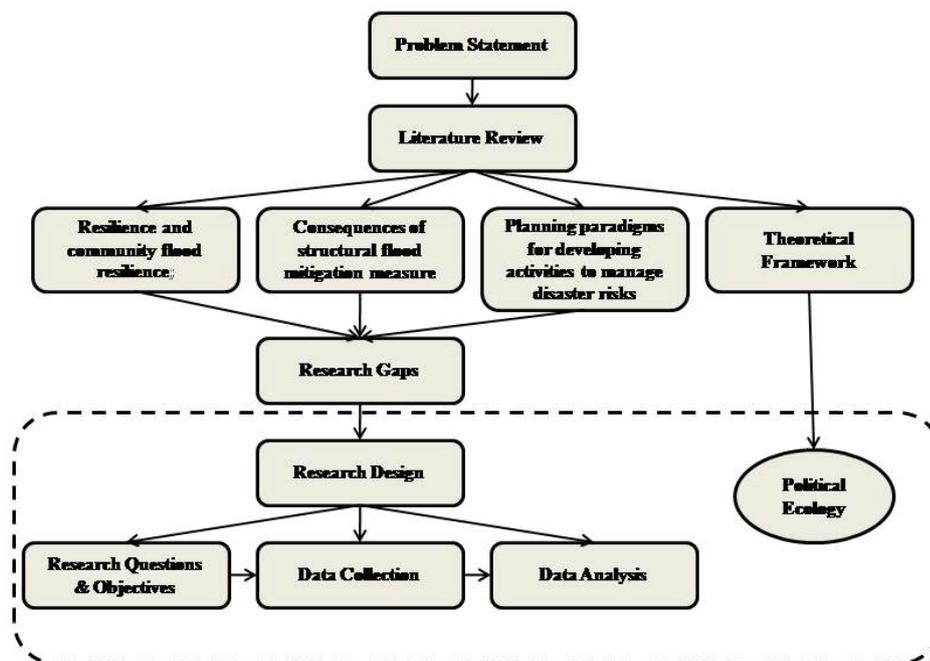


Figure 2-1 Simplified research process

Chapter 3 : Context: The *Haor* Region

Bangladesh is one of the most densely populated countries in the world, with its population of over 150 million (Bureau of Statistics, 2008) living in an area of 147,570 km² (1,045 persons per km²). Except the hilly regions in the northeast and south-east and terrace land in the north-west and central zones, it is one of the largest deltas in the world, formed by the dense network of the tributaries of three major rivers, namely the Ganges, the Brahmaputra and the Meghna (Figure 3-1). The land area of the country is broadly divided into three categories i.e. floodplain (80%), pleistocene terrace (8%), and tertiary hills (12%), based on its geological formation (MoEF, 2005). Bangladesh, one of the most disaster-prone countries in the world (DMB, 2010), is vulnerable to climate stimuli (including both variability as well as extreme events) because of its low economic strength, inadequate infrastructure, low level of social development, lack of institutional capacity, and a higher dependency on natural resources (MoEF, 2005). Bangladesh is identified as the world's most flood-prone country (Thompson & Sultana, 1996). The inhabitants of the *Haor* region of the north-eastern part of Bangladesh

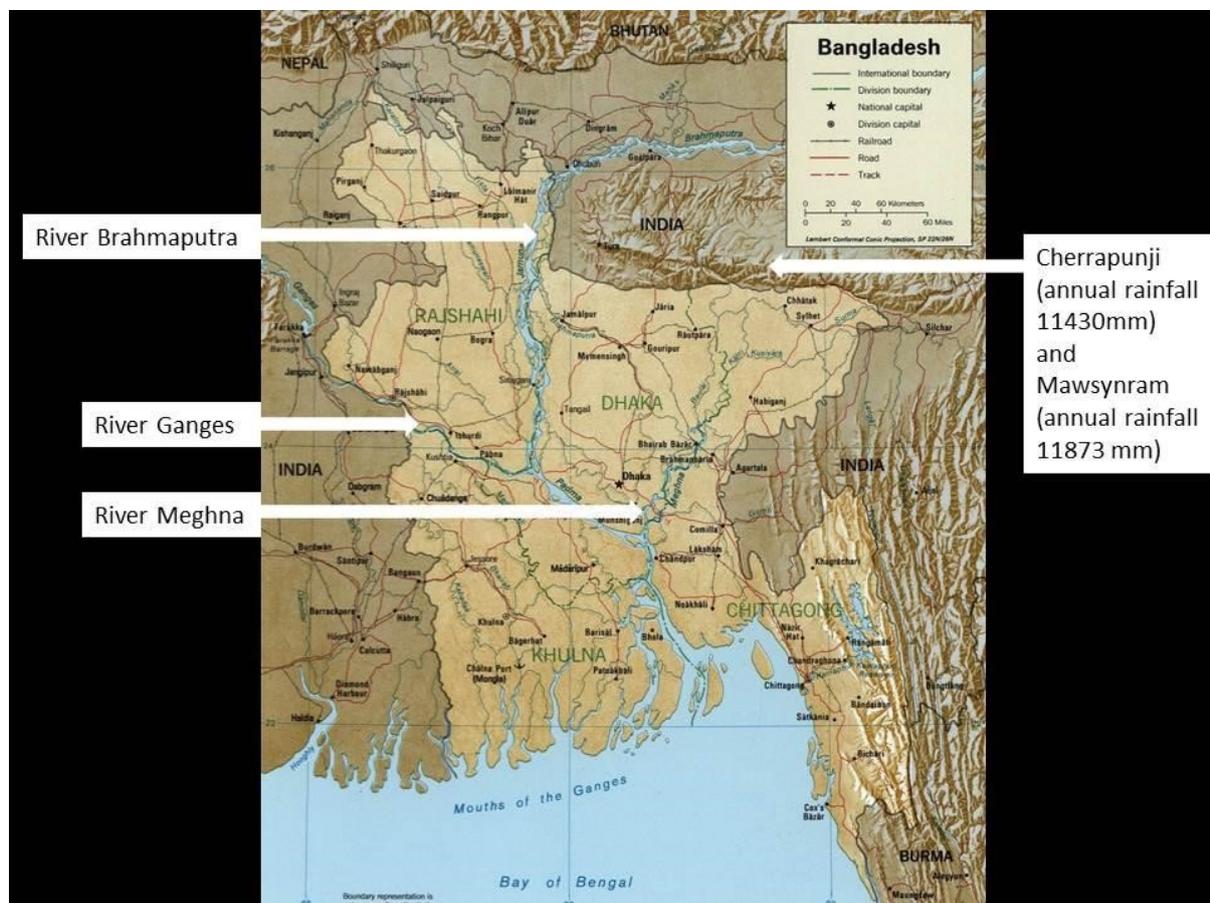


Figure 3-1Map of Bangladesh (Atlas of Bangladesh, 2014) edited by the author

experience flood every year. The following sections provide details of the *Haor* region as well as its settlements and inhabitants.

3.1. Flood and Floodplains of Bangladesh

Two-thirds of the country is less than 5 meters above sea level, making Bangladesh one of the most flood-prone countries in the world (IFAD, 2011), where some parts experience flood almost every year, causing considerable damage (Alam, 2000). Regular river floods affect 25%-30% of the country, increasing up to 68% in extreme years (DMB, 2010). Floods result primarily from heavy rainfall in upper positions (the great Himalayan range of India) of its watersheds (Alam, 2000). Rainstorms in the Indian Hills (Cherrapunji in the state of Meghalaya with an annual average rainfall of 11,430 mm and Mawsynram with an average of 11,873 mm (IFAD, 2011) (Figure 3-1) contribute to the severe rise of water levels in rivers and cause widespread flooding in addition to local monsoon rains. The problem is exacerbated by factors such as silting of river beds, reduction in the carrying capacity of river channels, erosion of beds and banks leading to channels, erosion of beds and banks leading to changes in river courses, synchronization of floods in the main and tributary rivers and retardation due to tidal effects and obstructions to flow, due to landslides and flood control infrastructures (MoEF, 2005) and the changing climatic variability is very likely to increase the scale and duration of floods (IFAD, 2011).

3.2. The Haor Region

3.2.1. General Description

The *Haor* region in north-eastern Bangladesh (Figure 3-2) lies within the floodplains of the river Meghna, along with its several branches and tributaries (MoEF, 2005). This tectonic depression is being pushed down as the Indian Plate collides with the Eurasian plate (IFAD, 2011). It contains permanent water bodies (which are also termed as *haor*), rivers, channels and streams, seasonally cultivable lands (locally known as *beel*) and artificial islands of settlements. The whole *Haor* region, a mosaic of wetlands and seasonally inundated lands (MoWR, 2010), annually turns into an almost uninterrupted large but shallow (depth 1.8 m to more than 3m) water-body (MoEF, 2005) (Figure 3-3). This is a result of its saucer-shaped, depressed condition (Alam & Hasan, 2010) and regular, extended periods of monsoon flooding (from June to September) and extreme flash flooding (Salauddin & Islam, 2011). It covers more than 24,000 km² area, approximately 17% of the country's land area (Alam &

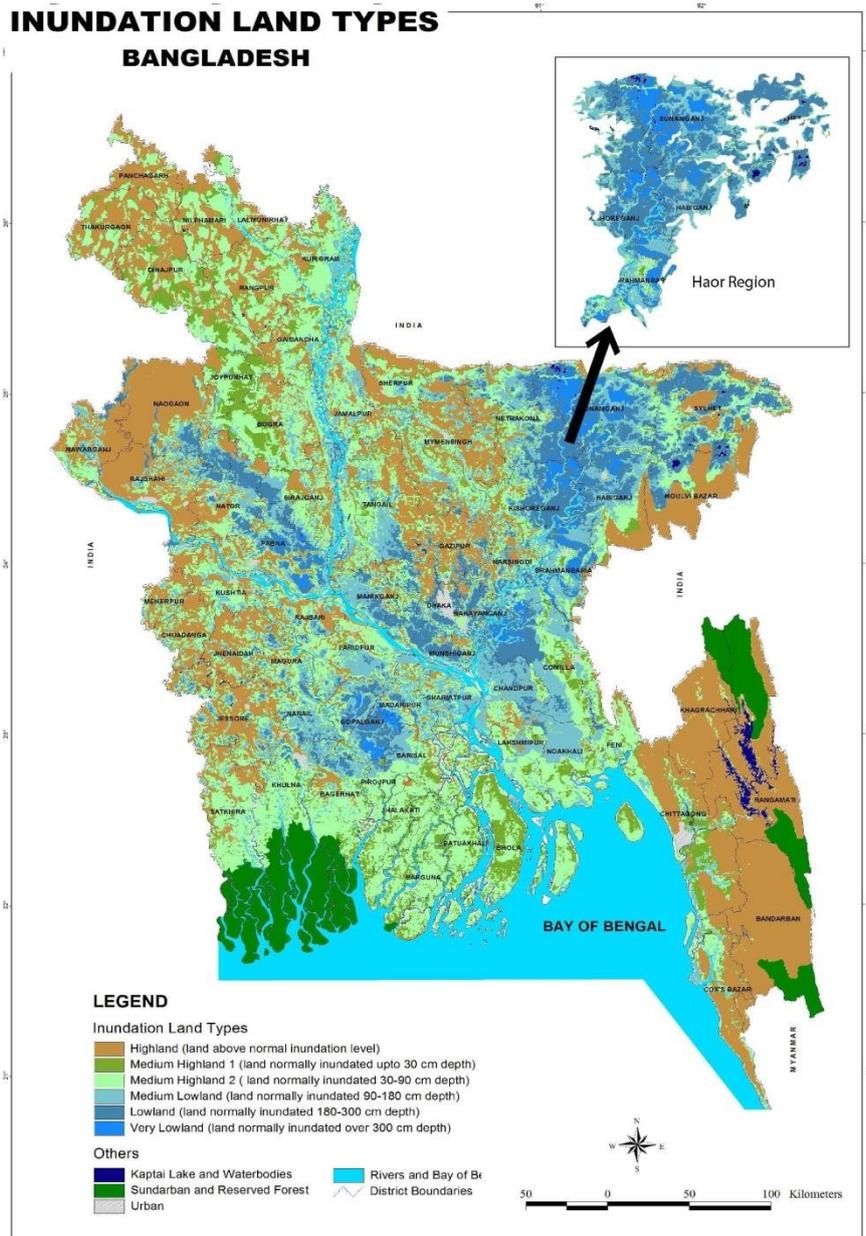
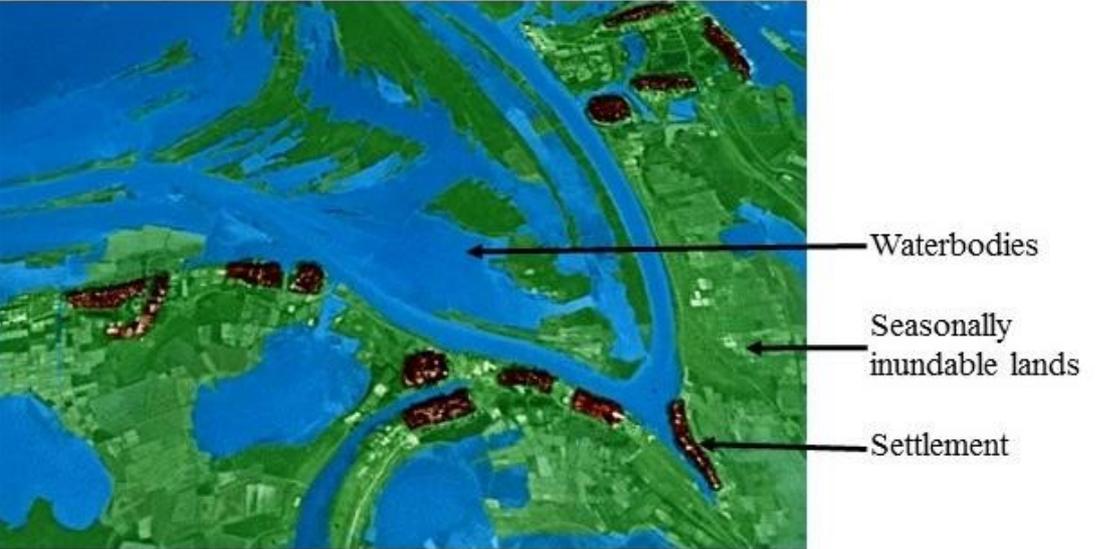


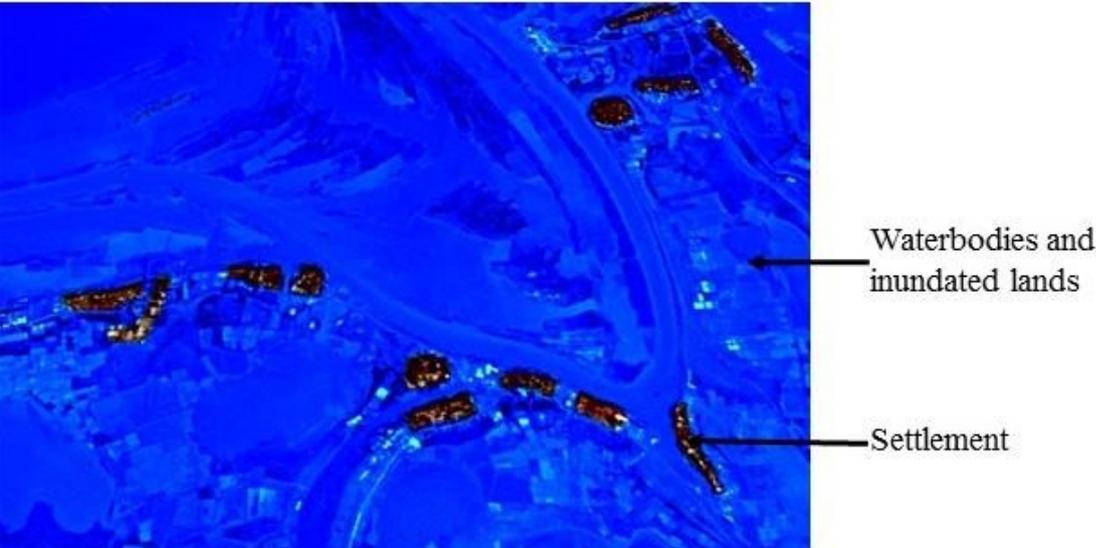
Figure 3-2 The Haor region is shown in inset: Medium lowland, lowland and very lowland of the North-eastern part of Bangladesh (BARC, 1999)

Hassan, 2010) and stretches over parts of seven districts of the north-eastern region of Bangladesh, i.e. Sylhet, Sunamganj, Habiganj, Moulavibazar, Netrakona, Brahmanbaria and Kishoreganj (MoWR, 2010), though it does not have any defined territory. The *Haor* region provides very important habitations for the unique and dynamic ecosystems, which have immense productive and ecological value e.g., storage of rainfall-runoff, groundwater recharge, providing habitats for fish, wildlife, aquatic plants and animals, resort to migratory birds, support to biodiversity, *haor* area plant-based socioeconomic activities, fishing, agriculture and recreation (Salauddin & Islam, 2011).

The *Haor* region is sub-tropical monsoon in its climatic nature with three prominent seasons: summer, monsoon and winter. Summer begins in April and continues through to June. The monsoon is the rainy season, extending from June to September. Winter is the following season with the peak cold weather in December and January. This area is characterized by the highest rainfall with average annual rainfall in the region of 4130 mm, almost double that of the country’s average (Salauddin & Islam, 2011) and relatively low temperature compared to the annual average of the country (lowest average 26°C and highest average 33°C (IFAD, 2011)).



Dry season (October/November –March/April)



Wet season (April/May- September/October)

Figure 3-3 A bird’s eye image of the *Haor* region in dry and wet season (Google earth, 2014), edited by the author

3.2.2. Life and Livelihood

The *Haor* region experiences severe poverty and offers limited livelihood options for its residents (IFAD, 2011), particularly as a consequence of seasonal flooding. Most of the region, including its cultivable lands, is inundated for 6 to 7 months of the year by seasonal floods. The floods limit the potential for growth in agricultural production and rural enterprise, but are necessary for the ecological balance of the region and the wider landscape. Along with seasonal cultivation, year-round fishing and off-farm labor are the main sources of income of the households of *haor* communities. Fishing in the permanent water bodies could be an important income source for many poor households. Long-term local government leases of the water bodies through ‘open tenders’ limit access to fishing to those wealthy enough to afford them. Those who cannot afford such leases are restricted in their fishing, inhibiting realization of the full potential of the fisheries sector. As a consequence of the leases, many traditional fishermen have had to change their occupations, and those who still make their living from fishing have to pay money or give a share of the catch to get fishing rights (IFAD, 2011). Diminished income from such activities forces many men to seasonally migrate to nearby small towns, cities and the capital, in search of temporary jobs.

Along with the year-round naval transportation, very limited numbers of submersible rural roads provide some connectivity during the dry season. The challenged communication network limits the incentives for increasing production, discourages rural growth, limits access to markets and off-farm employment opportunities and limits access to existing social services, particularly health and education (IFAD, 2011).

3.2.3. Settlements and Challenges, faced by Communities

A 12% area of the *Haor* region of more than 24,000 km² (Alam & Hassan, 2010) consists of settlement that accommodates over 19 million people (MoWR, 2010) in several artificially elevated, isolated, island-like habitats of 10 to 200 families (anecdote).

- **Traditional System of Building Settlements**

As it is near to impossible to get any piece of land that does not go under water during the monsoon period, settlements are usually built over artificially raised or elevated land mass. At first, a suitable base land is found, which remains dry in the dry season and far from main river-courses, canals and permanent water bodies (*haors*). Then, a considerable amount of area is designated, which can accommodate multiple households, and the elevation of that

area is raised up to 2.75 m to 3.75m by piling up a huge amount of soil (anecdote) and finally, houses are built on top of that. It is the traditional way of building habitats that are not only laborious but also expensive. These habitats are at risk of being washed away or collapsing due to the effects of base-erosion, flash flood, and strong waves of the vast water body during the monsoon period and pre-monsoon period (Anik & Khan, 2012) (Figure 3-4 and 3-5).

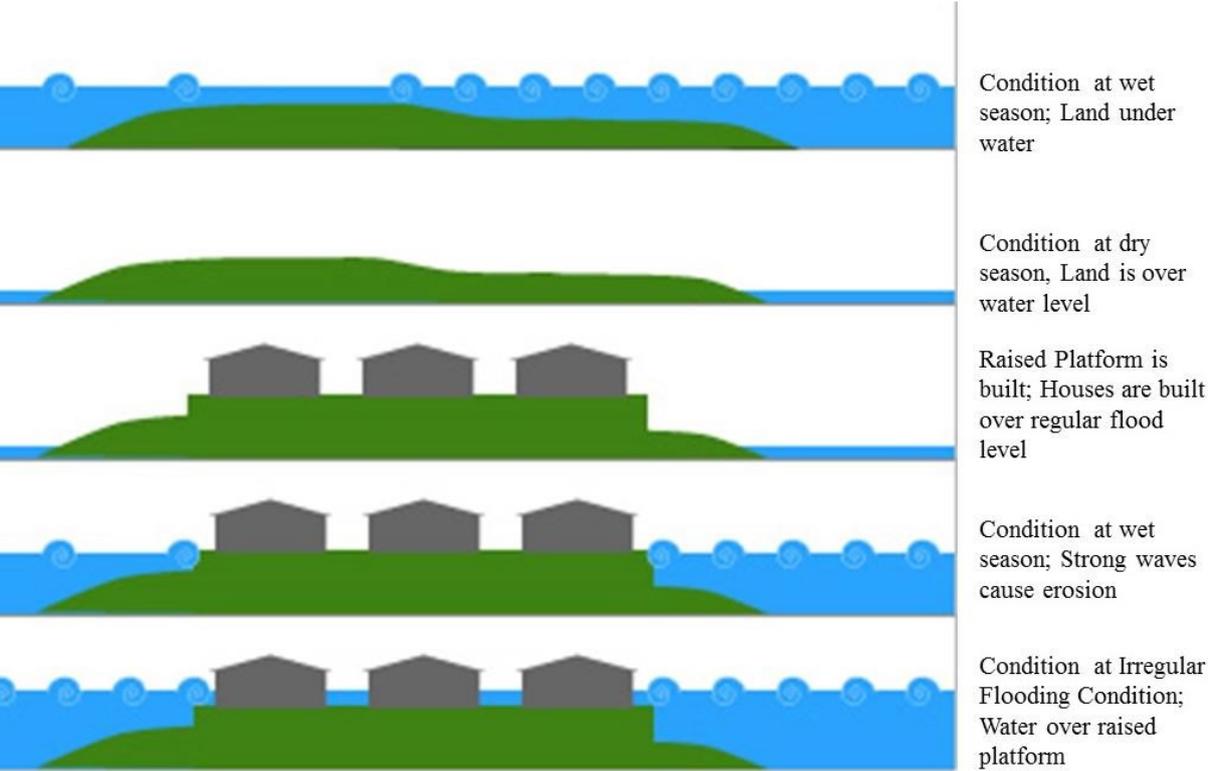


Figure 3-4 Traditional method of building a settlement in the *Haor* region

- **Hazards and Risks to Settlements**

Monsoonal flood is the main hazard for the *Haor* region, which submerges the primary production sector (e.g. crops and fisheries) and thus threatens the lives and livelihoods of the people. Intensive rainfall in the upstream hilly area and subsequent runoff, sedimentation in the rivers, deforestation and hill cuts, landslide, improper drainage, improper road and water management infrastructure and the effects of climatic variability are the main reasons for the devastation caused by flooding (MoWR, 2010). Strong wave action of the vast water body of the extended monsoon period adds to the vulnerability as it can potentially wash away the land and poses a major threat to many settlements in the *Haor* region (IFAD, 2011). In their research, Alam and Hasan (2010) identified that, until the last century, the wave attack was not as serious a threat to the existence of settlements as it is presently and in some locations,

the wave height has increased more than two-fold, (from approximately 0.6 m to approximately 1.5 m). This is severely threatening the settlements (Alam & Hasan, 2010).

Along with this, the sub-basin of this area is estimated to be sinking at 2.1 cm per year because of down-thrusting under the Shillong mass. However, based on analysis of sediment thickness, some researchers claim the rate of sinking is much less, at 2-4 mm/year (IFAD, 2011). The gradual sinking of the basin area acts as a catalyst to enhance flood-related adversities.



Figure 3-5 A typical settlement of the Haor region during the wet season (Karim, 2014)

- **Structural Mitigation Measures**

Protecting the edges of the elevated base-ground of settlements from wave attacks is the main challenge for the households. In older times the settlements were used to be built within the natural forests of trees which can naturally survive long in a waterlogged condition for extended period. The settlements built within the forest used to be naturally protected by vegetation boundary. As all these lands have gone under cultivation, the possibility of getting protection by natural vegetation boundary is very limited (Tod et al, 2008). Traditional structural mitigation measures for protecting edges contains

- Bamboo poles with layers of bamboo mat, filled with *choila* grass (*Hemarthria compressa*)
- Piles of sandbags or bags of water hyacinth (*Ichhoornia crassipes*)

- Planted or naturally grown vegetation boundary of mango-pine (*Barringtonia acutangula*) and karaj (*Pongamia pinnata*) trees
- And any combination of these systems (Figure 3-6)



Figure 3-6 Examples of traditional structural mitigation measures for protecting settlement edges (Field survey, 2015)

Traditional fortifications that use bamboo poles, reeds, mats, sand bags or bags of water hyacinth have been found to be ineffective (Alam & Hasan, 2010).

Several external bodies (e.g. Care Bangladesh, Concern Worldwide Bangladesh) provide financial and technical support to fortify the settlements with non-traditional structural mitigation measures; e.g. brick wall, concrete block wall. (Figure 3-7). These initiatives

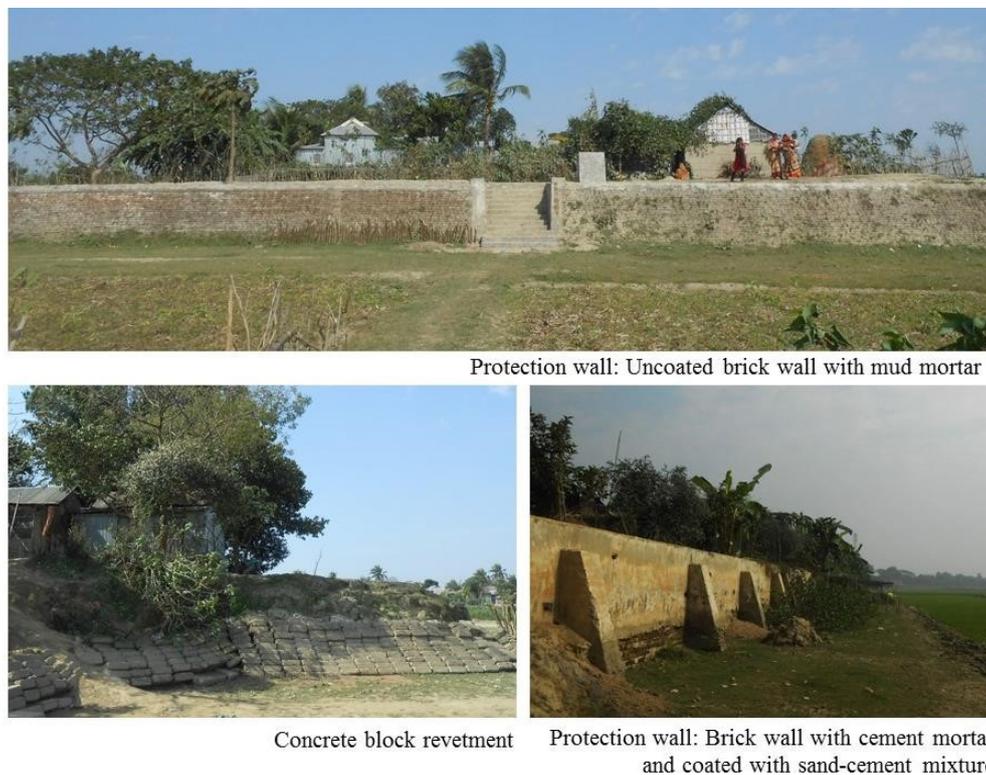


Figure 3-7 Examples of non-traditional mitigation measures for protecting settlement edges (Field survey, 2015)

support the vision 2021 of Government of Bangladesh, which contains a strategic theme of social safety net and improved standard of living to protect people from all sorts of social, economic and natural hazard risks (MoWR, 2010). The Master Plan of the *Haor* area, prepared by the Ministry of Water Resources in 2010 for the next 20 years, also proposed to allocate 2.22% of its whole budget to improve the condition of housing and settlements with fortifications and settlements at new habitats (MoWR, 2010).

Increased incidents of extreme weather associated with change in climatic variables (Field et al, 2012), deforestation of upstream areas, changing in cropping patterns (Alam & Hasan, 2010) and gradual sinking of this tectonic depression (IFAD, 2011) have been increasing *Haor* communities' flood vulnerability, modifying the frequency, intensity, duration, and timing of flood events and thereby potentially compromising fortification infrastructures and undermining community flood resilience.

3.2.4. Planning Initiatives for the Haor Region

The *Haor* Basin is an area that has come into sharp focus because of its vulnerability to annual flooding. The Government has formulated several key policy initiatives that focus on development in the Haor region. The *Haor* Development Plan is prepared by the Bangladesh Haors and Wetland Development Board (BHWDB) as the mandate to coordinate the activities for integrated development of the Haor region and wetlands in Bangladesh. The Ministry of Land has also announced a new policy for the leasing of public water bodies that aims to provide secure access to groups of genuine fishermen at a nominal cost. In addition, the Bangladesh Government has formulated the Bangladesh Climate Change Strategy and Action Plan (CCSAP) 2009 to deal with some of the climate change challenges in the country. The National Disaster Management Policy 2010 (Draft), the Disaster Management Act 2008 and the National Plan for Disaster Management 2007-2015 address issues, related to all possible disasters with a major focus on flood-mitigation. The National Housing Policy 2008 (Draft) promises to provide safe and secure housing to all (including *Haor* communities). The National Adaptation Program for Action (NAPA) 2005 encompasses adaptation strategies and programs for nation-wide, naturally vulnerable communities. The National Environmental Action Plan 1992 and the National Environmental Policy 1992 work to manage environmentally sensitive areas, where the *Haor* region is identified as an environmentally sensitive area. The National Water Policy 2000 is prepared to ensure sustainable use of the

water sources of Bangladesh. These policy pronouncements and plans directly or indirectly highlight priorities, assigned to the *Haor* region by the Government of Bangladesh.

3.3. Chapter Summary

The *Haor* region, as a large bowl-shaped depression with several permanent lakes and a complex maze of ancient and recent water distributor channels, is a unique natural condition which accommodates almost 17% of the population of Bangladesh in densely populated, scattered settlements in a much-challenged condition. During the monsoon season when the region gets flooded, individual settlements look like isolated islands surrounded by vast expanses of open water and the base ground of settlements are subject to erosion by waves formed by winds blowing across the large area of open water (Tod et al., 2008). Various NGOs operate their projects and programs in that region, not only for saving the settlements from possible erosions but also for improving the living conditions of the inhabitants. Because of geo-morphological conditions and involvement of NGOs as external bodies, the *Haor* region has been consciously chosen to be studied for this research.

Chapter 4 : Research Methods and Design

Hirschheim (1985) and Patton (1980) present the post-positivist research perspective as methodological pluralism, where researchers have the freedom to decide which approach is the most appropriate for each research objective (Wildemuth, 1993), without ensuring certainty and universal generalization (Cooper, 1997). This perspective informs the current research, which follows the grounded theory method, using a range of techniques (e.g. focus group discussions, semi-structured interviews, cognitive mapping and document review) to achieve the specified objectives as presented in this chapter.

4.1. Research Paradigms and Tools

Adoption of a research paradigm and perspective leads the process of selecting methods and tools for collecting and analyzing data. The research paradigm, as the philosophical position of the research, denotes a system of inquiry within which more specific choices about methodologies are made (Denzin & Lincoln, 1994), especially when there are multiple ways to satisfy inquiries. Philosophically, all research works are based on assumptions of how the world is perceived (the ontology) and how it can be understood (the epistemology) (Trochim, 2001). Considering the two major schools of thought prevalent in social sciences, this researcher has adopted a post-positivist view for advancing existing theories to explaining perceptions of community vulnerability and resilience. The method of building theories which are embedded on systematically gathered and analyzed data (Glaser & Strauss, 1967) is known as the grounded theory method. It allows the researcher to follow a flexible set of inductive strategies or tools or techniques for collecting qualitative data and analyzing those for building inductive theories (Charmaz, 2008).

Ontologically, the critical realist view of post-positivist paradigm denotes that the existing realities can never be fully comprehended; whereas epistemologically it takes a modified objectivist view, saying external realities can only be approximated with special emphasis placed on external guardians such as critical traditions and the critical communities (Jabeen, 2012). Critical realists try to ‘construe’ the world rather than ‘construct’ it (Sayer, 2000), leading a search to find casual relationships. The cause of a relationship can be investigated through asking ‘what makes it happen’, what ‘produces’, ‘generates’, ‘creates’ or ‘determines’ it, or, more weak, what ‘enables’ or ‘leads to’ it (Sayer, 1992, p.104). The world is socially

constructed, and any event cannot be understood by studying individuals in isolation, but rather through the connections between people that comprise society (Easton, 2010). For studying societies, primary assumptions based on assumptions made in previous studies may help to establish the causal relation and illustrate a system of thinking about the world that can be found acceptable. The perception of acceptability transforms the epistemologically objectivism into epistemologically subjectivism (Jabeen, 2012).

Guba (1990) suggests methodology used in post-positivist research should be 'dialogic' and 'transformative' in nature. Towards that end, this research incorporates communicative and participatory methods. This research aims to advance existing theories of community resilience and vulnerabilities through analyzing perceptions of certain communities who have experiences of having structural flood mitigation measures and participating in the development planning for mitigating flood-adversities. Any method to study these issues needs to be able to comprehend the inner dynamics of each issue of study.

The literature review indicates that people's lived experiences in place provide an embodied context for generating community perceptions of change, in and of the environment. Development activities, as an outcome of development planning, change the environment. Conceptualizing the community perception demands the pedagogical debate towards the rich multiplicity of planning practices for enhancing community resilience as the core agenda, overarching themes of top-down versus bottom-up, professionals' knowledge versus traditional knowledge and structural versus non-structural mitigation measures. Therefore, it is imperative to explore the causal relations and inner-dynamics to integrate community perceptions on flood mitigation and incorporation of community perceptions in development planning.

The grounded theory method, within the spectrum of post-positivism, emphasizes the option of gathering data, considering multiple variables in a natural setting, and reintroduces the findings in the exploration process to rectify findings derived from any false perception (Guba, 1990). The following discussion summarizes key features of used tools and techniques gathered from literature and explains their relevancy for this research.

4.1.1. Qualitative Research Tools

Qualitative research begins with a research problem, explaining the context, a theoretical lens, a researcher and their assumptions (Creswell, 2007). Unlike quantitative analysis, qualitative research lacks large enough sample sizes to undertake statistical analyses to prove or disprove hypotheses, and has no defined end (Chowdhury, 2014). Rather, qualitative research attempts to

holistically address problems, engaging in complex description and interpretation of a problem, communicating the voices of research participants, and reflecting on both theory and action. As Denzin & Lincoln (1994) indicate:

Qualitative research is multi-method in focus, involving an interpretive, naturalistic approach to its subject matter. This means that qualitative research studies things in their natural settings, attempting to make sense of, or interpret phenomena, in terms that the people bring to them. (p.2)

Qualitative studies, therefore, depend on perceptions and responses as central to enquiry rather than understanding causes and consequences of the phenomena (Silverman, 2005). These employ a range of different approaches and methods that do not rely on numerical measurement and statistical analysis. Qualitative methods rely on multiple data sources and data collection tools, focus on participants' meanings about issues, and analyze data following inductive processes after conducting interpretive inquiries (Creswell, 2007). Methods (e.g. observations, documents reviews, storytelling, focus group discussions, introspection, image or drawing analysis, ethno-history collection, interviews) are used to reveal information about the subject of investigation. Combinations of multiple methods, empirical materials and perspectives, and observers, add to the rigor, breadth, and depth of investigation (Creswell, 2007; Quisumbing, 2003).

There exist many critiques of qualitative research methods, regarding the processes of data collection and analysis. Denzin & Lincoln (1994) describe qualitative studies as unscientific and merely exploratory in nature and elaborate on personal experiences with intensive bias. Researchers more familiar with quantitative and statistical data analysis methods find the aims and methods of qualitative data analyses imprecise (Chowdhury, 2014), taking issue with small sample sizes, representativeness and authenticity (Gordon & Patterson, 2013; Seale, 1999) as well as reliability (Silverman, 2005). To address these concerns, Mason (2013) insists that qualitative research requires a highly active involvement, and a great deal of intellectual, practical, physical and emotional effort from researchers. Further, Silverman (2005) suggests engaging in a variety of data collection strategies, pragmatically selected, to address the research questions.

In dealing with *haor* communities of Bangladesh, a significant concern is considering the number of variables, which are difficult to predict, let alone quantify and measure in clearly defined and identifiable parameters. This research calls for the breadth and depth of information regarding community perceptions about flood resilience and inclusion of community priorities and concerns in development planning for mitigating flood adversities. The multi-focus,

interpretive nature of this research's questions, set within the complex empirical reality of community flood resilience and planning for marginalized communities, and the use of 'first-hand' accounts to explain a physical/social phenomenon, highlighted that the qualitative method would be most appropriate for the study. Hence, this research adopted qualitative methods. However, the exploration process in the natural setting within the *haor* communities with the participants, necessitated the use of flexible tools and techniques. A significant portion of the population is not highly literate; they have limited time and incentive to get involved with this kind of research activity where there is no visible benefit to them. Taking into consideration all these ground realities this post-positivist research employs multiple lines of inquiry to answer research questions, where the unit of analysis is 'community'. It primarily employs the case study method for which data has been collected in a participatory way. Data collection from the communities includes cognitive mapping, focus group discussion and semi-structured, in-depth interviews. To enhance the level of reliability also includes reviewing GO and NGO documents (plan, policy, project detail, evaluation report etc.), relevant to the development of the case study area and interviewing personnel involved in development planning. These approaches or methods are briefly explained in the following sections.

Case Study Approach

This research employs an explanatory single context, multiple case approach, with the Haor region of Bangladesh and multiple settlements of this region that have experiences of both flooding and involvement of external bodies for their development, as cases.

As a research approach, case studies are well suited for developing understanding of complex social phenomena of an investigated subject or event. They involve in-depth and in-situ empirical inquiry into a phenomenon while relevant behaviors cannot be manipulated (Yin, 2009). The case study method is most useful for generating a hypothesis, while other methods are more suitable for hypotheses testing and theory building (Flyvbjerg, 2006). Flyvbjerg (2006) argues that one cannot generalize the outcome from a single case; therefore, the single case study cannot contribute to scientific development. Similarly, Proverbs and Gameson (2008), claim that multiple cases enhance the level of certainty, to enable application of outcomes in other contexts. However, Simons (2009) asserts that even a mono-contextual single case study can contribute to knowledge. Further, Taylor (2013) places a high confidence in case study research, as it allows for exploration of research questions through the use of multiple data sources within a contextual, real-life setting. Moreover, a case study along with

its intensive accompanying descriptions enables readers to make judgments about the relevance of findings to their own situations.

Participatory Appraisal

This research aims to follow the underlying principles of participatory approaches and employs a range of participatory tools, which include focus group discussions, transect walks, preparation of historical timelines, preparation, scoring, ranking and comparing and strength, weakness, opportunity and threat (SWOT) analysis.

Participatory appraisals engage community members in research and have been in use for over three decades in a diverse range of fields, including natural resource management, agriculture, and poverty reduction programs (Chambers, 1994). They draw upon applied anthropology, appreciating the richness and validity of local people's knowledge (Narayansamy, 2009) and usually adopt several tools of Agro-Eco System Analysis (AESAs) (Conway et al, 1989). These tools can provide insights into community experiences with flooding and community perceptions of flood resilience, as they can challenge the quantitative systems of measurement through which current systems see and present the world (Cottam, 1994). Shifts in planning paradigms (from rational to participatory), reversing power dynamics, demand local diversity rather than centralized standardization, and allow ongoing learning throughout a process rather than adopting predetermined paths from blueprints; this trend has promoted the use of participatory appraisal methods (Chambers, 1994), such as Participatory Rural Appraisal (PRA) and Participatory Urban Appraisal (PUA). In contrast to rational approaches, community members play an active role in participatory appraisals while acting as facilitators (Moser & McIlwaine, 1999). As such, researchers use participatory methods to assist local people in analysing information, practicing critical self-awareness, taking responsibility and sharing their knowledge of life and conditions to plan and to act (Bhandari, 2003).

Cognitive Mapping and Visual Research

Over the last three decades, qualitative researchers in visual sociology and anthropology have taken up and refined visual approaches to enhance their understanding of human conditions (Mitchell, 2011). Within social science fields, a growing body of interdisciplinary scholarship utilizes image-based techniques (Mitchell, 2011). Visual methods in sociology and anthropology are grounded in the idea that valid scientific insight into society can be acquired by observing, analyzing, and theorizing its visual manifestations (Pauwels, 2011). Depending on research design, imagery associated with research can take various forms, including:

physical artifacts and settings; photographs or video recordings; drawings, diagrams, or paintings; direct observation of activities and settings; or visualizations inferred through the comments of research subjects or other researchers (Wagner, 2011).

Cognitive (or mental) mapping exists as a visual manifestation of patterns relating to a place and portrays physical representations of those thoughts to produce individual's cognitive maps, or graphical representations of perceptions of place (Tuan, 1975). Downs and Stea (1973) define cognitive mapping as a series of psychological transformations by which an individual acquires, stores, recalls, and decodes information about relative locations and attributes of phenomena in their everyday spatial environment. It describes the marriage of spatial and environmental cognition, the mental representation of spatial knowledge and the internal processes that imbue environments with meaning (Kitchin, 1994). The resulting image denotes the importance of items, playing significant roles in generating orientation and consequently forming that person's geographic imagination (Kitchin, 1994; Lynch, 1960). People store information about their environment and use that information to make spatial decisions, with cognitive mapping helping to explain and lead more developed understanding of spatial behavior. Cognitive maps examine a range of spatial products, which can obviously illuminate the processes of spatial decision making and explore the underlying reasons for subsequent behaviors (Kitchin, 1994). Acquisition of geographical 'survival' knowledge (Stea, 1969; Kaplan, 1973) is vital for adaptation to life in a disaster-prone environment. Indeed, Kaplan (1973) proposes that such knowledge gives a selective advantage in a dangerous world, and hypothesizes that cognitive maps develop as a quick and efficient mechanism for handling information. By harnessing information about communities' spatial perceptions of their spaces, their environment can be managed with better planning and design (Lynch, 1976).

Maps produced via this method do not display a high degree of spatial accuracy, nor is such accuracy their goal. Maps are produced in a qualitative, hand-drawn fashion as a means for not only mapping significant features, but also for promoting more spatially literate, verbal responses from participants. These maps may contain interesting spatial distortions and these distortions indicate the relative strength attributed to investigate reasons behind these distortions (Brennan-Horley, 2010).

Participatory appraisal methods usually advise to conduct transect walks to have an understanding of the life and livelihoods of the community, as well as the resources of different kinds, through a direct observation of the livelihood opportunities and resources (Narayansamy, 2009). Transect walks are observatory walks or treks across the community/ area/ settlement to

study and trace natural resources, topography, indigenous technology, soils and vegetation, farming practices, problems and opportunities that are cross-tallied with resource mapping and modeling (Mascarenhas, 1992; Mascarenhas, 1991). Transect walks are often tied with cognitive mapping sessions to gain a better interpretation of the features presented in maps. Focus group discussions and transect walks, along with prepared maps or any kind of visual representation, assist a researcher to realize a nuanced understanding of participants' experiences, associated with their spatial environment.

In-Depth Semi-Structured Interviews

Interviews, covering a wide range of practices (Seidman, 2006) not only involve conversation but also give scope to study respondents' gestures, facial expressions and pauses, and their personal environment. Interviews are useful for collecting a wide range of data, from factual demographic data to highly personal and intimate information relating to a person's opinions, attitudes, values, beliefs, past experiences and future intentions.

Interviews are broadly classified as either (i) structured or directive (ii) unstructured or nondirective or (iii) semi-structured. Structured interviews with pre-set, standardized and normally closed questions are suitable for a large-scale, formalized survey where the same questions are put to all respondents with concerns for acquiring measurement reliability (Seidman, 2006; Krishnaswami, 2002). Unstructured interviews with open-ended questions are the least structured, wherein interviewees are encouraged to talk freely about given topics with minimum prompting or guidance. Open-ended questions focus more on subjective experiences of participants rather than focusing on external structures (Seidman, 2006), though as Schutz (1967) indicates, it is not possible to experience what the participant experienced, only to record their experiences. Semi-structured interviews attempt to discuss the actual effects of a given experience to which respondents have been exposed. Questions may be asked according to a flexible checklist or guide rather than from a formal questionnaire (Mikkelsen 2005). Seidman (2006) identifies that for in-depth interviewing it is important to build upon and explore participants' responses to questions, where participants are allowed to reconstruct their experience within the topic under study. Considering the time and budget constraints and necessity of practicing dialogic and communicative approaches, this research has decided to employ in-depth, semi-structured interviews.

Document Review

Document reviews are a systematic procedure for identifying, analyzing, and deriving useful information from existing documents (Witkin & Altschuld, 1995) including plan, policy, legislative documents, reports, program logs, performance ratings, funding proposals etc. According to Yin (2009), documents can provide specific details to support evidence from other sources, such as interviews. Review of existing documents helps to understand the history, philosophy, and operation of the program that is being evaluated and the organization in which it operates. Such reviews contribute to understanding the program and organization, helping to formulate questions for interviews, questionnaires, or focus groups, or towards development of an observation guide (DHHS, 2009).

4.2. Research Design

The following sections chronologically narrate the steps of this research, which include *in-situ* data collection in the communities and outside the communities.

4.2.1. In Situ Data Collection

In situ data collection from case study areas employed focus group discussion, historical timeline preparations, transect walks, community mapping, scoring, ranking and comparing along with a major focus on cognitive mapping in a participatory way. This research employed an explanatory, single-context but multiple case-study approach. The context was the *Haor* region of Bangladesh and cases were multiple settlements (communities) of this region that had experienced both flooding and the involvement of external bodies in their development.

Introductory Meeting

The procedure started with an introductory meeting, which was open to all. Community members were approached via local networks, owing to low levels of literacy. This researcher worked with community leaders to convene an initial 30 minute meeting (ideally as part of a regularly scheduled community meeting) to address the aims and objectives of the research and the expectations associated with participation. This researcher, along with research assistants, selected the required number of community members to participate in the next stages. Participants were designated the names of others who could not attend the meeting, in order to pass on the introductory information to those members so that they can also make decisions for participating or not participating in the research.

Focus Group Discussion

The next stage involved focus groups with interested participants. This was the first session of data collection in a participatory way. The session started by preparing the historical timeline of settlement. The participants as a group identified the significant changes of the built environment and their views about impacts of identified changes. The session also generated discussions on community flood vulnerabilities, mitigation measures and their communal experience with any kind of development projects with structural mitigation measures.

Cognitive Mapping

In the second session, participants were asked to prepare cognitive maps in smaller groups. The cognitive mapping method involved a series of ordered tasks, as presented in Table 4-1.

Table 4-1 Ordered tasks required for cognitive mapping

Tasks	
1.	Participants were divided into small groups of the same gender and age-group.
2.	Small groups had a discussion with the researcher about the physical condition of their settlement before and after having the latest flood protection measure.
3a.	Drawing Map 01: They showed the previous condition (before having the latest flood protection measure) of their settlement and identified water level, damage-prone spots and safe locations.
3b.	Drawing Map 02: They showed the present condition (with the latest flood protection measure) and identified water level, damage-prone spots and safe locations.
4.	Each small group explained their map to the researcher individually.
5.	The researcher took a walk through the settlement with each small group to read/interpret their map physically. Participants had to relate their map with the real condition and had to explain causes of identifying the feature or condition as important and reasons for denoting any area/ location as safe or risky. After the walk, the group members optionally updated or edited their maps.
6.	All groups of the same gender had a discussion session, where each small group shared their map with others. In that discussion, similarities and dissimilarities of their prepared maps were identified.

In-Depth Semi-Structured Group Interview

Finally, the research team conducted a semi-structured, in-depth group interview with all participants. This interview was the concluding stage of collecting data through a participatory group activity. It revealed the ultimate factors of perceiving community flood vulnerability, community flood resilience, success and failure of development projects, with structural mitigation measures. It also included analytical games (e.g. pair-wise comparison and strength, weakness, opportunity and threat (SWOT) analysis).

4.2.2. Data Collection outside the Communities

This research targeted a review of available national and local government documents and NGO documents (project/program proposal report and project/program evaluation reports) to discover the considerations for enhancing community flood resilience of *haor* communities and the scope of community participation in the planning process for mitigation of flood risk of *haor* communities. Following document review, in-depth, semi-structured interviews were compiled, to be conducted with representative officials of government (GO) and nongovernment organizations (NGO), involved in mitigating flood damages in the *Haor* region.

These interviews contributed to the researcher’s understanding of the planning process and priorities of projects and programs targeting flood risk in *haor* communities. Specific attention was paid to identifying strategies for community participation and inclusion of local priorities and concerns. Table 4-2 provides the list of expected data from each data collection tool and figure 1-1 of chapter 1 diagrammatically explains which data will feed research questions and objectives.

Table 4-2 Stages of data collection with associated tools and expected data

Stage	Tool	Expected Data
In situ data collection in the communities	Focus Group Discussion	Historic time-line of settlement Significant physical changes of settlement, its reason and impacts Generic perceptions of flood vulnerability and flood resilience
	Cognitive Mapping	Impacts of structural mitigation measures on vulnerability and resilience
	Semi-structured, In-depth Group Interview	Chronological list of factors that exacerbate flood vulnerability Chronological list of factors that enhance flood resilience SWOT analysis of the latest protection measure Communities’ current risks and capacities Information and comments (reactions) about community participation in decision making, implementing, monitoring and maintenance process of the latest protection measure.
Efforts outside the communities	Document Acquisition and Review	Scopes in national and local level documents for addressing the flood issue of <i>Haor</i> region Process of development planning at local level for having flood mitigation measures Scope of community participation and inclusion of local priorities and concerns in development planning at local level.
	In-depth, Semi-Structured Interviews with Key Informants	Process of development planning at local level Scope for community participation and inclusion of community priorities and concerns in the planning process

4.3. Selection, Delineation and Process of Collecting Data

4.3.1. Case Selection and Delineation

Exploring community perceptions about community flood resilience and its annotation with structural mitigation measures to reduce the risk of flood damages requires a situated investigation. Two criteria were established to identify suitable cases, each case needed to involve:

- A flood-prone region where its communities have experiences of being affected by flood, because of its geo-morphological condition and the physical condition of settlements; and
- Communities that have experiences of being involved in externally driven development activities for mitigating flood risks.

An initial evaluation demonstrated that a case study of *haor* communities of the *Haor* region of Bangladesh could fulfill these criteria and would provide a suitably situated investigation for exploring community perceptions of flood resilience and evaluating the scope of incorporating community priorities and concerns for introducing flood mitigation measures. Chapter 3 provided the detailed description of the *Haor* region and the condition of its settlements. Isolated, island-like individual settlements are considered here as individual *haor* communities. Community members are the inhabitants who are living within the physical boundary of a settlement. The intention was to study the community as a unit to understand community perceptions regarding the spatial environment of its settlement territory. Settlements were selected based on two conditions to achieve a comprehensive understanding of various events and spaces. The two conditions are:

- Settlements with comparable household numbers and physical size.
- Varied nature of latest structural mitigation measures (new technology or traditional system).

The communities also needed to be approachable in terms of transportation and willingness of the local people. This was also limited by the research-time-frame and fund availability.

Considering all conditions and limitations, three settlements were selected from the sub-district of Itna of the Kishoreganj district. The *Haor* region covers more than 24,000 km² area, which is approximately 17% of the country's total land area (Alam & Hassan, 2010) and it stretches over parts of seven districts of the north-eastern region of Bangladesh, including Kishoreganj

(MoWR, 2010). The Itna sub-district of the Kishoreganj District was chosen for this research as the area is or has:

- Representative in terms of flood-related vulnerabilities among *haor* communities;
- Relatively easy to access compared to other parts of the region;
- More island-like settlements than other areas;
- Various kinds of structural interventions (including traditional measures) within close geographic proximity to each other; and
- Communities with extensive experiences working with various NGOs.

This final reason was important, as the research required assistance from NGOs to facilitate access to communities.

Within the Itna sub-district, three settlements were selected (villages indicated in parentheses) as listed below and shown on the map in Figure 4-1

- Nayahati (Sahila)
- Concernpara (Sahila)
- Nakusha-Dashkusha (Betegaon)

As the map shows, Sahila and Betegaon villages are in close proximity to one another, although being on opposite sides of the river. All of the selected settlements

- Are representative of the physical environment, geographical location and flood related vulnerabilities of the region;
- Possess different kinds of structural flood mitigation measures (including traditional measures);
- Are comparable with each other in terms of land area, physical shape and household numbers;
- Are experienced with working with similar types of NGOs and similar types of projects and programs; and
- Are aware of what occurs in other settlements.

Moreover, towards a researcher, warm cooperation from the community members and assistance from the NGO officials were extended to conduct the study there.

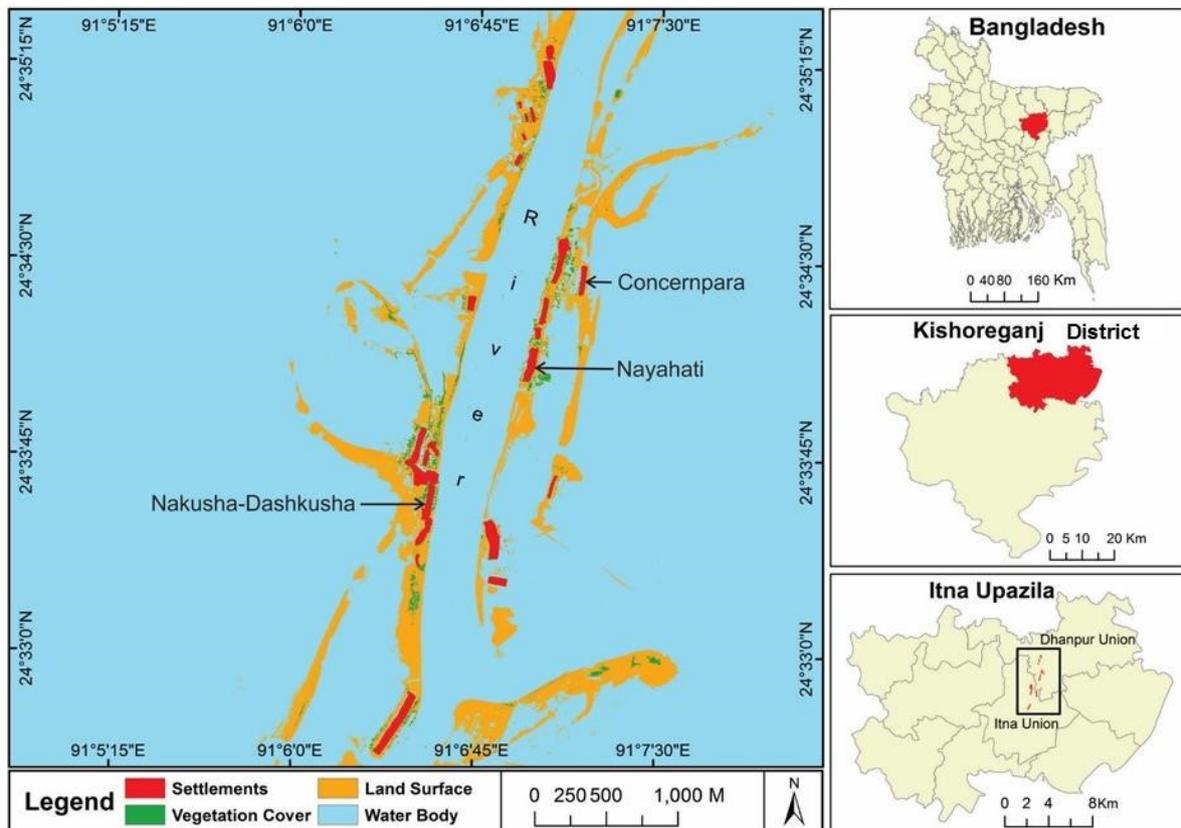


Figure 4-1 GIS map showing the locations of three case study settlements based on satellite images from October 2014 (Apollo mapping, 2014)

4.3.2. Timing for Data Collection

The timing of the fieldwork was chosen to take advantage of the flood condition and it was from mid-October 2015, to mid-December 2015. This was right after the monsoon or flooding period, while the communities were not suffering from the flood and they had a condition to share their experiences. It was also safe for this researcher to travel and conduct data collection after the flooding period. Considering the time constraints for the research, the timing of the fieldwork was chosen to take full advantage of the right time and fresh memories of the disaster period from the community members. Prior studies and prior contact with the NGO employees (who have experiences of working in the *Haor* region) made the researcher aware of the seasonal condition and helped me to plan accordingly.

4.3.3. Selection of Participants from Communities and Process of Conducting the Session

Section 3.2.2 describes that naval transportation was the most convenient mode of transportation to reach those settlements from the nearest small urban centers. It used to take 2 to 3 hours (one way) to reach settlements by small boats from Itna, the closest small urban

center where the researcher used to reside during the whole fieldwork period. It used to take 4-5 hours to reach Ina from Kishoreganj, the district town, by bigger public boats. It also used to take 4-5 hours by train to reach Kishoreganj from the capital, Dhaka. A local NGO employee (who had experienced working as a field facilitator in selected settlements) and two community members (one male and one female) from each community were recruited to assist in the data collection process. Recruited community members were local leaders and had previous experience of working with research or practical projects (primarily NGO programs/projects). Their assistance allowed the smooth navigation into the communities with necessary awareness about socio-cultural and emotional issues of the communities. They also assisted to recruit suitable participants to form a representative sample composition. Assistance from a research fellow from the Department of Geography, Dhaka University, was also obtained to prepare GIS-based maps of the study area (selected settlements).

Introductory Meeting

The process started with an introductory meeting that was open to all. Community members were approached via local networks, owing to low levels of literacy. The research team worked with community leaders and seniors to convene an initial 30-minute meeting (ideally as part of a regularly scheduled event) to address the aims and objectives of the research and expectations associated with their participation.

All settlements are linear in shape, where those have the river Dhanu on one side and a *Haor* (seasonal water body/wetland) on another side. Originally the vast seasonal water bodies or wetlands are called as *haor*. The region is known as *Haor* region because of existences of multiple *haor* water-bodies. Though all settlements were small in size and everyone from the community was aware of the physical condition of the whole settlement, it was decided to have a good mix of households of these two sides for recruiting participants for data collection. All households were not of same economic condition. Several times, through a participatory wealth ranking process, the households were classified into four economic groups, i.e., extremely poor, poor, middle class and rich. In 2010, among all households of the *Haor* region of the Kishoreganj districts, 5.9 % were identified as rich, 21.5% were identified as middle class, 43.6% were identified as poor and 29.1% were identified as extremely poor (IFAD, 2011). Every household identified itself to a specific economic group. It was decided to have a proportionate mix of different economic classes in the research participants, by selecting the required number of community members from each economic class to form a well-represented sample composition. Because of time constraints and other priorities of the participants, the

research team failed to recruit all the same participants for all sessions, conducted in a particular settlement, which can be considered as a limitation of this research.

Focus Group Discussion

Participants were not less than 25 or more than 30. As the session was conducted during the day time and most of the male members of a community were out of the area for work, the research team failed to get enough male participants to make the equal representation of both genders, for some case studies. In terms of economic condition, the team tried to get around 20% of extremely poor households, around 50% of poor households, around 25% of middleclass households and around 5% of rich households. Location wise, the team tried to get almost half of the participants from both sides of a settlement. Table 4-3 shows the composition of participants of the three focus group discussion sessions.

Table 4-3 Composition of participants of three focus group discussion sessions

	Settlement	Total	Gender		Economic Condition				Location	
			Male	Female	Extreme Poor	Poor	Middle Income	Rich	Haor Side	River Side
1	Nayahati	29	12	17	6	15	7	1	12	17
2	Concernpara	30	11	19	8	12	8	2	17	13
3	Nakusha-Dashkush	26	9	17	5	14	6	1	11	15
	Total	85	32	53	19	41	21	4	40	45
	Percentage	100	37.65	62.35	22.35	48.23	24.71	4.71	47.06	52.94

Focus group discussion aimed to prepare a historical timeline of the settlement with significant changes and to discover community perceptions about vulnerability, resilience and capacities to enhance resilience. A questionnaire was prepared with four major themes: history of the physical environment of the settlement, general flood vulnerabilities of *haor* communities, community capacities to reduce flood-vulnerabilities and perception of community flood resilience. The discussions were conducted in such a way so that the participants did not face any difficulties in understanding any technical term or academic word. Table 4-4 shows the questionnaire. All focus group discussions sessions were audio recorded and they were transcribed and edited for further data analysis.

Table 4-4 Questionnaire for the focus group discussion

History of Physical Environment of the Settlement	
1.	How did you start to build your settlement at present location?
2.	What changes have happened in the physical environment of your settlement?
3.	What are the significant changes? What were reasons for those changes? What are consequences of those changes?
General Flood Vulnerabilities of <i>haor</i> Communities	
1.	What factors are usually responsible for putting <i>haor</i> communities at risk of flooding?
2.	What kinds of problem do you (and other <i>haor</i> communities) usually face because of flood?
Community Capacities to Reduce Flood Vulnerabilities	
1.	What do you (and other <i>haor</i> communities) usually do to reduce flood damages?
2.	What factors usually help to protect <i>haor</i> communities from flood-related problems?
Perception of Community Flood Resilience	
1.	What kind of conditions do you expect regarding dealing with flood related problems?
2.	When do you feel that you (your community) are capable to deal with flood events? Why?

Cognitive Mapping

Cognitive mapping was employed with focus group discussion, community mapping and transect walk and satisfied the intention of conducting multiple lines of inquiry to support each other. This method ensured another level of participation of community members besides capturing the discussion. The satellite image of the chosen area was collected (figure 4-2). Based on the satellite image and acquired first hand geographical coordinates of settlement boundaries and main dwelling units, the GIS expert assistant for this study prepared the



Figure 4-2 Satellite image of October 2014 (Apollo Mapping, 2014)

detailed map of each settlement. Simplified versions of these maps were supplied to the participants to draw on. Participants were initially divided by gender to ensure a culturally comfortable environment. Further division was applied to differentiate those who would have been adults before the installation of the latest mitigation measure in most of the cases, and those who may not have yet reached adulthood at that time. A cut-off of 40 years of age was established to differentiate between junior (18-40) and senior (40+) groups. A certain level of homogeneity among group members was maintained only for ensuring a comfortable environment for its members to work as a group. Socio-culturally, people feel more comfortable when working in a group of the same gender and of similar age. Each group got two copies of the same map, where the boundary of their settlement with one to three major/identifiable houses had been shown. The study intended to get three features to be marked on the map by providing legends to mark those features. Table 4-5 shows the features and legend for each feature. Each group produced two maps, where one showed the current condition of the settlement and other showed the previous condition (condition before having the latest structural mitigation measures or condition, while the settlement was first established). Depending on the number of participants from each settlement, 8-10 cognitive maps were prepared.

Table 4-5 Representation of features on cognitive maps

Features	Categories	Representations	Images
Areas of perceived risk	Low risk - somewhat prone to flood damage	Yellow Cross	
	Moderate risk - prone to flood damage	Orange Cross	
	High risk - severely prone to flood damage	Red Cross	
Depth of flood water	Up to knee-level (0.4 m)	Purple Waves	
	Up to shoulder level (head remains above water) (1.5 m)	Light Blue Waves	
	Over shoulder level (head potentially submerged) (>1.5 m)	Dark Blue Waves	
Safe area for habitation		Dark Green Hatching	
Previous land area or any previous feature		Green Line	

Table 4-6 shows the composition of participants for this activity. In this case, the study tried to get a good mix of participants from different economic strata and the other features explained

in the previous section. In the post-drawing session, each small group explained their map and conducted transect walks with the research team. These transect walks and discussion sessions were audio recorded and transcribed and edited later. The community members had the option to get back a copy of the transcribed format to review it.

Table 4-6 Composition of participants of preparing cognitive maps

	Habitat	Total	Gender		Economic Condition				Location	
			Male	Female	Extreme Poor	Poor	Middle Income	Rich	Haor Ride	River Side
1	Nayahati	18	7	11	5	8	4	1	10	8
2	Concernpara	18	7	11	6	9	3	0	9	9
3	Nakusha-Dashkusha	16	6	10	4	7	4	1	6	10
	Total	52	20	32	15	24	11	2	25	27
	Percentage	100	41.38	58.62	28.85	46.15	21.15	3.85	48.07	51.93

In-Depth Semi-Structured Group Interview

Semi-structured, in-depth group interviews were more specific than focus group discussions. The data was generated from the agreement, disagreement, asking questions and giving answers, which brought out attitudes, opinions, experiences and perspectives to ensure a complete and comprehensible picture of the participants' thinking (Morgan, 1997), rather than simply relying on this researcher's assumptions about what was relevant. Besides providing specific answers to the questions asked, the participants were engaged to pair-wise comparing and SWOT analysis. Pair-wise comparison was done through a voting process and the community people participated as voters. Participants who supported one among two items were asked to raise their hands. The winner of the comparison was the one with the most votes, and each win was worth 1 point. If almost equal votes were cast for both items, it was considered as a tie condition. Each tie was worth 1/2 point to each. The group interview session was designed to get definite lists and rankings of reasons for flood risks, factors to mitigate flood damages and contributors for mitigation flood-damages. It captured the community's SWOT analysis about the mitigation measures and their ideas/comments on the scope of community participation and inclusion of their concerns and priorities in the planning and implementation procedure for mitigation of flood-damages. The questionnaire used in this

session is shown in Table 4-7, and Table 4-8 shows the composition of participants for this session. Here, also we followed the same criteria (explained in 4.4.3.2) for choosing participants.

Table 4-7 Questionnaire for the Semi-Structured In-depth Group Interview

Listing and Ranking of Flood Resilience Factors	
1.	What factors do usually work to protect a <i>haor</i> community from flood-damages? Make a list of these and identify the most important one.
Listing and Ranking of Flood Vulnerability Factors	
1.	What factors do usually enhance the risk of flood-damages? Make a list of it and identify the most important one.
Listing and Ranking of Contributors for Enhancing Flood Resilience	
1.	Who are responsible for protecting <i>haor</i> communities from flood damages? What do they usually do? Make a list of them and identify the most important one.
SWOT Analysis of Current Structural Flood Mitigation Measures and Condition of before and after having this measure.	
1.	What kind of protection do you have now? What are the strengths, weaknesses, opportunities and threats of it?
2.	How was the condition before having the latest protection measure (wall)? What were the causes of risks at that time? Make a priority list of these causes. What were the factors, those used to help you to reduce flood-damages? Make a priority list of these factors.
3.	How is the condition with the current flood protection measure? What were causes of risks at present time? Make a priority list of these causes.
4.	What are factors those help you to reduce flood-damages? Make a priority list of these factors.
Planning Process for the Current Structural Flood Mitigation Measures	
1.	How did you get your latest protection measure (wall)? How were major decisions taken? How did you work with external bodies?
2.	Who funded the latest protection measure (wall)? Do you think decisions are mostly imposed by those who provide a bigger share of funding? Explain or elaborate.
3.	How was your role at implementation level? Do you think an active role at implementation level makes you more confident about the consequences of the project? Explain or elaborate.
4.	How is your role for monitoring, maintaining, repairing and altering this protection measure (wall)? Do you think an active role at this level makes you more confident about the consequences of the project outcome? Explain or elaborate.
5.	When do feel more confident about protection; (or mitigating flood damages) while decisions are taken by external bodies or when decisions are mostly taken by you (community members)?

Table 4-8 Composition of participants for semi-structured in-depth group interview

	Habitat	Total	Gender		Economic Condition				Location	
			Male	Female	Extreme Poor	Poor	Middle Income	Rich	Haor Ride	River Side
1	Nayahati	30	14	16	6	15	7	2	17	13
2	Concernpara	26	11	15	7	12	5	2	10	16
3	Nakusha-Dashkusha	29	13	16	9	13	6	1	14	15
	Total	85	38	47	22	40	18	5	41	44
	Percentage	100	44.71	55.29	25.96	47.06	21.18	5.88	48.23	51.77

4.3.4. Document Selection

Documents were selected through a simple process designed to distinguish material relevant to the study. Two types of documents were collected for this study: Governmental Organization (GO) Documents and Non-Governmental Organization (NGO) Documents. The *Haor* region is an environmentally unique feature of Bangladesh where the communities are vulnerable to flood-damages. Besides the area itself, there are larger scale issues, connected with the case study area. These include disaster management, climate change and adaptation to climate change variables, water resources, housing and environment. The national strategic plan and policy documents on relevant issues were collected and reviewed. Table 4-9 shows the list of reviewed GO documents.

The NGO documents were selected considering NGOs; those work/worked in the *Haor* region, especially in the case study area (explained in section 4.4.1). From the primary contact, three NGOs were identified, who ran their programs/projects for mitigating flood adversities of *haor* communities. These are: Concern Bangladesh, CARE Bangladesh and People's Oriented Program Implementation (POPI). Among these POPI worked as the partner NGO of CARE Bangladesh. Publicly available current documents on the program and projects of these NGOs were collected, which have components of dealing with flood risk mitigation issues. Table 4-10 shows the list of NGO documents with their sources, types, and year of publication. These all were reviewed to determine proposals and comments on measures for mitigating flood risks of *haor* communities and scope of community participation and inclusion of community concerns and priorities for planning for mitigation flood risk of *haor* communities.

Table 4-9 List of GO documents

No	Document Name	Source	Year	Type
1.	Master Plan of Haor Area	Ministry of Water Resources and Bangladesh Haor and Wetland Development Board	2012	Draft Strategic Plan
2.	National Plan Disaster Management 2010-2015	Disaster Management Bureau and Disaster Management and Relief Division	2010	Strategic Plan
3.	Bangladesh Climate Change Strategy and Action Plan	Ministry of Environment and Forest	2009	Strategic Plan
4.	National Housing Policy	National Housing Authority	2008	Draft Policy Document
5.	National Adaptation Programme of Action (NAPA)	Ministry of Environment and Forest	2005	Strategic Plan
6.	National Water Management Plan	Ministry of Water Resources	2001	Strategic Plan
7.	National Environment Management Action Plan (NEMAP)	Ministry of Environment and Forest	1995	Strategic Plan

Table 4-10 List of NGO documents

No	Document Name	Source	Year	Type
1.	SHOUHARDO II : Multi-Year Assistance Program (MYAP): Final Quantitative Performance Evaluation	CARE Bangladesh, GoB & USAID	2015	Program Evaluation Report
2.	Knowledge Management Strategy: SHOUHARDO II Program, CARE, Bangladesh	CARE, Bangladesh GoB & USAID	2014	Program Fact Report
3.	Assessment of Household Vulnerabilities to Climate Change in the Haor Region of Bangladesh	CARE Bangladesh, Water Aid Bangladesh & Centre for Global Change	2013	Assessment Report
4.	Haor Initiatives for Sustainable Alternative Livelihood (HISAL) Project	Concern Worldwide	2012	Final Evaluation Report
5.	CARE Bangladesh: SHOUHARDO II Program	CARE Bangladesh, GoB & USAID	2011	Baseline Study Report
6.	Prospective Value Chains for FSUP-H	CARE Bangladesh	2010	Program Evaluation Report
7.	SHOUHARDO: A Title II Program of USAID	CARE Bangladesh, GoB & USAID	2009	Final Evaluation Report
8.	Assessment of the Effectiveness of Homestead Raising and Mound Protection Works Implemented by the SHOUHARDO program	CARE Bangladesh, GoB & USAID	2008	Final Evaluation Report
9.	Sanitation Study: Khaliajuri	Concern Bangladesh	1995	Final Evaluation Report

4.3.5. Selection of Key Informants for Semi-Structured In-Depth Interviews

The fieldwork in Bangladesh for collecting data from *haor* communities and interviewing key informants in Dhaka, extended over two months from mid-October 2015 to mid-December 2015. Three NGOs were approached to interview their employees, who are/were involved with the programs/projects in the *Haor* region. Three employees from each NGO were interviewed to obtain better qualitative data about their experiences. Three employees from three different level were selected, where one of them is a

- Field-facilitator, who has/had direct experience of working with the community members and has/had to visit the project area frequently
- Project/Program Supervisor, a mid-level employee who supervise/supervised the activities of the field facilitators and visit/visited the project area occasionally
- Director/Manager of the Division, a top-level employee who is/was in charge of the whole program/ project or the division/wing that deals/dealt the issues of *Haor* region.

As in most cases, the appropriate individual participant was not known to the research team; initially the head of the organization was approached and requested to nominate the potential employee from the organization. The communication was initiated through a Participation Request Letter (Appendix 1) in the form of an email, which introduced the research team, provided a summary of the research topic and design, outlined participant involvement and requested an interview. Besides this email, there was a Participant Information Sheet (Appendix 2), providing contact information, explaining research objectives and details about the scope and conditions of participation. This was followed by phone communications and personal meetings with organizations and individuals as necessary to agree on and schedule interviews. In all three cases, participants were engaged through professional networks.

In total, nine participants participated in the in-depth, semi-structured key informant interview sessions. Through prior contact, this researcher knew that no government organization (GO) was directly involved through its programs/projects to mitigate flood risk in the case study area (selected settlements). This information supported the decision of not including any GO employee in the interviewee list for this study.

Process of In-depth Semi-Structured Interviews

According to an established protocol, all in-depth, semi-structured interviews were conducted in person, either in their head office at Dhaka or in the project/site/local office at Kishoreganj.

The interview was designed to obtain their professional experiences, while working with the projects/programs for the whole *Haor* region. The interviews followed a set of questions, which were aimed at promoting discussion of themes relevant to the focus of the research and are listed in Table 4-11. These questions were framed and articulated in language appropriate to the knowledge and experience of participants and referenced events and circumstances relevant to the case study. Questions were designed to introduce an idea and focus considerations without steering or leading responses.

The interview questions were designed specifically to get comments from the interviewees about the scope and process of including community concerns and priorities, while implementing their projects/programs for mitigating flood risk of the *haor* communities. The interview questions were refocused by the findings of the document analysis, which identified themes and conditions of particular relevance to the case study. It also contained the scope to compare their response with the responses from the community members. The interview sessions produced more than 10 hours of interview material recorded using a digital audio recording device. Interviews ranged from between 40 minutes to 100 minutes depending on how engaged a participant was, how much information they had to contribute and how relevant the information was to the study. All interview recordings were transcribed. Each participant had the option to get a copy of his/her interview to review and amend their comments or make any additional statement. This research does not reveal either the names of the participants or the names of his/her organizations, while using the content.

Table 4-11 Questions for the In-depth Semi Structured Interview with Key Informants

Policy/ Plan/ Project for <i>Haor</i> Settlement Protection	
1.	What kind of policy/ plan/ project does your organization have for <i>Haor</i> settlement protection?
Understanding Risk	
1.	How does your organization identify flood risk for the <i>haor</i> communities?
2.	How does your organization select a <i>haor</i> settlement for implementing your plan/ project?
Community Participation in Decision Making	
1.	How does your institution/ organization start your project? (Especially the decision-making process.)
2.	At which level, does your institution/ organization usually allow community members to participate?
3.	How does your institution/ organization incorporate opinions/ decisions/knowledge of community members?
4.	Do you find any relationship between financing and decision making? Explain.
Community Participation in Implementation	
1.	How does your institution/ organization allow community members to participate after decision making?

4.4. Data Analysis Method

This research was founded on case study descriptions where selected *haor* communities were studied in a participatory way, relevant NGO employees were interviewed, and relevant documents were reviewed to understand community perceptions and the event of the planning process. Published documents, transcribed interviews and focus group discussions and cognitive maps were analyzed to interpret contents, decipher meanings and building theories. In addition, adopting a post-positivist view within a research paradigm supported the rationale for the qualitative research design that did not follow any single analytical framework or tools and techniques to address all the variables of the research. Therefore, this research benefited from several frameworks and participatory tools, which were combined under the umbrella of the content analysis method.

4.4.1. Content Analysis Method

The content analysis method is the methodological and systematic study of the text. It differs from an ordinary reading, in that the text is selected according to explicit rules and subjected to a consistent analysis (Shapiro & Markoff, 1997). Yin (2009) proposes to employ examining, categorizing, tabulating, testing or recombining qualitative evidence to address the initial propositions of a study. The content analysis method also requires the data to be organized and interpreted in clearly defined and well-established procedures. The researcher has to identify the focus and rationale of the study, identify appropriate sample texts (as well as features of maps) and the units of analysis, decide on the parameters of the analysis, decide how to measure codes and distinguish among concepts, develop rules for coding, decide what to do with surplus information, codes texts (features of maps) and perform analysis, and interpret the results (Sproule, 2006). Coding is certainly a key element of the grounded theory method (Bryant, 2017), which should be done through a very clear process and within a framework (Dunn, 2010), whereas these coding categories identify and distinguish concepts or themes in a descriptive and analytic way (Cope, 2010). According to Creswell (2007)

These codes can

Represent information that researchers expect to find before the study;

Represent surprising information that researcher did not expect to find;

And present information that is conceptually interesting or unusual to researchers (and potential participants and audiences). p. 153

The task of developing coding framework, coding process and coding categories is part of the qualitative analysis (Cope, 2010) and it requires flexibility and involvement of the researcher

in dealing with the data analysis (Willis, 2006). Hsieh and Shannon (2005) identify three distinct approaches: conventional, directed, or summative. In the conventional content analysis, instead of using preconceived categories (Kondracki & Wellman, 2002), coding categories are generated directly from the data. In a directed approach, the analysis starts with an existing or prior research or theory and its research findings are used as key concepts or variables for developing initial coding categories (Potter & Levine-Donnerstein, 1999). A summative content analysis involves a quantitative focus on counting the frequency of specific words or content (Kondracki & Wellman, 2002) and its qualitative inquiry goes beyond mere word counts to interpret the underlying context. This research followed the conventional approach for coding to examine all data in a category by comparing each segment of data with every other segment, working up to a clear definition of each concept, identified as a 'code' (Bryant, 2017).

The coded data are needed to be interpreted and there is a range of approaches, like thematic analysis, narrative analysis and discourse analysis (Willis, 2006). Each approach has a particular focus and purpose, and methodological tradition. The thematic analysis focuses on the central ideas that emerge from the data, the narrative analysis is concerned with people's experience and understanding of events and discourse analysis examines how language is constructed (Willis, 2006). This research applied the narrative content analysis method, as there was a need to understand community experiences with flood and flood mitigation measures and the event of planning through the lens of community participation.

4.4.2. Analytical Method for Reviewing Documents

Determining the accuracy of the documents may involve comparing the documents that contain similar information and checking the documents against the aim and objectives of reviewing documents (DHHS, 2009). The document review process started with making a list of information (characteristics or attributes) required to be assessed from the collected documents. Document review assisted in addressing the second research question of this research: How are community concerns and priorities incorporated in selection and implementation of structural flood mitigation measures? The documents were interpreted and explored through a process of qualitative content analysis to investigate scope, condition and comments on power sharing in decision-making for incorporating indigenous concerns and priorities for mitigating flood risks in the *Haor* region. The contents of documents were coded

based on a framework, initially derived from relevant theory and literature, discussed in sections 2.2 and 2.3. Final coding categories were modified to sort out collected data.

Coding categories distinguish ‘measures of flood risk management’ and ‘development planning’ with multiple subcategories (table 4-12). The measures are categorized into four areas: non-structural measures, structural measures, plantation and combination of more than one of the former. The structural measure generated two sub-categories: service structures and flood infrastructure. Presence and absence of community participation denoted the subcategory of the ‘development planning’ code. The scope of community participation was initially influenced by Arnstein (1969)’s classic and influential ‘Ladder of Citizen Participation’, where *manipulation* and *therapy* are marked as degrees of non-participation, *informing*, *consultation*, and *placation* as degrees of tokenism, and *partnership*, *delegated power* and *citizen control* as degrees of citizen power. This research has categorized the level of community participation into six sub-categories, based on available data: community as informer, consultation, convincing, partnership, empowerment and controlled by community. Besides these categories, another two sub-categories highlighted the community nonparticipation (top-down approach, as the radical opposite of participatory approach) and the post-positivist concept of incrementalism (the ‘pick and mix’ planning practice for relating to issues, time and space in a linear and non-linear manner (Allmendinger, 2002)). Table 4-12 explains all coding categories in detail. Special care was taken so that the same coding categories and frame work for analyzing the contents, derived from other data collection methods, could be used.

Document coding followed a straightforward and consistent process using QSR NVivo 11 qualitative analysis software. NVivo is a computer-assisted qualitative data analysis software (CAQDAS) that helps researchers to manage, shape and make sense of unstructured information. It aided in classifying, sorting and arranging information from the transcribed interviews for developing meaningful and evidence-based conclusions. Instead of drawing any conclusion, it provided a workspace and tools to enable this researcher to easily work through collected information. The coding process proceeded in a single phase, in which the content of each document was coded according to the document coding framework. This involved reviewing, considering and allocating content to the established coding categories. The process produced a catalogue of content, which illustrated how the documents individually and collectively support data, derived from other sources, for addressing the second research question.

Table 4-12 Coding framework for analyzing documents and semi-structured in-depth key informant interviews

Coding Category	Sub Category	Details of Coding Category	
Flood Mitigation Measures	Non-Structural Measure	Content discussing the importance and nature of non-structural mitigation measures, e.g. early warning, training etc.	
	Structural Measure	Service Structure	Content discussing the importance and nature of service structures, e.g. sanitary latrines, safe water sources.
		Flood Structure	Content discussing the importance and nature of flood structures, e.g. protection wall, raising the base ground etc.
	Plantation	Content discussing the importance and nature of plantation or forestation	
	Combination of more than one	Content discussing the importance of combining non-structural measures, plantation or structural measures	
Planning Process	Community Non-Participation	Content discussing planning events, where decisions are made from the top level	
	Community Participation	Community as Informer	Content discussing planning events, where only information is collected from the community
		Consultation	Content discussing planning events, where communities are kept fully informed and encouraged to express their opinions but have little or no impact on outcomes
		Convincing	Content discussing planning events, where communities are convinced, or their decisions are modified or manipulated so that their decisions match with already taken decisions.
		Partnership	Content discussing planning events, where community decisions are negotiated
		Empowerment	Content discussing planning events, where communities are given responsibilities for managing aspects or all of any initiatives or programs that result
		Controlled by Community	Content discussing planning events, where communities are independent to take decisions and implement their decisions.
	Mix of Top-down and Community Participation	Content discussing planning events where linear and non-linear processes are combined	

4.4.3. Analytical Method for Reviewing In-Depth Semi-Structured Interviews

Coolican (1994) points out various skills that interviewers (researchers) need in order to obtain valuable data. These skills involve establishing a good understanding with the person being interviewed, adopting a non-judgmental approach, and developing effective listening skills. The processing of semi-structured in-depth interviews started from the period of interviewing in order to keep the interview moving forward. Afterwards, each interview was mentally reviewed in anticipation of the next one. The interviews were transcribed for employing the computer software package- NVivo 11 and manual observations. Two sets of interviews were collected: the first one was with key informants (NGO employees) and the other one was with community members in a group meeting for individual settlements.

Key Informant Interviews

These semi-structured, in-depth interviews assisted in addressing the second research question of this research: How are community concerns and priorities incorporated in selection and implementation of structural flood mitigation measures? Interviews were interpreted and explored through a process of qualitative content analysis to explore scope, condition and comments on power sharing in decision-making for incorporating indigenous concerns and priorities for mitigating flood risks in the *Haor* region. The same coding categories and coding frameworks (table 4-12) were used for analyzing documents.

Group Interviews

Outcomes from the semi-structured, in-depth group interviews assisted in understanding community perceptions on flood resilience in association with structural flood mitigation measures and the community participation in the whole planning process for mitigating flood damages.

Listing and ranking of various factors in a participatory way was a major part of these sessions and it initiated the process of data analysis and helped to present the data in an easily comprehensible way. The list and chronological ranks of flood resilience factors, flood vulnerability factors and contributors for enhancing flood resilience for three settlements provide the scope to understand how a community perceives its flood resilience in association with structural mitigation measures through a comparative evaluation.

The SWOT analysis of current structural flood mitigation measures and listing and ranking of positive and negative attributes of its pre- and post-conditions were needed to be coded to obtain detailed investigation on impacts of structural mitigation measures on community perceptions of flood resilience.

The later part of these interviews on the planning process, along with the outcomes derived from document review and key informant interviews, aided in exploring information selection and power sharing in decision making for flood mitigation development projects and unpacking the impact of dynamics of planning processes on community perceptions of flood resilience. The coding categories, applied on the document review and key informant interview, are similarly applied to this segment of group interviews to allow triangulation of data derived from various sources (table 4-12).

4.4.4. Analytical Methods for Focus Group Discussion

The focus group discussion was the first session aimed at addressing the first research question: 'How do structural flood mitigation measures impact on community perceptions of community flood resilience? This session was followed by sessions of cognitive mapping and semi structured, in-depth group interviews. The main objective of these sessions was to let the participants think about this research problem. By following a participatory method, the longer and interactive involvement of participants facilitated the participants to open up more freely and respond in detail. Outcomes from the focus group discussions assisted in understanding community perceptions of flood resilience and the relationship between structural flood mitigation measures and perceptions of community flood resilience.

The analysis process started with preparing the historical timeline of each settlement from data on the establishment of settlements, significant changes in the physical environment and their impacts or consequences as communities perceived them. Following the content analysis method, this part was analyzed to get positive or negative impacts of significant changes on the lives and lifestyle of the communities. The other three important outcomes of these focus group discussions were perceiving flood vulnerability, perceiving flood resilience and community capacities to enhance flood resilience or eliminate flood vulnerability. The content revealed conditions for feeling vulnerable or resilient in terms of various combinations of the natural threats, conditions of built environments, communal capacities, financial condition, and external decisions/supports. Table 4-13 shows the coding categories along with the coding framework.

Table 4-13 Coding categories and frameworks for analyzing focus group discussions

Coding Category	Sub-Category	Details of Coding Category
Changes in physical environment of the settlement	Positive Impacts	Contents where participants expressed their satisfaction about the particular change
	Negative Impacts	Contents where participants expressed their dissatisfaction about the particular change
Conditions for perceiving vulnerable	Natural Conditions	Natural threats of flood-adversities
	Condition of Built Environment	Disadvantages of built environment features
	Internal capacities	Disadvantageous attitudes and skills of community members
	Financial Condition	Restrained financial condition
	External Organizational Support	Disadvantages, made by NGOs
Conditions for perceiving resilience	Natural Conditions	Natural favorable condition.
	Condition of Built Environment	Advantages of built environment features
	Internal capacities	Advantageous attitudes and skills of community members
	Financial Condition	Aided financial condition
	External Organizational Support	Advantages, made by NGOs

4.4.5. Analytical Method for Cognitive Mapping

Environment and behavior are interdependent (Lee, 1968), and as a result the environment can influence behavior, and the reasoning behind behaviors influences creation or modification of the environment (Kitchin, 1994). Cognitive maps may help to identify that link. The cognitive mapping exercise is a means for eliciting a physical manifestation of collaborative cognitive maps or graphical representations of place. This qualitative tool combines participatory mapping, transect walk and focus group discussion (interviews) to acquire experiential spatial data, particularly those which might be missed by any other tools. When reflecting on the method, cognitive mapping brings certain benefits to interviews. Mapping discussions and transect walks encourage participants to think about questions spatially, with responses becoming more grounded and geographically specific (BrenanHorley, 2010). Combination of the cognitive mapping exercise with other participatory appraisal tools helped to tie participants’ responses with a greater sense of place. These mental maps, as hand-drawn images on paper, were categorized and coded to identify the community’s geographic imagination for behaving in a certain way.

The research team facilitated small groups of community members in graphically depicting areas of risk and relative safety during flood events. The participants were asked to use some given legends on maps to portray their ideas about their space. Every person had his/her own idea about sign and color. As a group of 3-4 members, the participants had to make a single decision to draw something, just like how in a community, every individual unites and makes a communal decision. Even in given conditions, every group did not draw the same thing. Every group had its own interpretation about the legends and how it used the legends. In some cases, the groups invented their own symbols to represent their knowledge graphically. The transect walks and talk sessions revealed those explanations. The translated transcriptions of these sessions also produced text, along with drawings for applying the content analysis method. The maps of current and previous conditions provided scope to have a comparative study not only between current and previous conditions of a single settlement but also with intra-settlements. The coding categories were formed to interpret the legends along with their inherent attributes with a special focus on the portrayal of impacts of structural mitigation measures. Table 4-14 shows the coding categories with the coding framework.

Table 4-14 Detailed coding categories for analyzing cognitive maps

Coding Categories	Sub Codes	Coding Frameworks
Flood water level	Level 1	Water level up to average knee-level and its impact
	Level 2	Water level up to average shoulder level/ where a participant can stand and breathe, and its impact
	Level 3	Water level more than the previous level and its impact
Risks	Severe risk	Locations identified as areas of severe risk and relevant thoughts
	Moderate risk	Locations identified as areas of moderate risk and relevant thoughts
	Low risk	Locations identified as areas of low risk and relevant thoughts
Safe area	Locations identified as areas of safety and relevant thoughts	

4.4.6. Triangulation and Interpretation

Triangulation is the process of cross-checking available data. Triangulation is a test of validity for ‘learning from several, quite often three methods, disciplines, individuals or groups, locations, types of information, items and/or points in a discussion, to cross-check, compare, gain insights and successively approximate’ (Narayansamy, 2009). There are triangulations of many types. Mikkelsen (2005) suggested five types of triangulation: Data triangulation, Investigator triangulation, Discipline triangulation, Theoretical triangulation; and Methodological triangulation. This research employs methodical triangulation as it applies to multiple lines of inquiries. Methodological triangulation involves ‘within-method’

triangulation or ‘between-method’ triangulation. If the same method is used on different occasions, it is known as within-method triangulation, for instance, the use of mapping for the collection of demographic data and wealth ranking. Between-method triangulation involves a combination of two or more different research strategies or methods in the study of the same empirical units (Narayansamy, 2009). The current research more specifically followed the between-method triangulation structure.

All data were evaluated and interpreted through an analytical process. Summaries were prepared based on coding categories and these summaries documented the experiences and perspectives of participants. To support the synopsis, direct quotations were used. The results derived from this process were linked with the key concepts in the relevant literature and attempts to find out ways to apply to planning practice.

4.5. Research Ethics

This research involved the participation of community members of *haor* communities from Bangladesh and officials of NGOs, involved in development activities in the *Haor* region. The research topic might cause stress for participants of *haor* communities, as they were asked to discuss their experiences with flooding. The risk to such participants was believed to be negligible. The research followed research ethics standards and the Queensland University of Technology Research Ethics Committee approved it (Queensland University of Technology Research Ethics Approval Number 1500000378). The research did not involve any activity for which there was a foreseeable risk of harm or discomfort to researchers or participants. Participants were approached using an approved Research Participation Request (Appendix 1) and provided an approved Research Participant Information Sheet (Appendix 2). Participants were asked to indicate their consent to participate by completing a written consent form or communicating their consent verbally. Participation in the data collection process was confidential and transcripts were de-identified.

4.6. Research Challenges and Limitations

4.6.1. Research Challenges

A number of challenges were encountered throughout the research. The following identifies each of those challenges and how they were overcome. The first challenge was how to capture community perceptions about community flood resilience, which is defined and framed in various ways in the literature. Community resilience is not only combinations of tangible

properties, but also includes intangible properties, like knowledge, skills and experiences as well as socio-political, socio-cultural, and psychological aspects. Limited pieces of literature are available, which have explored impacts of structural mitigation measures from the perspective of beneficiary groups. This was undertaken by first identifying methods to capture community perceptions, which enabled the discovery of various facets of the issue and to generate a conclusive idea from the collected data.

Another challenge was anticipating and responding to criticisms of qualitative case study methods. The most common criticism is that qualitative case study research can lack scientific rigor in its design and conduct. This was addressed by documenting and justifying the criteria used to make each research decision, establishing and following systematic procedures and protocols for data collection and analysis, by employing multiple research methods, and by furnishing the summary of results with ample quotes from participants.

This research studies the community conditions of the *Haor* region in Bangladesh. As the researcher here, I have never visited the region previously, though I am from Bangladesh. As for any researcher, my knowledge was to be always impartial, because of my positionality - the perspective shaped by my unique mix of race, class, gender, nationality and sexuality, as well as location in time and space, which influence how one views the world and interpret it (Mullings, 1999). For me, this is the research I have conducted in an unfamiliar context of a familiar country.

With little knowledge of the society and culture of the study area, it was not easy for me to understand some of the dynamics. Working at the household and community levels in a fairly conservative society requires being responsive to the culture and social norms and my assistants always helped me to address those issues. I always found the communities as very welcoming and willing to cooperate. I was offered lunch or tea in the households. Spending times and having informal conversations with my assistants, and my boat journeys to reach the settlements every day, helped me to be familiar with the local context.

The community members speak in a distinct dialect of Bangla language, whereas I know only the standard form of it. Still, I could communicate with different stakeholders, especially community members, in a comfortable language, occasionally needing interpretations from my assistants. With the support from my assistants, I received respect as well as open opinions from both female and male members from the community. My assistant, the NGO field facilitator, helped me to understand the local dialects and different terminologies, which the

communities use to express vulnerability and resilience. Similarly, in rare cases, he had to rephrase my question, so that the community members could understand and respond properly. However, I had to be very careful about the appropriate expression while transcribing the community responses to avoid the pitfall of ‘putting words in their mouths’.

On every occasion I had to explain who I was and where I was from; the purpose of the study; the basis on which the participants had been selected to take part; what participation entailed (e.g. being interviewed, surveyed, photographed or voice recorded); the time and effort needed by those whose collaboration was being sought; and the purpose for which the data would be used. In addition, I followed the standard research practice of providing them with a brief of my research work with all the details in Bangla in addition to explaining verbally. I also used a Bangla consent form and maintained the confidentiality of individuals in the data analysis process.

Some of these households experienced research fatigue, being a participant/beneficiary of several NGO-driven activities, and tended to provide ‘answers’ following the questions rather than engaging in frank discussion, which I was more interested in. I had to be more sensitive to make them involved in the discussion process. The data for spatial inquiry required the use of visual tools like mapping, or drawings. Most community members were uncomfortable with ‘drawing’; some respondents preferred to ‘say’ things so that I could ‘draw’. In such instances, I had to encourage them to draw. However, I had to be very careful not to offend their dignity.

4.6.2. Research Limitations

This research is restrained by some limitations. The first limitation relates to the theoretical framework for defining community flood resilience and lens of capturing community perceptions. The lived experiences of people in place provide an embodied context for generating perceptions of change in and of the environment. Potential hazards and ventures (like, development with structural mitigation measures) to mitigate, making changes in and of the surrounding environment, provide a context to perceive community resilience. This limitation has been addressed by investigating the ways in which communities have responded to the event and changes in and of the surrounding environment.

Other limitations relate to methodological aspects of the research. Only three settlements of a small area were surveyed for this research. Semi-structured, in-depth interview participants included employees from three NGOs, because most development activities that took place in the case study area, were conducted by these three NGOs. Nevertheless, this could be

construed as potentially over-representing perspectives of a small area and be considered a limitation. Data which includes the experiences and opinions of individual participants are necessarily influenced by their experiences, values and interpretations. This characteristic of social research can be considered a limitation but was controlled by validating information with multiple participants and multiple methods. The coding was undertaken by a single researcher; the involvement of multiple researchers could have validated this process but was not permitted within resource constraints. The process of analyzing and interpreting the data is necessarily influenced by the researchers' world view.

The final limitation relates to the generalizability and transferability of the research. The results of a case study apply most directly in the context of the case, but the findings of case study research can also have broader relevance and application. The challenge for case study research is to demonstrate this on the basis of analytical generalizability, by linking empirical evidence with theoretical propositions and using the theoretical framework as a template from which to generalize results. Because this research involves a single context, which is the *Haor* region of Bangladesh, and because the theory itself anticipates a high level of variation, generalizability and transferability could be challenged. This was addressed by directly linking the observations and results of the study to the relevant aspects of the context and the significant conditions to which they relate. These results are used to reflect on and inform theory, and recommendations are offered to practice, but qualified by reference to the context in which they apply and the frame to which they relate.

4.7. Result Chapters Organization

Chapter 5 to Chapter 7 have been organized as result chapters where collected data, along with their analyzed contents have been elaborately explained to address the research questions as well as to fulfill research objectives. Chapters have been organized based on the outcome of thematic analysis and triangulation of data, collected from three different sources, i.e. communities, key informants (NGO officials) and documents.

Based on selected data collected during introductory meetings and focus group discussions with community participants, Chapter 5 has provided a descriptive narration of each case study settlement along with stating significant changes in the built environment and their consequences regarding their flood experiences. It has provided the background information to understand the settlement development profile.

Based on data collected from the community during three different sessions, i.e. focus group discussions, cognitive mapping and in-depth semi-structured group interviews, Chapter 6 has explored the community awareness about structural flood mitigation measures and provided insight into community perceptions on flood vulnerability and flood resilience. Findings presented in Chapter 6 have been derived from the data collected only from community participants. Relevant parts of the focus group discussion session were analyzed to structure generic perceptions of flood vulnerability and flood resilience of haor communities. The cognitive maps have been interpreted to discover the awareness of the community members regarding the consequences of current structural mitigation measures. Relevant parts of in-depth semi-structured interview, which include SWOT analysis of current structural mitigation measures, pair-wise comparison of vulnerability factors and resilience factors and responses to questions related to individual community’s current risks and capacities, have been used for this chapter. Table 4-15 shows the data used in chapter 6.

Table 4-15 List of data used in Chapter 6

Data Collection Session		List of Data, used in Chapter 6
Focus Group Discussion		Community Perceptions about generic risks, associated with flood (flood vulnerability) for any haor settlement
		Community Perceptions about generic capacities to deal with flood-adversities (flood resilience) for any haor settlement
Cognitive Mapping		Settlement-specific experiences before installing current structural mitigation measure
		Settlement-specific experiences after installing current structural mitigation measure
In-Depth Semi-Structured Interview	SWOT Analysis	Settlement-specific awareness information about its current structural mitigation measures
	Questions	Settlement-specific information about current risks and capacities to deal with current flood-vulnerabilities
	Pair-Wise Comparison	Settlement-specific risk (vulnerability) factor comparison
Settlement-specific resilience factor comparison		

Chapter 7 has used data collected from three different sources, i.e., documents, key informants and community participants. The communities of three different settlements have explained and evaluated their involvements with NGOs in the development planning process. The relevant national documents have revealed the scope for managing disaster risks on a larger scale, which are equally relevant for the *haor* communities. The systematic reading and reviewing, and a thematic content analysis of selected NGO documents have disclosed the aims, objectives and planning process of NGO programs and projects. The NGO officials also have explained the same issue from their own perspectives. These three sources of data, as well as their analysed outcome, have helped to categorize the level of community participation in NGO-involved

development activities. Table 4-16 shows the data used in this chapter. Finally, Chapter 8 will summarize major findings of this research. Figure 4-3 shows the chapter organization diagram.

Table 4-16 List of data used in Chapter 7

Data Collection Session	List of Data, used in Chapter 7
Community Interview	Comments on scopes and extends of community participation in NGO initiated development activities
Document Review	Scopes and practices of protecting haor settlements and incorporating community concerns and priorities
Key Informant Interview	Comments on scopes and extend of community participation in NGO initiated development activities

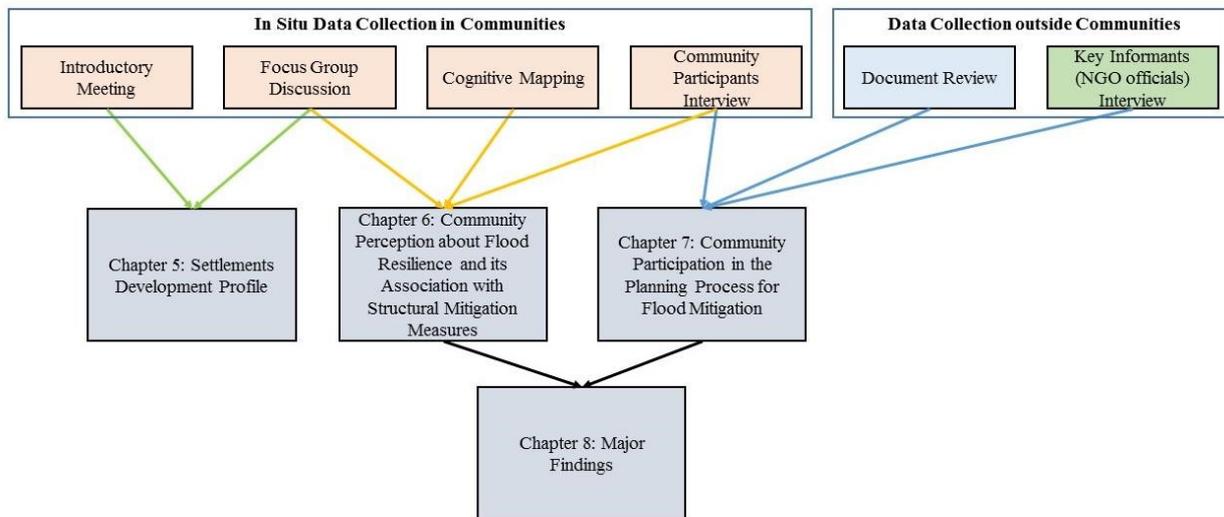


Figure 4-3 Organization of result chapters

Chapter 5 : Settlement Development Profile

This chapter presents succinct histories of selected case study settlements (represented in figure 4-2 and figure 5-1), under review in this study, drawing upon interactions with the participants of each settlement during the introductory meeting and focus group discussion sessions. It identifies significant features of each settlement and constructs narratives of the history of development of each settlement, specifically highlighting interactions with flooding and significant changes within the built environment. In combination, this information forms a development profile for each settlement to facilitate exploration of community perceptions of changes to the built environment of the settlements in later chapters.



Figure 5-1 Maps of three settlements (Field survey, 2015)

5.1. Settlement 1: Nayahati

The settlement of Nayahati (figure 5-1) belongs to Dhanpur Union in the Itna sub-district of Kishoreganj, within the *Haor* region. Like other *Haor* region settlements, Nayahati was built upon an artificially elevated island, with dredged soil added to the base. The current land area (10471m² or 2.59 acres) of the settlement accommodates between 190 and 200 families (around 325 persons per acre). Historically, most of the houses were built with earthen floors,

bamboo mat walls and thatched roofs, however, contemporary construction favors corrugated iron sheets for both walls and roofs (figure 5-2 A).

The settlement is isolated, requiring 5 ½ to 6 hours multiple journeys from the district centre of Kishoreganj. Travel to the settlement from Kishoreganj requires a one to one-and-a-half-hour trip to the major river port of Chamraghat by three-wheeler auto-rickshaw, followed by a



Figure 5-2 Images of Nayahati. A: Typical houses B: Traditional structural mitigation measures- piles of sandbags, C: Non-traditional structural mitigation measure-brick wall with mud mortar (Field survey, 2015)

three-hour trip on a regular public boat to Itna, and finally, a one-and-a-half hour chartered trip to Nayahati. The public boat leaves from Chamraghat every 30 minutes from 6 am to 5 pm every day, thus restricting the travelling options at night.

The researcher observed multiple types of flood protection measures in place, including both traditional and non-traditional fortifications. Traditional measures observed included the use of piled sandbags reinforced with bamboo poles and layers of bamboo mat, *choila* grass (*Hemarthria compressa*) and or bags of water hyacinth (*Ichhoornia crassipes*) (figure 5-2 B).

Community members reported that these measures were generally re-installed every year in anticipation of the start of the flooding season. Loose plantations of planted mango-pine (*Barringtonia acutangula*) and *karaj* (*Pongamnia pinnata*) trees were also used for stabilisation of soil to prevent erosion during flood events. Non-traditional brick and mud mortar walls were also observed on its east and south edges (figure 5-2 C).

Participants indicated that Nayahati has been in its present location for at least 100 years, and dated the involvement of NGOs in the settlement to 1994. They communicated that the settlement was always vulnerable with the risk of being eradicated, washed away and catastrophically collapsed, indicating that the arrival of NGOs marked a significant shift in their relationship with flood events, and in the methods of flood protection used in their settlement. The following sub-sections detail the history of the settlement before and after 1994, with specific attention paid to the use of flood protection measures.

5.1.1. Prior to NGO Involvement

Oral histories communicated by the participants indicate that initially the settlement was constructed in the middle of a naturally occurring dense forest of mango-pine (*Barringtonia acutangula*) *karaj* (*Pongamnia pinnata*) trees and other local trees and bushes. The forest that once grew throughout the basin reduced the area of open water and provided masses of vegetation to absorb the energy of waves (Tod et al, 2008). Gradually the landowners of those lands, who usually do not live nearby, cleared up the natural forest for using those lands (which are usually very fertile) for crop cultivation. Traditional structural mitigation measures, relied upon during this undefined ‘early’ period of the settlement, would have employed harvested bamboo mats interspersed with growing *choila* grass (*Hemarthria compressa*) held in place with bamboo poles and reeds. Removal of the forest increased the plight of settlements, to the extent that traditional methods of protecting the raised base ground are becoming less effective. Moreover, over time, demands for these resources exceeded local sources, requiring that the community imported bamboos and *choila* grass.

Community members indicated that over time they modified the traditional measures to incorporate measures from other communities. For example, the community began to include bags of water hyacinth (*Ichhornia crassipes*) as availability of *choila* grass declined, and incorporated sand bags after learning that this measure was successful in temporary protection of lands of government buildings in Itna and other larger settlements. The community started to purchase bags and sourced sand locally, but sometimes had to rely upon hired labour to

assist with installation. Gradually, the community installed these modified traditional measures on all edges of the settlement but acknowledged that it was insufficient to protect the settlement, especially against strong wave activity. One participant stated during the focus group discussion session that

Every year we had to rebuild or repair the traditional fencing. It used to collapse repeatedly, and we had to repair those even in a flooded condition. But, still, we could not save our land and houses most of the times (Participant 1F-6).

Participants acknowledged the insufficiency of the traditional measures and expressed frustration over the financial investment required for the measures, especially as they failed repeatedly over multiple years. Participants expressed an understanding of wave dynamics and their roles in the erosion of their settlement, targeting the southern and eastern sides of their settlement for protection based on observations of wave intensity and direction. Residents indicated that the north side of the settlement has always been protected by the location of nearby settlements, and reported significant losses of homes on its southern and eastern sides.

5.1.2. Development Following NGO Involvement

In 1994 for the first time, Nayahati received direct external support from Concern Bangladesh, an NGO, in the form of providing free dredged soil to restore the village to its original size and height. Only bamboo poles with bamboo mats were inserted to hold the soil, while the community was expecting to get some sort of non-traditional structures to permanently eliminate the chance of being collapsing or eroded. The participants conveyed that, at that time, they were not even introduced to the method of using piles of sandbags for protecting the vulnerable edges of the base ground. One of the participants said,

It was good that we got some free soil. Otherwise, we had to buy those. But, it was not very effective, as without proper edge protection, it is always hard to protect the soil from being washed away. Still, we were grateful to Concern (Participant 1F-3).

At that same time, Concern also gave seedlings of mango-pine (*Barringtonia acutangula*) and karaj (*Pongamia pinnata*) trees to plant around the settlement to form an effective vegetation boundary. As local plants of the *Haor* region, these trees can survive in the waterlogged conditions and series of bigger trees can help to reduce the wave force and contribute to protecting the settlement. Plants need 8 to 10 years to reach the condition that can contribute to protecting the settlement. Planting seedlings cannot fulfill the purpose immediately. One of the participants said,

How can those seedlings survive, if they are completely submerged under the water? Moreover, sometimes those get buried under collapsed soil (Participant 1M-11).

Gradually the communities (not only Nayahati) of that location took on the knowledge of using piled-up sandbags for protecting the edges. They noticed this was used in various government building construction sites for protecting their sites temporarily. One of the participants said

We found that, piles of sandbags work better to protect the edges (Participant 1F-17).

In 2011, for the first time, as a non-traditional structural mitigation measure, protection walls were built on its east and south edges after reinstalling the damaged part of the settlement (figure 5-2 C). CARE Bangladesh, as a part of its regular program for developing the *Haor* region, initiated and implemented this project of building protection walls. The participants identified it as a significant change for the built environment of their settlement.

5.2. Settlement 2: Concernpara

The settlement of Concernpara (figure 5-1) also belongs to Dhanpur Union in the Itna subdistrict of Kishoreganj, within the *Haor* region. The current land area (6007m² or 1.48 acres) of the settlement accommodates between 220 and 230 families (around 653 persons per acre). Historically most of the houses were built with earthen floors, bamboo mat walls and thatch roofs, however, contemporary construction favours corrugated iron sheets for both walls and roofs (figure 5-3A). Concernpara, close to Nayahati, requires similar kinds of multiple journeys to reach it from the district centre of Kishoreganj. Here also, the researcher observed multiple types of flood protection measures in place, including both traditional and nontraditional. Traditional measures on the west edge observed here, were just like the traditional measures, observed in Nayahati. The loose pile of concrete blocks on the other three edges was observed as an improper attempt to form a revetment (figure 5-3 B, C & D). Loose plantations of trees were also present around the settlement.

The focus group participants indicated that Concernpara, in its present location, was established in or around 1990 with financial and organizational support, received from Concern Bangladesh. Like Nayahati settlement it did not have any phase of development prior to NGO involvement. In or around 1990, Concern Bangladesh was running its regular haor-based programs in the neighboring area. In the regular community meeting with field facilitators of Concern Bangladesh, conducted in other neighboring settlements, a significant amount of landless families requested Concern Bangladesh to assist in building a new settlement for them.

At that time, most of the current residents of Concernpara did not have any permanent residences. As one participant said,

We did not have any land. We lost our land and houses because of floods and used to live as refugees on others lands in neighboring settlements (Participant 2F-1).

Under the regular program, Concern Bangladesh formed a project to assist to selected landless families to establish a new settlement at their chosen location. According to the deal, conducted between the NGO and the community, the community had to buy land (lowland). The community as a group bought almost three acres of land from the local land owner. Concern Bangladesh provided a fund to accumulate the dredged soil to prepare the raised base ground. As the settlement was established with the help of Concern Bangladesh, the new inhabitants started to call their settlement Concernpara, which means ‘concerned neighborhood’ (‘para’ means neighborhood in the local language). The newly formed community wanted to get a non-traditional structural measure to protect the vulnerable edges of the base ground. But, any such consideration was not included in the project proposal.



Figure 5-3 Images of Concernpara. A: Typical houses B, C & D: Dismantled condition of concrete block revetment (Field survey, 2015)

The community did not have any other option other than building the traditional fencing, using bamboo poles, bamboo mats, *choila* grass (*Hemarthria compressa*) or similar kinds of materials. Within one year, almost half of the area was collapsed due to regular flash floods and strong wave activities. In the following year, Concern Bangladesh supported accumulating dredged soil to rebuild the demolished part. To describe the condition of that time, one of the focus group discussion participants said,

Every year our neighborhood used to be damaged by the flood. Our habitat was gradually becoming smaller. The eastern side was severely prone to damage. It was near to impossible to live in this settlement. We used to try to protect our land with traditional fencing, which was completely ineffective (Participant 2F-10).

The residents also tried to create a vegetation boundary through planting mango-pine (*Barringtonia acutangula*) and *karaj* (*Pongamnia pinnata*) trees. Within 5-6 years, Concern Bangladesh undertook a project to construct a non-traditional structural mitigation measure, aiming to protect the edges of the elevated mound with concrete blocks as a form of revetment on the eastern, southern, and northern edges, where the waves were strongest and erosion most likely. Unknown reasons prohibited the use of wire cable or synthetic fiber rope to join individual blocks and geo-textiles to allow drainage, both of which are a common method to stabilize this kind of revetment structure (CDoT, 2004). One of the participants expressed her reaction,

It was completely their idea to use concrete block. We agreed with their decision, as they said, it would be good for us (Participant 2F-18).

Despite having concrete block revetments, the settlement loses land and houses on the northeast and south-east corners each year. Participants reported that the concrete blocks used to be dislodged by waves during floods, and communicated an understanding that the arrangement of the blocks, being neither fixed nor otherwise joined together, contributed to revetment failures. Participants stated that displacement of a single block could compromise the whole revetment, as the adjacent unsupported blocks would also fall as shown in figure 53 B, C & D. They reported that after revetment failures in the first year, Concern Bangladesh returned and indicated that the revetment would need to be reinstalled, underpinned by geo-textiles and cables. They understood that without such re-installation, the revetments would continue to fail, however, re-installation did not occur. Like the settlement of Nayahati, this community also started to use piled up sandbags from the mid-nineties. The residents usually employ this method where the settlement doesn't have concrete blocks.

5.3. Settlement 3: Nakusha-Dashkusha

This settlement is different from the other two settlements in terms of the nature of structural flood mitigation measures. Whereas Nayahati has brick-mud, mortar- built protection walls and Concernpara has revetments of concrete blocks, Nakusha-Dashkusha does not have anything like those (figure 5-4 A). It is also situated on the western banks of the river Dhanu, whereas the other two are on the eastern bank. It can also be identified as a combination of two islands, where the northern part is called Nakusha and the southern part is called Dashkusha (figure 5-1). The participants claimed these two islands used to be connected as a continuous piece of land, but over the period due to soil erosion, the two chunks of lands became disjoined (figure 5-4 B). The southern part was constructed as an extension of the original northern part after the great flood of 1988. The settlement of Nakusha-Dashkusha belongs to Inta Union in Itna sub-district of Kishoreganj, within the *Haor* region. The current land area (8913 m² or 2.20 acres) accommodates between 240 and 250 families (around 477 persons per acre). This settlement is also isolated and a chartered trip from the sub-district centre of Itna takes around one hour.

The focus group discussion participants indicated the Nakusha part as an old settlement, has been in its present location for at least 100 years. Just like the other settlements of the *Haor* region, Nakusha was built upon an artificial elevated island, with dredged soil added to the base. But Dashkusha, the southern part, was built as an extension of it after one or two years of the great flood of 1988. In 1988, Bangladesh had a catastrophic flood when 61% area of the whole country was flooded (Alam, 2000). Because of the 1988 flood, lots of settlements were



Figure 5-4 Images of Nakusha Dashkusha. A: Traditional structural mitigation measures B: Gap space between Nakusha and Dashkusha (Field survey, 2015)

partially or completely washed away and some of the refugees of those lost settlements were organized and built the Dashkusha part as the extension of the existing Nakusha settlement without any financial or organizational involvement or support of any external body. Other than this, the participants could not identify any other major changes in the built environment, though part of it is eradicated and rebuilt almost every year and it has been decreasing in land area. One of the participants said,

After the great flood of 1988 lots of residents of the Haor region lost their houses. Some of us decided to build a new settlement as an extension of Nakusha. We found that the present location of Nakusha was quite safe because of the presence of multiple neighboring settlements in close proximity (Participant 3M-2).

In terms of getting assistance from NGO for developing the built environment, in 1995/96 for only one time, the settlement received free dredged soil from Concern Bangladesh. One of the participants said,

We as a community most of the time become a victim of NGOs' ignorance. NGOs never consider our real problems seriously. Just one time, we got some free soil for reinstalling the damaged part of our settlement. But, that was insignificant (Participant 3F 5).

Another said

All NGOs are same. They don't like to help to build a protection wall. Every time they come, we become hopeful but at end get some useless stuff (Participant 3F-8).

It is very significant that, whereas the neighboring settlements got support from various NGOs to get some sort of non-traditional structural mitigation measure, this settlement did not get anything like that, though Concern Bangladesh, CARE Bangladesh and POPI (mentioned in the previous chapter) ran their programs here several times.

5.4. Chapter Summary

Nayahati, Concernpara and Nakusha-Dashkusha - all of these have been started to get attention from NGOs since the nineties. Concern Bangladesh was directly involved in establishing the settlement of Concernpara. In the mid-nineties, these settlements received free dredged soil to rebuild the settlements. It is important to discover why in the nineties these *haor* communities were started to get attention from NGOs. The participants of Nakusha-Dashkusha mentioned that the southern part of it was established by a group of landless people, who lost their lands due to the severe flood of 1988. On record, in 1987 and 1988, Bangladesh had floods, which were reported as the worst (Chowdhury, 1988; UNDP, 1989). It can be easily assumed that as the after-effect of these floods, the *Haor* region started to get

attention for mitigating flood damages. In the mid-nineties, a concrete block revetment was built in Concernpara and in 2011, a protection wall was built in Nayahati. It is also significant to note that the residents started to use piled-up sand bags from the mid-nineties and found that this is more effective than the very traditional fencing of bamboo poles, bamboo mats, *choila* grass and similar kinds of organic materials. Table 5-1 summarizes the significant changes of three settlements.

Table 5-1 List of significant changes in the built environment of three settlements

Time Frame	Nayahati	Concernpara	Nakusha-Dashkusha
Early 90s	-	Establishment of the whole settlement with NGO support	Establishment of the southern part
Mid 90s	Receiving dredged soil from NGO	Construction of concrete block revetment with NGO support	Receiving dredged soil from NGO
	Introducing use of sand bags	Introducing use of sand bags	Introducing use of sand bags
Late 90s – Late 00s	-	-	-
2011	Construction of brick mud mortar wall with NGO support	-	-

Chapter 6 : Community Perceptions about Flood Resilience and its Association with Structural Mitigation Measures

This is the first result chapter that has addressed the first research question: How do structural mitigation measures impact on community perceptions of flood resilience? It has determined properties of community flood resilience, as perceived by the community. The community awareness has been evaluated to investigate their understanding of positive and negative impacts of structural mitigation measures. It has identified the relationship between structural mitigation measures and perceptions of community flood resilience. In the case of discovering perceptions about resilience it has also discovered the related perceptions of risks or vulnerability

6.1. Community Perceptions about Flood Vulnerability and Resilience

Community participants from Nayahati, Concernpara and Nakusha-Dashkusha identified a series of components which denote their flood vulnerability and flood resilience.

6.1.1. Community Perceptions about Flood Vulnerabilities

The components which denote the community flood vulnerability include natural features or threats, features of the built environment, socio-economic condition, financial incapability, communal incapability and imposed external decisions. Based on Table 4-13 of Chapter 4, Communities' perceived components are categorized as follows.

- **Natural Threats**

Though the regular flooding is not considered as a problem or risk, the waves are considered as the main natural threat by the participants of all three settlements. The isolated settlements, built over the artificially raised ground, are exposed to strong wave activities which may erode the mounds, washing away accumulated soils and potentially resulting in a catastrophic collapse of the mound. As one of the participants said,

Strong waves are the main problem. Waves hit the edges of raised base ground and gradually the protections (whatever we have) become weaker and suddenly those may collapse. Immediately a bigger chunk of soil may fall into the water and erosion may start to take parts at a very fast pace (Participants 2F-1).

Participants conveyed the idea that, residents are usually aware of the wave directions with the level of severity for respective settlements. They also classify waves as either originating from the river or originating from the *haor*. Depending on locations of individual settlements, some are severely affected by waves from the *haor* and some are severely affected by waves from the river. The cognitive maps (explained in section 6.2) expressed their perceptions of locations of risks more clearly.

Every participant claimed that inhabitants of the *Haor* region know the usual timing of regular flooding and inhabitants must take measures or get prepared for the flooded condition. Sometimes the region is hit by early/untimely flash flooding when it does not have time to get prepared with reinstallation or repair of existing mitigation measures. One of the participants mentioned,

Nowadays this kind of early flash flood is happening more often. We do not get time to tie the fencing (traditional structural mitigation measure) (Participant IM-9).

It was conveyed that, the region faces severe flooding occasionally, while the water flows over the raised base ground of the settlements. Recently in 1988, 1998 and 2004, the region experienced severe flooding while the flood-water rose up to 1 to 2 feet (30.5 to 61 cm) over the raised base ground. But, it did not happen after 2004 until 2015 (while this study was conducted, and this research does not intend to deal with the issue of why it did not flood severely after 2004).

- **Conditions of Built Environment**

The participants preferred to associate wave-related vulnerabilities with the physical weakness of the built environment (settlements), considering its condition of being prone to be damaged. The settlements are not built in such a way that these can resist the unmitigated wave forces. The edges of the settlements need to be protected with some sort of infrastructures (which are considered as structural mitigation measures in this research). Traditional measures include the use of piled sandbags reinforced with bamboo poles and layers of bamboo mat, *choila* grass (*Hemarthria compressa*) and or bags of water hyacinth (*Ichhoornia crassipes*). Community members reported that traditional measures were generally re-installed every year in anticipation of the start of the flooding season.

The oral history passed down from the ancestors, provided the understanding that, the regular *haor* settlements used to be surrounded by dense forest of *mango-pine* (*Barringtonia acutangula*), *karaj* (*Pongamnia pinnata*) and similar kinds of plants that can survive in a

waterlogged condition. It means, settlements were used to be built considering the presence of natural forest so that settlements could be quite protected by the dense natural forest. Gradually over the period through the process of massive deforestation, all surrounding lands went under crop cultivation, making the settlement exposed to strong waves. Now people do not have the choice to build settlements in the middle of a natural forest setting. There are some reserved forests in that region where building settlements are completely prohibited for protecting natural forests and bio-diversities. One of the participants said,

We heard that in older times there was forest around every settlement. As a result, the settlements used not to get hit by the waves severely. The traditional fencing used to work fine while we had dense forest around our settlement (Participant 3F-12).

The positioning of a settlement, considering other settlements and river channels, is also an important issue for enhancing or reducing chances of being damaged. Settlements, which are very isolated and/or close to multiple river channels, are prone to be damaged.

The participants conveyed their understanding that the soil of the *Haor* region is very sandy in nature and not suitable for any kind of construction work. Residents usually collect soil from the river bed to build the base ground and they have no other easily available choice of material to strengthen the foundation. Bricks are most common as hard materials in Bangladesh. Due to their cost, the households of *haor* communities usually cannot afford to use them. One of the participants said,

Even our soil is valueless. No one will use this soil for anything. But we have to use it. It collapses and washes away very easily (Participant 2F-3).

Participants expressed their concerns about experimental structural mitigation measures, which might be built for protecting the settlement but failed to do that and exacerbate vulnerabilities. Among the three case study settlements, the settlement of Concernpara is facing a similar kind of problem, which other settlements usually do not face. Building a concrete block revetment was unsuccessful and because of having the remaining concrete blocks of that revetment, the inhabitants needed to pile those up to form a protective wall for their settlement. Subsequent discussions indicated that despite having the concrete block revetment, the settlement loses land and houses on the northeast and south-east corners each year. Participants reported that the concrete blocks can be dislodged by waves during floods, and communicated an understanding that the arrangement of the blocks, being neither fixed nor otherwise joined together, contributes to revetment failures. Participants stated that displacement of a single block can compromise the whole revetment, as the adjacent unsupported blocks will also fall. Community members patrol the walls during flood events,

looking for failures. They reported that they must enter the floodwaters to reset the heavy blocks as soon as possible, regardless of the severity of the current or time of day. Participants in the current research reported that many people are injured during this kind of repair, which generally must be undertaken each year. The possibility of health injury as an added component of risk has been introduced here by installing inappropriate structural mitigation measures. One of the participants of Concernpara said,

For us, concrete blocks are added problems. Everyone from our habitat got hurt by these blocks and these blocks also hit the ground (Participant 2F-3).

- **Financial Condition**

Participants identified inhabitants' financial incapability as a vital issue for not being able to build their settlements with appropriate mitigation structures to protect the settlement. Moreover, inhabitants need to invest every year in strengthening their traditional fences. One of the participants said

We cannot save any money to do something else. We always need to save money for the monsoon period so that we can take some measures to protect our lands (Participant 1F-1).

Another person said

Some families cannot even save money for that need. Sometimes they take loans from neighbours or from money with high interest...use up the money received from NGOs for other purposes (Participant 2F-5).

Another participant said

Usually everyone knows what to do to protect the settlement permanently. But, it requires a big financial investment. Not any haor community can afford to invest such a big amount at a time (Participant 3M-2).

- **Communal Capacities**

The participants identified their limited local knowledge and skills to build resilient settlement as drawbacks for exacerbating flood-adversities. One of the participants said,

Everyone builds settlements in similar way. We don't know any other way to build houses here (Participant 2M-8).

Though, in general, communities are united to deal with flood-adversities, an experience of the settlement of Nakusha-Dashkusha depicts a different story where, because of a decision of NGOs, the community members failed to make a coherent choice. Nakusha-Dashkusha is a part of a bigger cluster of isolated settlements, where twice in recent history, NGOs were asked to find out the most vulnerable settlement, more specifically its one or two edges, where

they could assist to build protection walls with their limited budget. It was hard for them to pick one or two settlements among the group as everyone from the community committee wanted to get help for his/her settlement. As a result, the NGOs had to abandon their projects. One of the participants said,

How can we choose one or two settlements, while we all have the same problem and we all want protection walls along our houses?... We regret that condition. If we could make any decision at least a few settlements among us could get protection walls (Participant 3F-1).

This situation will be discussed more in Chapter 8, which is focused towards planning process, especially the scope for community participation in the decision-making process.

- **Decisions of External Organizations**

Participants identified that some decisions of NGOs (external organizations) act passively to exacerbate their problems. The condition mentioned in the previous section, was identified as one example of an imposed decision that impacted the Nakusha-Dashkusha community negatively. The residents of neighboring settlements were asked to choose one or two settlements for getting protection walls and their social coherence was disturbed because of this kind of insensitive imposed decision of NGOs. One participant said,

Now everyone thinks we did not get a protection wall, because residents of neighboring settlements did not want that (Participant 3F-12).

Another said,

It negatively impacted on our communal harmony (Participant 3M-4).

The ineffective concrete block revetment of Concernpara is another example, where the decision about technology was not only inappropriate for the condition but also it added the chance of health injury and limited the chance of getting support from other NGOs. One of the participants of Concernpara said,

It has happened to several settlements that, their problem has been increased because of NGOs' activities. NGOs did not understand what is necessary to do and consequently residents are suffering because of NGOs' ineffective decisions (Participant 2F-1).

The decision-making issue of the planning process will be discussed in more detail in Chapter 8, which will be focused towards the scope for community participation in the decision-making process.

6.1.2. Community Perceptions about Flood Resilience

The participants from all three settlements desired to get rid of the fear or threat of losing their lands/homes. One of the participants from Concernpara said,

We want to live here without thinking of flood. We don't want our houses to be damaged by a flood. When we will be able to be completely tension free about the safety of our homestead, will find us in the most gifted condition (Participant 2F-6).

Every year the inhabitants need to take care of their settlements, installing or reinstalling some sort of protection measures. The traditional structural mitigation measures, which include organic materials and sand bags, demand the financial as well as physical involvement of every household. Even knowing that these traditional measures have no or little contribution in protecting the settlements, inhabitants need to invest for them. Community members patrol the protecting measures during flood events, looking for failures. They reported that everyone from the settlement (who is present at that time) must enter the floodwaters to repair the measure as soon as possible, regardless of the severity of the current or time of day. They usually cannot leave their settlements and go far searching for jobs/works, as they always need to be standing by for the reinstallation. The fishermen cannot go too far, thinking of the safety of their houses, as there would not be enough people to repair the measures. They have to spend the whole monsoon period, which is almost half of a year, with the fear of losing houses and lands. For some the fear becomes reality. They lose their lands. The participants wished to get free from this added burden to their lives and want to function normally; that reflects the various things the community may value doing or being. As one participant of Nakusha-Dashkusha said,

We want to go out for work without thinking of the safety of our houses (Participant 3M-4).

In focus group discussions, the participants of three settlements identified the properties of community flood resilience, which include features of the built environment, socio-economic status and types of organizational support. As explained in Table 4-13 of Chapter 4, the following factors are identified.

- **Condition of Built Environment**

The participants of all three settlements preferred to describe several qualities of the built environment of their settlement to remain safe from flood adversities. All settlements of the *Haor* region are not equally vulnerable and the participants identified that the advantageous position of the settlement, considering close proximity to neighboring settlements and distance

from active river channels, can make the settlements safe. Dense plantation, either planted or natural, helps significantly to save the settlement from erosion. An appropriate infrastructure can ensure the maximum safety to the settlement. One of the participants said,

We will not have any tension about the safety if strong enough and high enough walls can be installed on all edges of a settlement (Participant 1F-14).

The participants of Nayahati expressed their positive impression about the protection walls, built on the eastern and southern edges. Those two sides were the most prone to be damaged by wave activities and those sides are being protected since the protection walls have been built. As those parts were restored into their original size and shapes, the families who lost their houses and moved to other places, have started to come back and settle again. As one responded,

Now, we can sleep at night. We can go out for work even during the monsoon period. Most of us, who lost our houses and migrated from here, are coming back and building our new houses. Our children can go to school during the monsoon period (Participant 1F-10).

- **Financial Condition**

The participants conveyed their understanding that an appropriate infrastructure around their settlements can ensure the maximum safety of their settlement and for constructing this kind of structure, financial conditions need to be strong. They expressed their expectation to get sufficient financial support from external organizations. At the same time, they also expressed their desire to be financially independent so that they do not need to be dependent on external organizations' decisions and wishes. Financial capacity for installing an appropriate infrastructure, considering local ideas, would make inhabitants more confident about their safety. One of the participants said,

If we would have enough money to build protection walls, then we would not need to wait and depend on NGOs...It requires so much money that we cannot think of building walls without NGOs' support (Participant 2F-11).

Building or repairing the traditional structure, both with organic materials or sand bags and repairing the damaged part of a settlement with dredged soil, also requires financial investments. The lands that are more suitable for constructing new settlements are also expensive to buy. One of the participants said,

If we had enough money we would buy lands in a location that is naturally safe (within their vicinity) (Participant 1M-7).

Financial stability can help to avail lands in safer locations and to build effective protection measures.

- **Communal Capacities**

Participants identified experiences and awareness as two important capacities, which a *haor* community needs to survive in the *Haor* region. The awareness about the nature and timing of flooding, especially its associated wave activities, are necessary for being prepared for uncertain conditions. Their lifelong experience of living in this region, along with all its adversities, has made them confident to live in this area. As one of the participants said,

Who would dare to live in the Haor region? Only we can dare to live here and definitely do not want to migrate to anywhere else (Participant 3F-9).

Living in a certain location for a long time, especially generation after generation, has made them aware of all conditions of that location and the experiences of previous years have given them chances to be better prepared for the coming years. These experiences also help communities to acquire knowledge and skills. In general, *haor* communities have the traditional knowledge and skills to build a settlement in this area and protect those with traditional measures of organic materials. They also have acquired the knowledge and skill of protecting settlement edges with piles of sandbags. Participants of Nayahati found themselves fortunate with experience of working with the NGO in constructing the protection wall. This also has enhanced their knowledge and skills of brick construction. Inhabitants of Concernpara are experienced with constraints and possibilities of concrete blocks for forming revetment. They are now quite skilled with the manual handling of heavy concrete blocks. However, participants expressed their dissatisfaction with their limited knowledge and skills for building a resilient settlement and marked it as a cause of their vulnerability. Better knowledge and skills are preferred to enhance the safety of settlements.

Participants also valued, in general, acting coherently and collectively in a very united way for ensuring the safety of their settlements. Their nature of helping each other and dedication to save the settlement have made them capable of facing the challenges. As one of the participants stated,

We always work as a group, as we all believe that it is not any individual's problem; it is our common problem. Even, we do not hesitate to help to protect other settlements and let people build houses in our settlement if they lose their houses and we can accommodate them (Participant 1M-2).

Participants, mainly participants of Nayahati and Concernpara, indicated that they perform well under local leaders. Working with NGOs for several decades has helped to create local leaders, who can make decisions for the whole community and build community confidence while working with them. NGOs, through their dedicated programs for socio-economic development, helped in all settlements to form community committees with elected/selected members (Chapter 8 will discuss this in detail) and these committee members as local leaders play a vital role in negotiating with NGOS, implementing any project and other various activities. Participants identified their capacity of working unitedly under local leadership as a positive quality for handling flood adversities. As one participant said,

We respect our leaders. We believe that they will make right decisions for us...our responsibility is to work together (Participant 1F-15).

- **Supports from External Organizations**

The participants have experienced support from NGOs, as external organizations for various purposes. Nayahati received financial, technical and organization support from CARE Bangladesh for building protection walls on its east and south edges. Concernpara was established because of the project, operated by Concern Bangladesh. Besides direct intervention for protection from floods, other socio-economic development (e.g. forming female-headed community committee, increasing income) also actively and passively helped the communities to deal with flood adversities. All participants showed dependency on support and expectation to get better aid to mitigate flood adversities more effectively. One of the participants said,

Only NGOs can save us from our miseries if they want to do that. They have all the capacities, though sometimes they tend to by-pass our real problems (Participant 3F6).

6.2. Settlement Specific Experiences of Structural Mitigation Measures

A settlement-specific analysis for (1) Nayahati (2) Concernpara and (3) Nakusha-Dashkusha is provided here, considering the facts that three settlements have three different kinds of mitigation measures and have different experiences regarding their installation and consequences. As described in section 4.2.1., for preparing cognitive maps, each participatory group was given two copies of the base map of the respective settlement (figure 6-1). Base maps with indicative locations around the settlement boundary were prepared to frame cognitive mapping activities. Although the use of a base map does place some limits on cognitive mapping activities, doing so imparted a relative scale, which was necessary to allow

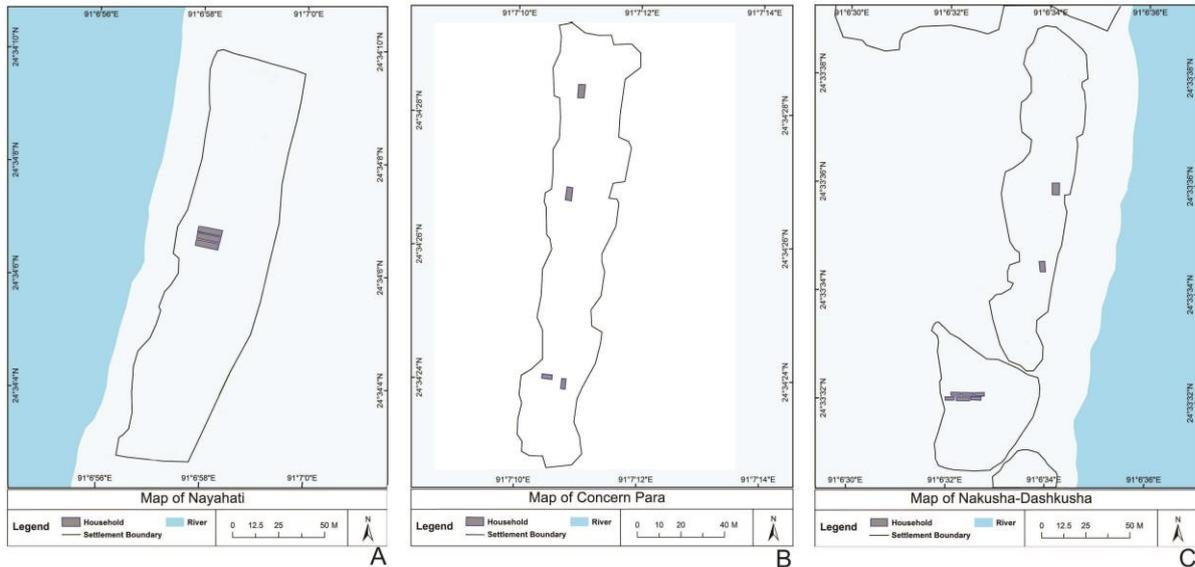


Figure 6-1 Base map A: Nayahati, B: Concernpara and C: Nakusha-Dashkusha

for cumulative analyses of maps. Participants were tasked with identifying locations of four types of features (table 6-1) on their cognitive maps, using one map to identify features under current condition (with the latest structural flood mitigation measure) and the other to represent previous conditions (before installation of the latest structural flood mitigation measure or initial stage of the settlement while it was established).

Table 6-1 Representation of features on cognitive maps

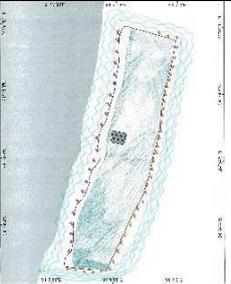
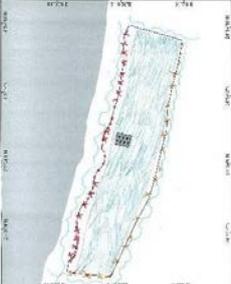
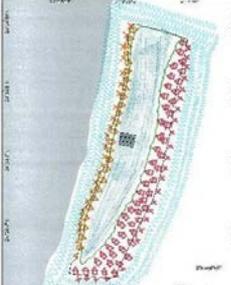
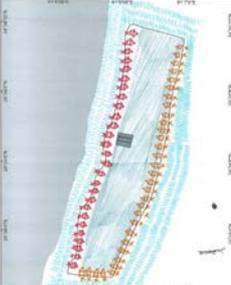
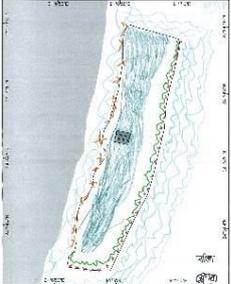
Features	Categories	Representations	Images
Areas of perceived risk	Low risk - somewhat prone to flood damage	Yellow cross	
	Moderate risk - prone to flood damage	Orange cross	
	High risk - severely prone to flood damage	Red cross	
	Up to knee-level (0.4 m)	Purple waves	
Depth of flood water	Up to shoulder level (head remains above water) (1.5 m)	Light blue waves	
	Over shoulder level (head potentially submerged) (>1.5 m)	Dark blue waves	
Safe area for habitation		Dark green hatching	
Previous land area or any previous feature		Green line	

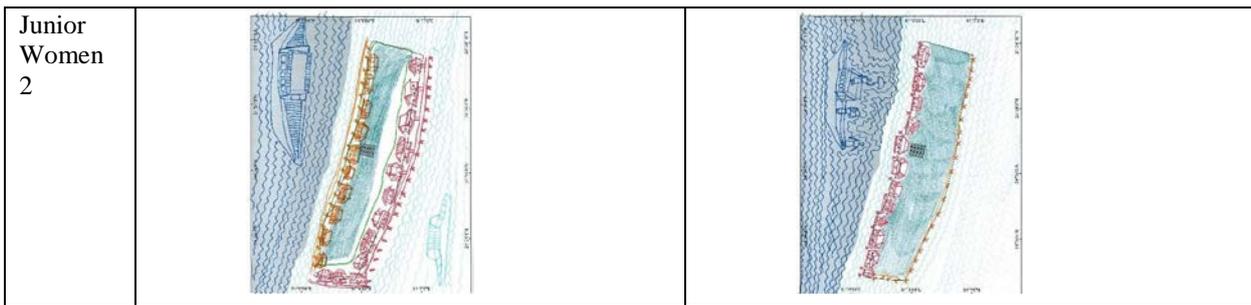
6.2.1. Settlement 1: Nayahati

6.2.1.1. Cognitive Maps

Table 6-2 presents cognitive maps produced by the participants from Nayahati settlement in two columns. The second column contains maps showing the previous condition, means the pre-protection wall condition (circa 2010) and the last column contains maps of current conditions. Appendix E contains detail description of maps of each group.

Table 6-2 Cognitive maps of Nayahati settlement (Field survey, 2015)

Group	Previous condition Pre-protection wall condition (circa 2010)	Current condition Post-protection wall condition
Senior Men		
Senior Women		
Junior Men		
Junior Women 1		



Through green colored, broken boundary lines, all five maps of previous condition show that the area of the settlement was smaller than its current area, before installing the current protection walls on its east and south edges. Review of the set of cognitive maps confirms that the participants perceived the settlement as flood prone along its edges, with varying levels of risk associated with particular spaces. Participants conveyed a familiarity with the intensity and direction of wave action, potentially contributing to their awareness of the settlement's risks of being damaged or collapsed. Except for the north edge, the rest of the edges were prone to be damaged. The broken boundary occurred due to losing lands, mostly from its southern and eastern sides, over a long period. The corners, especially, were severely prone to be damaged, which is clearly shown in the map, prepared by the group of junior men, as with three lines of red house symbols, this group expressed that the highest number of houses had been evicted from that corner. During transect walks, the other groups also agreed with this opinion. The red house symbols, as well as the red cross symbols, drawn by junior men's group and the second group of junior women, illustrate that those areas were at high risk of being collapsed and washed away, and that residents who had their houses on those sides lost their lands.

The orange house symbols, as well as orange cross symbols (drawn by same groups) over the western edge on all maps, denote the moderate risks, according to the participants' perceptions. In that condition, the western side was less risky than the east and south sides. It is necessary to mention that the participants were not given any house symbols to use; the group of junior men and the second group of junior women invented those symbols and used those to express their ideas more legitimately.

In current (post protection wall) condition, the east and south edges are identified as moderately risky (with orange cross symbols), whereas these sides were identified as severely risky in pre-protection wall conditions. The protection walls made a significant change in the community perceptions of risk. The participants felt reluctant to identify these edges as areas of low/no risk because of dissatisfaction with the details of the protection wall. Selection of details (height,

width, location, and construction technology) is a part of the planning process which will be discussed in Chapter 8. In this condition, the western edge is marked as the area of severe risk, using red cross symbols. But, this does not mean the risk of the western edge had been increased in the post-protection wall conditions. The western edge, which is protected with traditional fencing, even in post-protection wall conditions, has the same possibility of being collapsed/ damaged partially or at a slow pace. But this possibility of partial or slow-paced damage is considered as a severe risk, as the participants' level of expectation has been raised.

All groups have marked a bigger chunk of safe area in the current condition in comparison with the area marked in the maps, showing the condition before installing protection walls.

Every group marked almost the whole island as safe, leaving a small strip of land along its western edge, where it does not have any non-traditional infrastructure. It clearly shows the participants' confidence in non-traditional structural mitigation measures.

6.2.1.2. In-Depth Semi-Structured Interviews

- **SWOT Analysis of Current Structural Mitigation Measures**

The settlement has brick-mud mortar protection walls on the eastern and southern edges and piled up sandbags on the other two sides, which are occasionally reinforced with another layer of bamboo mat and other organic materials, depending on the availability of materials. With these mixed reactions about the efficiency of these protection measures on all four edges, the research team facilitated to conduct a SWOT analysis of structural measures to collect community perceptions regarding strength, weakness, opportunity and threats of current condition with current structural mitigation measures. Table 6-3 shows the outcome of SWOT analysis.

The participants identified the protection walls of eastern and southern edges as their biggest strength, as they found the houses, as well as lands of those parts, are protected from the wave activities of regular flooding conditions. Those who have houses on those sides, did not need to invest and intervene to protect the edges since the wall had been built. It directly helped them to become financially more solvent and to be able to enjoy the freedom of lifestyle that they value. It was observed by the research team that their houses are of better quality (figure 6-2) with upgraded building materials and services in terms of sanitation facilities and sources of safe drinking water. Participants identified the western edge as the weakest part of the settlement, as they still have to rely on non-traditional structural measures to protect that edge and invest for

it. Even during the monsoon period of 2015, the year when the study was conducted, five or six households lost part of their lands from the western side. Their houses are at high risk of being collapsed in the coming years.

The mud mortar layers of the protection walls (which are also unrendered) of eastern and southern edges easily allow plants to grow (Figure 6-3) and make the wall weak. The community members usually remove those plants, but the extended flooding period allows plants to grow very quickly. Participants noticed that sometimes strong waves dislodged some bricks from the wall and can make the wall weak. As a result, soil starts to be washed away from those breaches. The inhabitants usually attempt to fix the problem as soon as it has been noticed.

Table 6-3 SWOT Analysis of current structural mitigation measures of Nayahati settlement (Field survey, 2015)

Strength	Weakness
Southern and eastern edges are protected from wave activities of regular flooding.	<p>The risk of losing lands and houses from the western edge still exists.</p> <p>The community needs to invest and intervene to protect the western edge every year.</p> <p>The protection walls are weak where bricks can be dropped off by strong waves and a significant portion of wall can be damaged very easily.</p> <p>Vegetation can grow very easily on the walls and make those weak.</p> <p>The walls are not high enough and the water splashed over the wall scoops out soil.</p>
Opportunity	Threat
<p>The traditional structures can be replaced with non-traditional protection wall.</p> <p>The existing protraction wall can be made taller through adding more layers of bricks on top of it.</p> <p>The outer side of protection walls can be more protected with any water-resistant coating.</p> <p>The residents gained skills of building as well as repairing protection walls.</p> <p>Because of having walls on two sides the community is becoming financially solvent.</p>	<p>The settlement can be flooded in case of severe flooding, which happened last time in 2004.</p>

The participants conveyed their understanding that the walls are facing this kind of problem by using local mud as mortar material and not having any rendering or coating on the outer surface. The participants anticipated that the walls will not last for more than 10-12 years, as the layers of mud mortar will be completely decayed by that time. Participants also expressed their dissatisfaction with the height of walls. They described that sometimes, big waves splash over the wall and scoop out soil from the inner side of the wall, which makes the wall weak. During the 2004 flood, the raised-based ground went underwater 30.50 to 61.00 cm in height. If it floods again like that, the protection wall will not be able to save the settlement from being flooded. The participants expressed their hope of replacing the traditional structures of the western edge with non-traditional structures in future. They also have ideas

Figure 6-2 Plants have grown on the protection wall (Field Survey, 2015) to make the existing protection wall better by making it taller, through adding more brick layers and by adding a layer of cement plaster on the outer surface of walls. The skill of building a protection wall is now well-known to the inhabitants of Nayahati. Becoming financially solvent over the period is also opening up lots of opportunities to the households. Though the protection walls have been



Figure 6-2 Building a house of better quality (Field Survey, 2015)

performing well in the last three to four years, the participants conveyed their fear that these walls may catastrophically collapse anytime, and the residents might need to face a crisis for which they are not prepared at all.

- **Risks Associated with Current Condition**

In-depth, semi-structured group interviews were used to find out the risk factors, considering the current conditions of the structural flood mitigation measures. For current conditions, participants identified three major factors of risks and in order of severity these are:

- Absence of appropriate protection structure on the western edge
- Financial incapability and
- Faulty or non-suitable details of protection walls (like, using mud mortar, not having surface rendering etc.).

Participants expressed their complete dissatisfaction with traditional structural mitigation measures that employ organic materials and/or sand bags. Participants conveyed their understanding that not having any appropriate protection structure on the western edge is bothering them most. Those households especially that are on the western edge, are at threat of losing their lands partially or fully in coming years. They still need to invest and intervene every year. Secondly, the participants identified their financial incapability, which is not allowing them to build an appropriate mitigation structure on the western edge and to correct the faults of existing protection walls of eastern and southern edges. Lastly the participants identified the faulty or non-suitable details of the protection walls that were hindering the effectiveness of these walls.

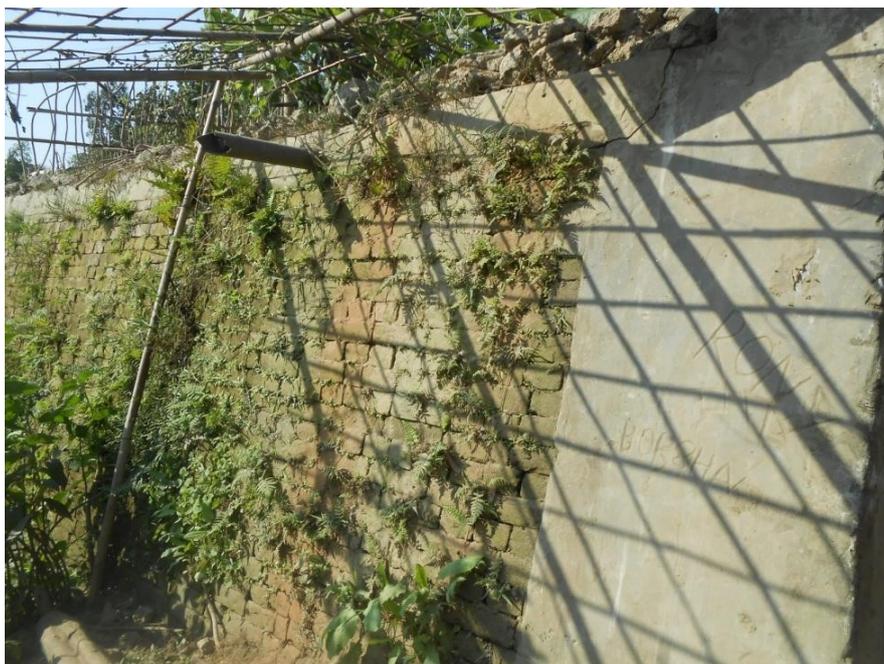


Figure 6-3 Wanted plants have grown in the protection wall (Field survey, 2015)

Participants were also approached to understand the factors that are helping the inhabitants to deal with current risks. Participants described the following

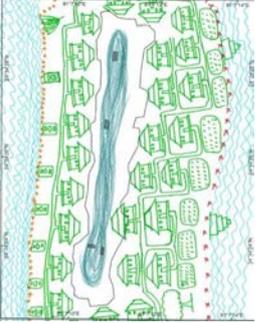
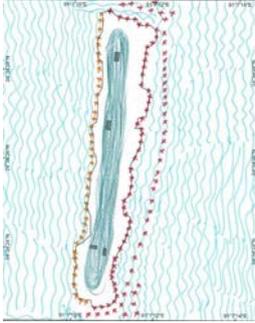
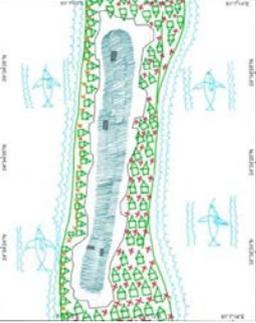
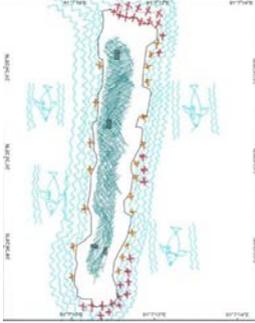
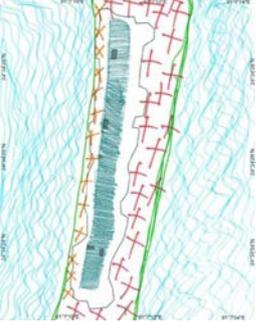
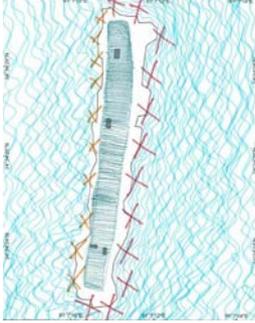
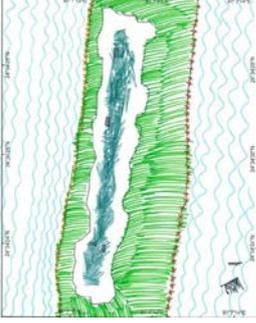
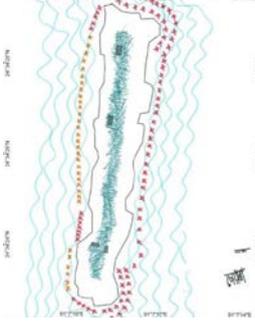
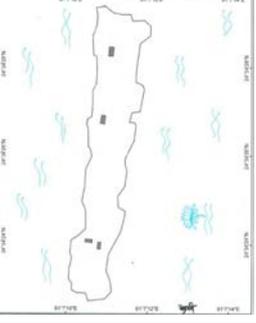
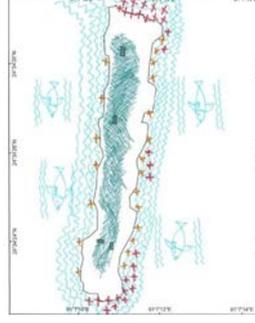
- i. **Awareness:** The community expressed their concern about the longevity of protection walls and that made them very much mindful about the maintenance of the walls. They have community committees with local leaders who are in charge of maintaining the wall. The regular maintenance includes noticing any damage and repairing that, and removing all plants. For the western edge where they do not have non-traditional protection walls, the community usually pays equal attention.
- ii. **Local leaders' activities:** It is a common practice of NGOs that while they work in any settlement, they always start the work through establishing a community committee (the next chapter explains it more elaborately). The members of this committee are local leaders who lead the community to achieve any goal. The participants appreciated the contributions of these local leaders in terms of making decisions for protecting the western edge and maintaining the protection wall.
- iii. **Unity among community members:** Participants found them as very united, as every household works coherently to protect the edges in every possible and affordable way.
- iv. **Experience:** Participants valued their experiences of living in this location and facing all adversities. At the same time, involvement of NGOs for building protection walls has contributed to their experiences. Every experience makes them better prepared for the future.
- v. **Skill of building sand-bag protection and repairing the brick wall:** After having the experience of constructing a protection wall, the participants found them in a better condition with knowledge and skills of brick and mud mortar construction, as a technology that was new for them. Their skill of piling up sand bags also helps them to deal with current risks.

6.2.2. Settlement 2: Concernpara

6.2.2.1. Cognitive Maps

Table 6-4 presents cognitive maps produced by the participants from Concernpara settlement in two columns. Second column contains maps showing the previous condition, while the settlement was established (circa 1990) and the last column contains maps of current conditions. Appendix E contains detail description of maps of each group.

Table 6-4 Cognitive maps of Concernpara settlement (Field survey, 2015)

Groups	Previous condition (While the settlement was first established (circa 1990))	Current condition
Senior Men		
Senior Women		
Junior Men		
Junior Women 1		
Junior Women 2		

The settlement of Concernpara is a relatively new settlement that was established with financial and organizational support, received from Concern Bangladesh. Participants identified that, at the initial stage of its establishment, the settlement, as well as the newly formed community, had several factors that made the settlement (community) vulnerable to flood. Because of the financial constraints, the community had to buy lands in such a location which was quite far from neighboring settlements and had no natural trees around. The location made the settlement exposed to devastating waves. The settlement was built in a very traditional way, which was identified as not very suitable for that condition by the participants. The settlement was in need of some sort of mitigation structures to protect the edges. At the initial stage, the traditional style of mitigation measures was employed and after five to six years of establishment, concrete block revetments were built on its three edges. The revetment was built with the direct assistance from Concern Bangladesh with great promise of protecting three vulnerable edges. But, from the following year, the inhabitants started to notice its inefficacies; as the blocks were not fixed/ tied to each other, water could get into the structure very easily and could displace the blocks from their original position and as a result, a bigger portion of the revetment used to collapse. Despite having concrete block revetments, the settlement used to lose lands.

Maps in both columns show that the level of vulnerability did not change, even after building concrete block revetments. Gradually the whole revetment was dismantled and left heavy concrete blocks behind. The inhabitants usually stack up those concrete blocks to form some sort of concrete block wall to try to protect edges. But this attempt does not ensure the safety of the settlement. As one of the participants stated,

As we have concrete blocks, we always try to stack those up and form a sort of wall of concrete blocks, hoping that it will not collapse. But, it collapses sometimes. People, as well as our lands, get hurt by loose concrete blocks. People also get injured while handling these heavy blocks (Participant 2F-4).

In case of Concernpara settlements, both male and female senior groups were confident in their ability to represent conditions before the installation of the concrete block revetments, reflecting that they were adults prior to the installation of the revetments. Junior groups were allowed to construct drawings of this period as well; however, these were set aside as they reflected oral history passed down from the senior groups rather than personal lived adult experiences. The senior groups agreed that their settlement had previously been larger, and indicated that Concernpara lost its lands from all four sides. Using their own symbols of greenhouses, both the senior groups expressed that lands are mostly lost from the north, east and south sides of the settlement, which experience strong wave activity. The senior men's

group also showed multiple rows of houses along with the pathways, backyard gardens and steps on east, south and north edges, which had been lost due to strong wave forces within a few years of building the settlement. Participants acknowledged that the traditional methods could not address the wave activity, and that they desired to have an appropriate infrastructure on four edges.

In the maps of current condition, participants expressed their familiarity with the intensity and direction of wave action in the current condition (with piles of concrete blocks on the north, east and south edges, as remaining from the revetment). Participants identified the settlement's severe risks on its north, east, and south edges, mainly because of strong wave actions. Once, these edges were reinforced with non-traditional mitigation measures - 40-50-kilogram concrete blocks formed into revetments, as verified by the transect walks. Participants in the current research remarked that it was difficult to maintain the blocks in their positions. Except two junior women's groups, three other groups identified the northeast and south-east corners as spots of high risk. As described in focus group discussion sessions, despite installing the concrete block revetments, the settlement used to lose land and houses on the northeast and south-east corners each year. Many people got injured while repairing or reinstalling the concrete blocks manually, which generally must be undertaken each year. The possibility of health injury as an added component of risk also encouraged participants to mark these three edges as locations of severe risk, with red cross symbols. Perceptions of risk within the settlement varied among the groups, predominantly on the basis of age. The cognitive map produced by the senior women's group communicates the greatest perceived risk amongst the groups. They assigned risk to all corners and protruding parts of the settlement, perhaps because of their long-lived experience with flooding. By contrast, the first group of junior women drew and assigned specific risk to an embayment on the western edge of the settlement, which they otherwise identified as being an area of lower risk. In follow-up discussions, they described a "coiling effect" (translated) occurring in the embayment, conveying an understanding of eddying, which resulted in scour and erosion. The second group of junior women assigned elevated risk to the first row of houses on all edges of the settlement, barring the west. They indicated that these areas are severely prone to flood adversities and believe that the land they sit on will be washed away in coming years. Houses similarly situated close on the settlement's western edge are believed to be at lower risk, with participants indicating that limited land loss is expected in these areas. These assessments communicate an understanding of erosion dynamics, with the junior groups potentially possessing a more nuanced

understanding of hazards. The junior groups are more likely to be involved with installing the traditional fencing and stacking up concrete blocks. Because of having detailed ideas about the current conditions of all edges, they can identify the potential reasons behind any failure of mitigation measures.

Though all groups identified the central part of the settlement as the safest area to live, both senior groups and the group of junior men identified the western edge as preferable and safest, communicating that wave energy is weakest on this part of the settlement. Perhaps because of the less aggressive waves, the western side of the settlement is reinforced with more traditional measures involving an inner layer of piled up sandbags, covered with local water hyacinth or *choila* grass and reinforced by bamboo mats and poles. Participants indicate that building and maintaining these measures is much easier and less risky than the piling up of concrete blocks.

6.2.2.2. In-Depth Semi-Structured Interview

- **SWOT Analysis of Current Structural Mitigation Measures**

In the current condition, piles of concrete blocks are observed on its eastern, northern and southern edges and piles of sandbags are observed on the other side. Table 6-5 shows the outcome of the SWOT analysis.

The participants are very disappointed with concrete blocks and sand bags and they really faced a hard time to find any benefits of these currently used materials. They expressed their preference for sand bags over concrete blocks, though they do not prefer to have piles of sand bags as a mitigation measure. Sandbags are just easier to handle. Participants conveyed their understanding that, because of consecutive involvements in facing challenges of protecting the settlement with concrete blocks or other materials, the community has become very much united and eager to operate any activity. This communal strength may provide the opportunity to implement projects successfully in future.

The ineffectiveness of concrete block revetment as well as the stacked up arrangement of concrete blocks was marked as the main weakness of this settlement. These blocks are not only hard to handle and injurious to health, but the stacks may even collapse anytime and make the settlement exposed to erode catastrophically. The participants conveyed the message that their settlement is always left out when any NGO decides to build new protection infrastructure, but by the same token,, Concernpara has already supported them to build protection infrastructure. However, these concrete blocks are hindering them in getting an appropriate structure. They are

urging external financial and organizational supports from any NGO, for the building of an appropriate structure. They would not mind getting a similar kind of protection wall that Nayahati settlement has.

Participants did not find any opportunity to utilize concrete blocks. They wanted to get rid of these concrete blocks. Despite having concrete blocks on three edges and sand bags on the other edges, the settlement is at high risk of being washed away. Every year it loses lands. The possibility of getting injured while handling the concrete blocks is an added threat to this community.

Table 6-5 SWOT Analysis of current structural mitigation measures of Concernpara settlement (Field survey, 2015)

Strength	Weakness
Sandbags are easier to handle.	The risk of losing lands and houses from all sides exists. The community needs to intervene to stack up concrete blocks every year. The community needs to invest and intervene to protect the western edge every year. The dislodged concrete blocks hit the raised base ground and trigger the rate of eradication. The remaining concrete block revetment lessens the chance of getting further assistance from any other NGO to build another mitigation structure.
Opportunity	Threat
The community members irrespective of gender and age became skilled in handling concrete blocks. An appropriate mitigation structure can be built with an NGO's support.	The manual handling of concrete blocks is injurious to health. The settlement can be severely damaged by strong waves.

• **Risks Associated with Current Condition**

The research team has attempted to find out factors that exacerbate risks, considering the current conditions of the structural flood mitigation measures. For the current condition, participants identified some factors that exacerbate risks, and in order of severity these are:

- having concrete blocks on three edges
- not having appropriate mitigation structures on all edges
- lack of skills and knowledge for building better settlements as well as utilizing concrete blocks
- not having vegetation boundary
- financial incapability

- less/no chance for getting assistance from NGO(s) for building appropriate mitigation structures

Participants conveyed the understanding that the settlement is not only missing any effective mitigation measure on its edges but also it contains concrete blocks on its edges, which enhance the problem. The community needs to pile those up manually, which is a very laborious job and injurious to health. The waves can dislodge the blocks and those dislodged blocks sometimes hit the raised based ground along with strong waves and enhance the rate of erosion of lands. Irrespective of the time of day and severity of waves, the community members need to jump into the water to reinstall the dislodged blocks. Despite having these concrete blocks and receiving an immense amount of effort from the inhabitants, the settlement loses its lands every year. The western edge, which is protected with piles of sandbags and occasionally with other organic materials, needs yearly investment and involvement. The participants expressed their dissatisfaction with their skills and knowledge of building resilient settlement, as well as utilizing the concrete blocks. The site also lacks any vegetation boundary that can effectively contribute to absorbing wave energy. Their financial incapability is also restricting them to build any better mitigation structures. Participants also conveyed their understanding that, because of having these concrete blocks, NGOs never consider this settlement for further investment in construction. Participants were also approached to know the factors that are helping the inhabitants to deal with current risks.

Participants described the following

- i. **Awareness:** The community needs to be aware of the condition of the concrete block revetment and traditional structure. For instance, the revetment is actually no longer a revetment. They have a community committee who are mainly in charge of making decisions for any maintenance and organizing repairmen. The regular maintenance or repair includes stacking up the dislodged concrete blocks, piling up sandbags and having an extra layer of bamboo mat and other organic materials.
- ii. **Local leaders' activities:** Some members of the community who are also members of community committee act like local leaders. The participants appreciated the contributions of these local leaders in terms of making decisions for protecting the settlement.
- iii. **Unity among community members:** Participants found them as very united, as each household works coherently to protect the edges in every possible and affordable way.

- iv. **Experience:** Participants valued their experiences of living in this location for more than two and half decades and handling concrete blocks for more than two decades. Their experiences have created their awareness about the possibilities and constraints of this location as well as concrete blocks. Every experience makes them better prepared for future occurrences and they understand the necessities involved.
- v. **Skill to build sandbag protection and piling up concrete blocks:** Their skill of piling up sand bags as well as concrete blocks helps them to deal with current risks.

6.2.3. Nakusha-Dashkusha Settlement

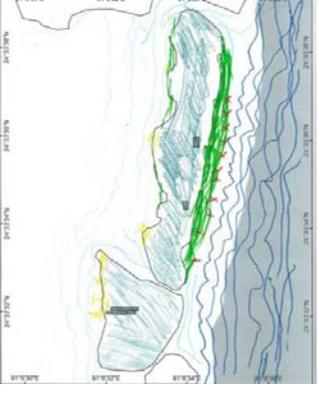
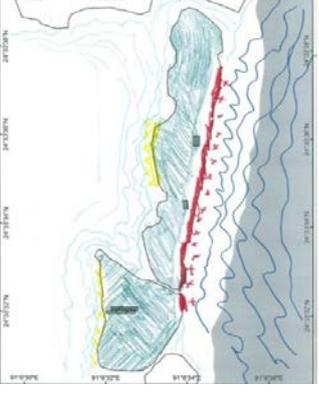
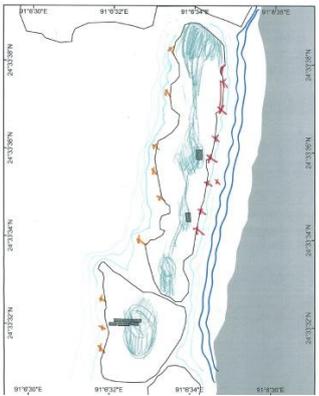
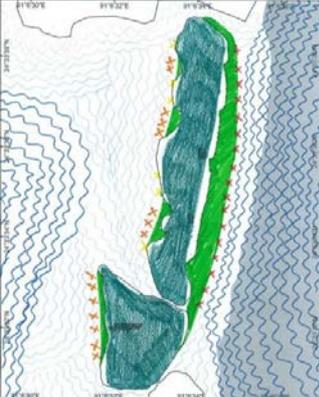
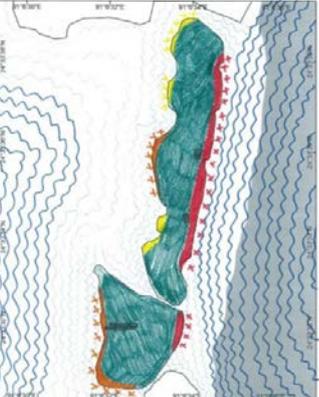
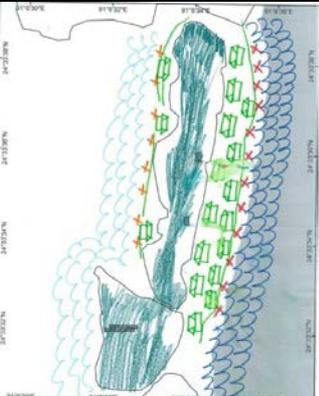
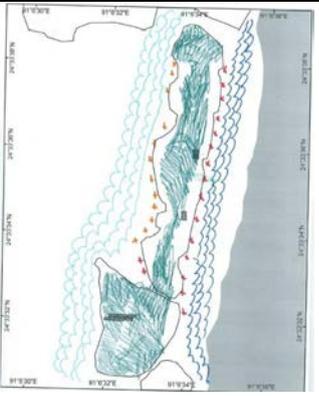
6.2.3.1. Cognitive Maps

Table 6-6 presents cognitive maps produced by the participants from Nakusha-Dashkusha settlement in two columns. Second column contains maps showing the previous condition, while the Dashkusha part of settlement was established (circa 1990) and the last column contains maps of current conditions. Appendix E contains detail description of maps of each group.

This settlement is different from other two settlements, as it does not have any nontraditional, structural mitigation measures. For preparing cognitive maps, the participants were asked to prepare one map for presenting its current condition and the other one based on their knowledge about the initial condition while the Dashkusha (southern) part was established. As an old settlement, none of the participants was present while its Nakusha part was established. In some cases, the maps of the previous condition reflect the oral history passed down from the ancestors rather than personal lived adult experiences.

In cognitive maps of previous condition of this settlement, each group showed that the settlement had previously been larger, and indicated that it had lost most of its lands from the east side of the settlement, which experiences strong waves from the river. Because of close proximity from other neighboring settlements, this settlement was/is quite protected from the north and south sides and moderately protected from the west side. All four maps of previous condition also give an idea that the Dashkusha part did not lose much of its land.

Table 6-6 Cognitive maps of Nakusha-Dashkusha settlement (Field Survey, 2015)

Group	Previous condition (While Dashkusha part was settlement (circa 1990))	Current condition
Senior Men		
Senior Women		
Junior Men		
Junior Women 1		

Both women's groups have used their own green house symbols to express their awareness about losing land. Drawing two rows of houses on the east edge and three random houses on the west edge by the junior women's group and drawing one row of houses on the east edge of the Nakusha part by the senior women's group strengthen the idea that the eastern edge of the Nakusha part was at high risk of being damaged. Besides the oral history received from their ancestors, participants have witnessed some of the incidents of erosion. The east edge was always severely prone to be damaged. Red cross symbols are put there for this reason. They assigned risk to all corners and protruding parts of the settlement, perhaps as a consequence of their long-lived experience with flooding.

In the maps of current condition, all groups conveyed their understanding about the settlement's severe vulnerability on its east edge, more specifically the east edge of the northern part. Houses situated close on the settlement's eastern edge are believed to be at high risk, with participants indicating that massive land loss is expected in the near future. Perceptions of risk within the settlement varied among the groups, but it cannot be said that it happens predominantly on the basis of age. Both men's groups identified the northeast tip of the Dashkusha (southern) part as severely prone to be damaged and two groups (senior women's group and junior men's group) identified that the western side of the Dashkusha part is moderately prone to be damaged. The cognitive map produced by the junior men's group communicates the greatest perceived risk amongst the groups. They assigned moderate risk to the central protruding part of Nakusha and the west and south-west corner of Dashkusha. By contrast, the senior men's group drew and assigned low risk to the same sides, perhaps as a consequence of similar lived experiences with flooding.

It was hard for the participants of Nakusha-Dashkusha to define differences between previous and current conditions, as the settlement did not experience any significant change in terms of installing mitigation structures. Each group in both maps identified an almost identical area as the safe zone for both cases. But, it was interesting to get a varied opinion about the same area from different groups. Except for the senior women's group, the rest of the groups were quite generous in marking the safe zone, especially in the case of Dashkusha, the southern part. Leaving a narrow strip on the west and the north-eastern tip, the rest of the island of Dashkusha was marked as safe and the participants described the reason for it as its close proximity to neighboring settlements. The senior women's group was conservative and not willing to mark the safe zone as bigger, as they thought it might enhance the chance for getting support from NGOs for building protection walls in future. Both men's groups marked mostly the western

part of Nakusha as safe, leaving a linear strip on the east and some protruding part on the west. Both women’s groups left an equal amount of linear space on both west and east sides, considering severe-to-moderate risks on both edges.

Cognitive maps give an indication of the depth of flood-water around the settlement. In Table 4.8, the dark blue wavy lines represent flood water level of more than 1.5 m, which is over shoulder level (head potentially submerged) and the light blue wavy lines represent flood water level of around 1.5 m, which is up to shoulder level (head remains above water). Whereas in current conditions, the water around Nayahati (table 6-1) and Concernpara (table 6-3) remains at around 1.5 m, in the same condition the water on the most part of the eastern side of Nakusha-Dashkusha remains higher than 1.5 meters. This signifies that the flood water is usually deeper on that side and the participants identified its reason as the close proximity of the river channel. Due to gradual river-bank erosion and the gradual shift of river channels, the river flows very close to the eastern edge of the settlement. Most of the current gap between the settlement line and river line (in dry condition) is the lost part of the settlement. This settlement had lands (as well as houses) on this gap which have collapsed and washed away.

6.2.3.2. In-Depth Semi-Structured Interview

Outcome of SWOT Analysis of Current Structural Mitigation Measures

In the current condition, piles of sandbags are observed on all sides. Table 6-7 shows the outcome of SWOT analysis.

Table 6-7 SWOT analysis of the current structural measure of Nakusha-Dashkusha settlement (Field survey, 2015)

Strength	Weakness
For using sand bag soil/sand can be collected without any cost.	The piling of sand-bags is not effective to protect the edges from the strong current of river. There is lack of unity among the inhabitants of this and neighboring settlements. <i>Choila</i> grass has become scarce and expensive to collect.
Opportunity	Threat
Building an appropriate mitigation structure only on one edge will cost less. Relocating the whole settlement to another safe site can be a better alternative for them.	Due to riverbank erosion and gradual shift of river channel the river flows very close to the settlement and there is high probability that the settlement will be washed away soon. For the same reason, any mitigation structure like a protection wall (even if it is built), will not survive long. It can be one of the reasons of not selecting this settlement for building any non-traditional mitigation measure.

The participants expressed their dissatisfaction with traditional structural mitigation measures. One positive side of using sandbags is that the soil/sand can be collected free for filling the bag, though these bags are needed to be bought or collected. As other neighboring settlements are

very close to its north and south, these two sides are quite protected by those settlements. The participants also felt that, as a bigger community (including inhabitants of neighbouring settlement), they are not united enough to make any decision on choosing the few edges for building mitigation structures. The participants conveyed their dissatisfaction with using sand bags or other organic materials for protecting edges. The *choila* grass has become scarce in the *Haor* region and inhabitants need to buy it at a high rate if they want to employ that method. As the settlement has the highest risk on the east side, participants found it as an opportunity that they would need comparatively less money to build any mitigation structure only on one side. It might make any NGO more interested in helping them to build a protection wall or similar kind of structure on one edge only. Participants found it as a big threat for them that the river is getting closer. NGOs may not select this settlement for implementing any bigger infrastructure-based project just because of the lesser chance of surviving long. Participants thought of another alternative, where the whole settlement could be relocated to a new safer location.

- **Risks Associated with Current Condition**

In-depth, semi-structured group interviews were conducted to find out the factors of risks, considering the current conditions of the structural flood mitigation measures. For the current condition, participants identified five major factors that exacerbate risks and in order of severity these are:

- not having appropriate mitigation structures on all edges
- Proximity to the river
- lack of skills and knowledge for building a better settlement
- not having vegetation boundary
- financial incapability

Participants expressed their complete dissatisfaction with traditional structural mitigation measures, which employ organic materials and/or sand bags. Participants conveyed their understanding that, not having any appropriate protection structure on the eastern edge is bothering them most. Especially the households that are on the eastern edge, are at threat of losing their lands partially or fully in the coming years. The river is getting closer year by year. It is considered the greatest threat to the survival of the whole settlement and residents can do nothing to stop this river erosion. The participants expressed their dissatisfaction with their skills and knowledge to build resilient settlement using easily available resources. The site also

lacks vegetation boundaries that can effectively contribute to absorbing wave energy. Every year, lots of trees are being uprooted due to land erosion (Figure 6-4). The participants identified their financial incapability, which is not allowing them to build an appropriate mitigation structure.



Figure 6-4 A tree has lost soil from its roots (Field survey, 2015)

Participants were also approached to understand the factors that are helping the inhabitants to deal with current risks. Participants described the following

- i. **Awareness:** The community needs to be always aware of the condition of the mitigation measure. They also have community members who act like local leaders and make decisions for any reinstallation and repair. The regular reinstallation or repair includes piling up sandbags and having an extra layer of bamboo mat and other organic materials.
- ii. **Local leaders' activities:** Some members of the community who are also members of community committee, act like local leaders. The participants appreciated the contributions of these local leaders in terms of making decisions for protecting the settlement.
- iii. **Skill to build sandbag protection:** Their skill of piling up sand bags as well as helps them to deal with current risks.

6.2.4. *Synthesis*

This research does not intend to have age and gender-based analysis of risk and resilience perceptions. The participants for cognitive mapping were grouped based on their age and gender, just to ensure a comfortable environment to work in a group. Still, the maps of different groups reveal variations among perceptions of different groups. Junior groups of Nayahati, senior groups of Concernpara and women's groups of Nakusha-Dashkusha introduced or invented new symbols for expressing their perceptions in a better way. Men's groups of Nayahati identified the south-east corner of their settlement as the most vulnerable to damage before the construction of protection walls. The junior women's group of Concernpara conveyed their better understanding of the wave dynamics. The junior men's group of Nakusha-Dashkusha showed better understanding about the range of risks on edges. All these maps convey the deep understanding of community members about their flood vulnerability and the impacts of structural mitigation measures on their overall vulnerability and resilience status.

The strength of any structural measure is based on its effectiveness, less financial involvement and ease of handling. The structure that is effective enough to resist the wave energy, easy to maintain and requires less or no maintenance, is always preferred and counted as an appropriate structure for this condition. Other associated factors are also considered while having SWOT analysis of structural mitigation measures, like having various kinds of structures with varying degrees of effectiveness, future projections and possibilities, communal integrity etc. These other factors are also affected by the consequences of structural mitigation measures. In the case of Nayahati, the new structure is, overall, appreciated for making significant positive impacts on the lives of the inhabitants. The positive consequences of protection walls at Nayahati are helping the inhabitants to become financially solvent and letting them enjoy the freedom of choice that they value. On the contrary, the concrete block revetment of Concernpara not only failed to fulfill its purpose but also enhanced the severity in multiple other ways. The concrete block revetment design failed to understand the complex and dynamic nature of *haor* flood and its negative consequences are also taking tolls on other issues, like health and fitness.

The communities are concerned about every detail of these structural measures and, so they can foresee the future risks or threats. The participants of Nayahati have predicted that the protection wall might not survive more than 12 years. The participants of Nakusha-Dashkusha have predicted the unavoidable river-bank erosion that might compromise the safety to future

structural mitigation measure (even if it is built in a non-traditional manner). Any technologically advanced structure may survive in this condition. The participants expressed their rationale about the possible solution and expressed their idea to relocate the whole settlement. Relocation of whole settlement is not a utopian idea in the *Haor* region. The settlement of Concernpara is actually a relocation of a previous settlement, which had been lost earlier.

The communal attributes, like awareness, local leadership or (limited) skills are the main tools for surviving with the current condition. A structural mitigation measure as an adaptive answer to the problem may ease the problem, considering that there might be inherent uncertainties in the predicted outcomes of innovation.

6.3. Vulnerability Factors and Resilience Factors

In-depth, semi-structured group interviews provided the scope to define a specific set of factors, which significantly contribute to exacerbating flood vulnerability and another set of factors that enhance flood resilience. In focus group discussion sessions, the participants enjoyed the freedom to express their ideas about reasons and natures of their flood vulnerability. In cognitive mapping sessions they expressed their awareness of the consequences of available structural mitigation measures. The in-depth, semi-structured interview provided them a scope to evaluate the structural mitigation measure and to assess their current risks and capacities to deal with current risks. All these activities then lead to making a common list of vulnerability factors and a common list of resilience factors.

6.3.1. List of Vulnerability Factors and their Pair-wise Comparison

In total, eight factors are identified that exacerbate flood vulnerability.

1. **Unmitigated wave activity:** The *Haor* region is naturally flood-prone and the strong wave, generated in the vast uninterrupted flooded condition, is one of the responsible factors for making the communities vulnerable to flood.
2. **Inappropriate Structure:** Wave activity places communities at significant risk and communities expect to have an appropriate kind of structure on settlement edges, which can ensure protection from the devastating waves. This structural mitigation measures can be traditional fencing or non-traditional infrastructures, like, brick walls, concrete blocks revetments etc. If structural measures that promised to protect, catastrophically fail, then the whole settlement may face the danger of being eroded. Inappropriate

structural mitigation measures, either traditional or non-traditional, are considered as an accountable factor that exacerbates flood adversities.

3. **Risky Locations of Settlements:** If a settlement is far from multiple river channels and surrounded by other settlements, it is very much protected from devastating waves because of its favorable location. Though *haor* settlements are isolated in nature, those can be built in a cluster so that the settlements can be protected by each other. But, it is not always possible to get a favorable location/plot to build the settlements. Favorable location/plots are either expensive to buy or already occupied with other settlements, markets or urban centers. Moreover, the settlement can be exposed to devastating waves after the catastrophic collapse of the neighboring settlements. The river course may change its path and put the settlement at risk. The unfavorable location of the settlement is identified as a considerable factor for putting the communities at risk.
4. **Lack of Construction Knowledge and Skills:** The participants feel that the inhabitants of the *Haor* region have a lack of knowledge and/or skills to build suitable settlements, along with house designs that would be more appropriate for addressing the natural hydrological hazards. They found that their settlements are weak and cannot resist the strong waves. In the case of fortifying the edges, they found the piles of sand bags work better than fencing of organic materials. But, this knowledge and skill alone are not enough to live in that region safely.
5. **Communal Disagreement:** Absence of unity or capacity to make communal decisions may put a settlement at risk. Sometimes, in the case of bigger settlements, everyone wants to get a protection wall on his/her side. Sometimes, some people forming a smaller group may think about only what is in their favor; they might not think of the community as a whole. Sometimes, some people are not obedient enough to the local leaders. Moreover, usually, an NGO refuses to run any big project (like building non-traditional structural mitigation measures) while it finds the community is not united or coherent enough to make any decision and run the project soundly.
6. **Inexperience:** The participants were aware that any decision about current condition is always influenced by prior experiences, which includes experiences of facing strong waves, building protection measures, working with NGOs, repairing damaged fencing, even experiences of losing houses or lands etc. Every experience makes them better prepared for the future. Lack of experience, especially in the situation of a newly built

settlement, impacts negatively on getting prepared for adverse conditions. The construction of Concernpara in its present location, which is quite far from adjacent settlements, can be described as an outcome of less experienced decisions.

7. **Financial Incapability:** The participants think that non-traditional structural mitigation measures (like, protection wall, revetment etc.) may assure the protection of their settlements and it involves a significant amount of financial investment for this kind of construction, which cannot be afforded by them. They also need money for reinstalling the traditional fencing and sometimes, it also becomes hard for some households to invest enough to make those stronger. The damaged part of any settlement is usually re-erected with dredged soil and it also involves financial involvement. For constructing a new settlement, a piece of land is bought and, as described earlier, better locations for construction are always expensive and usually, the inhabitants end up with a location that is already very prone to be damaged. Their financial incapability is a contributing factor for exacerbating their risks.
8. **External Harmful Decisions:** Participants have long experiences of working with NGOs. They found some of their decisions/interventions have no/little impacts on reducing flood vulnerabilities, and some of their decisions/interventions sometimes work negatively for reducing vulnerabilities. The example of Concernpara fits into this category, where the concrete block revetment not only has failed to give protection but also added the risk of health injury and nullified the chance of getting further assistance for building a better structural mitigation measure. The settlement of Nakusha-Dashkusha also has suffered because of the decision of NGOs, when NGOs asked the inhabitants to select a few settlements from a big group of settlements for getting assistance to build any structure. Their communal unity was disturbed because of this incident.

Pair-Wise Comparison of Vulnerability Factors

Pair-wise comparisons were conducted in three settlements (Appendix C) and table 6-8 shows individual scores of different factors for three settlements along with their mean, spread, median and ratio (spread to mean) values.

The radar diagram of Figure 6-5 shows values of three settlements with a mean. “Inappropriate structure” was considered as the most responsible factor for exacerbating vulnerability by all three settlements. “Inappropriate structure” as the structural flood mitigation measure was

installed to ensure protection but fails to meet that expectation and it shows the communities' highest concern about the effectiveness of structural mitigation measures. The "risky location" factor has scored the second highest and "financial incapability" scored third. The combination of these three factors gives the complete picture of communities' perception about vulnerable built environment. For various constraints (which include financial constraints too), a settlement is constructed on a risky location, where the settlement could be protected through constructing an appropriate mitigation structure, which also usually demands bigger financial involvement. In the column of 'Ratio

Spread to Mean' (table 6-8), the factors of 'community disintegration' and 'external harmful decision' scored higher than any other factors and it demands more explanations. The factor of 'community disintegration' has behaved differently mainly because of the experiences of Nakusha-Dashkusha community.

Table 6-8 Factors that exacerbate community flood vulnerability

Factors	Nayahati		Concernpara		Nakusha-Dashkusha		Average	Spread (Max-Min)	Median	Ratio Spread to Average
	Score	Scaled score= $x/(n-1)$	Score	Scaled score= $x/(n-1)$	Score	Scaled score= $x/(n-1)$				
Inappropriate Structure	6.5	0.93	6.0	0.86	6.5	0.93	0.90	0.07	0.93	0.08
Risky Location	6.0	0.86	5.5	0.79	5.0	0.71	0.79	0.14	0.79	0.18
Limited Knowledge and skill	3.5	0.50	3.0	0.43	2.5	0.36	0.43	0.14	0.43	0.33
Communal Disagreement	1.0	0.14	0.0	0.00	3.0	0.43	0.19	0.43	0.14	2.25
Inexperience	4.0	0.57	4.0	0.57	2.5	0.36	0.50	0.21	0.57	0.43
Financial Incapability	4.5	0.64	4.5	0.64	4.0	0.57	0.62	0.07	0.64	0.12
External Harmful Decision	1.0	0.14	4.0	0.57	3.5	0.50	0.40	0.43	0.50	1.06
Unmitigated Wave Activities	1.5	0.21	1.0	0.14	1.0	0.14	0.17	0.07	0.14	0.43

The inhabitants of Nakusha-Dashkusha failed to make a united decision to select a location for building protection walls and this caused the participants of Nakusha-Dashkusha to give a higher score to the 'community disintegration' factor, a higher score in comparison with the scores of the other two settlements. Similarly, the participants of Concernpara identified that the decision of building the concrete block revetment was harmful to their settlements; they put the 'external harmful decision' factor in a higher rank, whereas the participants of Nayahati scored

both these factors lowest. The participants of Nayahati did not find that they have a lack of unity among inhabitants and they are badly affected by any external harmful decision. The results show the common as well as settlement-specific concerns about responsible factors for exacerbating flood vulnerability. Vulnerabilities are principally perceived as the outcome of the inappropriately built environment, rather than merely as impacts of natural hazards.

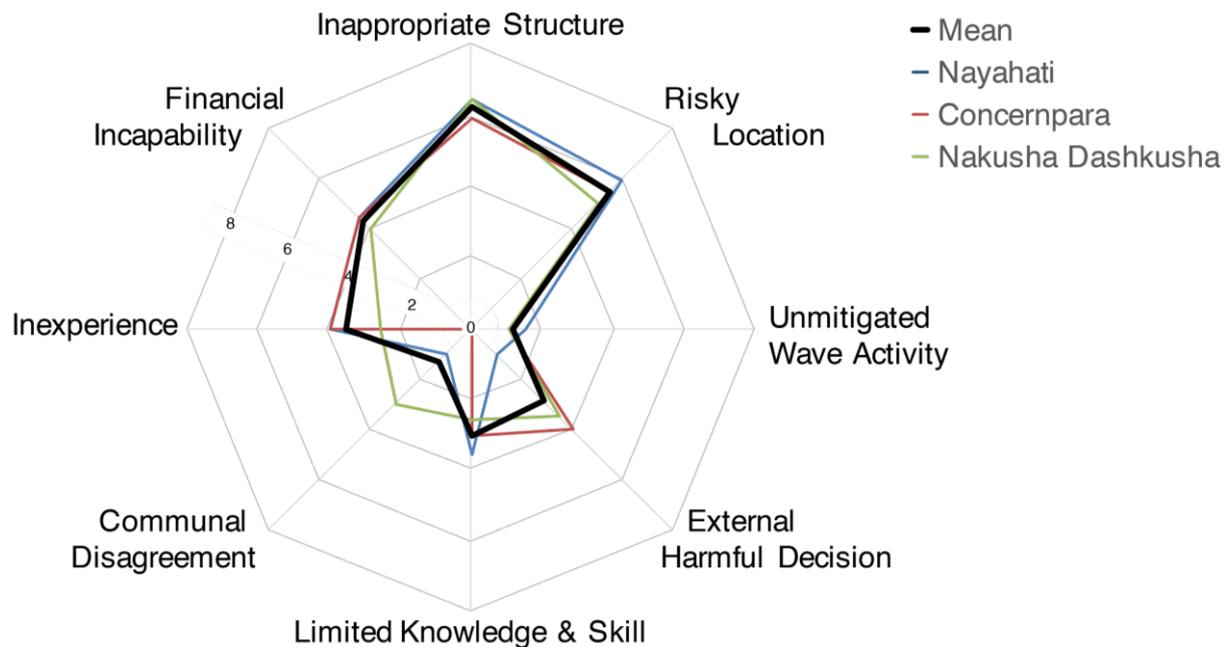


Figure 6-5 Mean and individual values of factors that exacerbate flood vulnerability for three settlements

6.3.2. List of Resilience Factors and their Pair-wise Comparison

In total, 12 factors are identified that enhance flood resilience.

1. **Experience:** Participants valued their experiences of living in the *Haor* region and facing all its adversities. At the same time, the involvement of NGOs with their various kinds of projects, mainly for protecting settlements, also has enriched all of them with experience. Every experience makes them better prepared for the future and more informed about possible necessities.
2. **Awareness:** Participants of all settlements identified themselves as very much aware about the time and nature of flooding, as well as its associated wave activities. They all try to get prepared before their settlement gets hit by floods. Participants also described that they had received training from NGOs on what to do during severe floods. By having volunteer teams for forecasting and rescuing, knowing where to take shelter, from where to get safe water and saving it for the crisis season, every community gets prepared to face the challenges.

3. **Construction Knowledge and Skills:** Participants expressed their dissatisfaction in having limited knowledge and skills for constructing resilient settlements and conveyed their understanding about the importance of appropriate construction knowledge and skills for enhancing community flood resilience. The participants of Nayahati, after having experience in constructing protection walls, found themselves in a better condition regarding knowledge and skill of brick and mud mortar construction, as a technology which was new for them.
4. **Favorable Location:** If a settlement is far from active river channels and uninterrupted huge *haor* (permanent water body) basin and surrounded by other settlements, the participants found it as a favorable location for any given settlement.
5. **Vegetation:** It is described in section 5.1.1. that, historically, the *haor* settlements were originally built in the middle of the natural forest. The participants, multiple times, expressed their understanding that a dense plantation boundary around a settlement helps to absorb the energy of waves. NGOs also, multiple times provided seedlings of the local plants, mainly mango-pine (*Barringtonia acutangula*) and *karaj* (*Pongamia pinnata*) to form an effective vegetation boundary around the case study settlements.
6. **Interdependibility:** Participants found it a positive attribute of the nature of their settlement that everyone's safety depends on the contribution of others. None can save his/her house or land if his/her neighbor is not doing that. As a result, every household works coherently to protect the edges in every possible and affordable way.
7. **Communal Unity:** Participants appreciated the importance of having unity within the community for making any big decision and executing it.
8. **Self-Financial Capacity:** Self-financial capacity means a community's own financial capability, with which a community can buy a suitable piece of land and build mitigation structures or whatever they want to build. Participants of all settlements desired a condition where their community would be so financially independent that they would not need to wait for external assistance.
9. **External Finance:** All case study settlements have the experience of receiving external finance, especially from NGOs, where that finance is provided for a specific purpose with specific conditions. Concernpara was established and its concrete block revetment was installed, with the financial support received from Concern Bangladesh. The

protection walls were erected on two edges of Nayahati with the financial support of CARE Bangladesh.

10. **External Organizational Support:** Besides financial support, the communities also receive organizational and technical support from NGOs. Participants of Nayahati especially appreciated the organizational and technical supports they had received during the construction of protection walls. Participants of all settlements conveyed the idea that, for a bigger project, like constructing any infrastructure, an external organizational support is very much necessary to plan and implement the whole process. Participants expressed their lack of confidence in planning and implementing any such project without organizational support, even if the money was provided.
11. **Local Leadership:** Participants indicated that local leaders can play roles for taking decisions on behalf of the whole community and the community feels confident while working under them. Participants recognized their capacity of working unitedly under local leadership as a positive quality for handling flood adversities.
12. **Appropriate Structure:** Wave activity places communities at significant risk and participants indicated their desire to have an appropriate kind of infrastructure on settlement edges, which can effectively ensure protection from flood adversities.

Pair-wise Comparison of Resilience Factors

Table 6-9 shows the ranked list of factors for three settlements with the mean value for each factor. Figure 6-6 shows the radar diagram of the same information. (Pair-wise comparisons of three settlements can be found in Appendix D). In the column of ratio spread to average, the factor of ‘interdependibility’ has scored the highest (1.20) and the factor of ‘local leadership’ has scored the second highest (0.75). Among the three settlements, the participants from Nakusha-Dashkusha gave more importance to the factor of

‘interdependibility’ than other two settlements. Even the factor of ‘communal unity’ has scored these factors and can be counted as the counter factor of ‘community disagreement’ that exacerbates community vulnerability. These three factors have been scored higher by the participants of Nakusha-Dashkusha because of the same experiences, while they could not make a communal decision to finalize some parts of one or two settlements from a bigger cluster of settlements for building NGO-supported protection walls. The participants of

Nayahati gave importance to the factor of ‘local leadership’, as they found strong contributions of local leaders during the construction of protection walls. Among three settlements, only

Nayahati has such a kind of protection wall, which they consider as an appropriate structure. The participants of another two settlements were also aware of the performances of this protection wall and desire to have a similar kind of structure with external financial, organizational and technical support.

Table 6-9 Factors that enhance community flood resilience

Factors	Nayahati		Concernpara		Nakusha-Dashkusha		Average	Spread (Max-Min)	Median	Ratio Spread to Average
	Score	Scaled Score= $x/(n-1)$	Score	Scaled Score= $x/(n-1)$	Score	Scaled Score= $x/(n-1)$				
Appropriate Structure	11	1.00	10.5	0.95	9.5	0.86	0.94	0.14	0.95	0.15
Favorable Location	7.5	0.68	10	0.91	9.0	0.82	0.80	0.23	0.82	0.28
Knowledge & Skill	4.5	0.41	4.5	0.41	4.5	0.41	0.41	0.00	0.41	0.00
Communal Unity	2.0	0.18	2.5	0.23	3.0	0.27	0.23	0.09	0.23	0.40
Experience	1.5	0.14	3.0	0.27	1.5	0.14	0.18	0.14	0.14	0.75
Self-Financial Capacity	7.5	0.68	7.0	0.64	7.5	0.68	0.67	0.05	0.68	0.07
External Finance	9.5	0.86	9.0	0.82	9.0	0.82	0.83	0.05	0.82	0.05
External Organizational Support	9.0	0.82	8.5	0.77	9.0	0.82	0.80	0.09	0.82	0.06
Vegetation	6.5	0.59	6.0	0.55	7.0	0.64	0.59	0.09	0.59	0.15
Interdependibility	0.5	0.05	0.5	0.05	1.5	0.14	0.08	0.00	0.05	1.20
Awareness	2.5	0.23	2.5	0.23	2.5	0.23	0.23	0.18	0.23	0.00
Local Leadership	4.0	0.36	2.0	0.18	2.0	0.18	0.24	0.18	0.18	0.75

The first four factors identified by all three settlements are similar. The ‘appropriate structure’ factor got the highest priority in the case of enhancing community flood resilience. The factors, which are in either second or in third positions, are ‘external finance’, ‘external organizational support’ and ‘favorable locations’. The combination of these four factors conveys the understanding that the communities prefer a built environment, which is built on a favorable location and protected with appropriate mitigation structures and preferably, these structures are built with external supports. This also proves their dependency on external assistance, which can be interpreted as a negative tendency for being resilient.

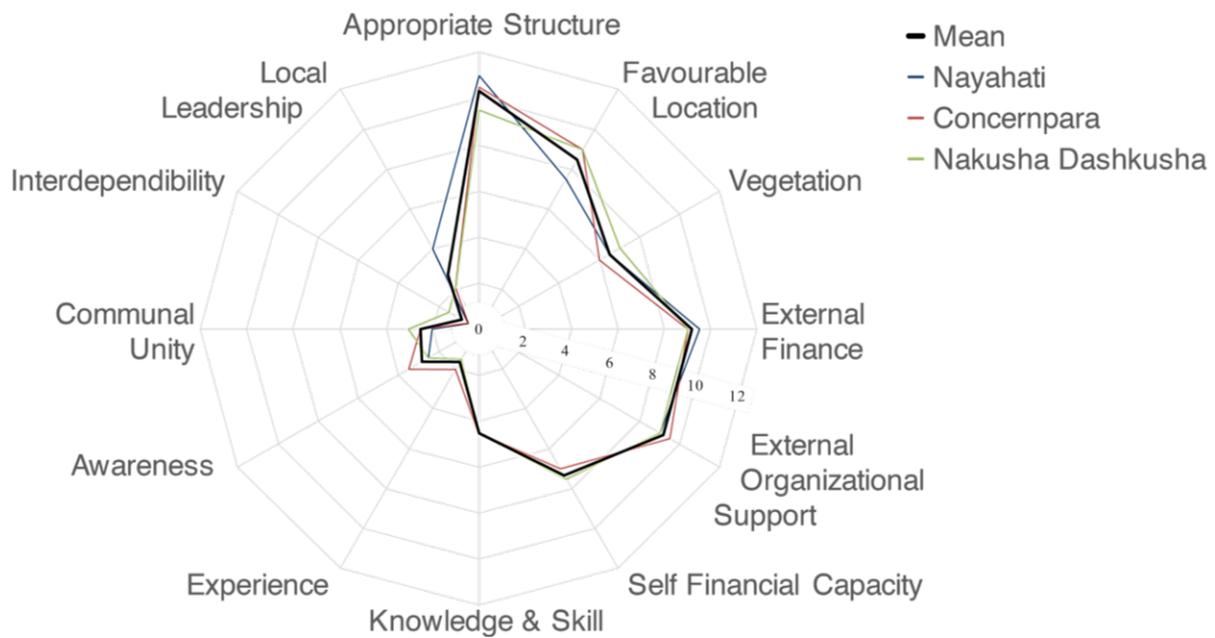


Figure 6-6 Mean and individual values of factors that exacerbate flood vulnerability for three settlements

Though they did not choose self-financial capacity over external financial support, they found that their financial independence would give them more choices. To achieve that financially solvent condition, they need external support for building a resilient built environment so that they do not need to spend money for protection purposes. The development with an appropriate infrastructure, is evidently not what the communities are looking for. According to the UNDP (1990), the primary objective of development is to benefit people with a view to creating an enabling environment for them. When the expansion of output and wealth is considered only a means, the end of development must be human well-being; and development analysis and planning should focus on relating the means to the ultimate end (UNDP, 1990). The *haor* communities desire infrastructure because of its usefulness and for the sake of enhancing community flood resilience. It is desirable to have more freedom to lead the kind of lives the *haor* communities have reason to value. “Development is expected to be more concerned with enhancing the quality of lives they live. Development is simultaneously the vision of a better life ---a life materially richer, institutionally more modern, and technologically more efficient -- and an array of means to achieve that vision (Goulet, 1992).”

The vegetation, as a part of the built environment, is also counted as a mid-level factor for enhancing flood resilience, considering its contribution to counter the wave energy. It is noticeable that communities did not find their own qualities, like ‘experience’, ‘awareness’, ‘interdependibility’ or ‘communal unity’ as their strength. They take it as granted that, usually all *haor* communities are aware of their conditions, are very united helpful to each other and have

life-long experiences, and these qualities are at the bottom of their list of factors for enhancing community flood resilience.

6.4. Triangulation and Interpretation

This research employs methodological triangulation. Data analyzed from focus group discussion, cognitive mapping, in-depth semi-structured group interviews and pair-wise comparison are needed to be combined, processed, evaluated and interpreted to get the complete picture of community perceptions about flood resilience and its association with structural flood mitigation measures, as outcomes of external assistance received from NGOs. Section 6.4.1. discovers impacts of external supports on community vulnerability and section 6.4.2 explores their expectations for acquiring freedom from all sources of vulnerability.

6.4.1. Impacts of External Supports on Community Vulnerability

NGOs with their programs and projects play a vital role in mitigating flood vulnerabilities and influencing community perceptions of resilience and vulnerability in the Haor region. The isolated haor settlements built over the artificially raised ground are exposed to strong wave activities, which may erode the mounds, washing away accumulated soils and potentially resulting in a catastrophic collapse of the mound. The communities' long-lived experiences have made them aware of the wave activity along with its degree of severity and about the shortcomings of their capacities to deal with it. The communities express their concerns about limitations of the built environment due to risky location, scarce vegetation and weak mitigation structures for protecting settlement-edges. The limitation of construction knowledge and skill and financial capacity hinders the built environment even in a favorable location and with appropriate structure that can be resilient enough to face the natural adversities. The communities' expectation for a resilient built environment and higher preference for the infrastructure-based development make them attracted to NGOs' organizational, technical and financial support so that they might have an appropriate structure on the edges of their settlements. Their limitations, which include financial incapability too, make them dependent on NGOs' support, whereas, in some cases, NGOs' interventions have multiplied the risks. Dependency is the association between settings, actions, or tasks such that one setting, action or task cannot be possible until one or more other settings, actions, or tasks have occurred, begun, or been completed. In the current context, dependency is the condition while the recipients are receiving external supports and for their further development or improvement, they believe that they still need support, because, the previous support failed to make recipients capable enough

to improve or develop by themselves without further external supports. Dependency on external supports as an added component exacerbate the vulnerabilities of haor communities.

6.4.2. Expecting Freedom from all Sources of Vulnerability

Vulnerabilities are broadly perceived as the deprivation of the right support, communal capabilities and facilities, rather than merely as impacts of natural threats. The communities wish to get rid of the vulnerability that hinders the freedom of lifestyle. The community considers 12 factors, which have the influence on giving freedom for functioning, that lead to community resilience, i.e., experience, awareness, construction knowledge and skill, favorable location, vegetation, interdependibility, communal unity, self-financial capacity, external finance, external organizational support, local leadership and appropriate structure. The communities give priority to ‘appropriate structure’ (structural mitigation measures), as well as all those factors that are directly linked with the infrastructure-based development of the built environment. Even the factors, which are intangible in nature, like local leadership, communal unity, interdependibility, experience or awareness, are chosen for the list considering their indirect contributions to the infrastructure-based development of the built environment. This freedom would make them able to function regularly in any given seasonal condition. Installing structures (which are not very effective to face challenges), making resources available for reinstalling these structures whenever necessary, not being able to leave the house, not being able to going far for earning livelihoods, not being able to perform daily activities properly, and overall, getting stressed and anxious about the safety of houses as well as the whole settlement, all hinder the ‘functioning’ that reflects the various things the community may value doing or being. Enhancing community resilience is communicated as removing sources of unfreedom, those that hinder the freedom of functioning.

6.5. Concluding Remarks

Sen (2005) in his book ‘Development as Freedom’, uses the term “unfreedom”, while he defines development as a process of expanding people’s freedom through removing sources of unfreedom, like economic poverty, lack of public facilities and social care or a denial of political and civil liberties. Similarly, enhancing community resilience is identified here as a process of expanding people’s freedom in a context where infrastructure-based development acts like adaptation to flood damages. Several scholars (Katyal & Petrisor, 2011; Schanze et al, 2008; WMO, 2006; Choudhury et al., 2004; FEMA, 1992a &1992b) discussed their concerns about structural mitigation measures for ensuring protection from floods, because of their

negative connotations on the environment and communities. But haor communities expressed their expectations for certain kinds of small-scale structures which are necessary in this specific condition. The communal attributes, like awareness, local leadership or (limited) skills are also considered as major attributes for surviving within the current condition. A structural mitigation measure as an adaptive answer to the problem may ease the problem, considering that there might be inherent uncertainties in the predicted outcomes of innovation. The communities' expectation for a resilient built environment and higher preference for the infrastructure-based development as adaptation make them attracted to NGOs' organizational, technical and financial support so that they might have an appropriate structure on the edges of their settlements. The development with appropriate infrastructure is evidently not what the communities are looking for. According to the UNDP (1990), the primary objective of development is to benefit people with a view to creating an enabling environment for them. When the expansion of output and wealth is considered only a means, the end of development must be human well-being; and development analysis and planning should focus on relating the means to the ultimate end (UNDP, 1990). The haor communities desire the infrastructures because of their usefulness and for easing the adaptation process for enhancing community flood resilience. It is desirable for having more freedom to lead the kind of lives that the haor communities have reason to value. Development as adaptation is expected to be more concerned with enhancing the quality of lives they live.

Development is simultaneously the vision of a better life ---a life materially richer, institutionally more modern, and technologically more efficient --- and an array of means to achieve that vision (Goulet, 1992, p. 467).

It is very important to see freedom in a sufficiently broad way that can enrich community capacities. The community capacities refer to the alternative combinations of functioning that are feasible for the community to achieve. Capacities provide substantive freedom to achieve alternative functioning combinations. For example, the communities want to achieve financial strength, where they would not need to wait for and depend on external assistance. On the other hand, the same community expresses their lack of confidence for having any infrastructure-based development without external organizational support, which express their dependency on external supports. Still, freedom is desired to be achieved through the expansion of the community capabilities to lead the kind of lives they value and these matters should be central to the process of enhancing community resilience. In this way, the *haor* communities find freedom as not only the primary end of community resilience, but also the principal means for enhancing resilience.

Chapter 7 : Community Participation in the Planning Process for Flood Mitigation

This is the second result chapter and addresses the second research question: How are community concerns and priorities incorporated in the selection and implementation of externally supported development activities for mitigating flood adversities? It explores scopes of information selection and power sharing in the planning process of externally supported development activities for mitigating flood adversities. It attempts to unpack the impacts of including community concerns and priorities in the planning process. This chapter draws on a systematic analysis of community responses and key informants' responses regarding community participation in the planning process and document review. Section 7.1 presents community experiences and opinions regarding scopes of community participation in the decision making and implementation process of NGO initiated projects; Section 7.2 presents a systematic review of government documents and NGO documents to highlight the scopes for addressing the issue of protecting *haor* settlements from flood adversities; Section 7.3 presents the key informants' responses regarding the decision making and implementation process of NGO projects for *haor* communities; and finally, Section 7.4 evaluates and categorizes the scopes of community participation in the planning process along with identifying a successful approach for community participation.

7.1. Responses from Communities

During in-depth semi-structured group interviews, the participants were asked to share their experiences of protecting their settlements and working with NGOs, focusing their involvement and contributions towards the project, and at the same time NGOs' attitude towards their concerns and proprieties. Participants unveiled the condition of residents' participation in the whole planning process from their perspectives.

7.1.1. Settlement 1: Nayahati

Protection walls were built on two edges of Nayahati settlement under the FSUP-H project of CARE Bangladesh. Before building these walls, the community had to take regular initiatives to protect edges with traditional structural measures. Even in current condition, this community needs to protect the other two edges with traditional structural measures. The participants described the process of building or repairing and maintaining the traditional

structural mitigation measures as team work where participation of all residents are ensured at various levels. The tasks include, evaluating the condition of structures, deciding the necessary action requires for building or repairing the structures, encouraging every household to build or repair the part of structures close to its house, encouraging the neighbors to help others who need helps (financial supports or physical labor), finishing all tasks before the regular flood season begins, forming multiple vigilant teams who can patrol the structure (especially at night) and evaluate its condition by rotation and taking immediate action if any fault or failure is noticed. Under the leading of local leaders, the whole community unitedly makes these decisions. As a traditional practice of protecting settlement in this way, every household usually behaves rationally and respectfully to follow all communal decisions for the sake of protecting the settlements. One of the participants said,

We need to spend every year to build all fencings (traditional structural mitigation measures) ... We help each other to build these fencings... If the watch team spots any weak point in the fence, it calls out others to go out and fix it... Several times we fail to fix it; waves are so strong, and we have nothing to do save it. (Participant 1F-2)

Another said,

Sometimes we even jump into the water and stand there as forming a human-embankment and pray to God so that gusty wind can stop, and waves can be calm down (Participant 1M-1).

According to the participants, the protection walls on east and south edges, as an effective structural measure for mitigating flood damages, positively contribute to enhance community flood resilience. However, though the community is grateful to CARE Bangladesh for receiving financial, technical and organizational support for building this protection wall, it has some dissatisfaction with its quality and planning process, conducted by CARE Bangladesh.

The first issue they identified was that though any *haor* community demands getting a better structure (protection wall or revetment), not every organization takes it as its first priority and also tries to downplay the importance of having infrastructure-based development, which also demands a large amount of financial involvement. Nayahati has been receiving support from NGOs since the early 1990s and in 2011 they have received a protection wall, which can protect the settlement partially; the inhabitants think this protection directly and indirectly will help them to enjoy the benefits of the regular support they receive from NGOs. The regular supports usually received from NGOs include receiving small financial support for running any home-based business, getting training on kitchen garden, building sanitary latrines, providing education and others. As an example, in the current condition with protection walls,

they may have sanitary latrines that will last a long time and even might be used during the monsoon period; now they have space to rear calves to run small-scale dairy farms; now they will have enough time and mental peace to acquire literacy and so on. It took a really long time to get any support from NGO, which the participants really can value. One of the participants commented,

We always told them (NGOs), you do not need to run any project other than building protection walls around our settlement. They (NGOs) repeatedly used to ignore our demand and used to show more interest to run other projects, like, building sanitary latrines, providing training on kitchen gardening, distributing a small amount of money for running small business, distributing calves for running a small-scale dairy firm etc. (Participant 1F-2).

The planning process for building protection walls started through community meetings with CARE's field facilitators, where the participants were asked to discuss and make a list of problems. As usual, the participants of those meetings put flood and flood-related problems in their priority list and demanded protection walls on four edges of their settlement. In the meetings prior to 2011 construction, a couple of times CARE agreed to build a protection wall, which never happened in those days. Though the community demanded to get walls on four sides, CARE, due to its budget limitation, wanted to build a wall on only one edge and asked the community to find out the most vulnerable edge of the settlement. This was even though the community identified that at least two edges should be chosen to build the protection wall and a wall on one edge would not only be ineffective and but also the wall itself would collapse soon. The community usually relies on the technical/engineered knowledge of NGO, but the community became surprised with the proposal of building a wall on one edge and could not agree with it. One of the participants commented,

It seemed, that time they (CARE) arrived with the decision of assisting to build a protection wall on one edge. They always ask us to give our decisions, but instead of following that, they always try to convince us to follow their decisions. But, we were happy as they finally realized that we desperately need protection walls other than anything else (Participant 1M-11).

Every time NGOs start to work through forming a committee with community members. A committee of nine female and six male members was formed at that time. The ratio of males and females was decided by the field facilitator and the community chose the persons. The committee signed the agreement on behalf of the community. This agreement included issues like available funding for the project, arranging labor according to the design prepared by CARE, all expenses related to this project and other important issues. The agreement defined the specific roles of each party. Building a protection wall contained two major works: 1.

Earth-filling and 2. Wall construction. The community funded and conducted the earth-filling work according to the agreement. As the NGO did not have enough funding to do both, they agreed to fund the wall construction only. The community had to fund and implement the earth-filling work and had to prove that the community was united enough to run a big project. That was another requirement, fixed by CARE for assisting to build the protection wall. Every family had to spend money and work on earth-filling. Field facilitators encouraged, organized and guided them to do work according to the preferred standard of CARE. There were some ultra-poor families within the settlement, who did not have their own land and houses. The field facilitator proposed to redistribute the land proportionately so that all families could get land.

A skilled engineer of CARE gave a day-long training to the committee members. The training included how to select skilled labor, how to select/buy all construction materials of good quality, how to keep the budget, how to maintain a report, how to distribute duties among committee members and how to monitor everyone. Then, all duties were distributed among committee members. The committee members decided the suitable time and labor charge for the construction work. One of the participants commented,

It (agreement) was basically prepared by them (CARE) and we had to agree with them to get their financial, technical and organizational support (Participant 1F-13).

In this case, CARE wanted to build a wall on only one edge and asked the community to select that side, which was a very impractical decision according to the community. Walls on only one edge not only would fail to protect the settlement, but also would collapse very quickly. Though the community prefers to rely on technical decisions of NGOs, this time the committee took a strong position and refused to take any sort of assistance if CARE did not agree to assist to build walls on at least two edges: east and south, identified by the committee members.

The participants think that, financial, technical and organizational capacities play a vital role in decision making. NGOs have these capacities and the community, not having these capacities, allows NGOs to impose their decisions. In community meetings, participants always demand infrastructure-based developments, which are usually ignored by NGOs. The community are not satisfied with the height and construction technology of the current protection walls. They feel confident when technical decisions are taken care of, based on all their concerns. But they usually find themselves in a captive condition while getting support from NGOs. One of the participants commented,

We asked to build protection walls in other nearby settlements, with connecting roads...and a bridge over the river so that we can be connected with the villages of the other side of the river. Our children could use those bridges or roads to go to school... CARE did only what they wanted to do. They always tried to convince us. They asked us to be satisfied with whatever we got from them... We are sure that, again, any other NGO will come to run some easy projects (Participant 1F-1).

7.1.2. Settlement 2: Concernpara

In the current condition, Concernpara has piled up concrete blocks (remaining of a concrete block revetment) on its east, north and south edges and piled up sand bags on the other edge as mitigation measures. The construction of the concrete block revetment as well as the establishment of the settlement happened under the projects, run by Concern Bangladesh.

Here also participants described that the work-process of NGOs starts with forming a community committee with selected/elected community members who can lead the community and raise their voices in the meetings with NGO facilitators. Participants said that, in community meetings either with committee members or with the whole community, NGO facilitators always ask them to list their problems and express their needs on priority basis. The NGO facilitators also raise various issues and continue the discussion to get a comprehensive picture of problems and needs. They feel really fortunate if NGO agrees to address any problem or need for which the community is longing, but this happens rarely.

One of the participants commented,

We have to depend on the wish/will of the NGOs. If their wish/will matches with ours, then it is good for us (Participant 2F-4).

During the time of establishing the settlement, in the regular community meeting with field facilitator, a significant amount of landless families gave their opinion to establish a new settlement. In the action plan, prepared by the community committee members, this demand was put on top of the priority list. Considering this demand, Concern Bangladesh formed a project to establish a new settlement. An agreement was signed between the beneficiaries and Concern. According to the agreement, the beneficiaries as a group, had to buy almost three acres of land from the local land owner. Concern Bangladesh provided funds to accumulate the dredged soil, to construct the raised base ground.

The newly formed community wanted to get a non-traditional structural measure to protect the vulnerable edges of the base ground. But, any such consideration was not included in the project proposal at that time. The community had to continue its traditional practice of building and maintain traditional fencings for protecting settlement edges. In the following

year, while Concern Bangladesh came to the settlement to operate their regular projects, the community members repeatedly insisted to assist to build an infrastructure to protect the edges. One of the participants commented,

We informed them which sides are more vulnerable or prone to damage. We always insisted to build protection walls (permanent, high enough, wide enough) on four sides to make the settlement free from all kind of flood-related risks (Participant 2F-3).

But at that time, Concern just supported accumulation of dredged soil to rebuild the demolished part of the settlement. Every year Concern used to run its regular projects, like forming a women's self-help group for generating internal savings, providing small asset grants and/or micro-credits for investing, to increase household incomes, provide sanitary latrines and tube-wells for getting safe water etc. But, because of the continuous erosion of the land and spending a significant amount for building some forms of protection, it was hard for the inhabitants to get benefits from all these initiatives. One of the participants commented,

Sometimes we had to use the asset grant/ loan for repairing the traditional fencing (mitigation measure), instead of investing it for any business or production activity... We could not save our sanitary latrines and tube wells in most of the cases. Those parts of lands were eroded with those structures. Without a proper protection structure around the settlement, it was/is always hard to save the land (Participant 2F-2).

After five to six years of establishing Concernpara, Concern Bangladesh for the first time agreed to build infrastructure to protect the settlement. Just like other years, in community meetings with field facilitators, the community members described the land-erosion as the most acute problem for the settlement and urged them to build appropriate infrastructures on four edges of their settlement. The community members and facilitators jointly decided to build some sort of infrastructure. Though the community demanded to get infrastructure on four edges, Concern, due to its budget limitation, wanted to build on one edge only and asked the community to find out the most vulnerable edge of the settlement. The community identified three sides: north, east and south sides for building infrastructure and this was agreed by both parties. The community was expecting to get brick walls with cement mortar, as they had seen this kind of wall in some places. But the NGO decided to build a concrete block revetment, which was completely unknown to the people of that area at that time. The field facilitators convinced the community saying that, the revetment would perform better than any brick wall. The community committee signed the agreement on behalf of the community. This agreement included issues like, available funds for the project, arranging labor according to the design prepared by the NGO, all expenses related to this project and other important issues. The agreement defined specific roles of each party. Building

infrastructure contained two major works: 1. Earth-filling and 2. Construction. The community funded and conducted the earth-filling work according to the agreement. Concern Bangladesh provided whole support, including skilled labor to build the concrete block revetments on three edges.

But, the revetment started to fail from the next year and the community came to realize that the arrangement of the blocks, being neither fixed nor otherwise joined together, contributes to revetment failures (as mentioned in earlier chapters). The community reported this case to Concern. Concern indicated that the revetment would need to be reinstalled, underpinned by geo-textiles and cables and it would need time to form a new project for fixing the problem. But, this never happened, as within a few years Concern ended its project in that vicinity. One of the participants commented,

Concern went away, throwing us into a disastrous condition with concrete blocks (Participant 2M-7).

Despite having concrete block revetments, the settlement loses land and houses on the northeast and southeast corners each year. Participants reported that the concrete blocks are dislodged by waves during floods, and communicated an understanding that displacement of a single block can compromise the whole revetment, as the adjacent unsupported blocks will also fall. After Concern, several other NGOs (like, CARE, POPI, ORA etc.) came with their projects and followed almost the same procedure of working. The community repeatedly requested every NGO to support them to remove the concrete blocks and install brick-built protection walls and repeatedly failed to convince any NGO to do that until this study was conducted there. The supports they usually receive are, i.e., seedlings of trees for creating a vegetation boundary, training on kitchen gardening and innovative agricultural systems, support for installing sanitary latrines, small grants for investing in small-scale business, micro-credit, awareness about social and legal issues etc. One of the participants commented,

NGOs think, once we get assistance for building infrastructure, we should not get any more support for the same purpose. If NGOs can manage some funding for building infrastructure, they will prefer to invest it for other settlements that have never got any support for building mitigation structures (Participant 2F-9).

Like participants of Nayahati, participants of Concernpara similarly think that financial, technical and organizational capacities play a vital role in decision making. NGOs have these capacities and the community does not have these capacities and this allows NGOs to impose their decisions. In community meetings, participants always demand infrastructure-based developments, which are usually ignored by the NGOs.

7.1.3. Settlement 3: Nakusha-Dashkusha

The settlement of Nakusha-Dashkusha is different from the other two settlements, as it does not have any non-traditional infrastructure for mitigating flood adversities. It is important to investigate why this settlement does not have any structure like that, while it has been receiving support from NGOs since 1990 and the community feels the necessity of an appropriate infrastructure for mitigating flood adversities. In 1995/96 for only one time, the settlement received free dredged soil from Concern Bangladesh.

The participants described that, though usually NGOs don't get interested to invest for any infrastructure-based development, CARE Bangladesh attempted twice in recent history to build non-traditional structural mitigation measures. Nakusha-Dashkusha is a part of clusters of settlements, where there are other settlements very close to it. CARE asked to them to select one or two edges of any one or two settlements among the big cluster for building structural mitigation measures. In the community committees, there were members from different parts of different settlements and everyone wanted to get that structure close to his/her residence and finally, they could not end up with a final decision about location for implementing the project. One of the participants commented,

Now we became kind of enemies of each other. As everyone thinks, his/her settlement did not get the infrastructure because of the others. But, we all regretted it. If anyone would sacrifice, then another would get the benefit. But who would like to sacrifice? (Participant 2F-6).

CARE portrayed it as the failure of the community. As a condition for getting assistance for such a kind of project, usually NGOs expect the community to be united and behave coherently and comprehensively to ensure the success of the project. Because of limited budget and the decision made by CARE, the settlement lost its communal harmony with neighboring communities. One of the participants commented,

CARE said, "We asked you to make a decision. But you could not make it. You are not ready to conduct such a big project" (Participant 2F-1).

Like participants of the other two settlements, participants of Nakusha-Dashkusha similarly think that, financial, technical and organizational capacities play a vital role in decision making. NGOs always come with pre-decided projects and have meetings and training sessions to make the community feel that what they have decided is necessary for the community. The participants appreciate the NGOs' involvement for socio-economic development, i.e., making women financially strong or solvent, stopping child-marriage, educating women, delivering power to women to make decisions. The participants realized

that, because of the activities of NGOs, the position of a woman either in her family or in her community has been upgraded. Besides doing these things, NGOs could contribute more effectively to mitigate flood-adversities if they would prioritize community concerns and ideas. One of the female participants commented,

Now I can raise my voice and the community listens to me. I am a member of the committee and earn more than my husband and know my rights... But still we are facing the same problem because of flash flood and erosion (Participant 2F-2).

7.1.4. Synthesis

Figure 7-1 diagrammatically explains the interactions between the community and NGO while an NGO works in a community, based on community responses. Based on participants' opinions the NGO projects can be classified into two types: Projects, not incorporating community priorities and Projects, incorporating community priorities. The communities prefer to get supports for having infrastructure based development for ensuring structural protection of their settlement and in most of the cases they don't find NGOs are convinced to address their priorities. Though NGOs operate their project through establishing community committees and ensuring community involvement for addressing community problems in an organized way, in rare cases, the process serves its intended purpose.

7.2. Document Review

Section 4.3.4 provides the list of governmental or national documents and non-government organization documents, which were reviewed for this research. The documents are interpreted and explored through a process of qualitative content analysis, which is explained in the section 4.4.2.

- **Disaster Management Act 2012**

The Disaster Management Act 2012 is the only act that is applied for the whole country to have disaster management coordinated, object-oriented and strengthened activities and to formulate rules to build up systems of effective disaster management to fight against all types of disasters.

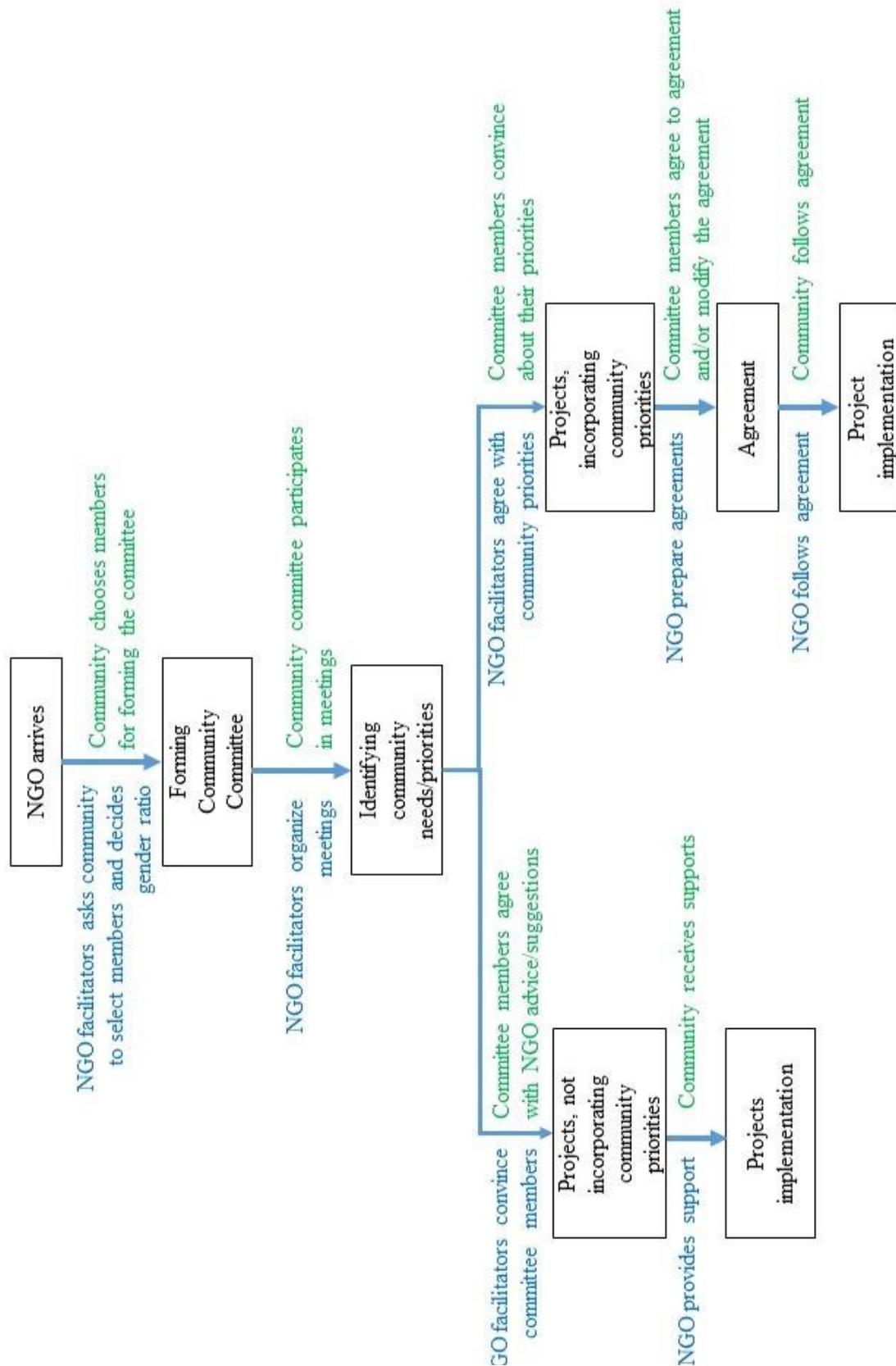


Figure 7-1 Community experiences of working with NGOs

It especially intends to reduce the overall effects of disaster by bringing the damaging effect of different types of disaster to a tolerable level through developing disaster risk reduction

programs and through engaging concerned government and non-governmental organizations. It advises the government to formulate Disaster Management Policy and Plans. This act is more focused on disaster response and recovery; as a result, it lacks the scope of enhancing community resilience through enforcing mitigation measures.

- **National Disaster Management Plan 2010-2015**

This is already an outdated document that contains seven strategic goals: professionalizing the disaster management system, mainstreaming risk reduction, strengthening institutional mechanisms, empowering at-risk communities, expanding risk reduction programming, strengthening the emergency response system and developing and strengthening networks. It acknowledges the importance of having a national-to-local level disaster management plan to tackle mitigation measures, building capacities and strengthening response mechanisms. It also proposes to have hazard-specific contingency plans, along with a plan for ‘disaster resilient cluster housing’ to make the settlements resilient to the particular hazards through incorporating necessary utilities and infrastructures. Its goal of ‘empowering at-risk communities’ intends to have resilient housing, with an understanding that communities have a greater understanding of the risks and vulnerabilities to hazards and anticipated climate change risks and strategies for reducing or managing all hazard risks. Along with relevant government ministries, it considers NGOs and development partners as supporting agencies for achieving its goals.

- **National Housing Policy 2008 (Draft)**

The national housing policy aims to provide houses and/or settlements and upgrade the houses and/or settlements in such a way that it ensures environment-friendly, healthy, safe, secured, economic, equitable and sustainable development. It identifies two crucial housing problems along with others:

- deficiency in developing sustainable housing for protecting environment and resources and
- lack of community participation in development planning and management

This research deals with these two vital issues. Strategically the housing policy asks to provide the habitation and rehabilitation in a hazard-prone location in such a way so that it decreases the adversities, mitigates the risks and ensures community participation. The *Haor* region as a regularly flood-affected area falls into this category and demands such kind of treatment.

- **Bangladesh Climate Change Strategy and Action Plan 2009**

This document is a part of the overall development as the issue of climate change has been strategically incorporated into the overall process of economic and social development. The action plan contains six pillars:

- Food security, social protection and health
- Comprehensive disaster management
- Infrastructure development
- Research and knowledge development
- Mitigation and low-carbon development and
- Capacity building and institutional development.

This document predicts heavier and more erratic rainfall with higher river flows, river bank erosion and increased sedimentation, mainly because of melting of the Himalayan glaciers. Though the predicted future scenario can make the *Haor* region more prone to disasters, the document did not consider the *Haor* region as its one of the focus areas. As a result, the programs are not designed considering the conditions of the *Haor* region, though strategically it has scope to address the issues of this region.

- **National Adaptation Programme of Action (NAPA) 2005**

This document proposes to adapt some future strategies to cope with the adverse impacts of the changed climate. This research is not considering the issues of climate change, but it considers flood, which is a major consideration for the adaptation to climate change. Even in the case-study area, local people felt that the flooding condition had indeed changed, mostly for the worse, over the years (Field survey, 2015), though this research was not intended to collect any data regarding the change of the flood scenario over an extended period. NAPA 2005 identifies the human settlement of the North-East region (includes the *Haor* region) as an affected sector because of flooding. Considering the impacts of climate change, the coastal region was considered of the highest importance in this document. The damages of settlements due to environmental adversities are almost neglected in the document. For the north-east and central part of Bangladesh (includes the *Haor* region), NAPA 2005 proposes to have future adaptation to the agricultural system and diversified fisheries, considering that these areas are prone to flash flood. As a result, it did not propose any priority project for protecting settlements of the *Haor* region.

- **National Water Management Plan 2001**

The national water management plan intends to provide a framework for all relevant bodies to plan and implement their own activities for ensuring the better utilization of water resources, avoiding any adverse impact. For rural areas, it aims to have protection from flooding as well as storm-water run-off and for mitigating hydrological disasters. It aims to have appropriate structural and non-structural mitigation measures to adapt to hydrological hazards. Specifically, for the *Haor* region (mentioned in the document as *Haor* basin), it proposes to have flood proofing programs for villages, along with other environmental management-related programs.

- **Master Plan of Haor Area 2012**

Though the Master Plan of the *Haor* Area 2012 is not a disaster management plan, it deals with all possible issues of the *Haor* region, which include its hydrological hazards and settlements. It is considered as an ‘integrated development plan’ that aims to protect the inhabitants from natural disasters and improve the livelihood conditions along with preserving, protecting and restoring the eco-system. Through a participatory planning process, it has provided a framework for the development for the next 20 years (up to 2032). Along with other socio-economic development components, it considers the issue of flood management as an important component for planning for the region. Among its six strategic thematic areas, the thematic area of ‘improved water and disaster management’ covers the development area of ‘water resources’, and the thematic area of ‘social safety net and improved standard of living’ covers the development area of ‘education, health, water supply & sanitation, housing & settlement and social services & facilities’. These two strategic thematic areas contain components that are relevant to this research. Its disaster management component stresses protecting lives and properties, particularly from water-related disasters through effective mitigation measures. It has been allocated 0.33% of its total budget for ‘housing and settlement’, specifically for its project of ‘village protection against wave action of the *haor* area’, which is also considered as a very high priority project.

- **Synthesis**

Though the term ‘community resilience’ is not described in any document, the status of vulnerability is expressed through describing the context and identifying problems. The National Water Management Plan 2001 and the Masterplan of *Haor* Area 2012, address the issue of protecting the *haor* settlements from flood adversities. On the other hand, the Climate

Change Strategy and Action Plan and National Adaptation Programme of Action (NAPA) 2005 did not consider the *haor* settlement and protecting *haor* settlements from flood-adversities as being within their scope of work. The National Disaster Management Plan 2010-2015 and the National Housing Policy 2008 seek to ensure effective participation of community members for better outcomes. Figure 7-2 shows the scope of reviewed government documents for addressing the intended issues of protecting *haor* settlements from flood adversities and community participation in the planning process.

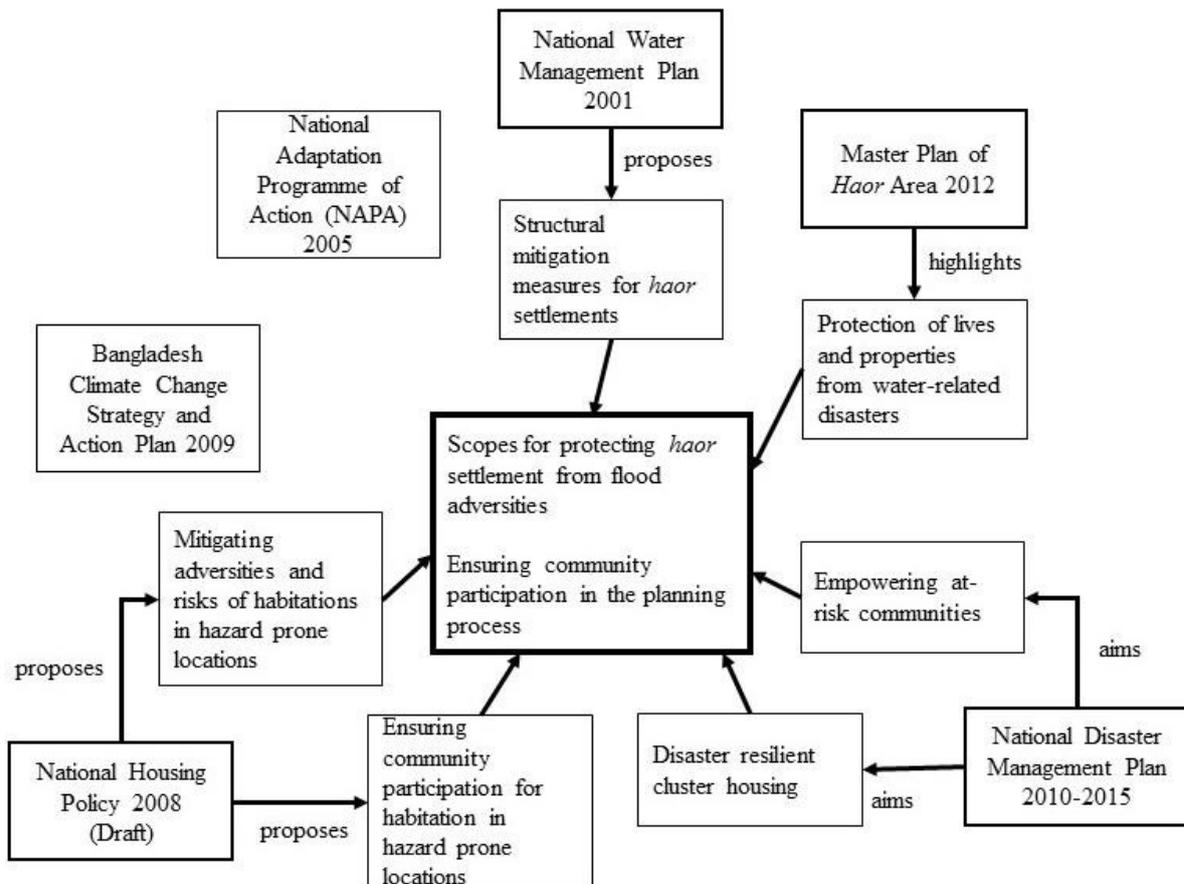


Figure 7-2 Scope of reviewed government documents

7.2.2. Documents on NGO Projects/Programs

Three NGOs (CARE Bangladesh, Concern Bangladesh and People’s Oriented Program Implementation (POPI)) were selected for reviewing their publicly available documents on relevant programs/projects. Three programs/projects of these NGOs were identified which are similar in nature. Under these programs/projects, flood mitigation measures are implemented for protecting *haor* settlements. These program/projects are:

- Food Security for Ultra-Poor-*Haor* (FSUP-H),

- Strengthening Household Abilities for Responding to Development Opportunities (SHOUHARDO) and
- *Haor* Initiatives for Sustainable Alternative Livelihoods (HISAL).

Documents on these program/projects, especially evaluation reports prepared by third parties, are reviewed to understand the aims, objectives, scope, strategies and operational process of these program/projects.

- **FSUP-H**

Food Security for Ultra Poor-*Haor* (FSUP-H) project, launched by CARE Bangladesh in 2008, aims to improve food access and utilization and reduce vulnerability for women and their dependents in ultra-poor households of three north-eastern districts of Bangladesh (Kishoreganj is one of these districts).

The project is usually operated through a multi-strata forum of community members, called village development committees. The main objective of forming these committees is to develop local leaders, who can take decisions on behalf of the community. Providing a small asset grant of BDT 4700 (AU\$ 78.93)⁴ to individual women of poor households for investing to generate income is a major component of this project. Some villages have received this asset grant as a group grant and the group utilized that money for bigger investment, i.e., agricultural projects.

Empowerment, Knowledge and Transformative Action (EKATA) is another kind of group which is formed with young people for disseminating development messages, such as discouragement of early marriage and payment of dowry, improved nutritional awareness, environmental and personal sanitation. Community savings groups are formed for providing a safety net to ultra-poor families during lean periods or times of hardship. Though the project is women-centered, its Engaging Men (EMI) initiatives involve men and boys to strengthen the work of empowering women. The project targets empowering the community in such ways that they can not only maintain the socio-economic development, initiated by the NGO, but also can operate development activities without any external influence. The FSUP-H project also motivates land owners to donate lands or sell the land in a very nominal price to landless families to form a new settlement or an extension of an existing settlement. Within the

⁴ Exchange Rate: Bangladeshi Taka 1 = AU\$ 0.016, 1 May 2017

extended scope of reducing vulnerabilities against women, the FSUP-H project has provided dredged soil to some settlements and built some village protection walls to save the settlements from flood adversities. Building infrastructure, i.e., protection walls, revetment, does not count as an embedded component of the FSUP-H project.

- **SHOUHARDO**

Strengthening Household Abilities for Responding to Development Opportunities (SHOUHARDO) program has been operating since 2004 for improving availability/economic access to food, improving health and nutrition of participants, empowering women and assisting communities and institutes for mitigating or responding to natural disasters. Its second phase as SHOUHARDO II commenced in 2010. This phase has included another objective, which is increasing elected body's and government service providers' responsiveness and accountability to the extreme poor households.

The program follows a standard set of procedures and guidelines to interact with participating communities and identify ways and means of transferring services and resources to beneficiaries. The targeted governance structure at the community level (and entry point) is the establishment of a Village Development Committee (VDC) – with elected members, including both men and women – that jointly develop a Community Action Plan (CAP) through a participatory process (it is claimed the process is a participatory process). Prior to developing the action plan, the VDCs are assisted through facilitating sessions for identifying community problems, conducting Climate Vulnerability and Capacity Analysis (CVCA) and gender analysis, and prioritization of community needs. An action plan is then drafted to address identified needs that fall within the scope of the program (e.g. shortage of food, ending violence against women, ending dowry, water, sanitation, and climate and disaster risk management (DRM) – with construction of infrastructure such as embankments and bridges. Field facilitators then work with VDCs and other specific groups in the community to develop strategies for addressing individual items on the CAP. Each VDC reviews its progress on an annual basis, using results from the CVCA, gender analysis and action planning process to hold itself accountable. Once established, the VDC also helps monitor progress made by four thematic groups in the communities. These are:

- Core Occupational Groups (COGS) aimed at increases in food production, and/or income (targeting both men and women);

- Growth Monitoring and Promotion (GMP) Groups aimed at improved nutrition and health status of children under 5 years of age;
- Early Childhood Community Development (ECCD) Groups for mothers and children between 0 and 8 years of age); and
- Empowerment, Knowledge and Transformative Action (EKATA) Groups focused on educating women and girls on empowerment and protection.

Each group is facilitated by a paid volunteer recruited from the community. Full-time employed field facilitators oversee a specific geographic area and provide technical support and oversight to volunteers from the four different groups. Field facilitators are employed by NGOs and they receive technical support from technical managers within these organizations.

Among its five strategic objectives, the last one was designed to achieve progress in disaster preparation and response and in climate change adaptations, aiming to build longer-term community resilience. This objective included the following interventions of recruiting and training community disaster volunteers for response during disasters; conducting participatory community vulnerability and community capacity analysis that guides adaption plans, and which applies to agricultural technologies; improving early warning and forecasting systems; creating and maintaining disaster resistant infrastructure such as water and sanitation, embankment, wave protection walls etc.

- **HISAL**

Haor Initiatives for Sustainable Alternative Livelihoods (HISAL) (2006-2011), implemented by Concern Bangladesh aims to empower households through developing sustainable community organizations, improving livelihood options, building effective and sustainable village protection (structural mitigation measures for protecting settlements) and increasing government resources and services. The women's self-help group (SHG)s and community based organization (CBO)s are developed for not only ensuring community participation in socio-economic development activities, but also to make community members proactive for their own development. The community groups and trained field-facilitators, appointed by NGO, jointly develop a plan to address community problems on a priority basis. The community groups are trained and made aware to identify community problems and prioritize all kinds of needs. Within the scope of HISAL, specific strategies are formulated for addressing identified problems (e.g. protecting settlement from erosion, shortage of nutrition, ending of early child-marriage, violence against women, water, sanitation etc.).

Synthesis

Figure 7-3 explains the decision making and operational process of the NGO programs which are summarized above. In all cases, the program starts not only with a vision and a mission, but also with its multiple fixed goals or strategic issues. Though communities are approached and asked to participate in the process of finalizing all operation details, the process follows such a dominating top-down process where definite scope for communities to contribute to redefine the goals or strategic issues are limited.

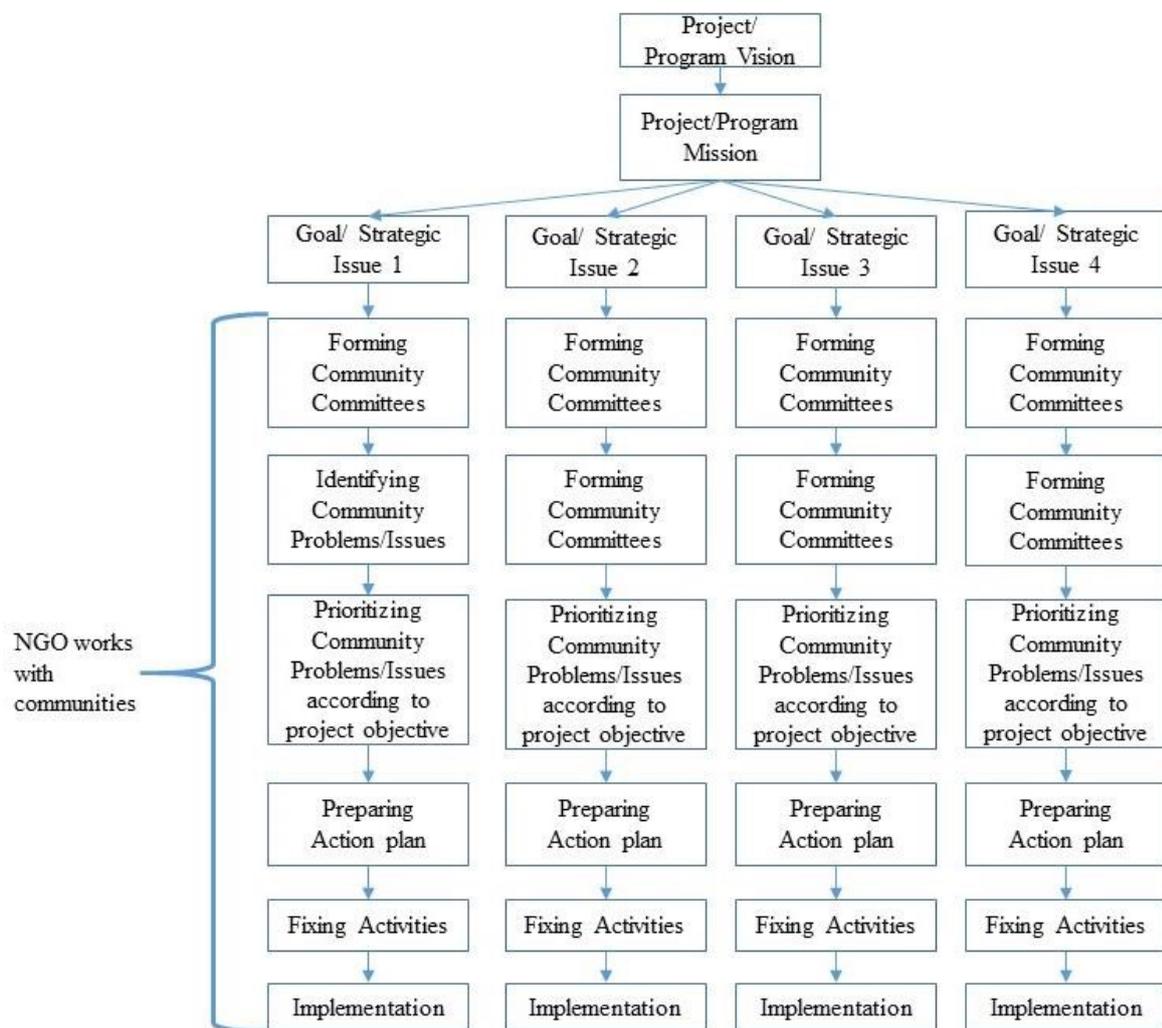


Figure 7-3 The planning process of NGO programs/projects

The reports (TANGO, 2015; Whiteside, 2012; Caldwell et al, 2011) find that investments in infrastructure have a direct impact on disaster risk reduction by decreasing *haor* communities' exposure to risk of hydrological hazards. According to Tod et al. (2008), there are clear major benefits to SHOUHARDO households from the construction of wave protection walls. Investment in the walls is technically and financially sound. The walls constructed by

SHOUHARDO generally performed well, although some modifications were required to the design. Infrastructure development activities like raising base-ground, extending existing settlement area and protecting the settlement-edges provide secured additional space for investing in ensuring food security (Tod et al, 2008; Whiteside, 2012; TANGO, 2015). Though the non-traditional structural mitigation measures (i.e., building protection wall) bring clear benefit to the local people and locality, building such kind of structures did not get priority in the project (Whiteside, 2012; TANGO, 2015). SHOUHARDO do not have the resources to solve wave protection problems throughout the *Haor* region and hence SHOUHARDO needs to start advocating on behalf of *Haor* communities for wave protection works to be funded by large donor organizations such as the World Bank or Asian Development Bank (Tod et al., 2008). The evaluation report, prepared by TANGO (2015), finds that the percentage of households that experienced a disaster and the number of disasters experienced increased or remained about the same overall and for both male and female-headed households. Similarly, the HISAL could not contribute enough for mitigating hydrological hazards, whereas the wave erosion and loss have increased for the wider inhabitants within the catchment area of HISAL over its lifetime. Its goal of improving livelihood options, building effective and sustainable village protection was partly achieved (Whiteside, 2012).

Though all program/projects claim to be operated in a community participatory way through forming various community groups, some reports (TANGO, 2015; Whiteside, 2012; TANGO, 2009) express their dissatisfaction with the level of community participation. TANGO (2009) finds that the community groups (which are formed as a committee for one term or year, to ensure community participation and empower community members) lack proper understanding of their responsibilities to get involved and to disseminate their duties to the next committees (of next term or year) for sustaining the process of empowerment. At the same time, the scope of building capacities (through learning and sharing) is usually not properly utilized. Sometimes, after the completion of a project, the committee does not realize what to do next and becomes inactive. The report recommends prioritizing the component of building for structural measures for protecting settlements using a robust analysis of flood risk and cost per household. Whiteside (2012) suggests letting the community group practice the 'bottom-up approach after an initial top-down phase of forming the group'. As experience grows, there will be more opportunity for community groups to support and learn from each other. External support can be delivered in a more specialized way but definitely in a less

intensive and regular way. Whiteside (2012) also identifies weaknesses in planning for sustainability of achievements. The proportion of the overall budget directly reaching the participants was rather low. The author recommends keeping the office's overhead cost down so that more funds can reach the beneficiary groups.

7.3. Responses from Key Informants

The interview responses received from nine key informants from three NGOs to get their perspective about the activity process of NGOs are summarized below under thematic headings.

7.3.1. Priority Listing

All interviewees indicated that their organizations value the concerns of *haor* communities and mainly work to enhance food security in that region and some of their activities directly or indirectly address the issue of adaptation to flood. Under donor-funded projects (e.g., FSUP-H, SHOUHARDO) they get involved in providing education, health-care, increasing agricultural production, eliminating extreme poverty, mainstreaming equality and right-based approaches, increasing livelihood options, providing micro-credit, protective plantation, research and advocacy and disaster management training (getting early warnings, building awareness about their threats and potentials, celebrating disaster days, activating the union-based committee, providing information about how to save valuable properties/ items, how to get safe water, where to go when seeking shelter, what they will do in a shelter etc.) The scope of their regular projects also includes assisting in having structural mitigation measures, like service structures (source of safe water and sanitary latrines) and protection structures (e.g., wall, revetment, and plantation) for mitigating flood damages. They also agreed that flood structures, which require more organizational and financial involvement, bring clear benefits to *haor* communities in terms of adaptation to flood. Their organizations prefer not to get involved in this kind of project very often, though most of the community strongly urges creation of building protection structures. Strategically it is perceived that infrastructure-based development has the risk of producing adverse impact on the environment and on the socio-economic cultural life-style of a community. One of the interviewees commented,

Building flood protection structures cannot be prioritized until having more research on their impacts and cost per household... We also need to identify how to finalize structures and construction technologies considering which are environmentally appropriate for the Haor region (Participant 8).

7.3.2. Settlement Selection

NGOs select settlements according to their pre-determined target area based on previous research, feedback or the drawbacks of previous projects, for ensuring equal distribution of their activities for achieving pre-determined goals, following pre-determined strategies. One of the interviewees commented,

We also assess their level of vulnerability, especially geographical vulnerability to flood. We try to find out which settlement is the most prone to damage among all adjacent settlements, with highest number of poor and extreme poor people and how our intervention will help a bigger community and a bigger catchment area so that we can ensure an equally distributed development (Participant 2)

Another commented

We always prefer to run smaller projects, which can make a bigger impact in their lives (Participant 3).

NGOs prefer to run regular small projects before planning a bigger project (like building protection wall) to check the community's quality or capability. The community is needed to be united, capable to fund almost half of the project and to work under local leaders for being chosen for big projects. At this stage, the scope of community participation is limited or absent. One of the participants commented,

Every project in its initial level proceeds in a 'top-down' way and community participation is ensured mainly in implementation phase (Participant 9).

7.3.3. Project Selection

The interviewees stated that, strategically, all projects should be community-led, which means projects should be planned and implemented by the community. To ensure that, a committee (e.g., village development committee, project implementation committee, and community based forum) is formed to make them actively involved in the planning and implementation process. The committee is asked to identify the settlement's problems, issues, especially where it needs help, and prepare a development plan for its settlement. More than half of the respondents wanted to express it as the process of empowering community, where the role of the community shifts to major decision making from just informing its condition. All agreed that most of the community members demand for mega-projects, like building heavy infrastructure to make the whole region flood-free; building road connections, bridges etc., which are not easy to fulfil. One of the interviewees commented,

Everyone has big dreams. They ask for bigger development (Participant 9).

Key informants feel that the community usually does not see the importance of practicing non-structural measures, as well as socio-economic development, and they need to make them understand which one is more important and appropriate for them. As one described,

They never understand the importance of social improvement through eliminating all social problems, like gender inequality, human right abuse, child exploitation, lack of education (Participant 1).

The field-facilitators (who are trained), through series of meetings on various issues, like education, human rights, micro-credit etc., help the community committee to make rational decisions. As one commented,

Even sometimes, they fail to appreciate their own positive aspects/ quality. Sometimes they desire for something which will not be beneficial for them. Sometimes, because of traditional values, socio-cultural customs/taboo and religious beliefs, it becomes hard for them to embrace something new (Participant 6).

The informants assured that instead of imposing decisions, NGOs try to motivate the community in such a way so that the community willingly agrees to fulfill the target of projects. Six out of nine respondents stated, sometimes it may seem that NGOs impose their decisions on the community, but they do it with best intention. One participant commented

NGOs always have some agenda, (e.g. increasing the number of school-going female children, decreasing the number of school drop-outs, decreasing the number of child deaths, increasing the number of households using sanitary latrines and others). None of these are less important than building a protection wall around their settlement (Participant 9).

7.3.4. Availing Fund

The interviewees think that in the final development plan, all decisions are jointly made by community committee members and NGO field-facilitators or experts. For building any structure, which is very sensitive in nature, a very logical proposal is needed to be prepared for getting approval from the donor, as it is not a direct component of the regular project. Decisions are not imposed by the donors. But, the donors are in a position for approving the budget for a particular project. Project proposals are required to be prepared in such a way so that a sufficient fund can be availed. Sometimes, development experts are appointed to prepare proposals. One commented,

Each and every donor has its own agenda to allocate the fund. If we know that a fund is available only for projects related to climate change mitigation, then we need to design our project proposal in such a way so that we can avail that fund (Participant 5).

Another commented,

To prepare a viable proposal, we definitely need to include community members' opinions and suggestions. We also need to prove that our process was participatory, where the community actively participated in the decision-making process (Participant 1).

7.3.5. Project Details

The NGO personnel conveyed the understanding that construction details are fixed by the engineers/experts based on available funds, community demand/necessity and the geographical/geological condition. Experts' opinion is shared with the beneficiary communities to get their approval, though it is realized that the scope of community participation is limited for selecting/choosing construction details (technology, width, length or height of wall/revetments. Seven out of nine respondents agreed that communities usually are not completely satisfied with the construction details. As one commented,

The community has to be satisfied with whatever they are getting from the NGO (Participant 7).

One of the respondents expressed his concerns about some experimental protection structures, which failed to fulfill their purpose. He commented,

If you (an NGO) are not sure about the technology, then you may go for a real-scale experiment or any pilot project. Why are you playing with the lives and houses of these haor communities? (Participant 9)

This kind of thing happened several times, where the project got enough funding and because of not including community opinion properly, the project outcome was not appreciated enough. But the respondents showed their concerns for any possible adverse impacts of their projects on the environment and the community. As the infrastructure-based development carries the chance of having negative impacts, NGOs always prefer not to get involved with it very easily.

7.3.6. Project Implementation Phase

The informants conveyed the message that active community participation is ensured in the implementation level, where community members get involved for ensuring the quality of the project and providing feedback. In the case of building a protection wall in Nayahati settlement, half of the project was completely funded and implemented by the community and the community received training and organizational support for it, which has enhanced the community capacities. One of the participants, who was involved in this project, commented,

The community got to know what is going on and became confident about the outcome. It may run similar kinds of activity in future without any assistance from NGO (Participant 4).

7.4. Triangulation and Interpretation

This research employs methodological triangulation. Data analyzed from document review, in-depth semi-structured group interviews and key-informant interviews are needed to be combined, processed, evaluated and interpreted to get the complete picture of community participation in the planning process, especially for receiving structural flood mitigation measures with NGOs' assistance. Section 7.4.1. evaluates the scopes of community participation and section 7.4.2 presents a planning example where meaning community participation ends up with community satisfaction about the outcome of the project.

7.4.1. Scopes for Community Participation

Governmental documents express the necessity of planning for natural disasters with a focus on affected settlements and incorporation of its inhabitants. Sometimes at field level, the development activities are carried out by NGOs through their projects and programs. The reviewed NGO documents reveal the fact that the projects and programs are designed with pre-determined goals and objectives, where the scope of community participation is completely absent. While the *haor* communities identify saving settlements from possible flood damages as their major concern, the projects are primarily designed to address food insecurity and other socio-economic factors, which are mostly guided by national or international development goals. From NGO documents, as well as from key-informant interviews, it is clear that, for the *Haor* region, floods, as well as adversities associated with floods are not addressed as the top priority of these projects and programs. Decisions about selecting settlements as the beneficiary of the projects and programs are also made from the top level. This condition resembles the rational planning paradigm, which analyses situations abstractly, narrowly and superficially, and likely fails to understand what real conditions mean to the people who live with those conditions (Baum, 1996). This phase is constrained with the limitation of including the community, which has information, ideas and interests to address its problems.

The responses from community members and key-informants have clearly revealed that the communities are always convinced or motivated to make the right decisions for them. This

'right decision' is defined by the NGO or donor according to their pre-determined goals. Arnstein (1969) defined this situation as manipulation, where the real objective is not to enable people to participate in planning or conducting programs, but to enable power-holders to 'educate' or 'cure' the participants (Arnstein, 1969). As a result, the community in a captive condition is forced to take suggested decisions and it receives some therapies, masked as community participation, all of which is identified as a dishonest and arrogant approach by Arnstein (1969). But, the studied communities have admitted their limitations in knowledge on technical details and expect to get reliable suggestions from the experts. Moreover, they appreciate the awareness and training they have received from NGOs especially on social and legal issues that have made a significant change in their social values. However, manipulating communities through by-passing their priority demands weakens the intension of real development.

In every case, the community gets the chance to be involved as informer first, while it is asked to provide information about its settlement, resources, problems and concerns. Based on the problems, the community also informs of its demands or necessities. This stage shows the hope of getting involved in the next phase of decision making, based on information, provided by the community. The information might be used to make decisions, but there is no guarantee that the decisions will address all the community's concerns. The community members might receive training or lectures to realize their problems. It can be said in some cases, that they are trained or made aware to give such information, for which NGOs are interested. All three case study conditions have showed that NGOs enjoy the power to pick and choose the necessity of the community to address. This symbolic participation, that allow the 'have nots' to have a voice to receive some charity, questions the whole concept of community participation.

It is confirmed by the NGO documents and interviews that, the community enjoys a co-deciding voice together with the NGO for preparing the development plan for the settlement. But, it does not ensure the implementation of decisions, made by the community, as the decisions are needed to be agreed upon by the NGO. Even in this phase, where the community is being consulted, it finds itself entrapped in a captive condition, where they have no choice other than agreeing with the imposed decisions. The NGO also faces pressure from the donor to design the project in such a way, so that the projects fulfill the donor's development goals without any negative impacts on socio-economic conditions and environments, and these projects should look like they are community participatory. Sometimes NGOs appoint consultants to prepare proposals with more focus on the fixed requirement of the donor, where

the actual scope of community participation is narrowed down. The lack of scope to participate ensures that community views are not usually heeded by the powerful external bodies

In a bigger project, like constructing a protection wall, the community get chances to be an active partner, where half of the work is funded and implemented by the community. The community is dissatisfied with the major decisions (though they had to agree with those decisions) and it may question the level of its active participation at the decision-making level. It seems that the NGO allocated the duty to the community and provided training, instructions and decisions so that the community could conduct its part of the work successfully. Though this kind of partnership does not enjoy the full freedom of partnership, it provides a stage for the community on which to actively participate.

The community values the process of working with NGOs, as it has enabled the community to develop the leadership quality to receive training and guidance and to get the experience of running projects. Every time the process begins with forming a forum or committee with selected/elected community members, especially women, and that ultimately builds leadership capacity. Over time, these leaders become more capable. The enhancement in capabilities potentially ensures the participation of a community to negotiate with, influence, control, and hold accountable institutions that affect their lives. The community of Nayahati had limited assets and limited capabilities to participate in the decision-making. In present conditions, they definitely practised some degree of influence on the NGO's decision.

The evaluation reports expressed their concerns about the effectiveness of community-based organizations. The community of Nayahati refused to participate in any project or accept any assistance for building protection walls, until the NGO agreed to build walls on at least two sides. This shows the frustration of the community about the assistance they have received from the NGOs previously. The community usually receives the assistance just like charity, which does not make any impact in the long run. The community under its local leadership was united and took control over the decision, which can be marked as the positive impact of the previous experiences of community participation.

7.4.2. A Successful Planning Outcome

Section 2.3.4. discussed the incremental process of planning as the considerable combination of two radical opposite paradigms, rational and participatory planning. Instead of the linear process of problem definition and solution development, it enjoys the flexibility of the

nonlinear process (Cohen et al, 1992; Alesh & Petak, 1986), considering limitations of community participation and dominance of rational planning approach and in this way the incremental planning for disaster management may accommodate unavoidable components of the rational paradigm and considerable components of the community participatory paradigm.

The case of building protection walls in Nayahati settlement can be explained as an attempt that incrementally allowed to penetrate the outcomes of community participation within the process of rational planning. Despite having certain limitations, this project has been considered as a successful project by the participants from Nayahati settlement. The project was conducted within the scope of the FSUP-H program, which is focused to improve food access and utilization and reduce vulnerability for women and their dependents in ultra-poor households. From the documents and key-informant interviews, it is clear that flood mitigation, especially infrastructure-based development for flood mitigation is always considered as a distant component of this kind of program, whereas the community members had always considered it as their prime issue.

NGOs as development partners of Bangladesh, address various development issues, based on national and international priorities. Selecting priorities are guided by several factors, where the community opinions could be the most influential factors. But the top-down rational approach of designing programs restricts the scope of giving priority to community opinion, perceptions and decisions. Whereas this study reveals the fact that the protection of *haor* settlements from flood damages is most important aspect for *haor* communities, no program is designed to focus on that community concern. The three main programs - FSUP-H, SHOUHARDO and HISAL, are not centered on flood mitigation or enhancing community flood resilience. The decision-making level practices the rational planning paradigm based on available information and because of the presence of professionals and presence of institutions and their methods of practice. The key-informants have revealed the fact that experts are hired to design the program in such a way so that it can avail the available grant. NGO projects or programs cannot run without international grants. The international grants are allocated for fulfilling specific agenda and the program details directly or indirectly attempt to meet that agenda. As an outcome of the rational planning paradigm, the NGOs involve community members to claim the positive impacts of community participation. But, usually the nature of participation varies between manipulations, through the empty ritual of participation, and the community does not enjoy having real power to affect the decisions.

NGOs were attracted to work in the *Haor* region, right after the severe flooding of 1988 and it took more than two decades for Nayahati to get an effective support for protecting their settlement. Though it took significant time, it can be explained as admitting the failure of the program and revisiting the strategies to accommodate community opinions, concerns and perceptions. The community is always approached to define their problems and find solutions. But, the community feels that their decisions are morphed into NGOs' pre-decided priorities and in this way the real issue of protecting the settlement from flood damages is always off the table. But at that time, in the case of Nayahati, it did not happen in that way. The process of community engagement for an extended period probably put the community in that position where their opinion could not be ignored.

In many ways the communities also surrender to the rational approach of decision making. They are dependent on technological decisions given by experts, though they are not completely blind to it. The communities also enjoy the work under the organizational process of NGOs, which comes in a top-down format. It also can be considered as the limitation of NGOs who intend to involve community members to empower them, so that in future they can plan and implement their own project. But this never occurred in the case study settlements and even the communities never think of implementing any big project without

NGOs' organizational support. It expresses communities' dependency on NGO-supports, though key-informants claimed that NGOs always try to intervene in such a way so that the communities do not develop dependency on support. For this reason, NGOs always prioritize to take on such projects which may help to improve the financial condition of inhabitants. Even after more than two decades, neither their financial condition nor their organizational ability has been reached to such a condition from where they can plan to make appropriate mitigation structure by themselves.

Though *haor* communities usually rely on technological decisions taken by NGOs, the community of Nayahati took over the control of decision making while they decided not to let CARE work until it agreed to build walls on at least two edges. Their decision forced CARE to amend its project proposal. On the other hand, the community demanded to get walls of certain size and shape of certain technology, but they were convinced to be happy with the suggested technology and construction details. The community was also empowered by NGOs, with training for making decisions regarding selecting materials and appointing construction workers.

Overall, the approach shows the success of being flexible enough to account for accommodating community concerns and priorities. Despite having a dominant component of rationalism, it showed respect to community consultation, ensured community partnership and empowered community to also enjoy taking ownership of certain parts within the rational framework of planning. Community would be more satisfied if approach to planning process more flexible and adaptive.

Based on responses from communities and key informants, document review and especially the experiences with the project of building protection walls in Nayahati, a diagram (figure 7-4) is developed to understand the planning process of NGO activities in Nayahati over the period. The projects of NGOs, which usually do not incorporate community priorities into project objectives go through a ritualistic process of community participation, which includes getting information from communities, convincing or manipulation them and consulting with them. Even this process of community participation, within a comparatively longer timeframe followed a non-linear route and was able to modify the project goals or strategic issues in such a way so that it could address the issue of protecting the settlement with non-traditional structure. Beyond the ritualistic nature of community participation, this time the NGO allowed to practice meaningful community participation which include partnering with communities, empowering them and taking control over major decisions. Thus, this project of building protection walls for protecting the settlement can be considered as an example of successful planning approach which followed both linear and non-linear processes.

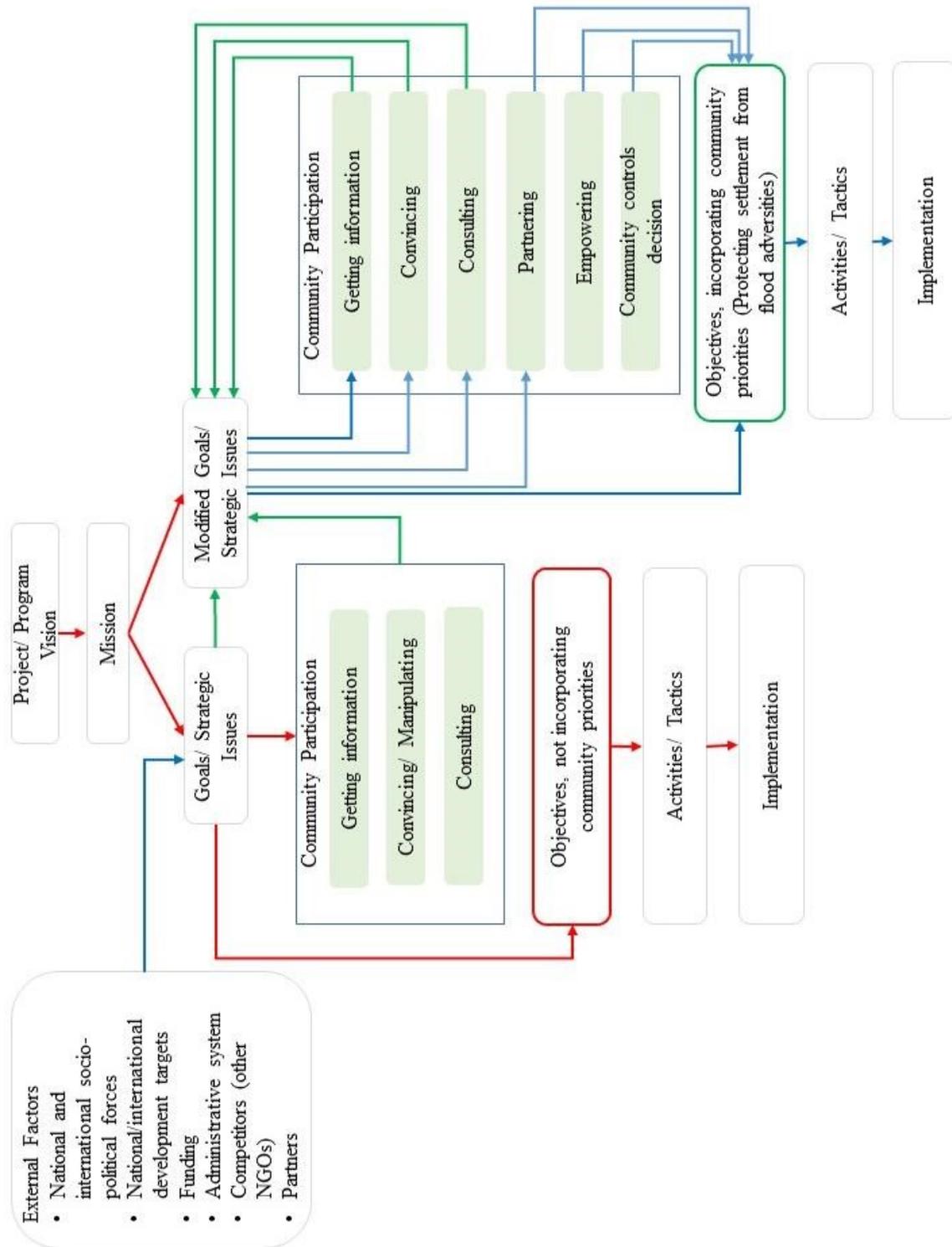


Figure 7-4 Planning process of NGO projects/programs in Nayahati

7.5. Concluding Remarks

The national acts, plans and policies of Bangladesh significantly address the issue of disaster management that include the protection of *haor* settlement, considering its communities' flood vulnerabilities. As the development partner of Bangladesh Government, NGOs are involved in

the *Haor* region with their programs and projects, which are primarily focused towards poverty elimination and living standards improvement. The broader scopes of these programs also include built-environment development activities, i.e., providing dredged soil, building protection walls. On the other hand, the communities identify the protection of their settlement as the primary necessity. They usually desire to have infrastructure-based development that can ensure the resilient built environment, mostly dependent on nontraditional structural mitigation measures. These non-traditional structural mitigation measures, as small-scale embankments, can save the settlements from being eroded. For NGOs, there are certain valuation problems involved in deciding what to choose if and when it turns out that some parts of community's contributions/decisions cannot be maintained along with socio-economic changes that may be needed for other reasons. Though NGO documents and key informants claim their planning process as community participatory, this lacks the real essence of community participation. The problem definition and possible solutions are primarily structured in a rational way where the scope of community participation is either absent or very guided. The limited scope of community participation either uses the community as a source of information or manipulates them to act according to a prescribed way. Convincing communities is a most practiced way that assists the communities to make the 'right decision'. Even in the phase where the community is being consulted, it finds itself contained in a captive condition, where it gets no other choice other than agreeing with the imposed decisions. This manipulation is mainly conducted to divert the community from their demand of infrastructure-based development, which requires higher financial involvement. But, in some cases, the communities have shown their confidence and have acted like real empowered entities and taken control over some parts of decisions. Their effective participation has made it possible to build non-traditional structural mitigation measures, which can play a significantly positive role for enhancing community flood resilience. The approach, that allowed the flexibility to incorporate the community opinions, perceptions and concerns within the rational top-down planning structure of NGOs, can be interpreted as an incremental process. Instead of the linear process of problem definition and solution development, the concept also encompasses the non-linear process (Cohen et al, 1992; Alesh & Petak, 1986) and considers limitations of community participation and the dominance of a rational planning approach. In this way, the mix of rational and participatory planning approaches in both linear and non-linear ways may accommodate unavoidable components of a rational paradigm and considerable components of a community participatory paradigm for the field of disaster management planning

Chapter 8 : Major Findings

This research investigated the impacts of structural flood mitigation measures on community perceptions of flood vulnerability and resilience. Shared experiences of past flood events and contributions of NGOs shape isolated communities' abilities to prepare for, cope with and recover from adverse impacts of future events that in turn inform community perceptions of both vulnerability and resilience. Cohesive communities naturally accumulate individual sensory impressions of phenomena, compiling and translating such into a coherent and unified view of their shared natural and built environment. External assistance for shaping the built environment contributes to defining communities' expectations about their desired condition of the built environment and the status of their resilience as well. This study explored community perceptions about community flood resilience along with its connotation with the development planning process where NGOs and community members are involved. It explored the political dynamics of involvement of NGOs in mitigating flood risks through development planning. It employed political ecology lens to provide a more nuanced understanding of interactions between external bodies and beneficiaries and the central role of knowledge and power sharing through ensuring effective and meaningful participation of beneficiaries.

This research identified communities' expressions for community resilience and the perceived factors that contribute to enhancing their community flood resilience. The communities' long-lived experiences of accommodating themselves in the *Haor* region, receiving support from NGOs and evaluating impacts of traditional and non-traditional structural flood mitigation measures have provided evidences to advance the theory to explain community resilience. The lens of political ecology showed how the flood as a disaster is a socially constructed phenomenon, neither natural nor neutral. Through exploring communities' risk and resilience perceptions, it contributed to strengthen the concept of political ecology, which define risk as "the compound function of biophysical hazard exposure and people's vulnerability, [meaning] their ability to anticipate, respond to, and recover from a hazard event" (Collins, 2008 p. 24). The political dynamics of involvement of NGOs and communities' expectations for receiving external supports from NGOs, have introduced the idea of dependency on external support as community vulnerability. The status of resilience and dependency on external supports usually contradict with each other. The communities' tendency to depend on external support has connections with the planning

process, followed by NGOs for operating their programs and projects. Chapter 7 explored community participation perceptions, along with incorporating community concerns and priorities in the planning process, and it introduced the concept of linear-non-linear planning approach as a practical solution, considering the actualities of rational and participatory planning paradigms for associating development with adaptation, a process of enhancing resilience.

This chapter summarizes the key findings of this thesis. These key findings are summed up in four sections: ‘resilience as freedom in the context of development as adaptation: a new understanding’, ‘external supports and support dependency: a new understanding of vulnerability’, ‘levels of community participation’ and ‘linear-non-linear planning approach for incremental adaptation’.

8.1. Research Findings

8.1.1. Resilience as Freedom in the Context of Development as Adaptation : A New Understanding

This research has determined the properties of community flood resilience and its association with structural flood mitigation measures, as perceived by the community. Structural mitigation measures as outcomes of development activities may ensure the adaptation process for enhancing resilience. The concept of community resilience, especially in the case of disaster mitigation or adaptation to hazards, is explored and explained by various authors (Brrero et al, 2013; Schelfaut et al, 2011; Norris et al, 2008; Coles & Buckle, 2004; Godschalk, 2003; Masten & Reed, 2002; Geis, 2000). Resilience is considered a distinct policy objective (Barret & Constat, 2011) and requires a theoretical explanation for better understanding of this concept. This research has focused on explaining resilience based on community perceptions. The Aristotelian approach to perception defines perception as a natural process or activity, whereby the perceiver comes to acquire knowledge of things in the world in which the perceiver is situated (Barry, 2003). As communities are composed of built, natural, social, political and economic environments, it was necessary to evaluate the built, natural, social, political and economic environments in terms of flood vulnerability, and importantly, how community members perceive their environment and their resilience as an inner strength to intervene and interact with the surroundings. The surrounding environment, including both natural and built, with their changed attributes, shape community perceptions. Perceptions have also resulted from the cumulative impacts of

interventions in built and natural environments. The investigation of human-environmental interactions through exploring social, economic, political and ecological elements provided a nuanced understanding of resilience.

The communities identified their lives in the *Haor* region as being very much restricted with the fear of losing their homes and lands. The communities have limited choices because of the presences of factors that exacerbate vulnerabilities in various scales. Each factor as a source of ‘unfreedom’ hinders the possibility to enjoy the desired level of freedom. Sen (2005), in his book ‘Development as Freedom’ introduced this freedom-centered perspective for explaining development that has a generic similarity to the common expectation of ‘quality of life’, based on the choices one has and desires to expand those choices. The communities’ generic expectation primarily concentrated around development that would expand choices for enjoying the desired level of quality of life. Similarly, Barret and Conostas (2014) explain development as a condition that ensures individual’s rights and meets aspirations for better living standards. Section 2.3.1. established the connection between ‘development’ and ‘adaptation’ in a disaster context, where the ‘development as external actors’ initiative triggers the process of adaptation for achieving resilience (Cannon & Muller-Mahn, 2010), as the ultimate target. Sen (1984) not only expected to acquire freedom from poverty, rather it was expected to ‘be’ and ‘do’, to ‘function’, to achieve desirable outcomes. Though Sen (2005)’s freedom-based view of development is criticized as highly romantic (Makuwira, 2006), this research found inspirations in it for understanding community perceptions about resilience. The communities primarily desired having infrastructure-based development as adaptation, preferably with external assistance and achieving self-financial strength to enrich community capacities. The community capacities refer to the alternative combinations of functioning that are feasible for the community to achieve. Freedom is desired to be achieved through the expansion of the community capabilities to lead the kind of lives they value. Development as adaptation is expected to be more concerned with enhancing the quality of lives they live.

This research viewed attempts in enhancing community flood resilience as a process of expanding the real freedom as both (i) the primary end and (ii) the principle means of achieving it. This is defined respectively as the ‘constitutive role’ and the ‘instrumental role’ of freedom in the process of adaptation for enhancing resilience. The constitutive role of freedom relates to the importance of substantive freedom in enriching human life. The substantive freedoms include elementary capabilities like being able to avoid such

deprivation as an absence of appropriate built-environment. Development, in this view, is the process of adaptation that expands human freedoms, and the assessment of development has to be informed by this consideration. The ‘instrumental role’ owns the idea of the effectiveness of freedom as means – not just as the end. This relates not merely to the obvious connection that expansion of freedom must contribute to enhancing community resilience, since community resilience itself can be seen as a process of enhancement of human freedom in general.

8.1.2. External Supports and Support Dependency : A New Understanding of Vulnerability

NGOs with their programs and projects play a vital role in mitigating flood vulnerabilities and influencing community perceptions of resilience and vulnerability in the *Haor* region. Several NGOs have been actively working in that region since the early 1990s. NGOs are usually considered as the source of alternative developments, which intends to operate projects of intervention in the Third World countries (Bebbington et al, 2008) who have colonial pasts in Africa, Latin America, Oceania and Asia. In Bangladesh they preferably work on democracy, rights, empowerment, participation, poverty and livelihoods (Craig & Porter, 2006). NGOs, along with their international donors, embrace a ‘democratic development paradigm’ that ideally follows a linear model that promotes participation (from representation to empowerment) of marginalized groups, so that these groups may be able to influence policy to benefit their conditions, leading over time to poverty reduction and finally to sustainable human development (Thomas, 2008). In this study, considering disaster as a social-natural phenomenon, disparities of power and knowledge is explored to understand the dynamics of community vulnerability and resilience.

While NGOs have been active for more than two decades in the *Haor* region, it is valid to investigate the communities’ condition after receiving continuous supports from NGOs over a long period. This research investigated the community resilience status, more specifically their expectations from NGOs and reactions towards NGOs’ planning approaches to operate their projects and programs. Based on the aims, objectives and nature of projects and their frequencies, this research has divided their projects into two categories:

- NGOs’ usual projects, which are run often or every year
- NGOs’ unusual projects, which are run occasionally

According to Bolinick (2008), NGOs are usually engaged with finding new and more effective poverty-reduction strategies for ensuring the effective use of aids, which are

targeted to achieve certain goals, now embedded within the Millennium Development Goals. Derksen and Verhallen (2008) describe, because of the dispersion of scarce resources, that more often NGOs must plan and implement such kind of projects or programs, which are small in scale and usually ineffective and/or unsustainable. Moreover, the claims about ‘real’ needs based on science or expertise disregard the claims of local communities as lay perceptions (Jasanoff, 1999; Baruah, 2012). In the *Haor* region, NGOs’ usual projects mainly focus on enhancing food security and eliminating poverty from that region and these also regularly address other socio-economic and/or non-structural issues, i.e. education, sanitation, gender equality, non-structural measures for flood mitigation and expanding scopes for household income. NGOs, with their large group of development professionals, design, manage and implement their various projects. The communities are usually advised on how they should define their problems and the community participation ritual in most of the cases undermines participation and disempowers ordinary people. NGO programs rarely initiate projects for building structural flood mitigation measures, i.e., protection walls, revetments. But they do these kinds of projects, as distant components of their regular programs. This research has categorized these as unusual projects of NGOs. These two types of projects very distinctively denote the difference between community priorities and NGO priorities. Whereas communities prefer to have infrastructure-based development for ensuring permanent protection of their settlement, NGOs’ programs focus towards food insecurity and elimination of poverty so that after some period, the communities can independently solve their problems. NGOs with their pre-decided projects and limited budgets always attempt to convince the community members to accept their proposals and let them run their pre-decided projects. Though NGOs ensure community engagement in the whole process, the process rarely allows community members to actively participate. As Derksen and Verhallen (2008) state, ideally, ‘cooperation’, ‘partnership’ and ‘participation’ are supposed to be practices, but in reality, the external support chain is dominated by the top-down process where the ‘upward accountability’ controls the development initiatives. These development initiatives are dominated by the capitalist approach, which exacerbate vulnerabilities as a “price for progress” and the beneficiaries need to unwillingly pay for it.

For the *haor* communities, protecting their settlements from unmitigated waves is the main challenge and they think, because of not addressing their main challenge, they cannot get the desired benefit from the usual projects, run by NGOs. The process works to a degree, where detailed donor requirements are transmitted to NGOs and NGOs with their local partners,

field facilitators and community committee members implement pre-decided usual projects as a part of their agreements with donors.

NGOs had been running their projects in Nayahati settlement since the early 1990s; still, after almost two decades, the community needed NGO supports to build their first protection wall, one which might ensure the permanent protection of their settlement. The general impression of the community members denote that they really do not need any more support from NGOs after that, because, with the assurance of permanent protection of significant portions of the settlement, they can reduce the amount of investment for building temporary protections every year, can work and earn during monsoon periods, have lands to create vegetable gardens and can build necessary service structures (i.e., sanitary latrines). If NGOs' previous projects are effective to make communities capable enough, then after two decades they could build the protection measures without any external support. But, it has not happened in that way. The difference between impacts after running the usual projects for a long time and impacts after one unusual project is very clear in the case of Nayahati settlement.

Similarly, in the current condition, the community of Concernpara settlement expects external (financial and organizational) supports for building an appropriate structure around their settlement for ensuring permanent protection of their settlement. The settlement was established with NGO support in the early nineties and in the mid-nineties it received support to build a concrete block revetment on its three edges. The revetment was not a successful intervention for ensuring permanent protection of their settlement. It introduced some other problems on top of their main challenge of protecting the settlement from unmitigated wave activities. That was not the end of receiving external supports; even after building the revetment, this community received support from NGOs for several issues, but not for building another but more appropriate structure that could really ensure protection. Even after two decades of building the unsuccessful revetment and receiving external supports in various forms, this community is in the same condition, where they still expect to receive external supports for addressing their prime challenge. The community of Nakusha-Dashkusha settlement is similarly expecting external supports for building a protection wall, despite engagement of NGOs with their usual projects on food security, eliminating poverty and other NGOs' preferable issues.

The nature of 'incentive-induced development', as an outcome of an organized form (organizational, technological and financial) of external support, develops or diminishes

dependency on external supports among the marginalized communities. The condition of Nayahati community until 2011 and current conditions of other settlements definitely depicts the communities' dependency on external supports. Dependency is the association between settings, actions, or tasks such that one setting, action or task cannot be possible until one or more other settings, actions, or tasks have occurred, begun, or been completed. In the current context, dependency is the condition while the recipients are receiving external supports and for their further development or improvement, they believe that they still need support, because, the previous support failed to make recipients capable enough to improve or develop by themselves without further external supports. The dependency theory of economics analyses the unequal and exploitative relationship between different areas and examines inequality in exchange relations (Lacher & Nepal, 2010). In the NGO-initiated development context, the dependency of communities on external support is different from that kind of dependency and requires more explanation.

For explaining dependency on external supports, it is necessary to analyze the nature of external supports regarding community concerns and expectations. From the case of Nayahati, some supports help to create and continue the dependency, while some other kinds of supports promise to make the shift in the trend of dependency. After the great flood of 1988, during the early nineties, several NGOs initiated programs to work in the *Haor* region. The *haor* communities saw these NGOs as the saviors who might have power and resources to solve their problems. Even in that period, flood and flood-related vulnerabilities due to weak built environment were the communities' main challenges, which were considered as essential to address by the communities. NGOs, through their programs also make the communities aware of other issues about which they were not aware, i.e., education, gender inequality and other socio-legal issues. The NGOs' process of implementing programs and awareness development activities made the community realize how powerless and unaware they are. NGOs through their programs and process of activities gave promises to solve some of their problems and created hope to solve all kinds of problems gradually. Their usual and unusual projects around the vicinity influenced the communities to believe their power and resources to solve all problems. NGOs let communities engage in the whole planning process, especially allowing them to express their concerns and demands, based on their knowledge. But because of the NGOs' pre-decided projects with 'upward accountability' and limited funding, NGOs, most of the time, bypass communities' major concerns and demands and ignore local knowledge and wisdom. Community concerns, such as local

knowledge, are often ignored, considering them as uninformed and naive while a development solution entails the ‘growth of ignorance’ (Hobart, 1993). The fact that vernacular knowledge tends to be regarded as inferior by modern science is widely recognized in the literature (Escobar 1998; Forsyth 2004)

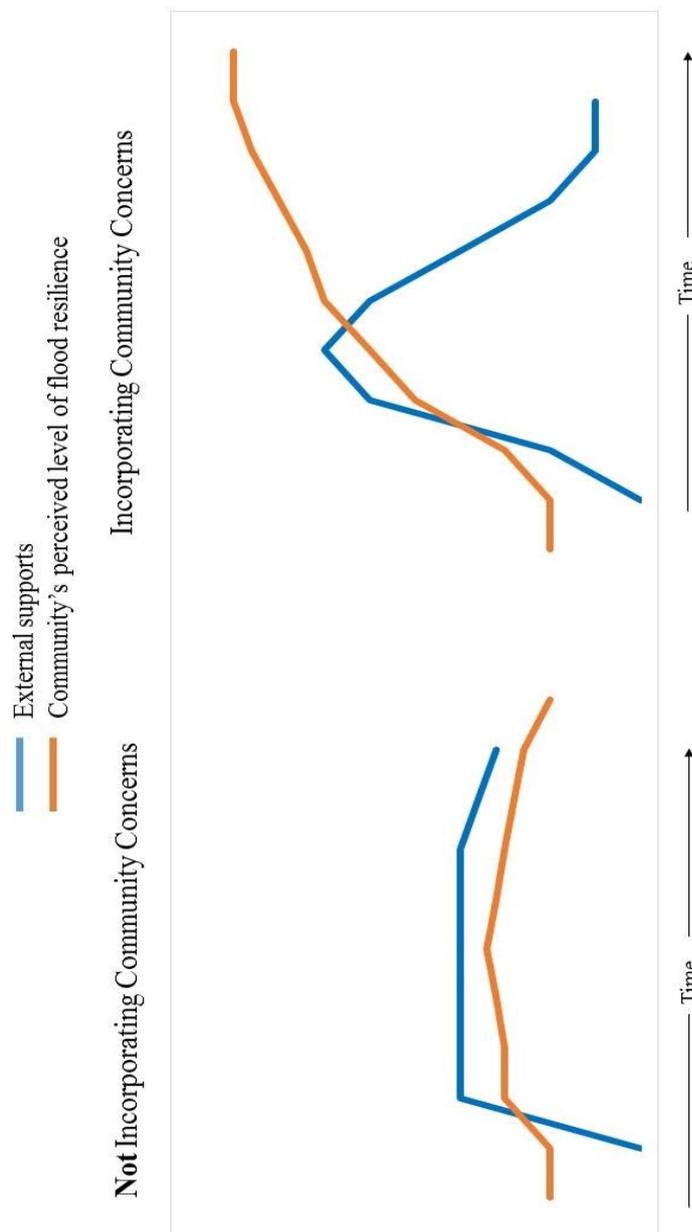


Figure 8-1 Diagrams show the relationship between community’s perceived level of flood resilience and nature external supports, associated with financial involvements

Communities’ major concerns were always about flood vulnerabilities due to weak built environment and the demand for infrastructure-based development that required higher investment. Most often, the projects run by NGOs are guided not by the demands of the *haor*

communities, but by the organizations' preferences, national/ international goals and donor priorities. In this way, external supports can be categorized into two ways:

- External supports, not incorporating community concerns (NGOs' usual projects)
- External supports, incorporating community concerns (NGOs' unusual projects)

The conceptual diagram of figure 8-1 shows the relationship of these two types of external supports with the community's perceived level of flood resilience. The community's perceived level of flood resilience is a simplified expression of understanding communities' overall reactions towards their combined capacities to deal with flood adversities. 'External supports not incorporating community concerns' are the usual projects of NGOs that demand sustained intervention, which in a way justifies the usefulness of NGO projects. These projects may slightly improve or not improve the community resilience level and the communities always expect to get external assistance to overcome their current condition and specially to address their main concerns. On the other hand, external supports incorporating community concerns indicates the diminishing needs for further external supports. These external supports as per community concerns might require comparatively higher investment, but it can promise to trigger a continuous enhancement in community resilience and lessen the necessity of future external supports. External supports not incorporating community concerns exacerbate the level of vulnerability through making the community dependent on external supports, whereas the initial higher investment for external supports as per community concerns extract the communities from the dependency trend. Higher investment, as well as supports for having infrastructure-based development, meets the communities' priority for protecting their settlements. It also enables the communities to enjoy the benefits of NGOs usual projects which are focused towards food insecurity, elimination of poverty and other socio-economic issues. It leads towards the condition when the communities will not need any further support and they will be able to solve their problems independently. The diminishing need of external supports endorses the real enhancement in resilience level. The ideal partnership needs to be practiced with such a notion that aims to enhance communities' perceived level of flood resilience, through addressing community concerns with high priority.

8.1.3. Level of Community Participation

Disasters are the result of knowledge and power dynamics that shape risk discourse in a society (Anderson 2001). Beck (2009) defines risk as ontologically power-laden, where the

power-holder decision makers can avoid the risks and communities as “involuntary consumers of dangers, do not have a say in these decisions” (Beck, 2009, p. 195). The knowledge and power dynamics are necessary to explore to understand the level of community participation. Arnstein (1969) explains that the nature of participation varies between manipulation through the empty ritual of participation and enjoying the real power to affect the outcome of the process. This research evaluated and categorized the scopes of community participation and it is influenced by Arnstein (1969)’s classic and influential ‘Ladder of Citizen Participation’, where *manipulation* and *therapy* are marked as degrees of non-participation, *informing*, *consultation*, and *placation* as degrees of tokenism, and *partnership*, *delegated power* and *citizen control* as degrees of citizen power. This research proposed to divide the planning process broadly into two categories: i.e. Community Non-Participation and Community Participation. Community non-participation is the phase where the community is completely absent from the scenario and community participation is the phase where the community is present to interact. According to the level of interactions, discussed in the section 7.4.1. the community participation is categorized into six chronological sub-categories, i.e.

- I. Convincing/manipulating community
- II. Community as informer
- III. Consultation
- IV. Partnership
- V. Empowerment, and
- VI. Controlled by community,

Here ‘convincing/manipulating community’ evokes the lowest level and ‘controlled by community’ ensures the highest level of community participation (Figure 8-2).



Figure 8-2 Levels of community participation, identified in this research

I. Convincing/Manipulating Community

At this level, communities are convinced or motivated to take the right decisions for them. This 'right decision' is defined by the NGO or donor according to their predetermined goals. Arnstein (1969) also defined this situation as manipulation, where the real objective is not to enable people to participate in planning or conducting programs, but to enable power-holders to 'educate' or 'cure' the participants. In some cases, communities found themselves in a captive condition, where they were forced to take suggested decisions and receive some therapies, masked as community participation, which is identified as a dishonest and arrogant approach by Arnstein (1969). However, communities might have a limitation in knowledge on technical details and may require reliable suggestions from the experts. Moreover, awareness and training on social and legal issues are often required to ensure the human rights of all. Manipulating communities, by by-passing their priorities and demands, weaken the intention of real development.

II. Community as Informer

Even in the ritualistic form of participation, the community gets a chance to be involved as the informer, while it is asked to provide information about their settlement, resources, problems and concerns. Based on the problems, the community also informs of its demands or necessities. This stage shows the hope of getting involved in the next phase of decision making, based on information, provided by the community. Their information might be used to make decisions, but there is no guarantee that the decisions will address all the community concerns.

III. Community Consultation

At this level, communities enjoy a co-deciding voice together with the external bodies, for preparing the development plan for the settlement. This does not ensure the implementation of decisions made by the community, as the decisions are needed to be agreed by the external bodies.

IV. Community Partnership

The ideal partnership works with such a notion where both parties share values and ideas and work as autonomous entities within their own peripheries to bring about changes (Derksen & Verhallen, 2008). At this level, communities and external

bodies work as partners and share an equal amount of the right to make decisions and equal scopes of work. The success of a partnership relies on the active participation of the beneficiary groups at the decision-making level.

V. Community Empowerment

The World Bank (2002) has defined empowerment as ‘the expansion of assets and capabilities of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives.’ The inclusion of the community in the development process initiates empowerment. The gradual process of empowerment allows the marginalized communities or groups of beneficiaries to participate in, negotiate with, influence, control, and hold accountable, the institutions that affect their lives. It is obvious that this marginalized community lacks power, and the process of working with external bodies helps it to enter the ‘power dynamics at work in the life context (McWhirter, 1991)’.

VI. Controlled by Community

Controlled by the community is the state where a community may dominate in deciding on a shared project and/or may initiate to design a project for their own development. It allows the local communities to control the local, national or international issues that directly affect their community. It is the ultimate level of community participation where the empowered communities enjoy the full power of decision making for finalizing objectives and activities of any project.

8.1.4. Linear-Non-Linear Planning Approach for Incremental Adaptation

Section 7.4.2 explained the planning process of building protection walls in Nayahati settlement and identified it as a successful outcome. This kind of planning practice that adopts the rational and participatory methods at various levels in a linear and non-linear process. More specifically, it can be identified as linear-non-linear planning for incremental adaptation which can effectively contribute to mitigate and manage disasters as uncertain events. The concept of linear-non-linear planning as an incremental process is referred here as an alternative combination of comprehensive rational planning, which allows adjustment considering the complexities of a real-world context. As a planning format it incrementally discovers, assesses, and addresses uncertainty by confronting the problem at hand, assessing conditions of uncertainty and utilizing available knowledge, rather than applying pre-decided

solutions, based on rational comprehensive approach. Both rational and participatory planning paradigms operate in a linear way, where the former one follows the top-down process and the later one follows the bottom-up approach. But, this proposed linear-non-linear planning approach accommodates the non-linear process of updating necessary stages considering inputs from other stages, along with following the linear natures of both dominating planning paradigms. This is a flexible planning approach that combines the rational planning paradigm and participatory planning paradigm through accommodating inputs from active community participation in a timely manner, within the dogmatic format of the top-down process. It effectively plans for disaster risk management, offering chances to overcome, or at least reduce uncertainties, through practicing incremental adaptation, by matching planning processes to problem characteristics.

Incremental adaptation is a term put forth by the Intergovernmental Panel on Climate Change (IPCC) to describe

actions where the central aim is to maintain the essence and integrity of a system or process at a given scale (Field et al. 2014, p. 3).

It is important to introduce the concept of incremental adaptation for enhancing flood resilience in the context of development of *haor* communities. It primarily requires building a resilient built environment, which needs to accommodate some structural measures, whereas scholars have discovered several examples where these kinds of infrastructures ended up with negative impacts on communities and the environment (elaborately explained in section 2.2). The studied communities preferred built environment development with an appropriate infrastructure. It needs to be realized that the communities were evidently not looking for infrastructure-based development, which requires a higher investment. They apparently wanted to ensure the protection of their settlements and wanted to get rid of the fear of losing their homes and lands in order to get opportunities to live the lives they valued. If a planted vegetation boundary and a safer location can ensure protection, then the communities will not demand to have infrastructure-based development. But, in the current given condition, an appropriate protection structure (structural mitigation measure) is the foremost need for the communities. The community and the NGO are the two main actors who usually develop common platforms to work together. Because of the lack of flexibility for accommodating outputs from community engagement in the planning process, the outcomes of their regular projects fail to contribute much to enhance community capacities to deal with the flood-related adversities. It gives NGOs further scope to work on similar

programs in the same area repeatedly and that cannot be the acceptable consequences of any development activity. Development should aim to diminish the need of external assistance, to improve capacities of marginalized communities and to maintain and improve the condition of the ecosystem so that the region can achieve all international development goals. For designing and running NGO programs, this research has proposed a framework of linear-non-linear planning approach which allows flexibility for accommodating inputs from any direction. This is shown in Figure 8.3.

Though the framework has non-linear flows of activities, it is divided into nine stages, which are again grouped into two levels of plans:

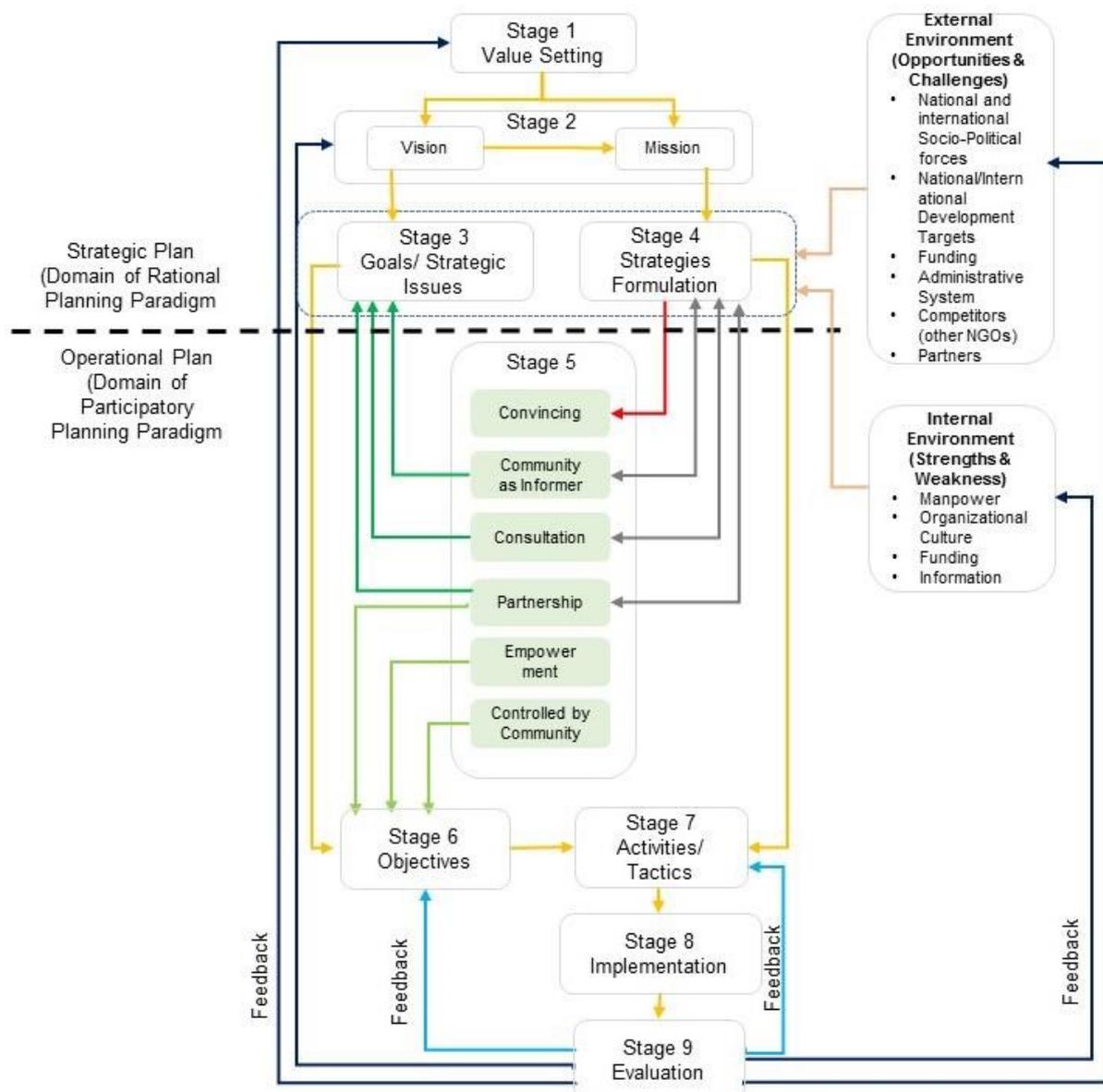


Figure 8-3 Format of linear-non-linear planning, proposed by the author

- Level 1: Strategic Plan and
- Level 2: Operational Plan

The formal planning process will start in a top-down rationalist manner, with a specification followed by a rigorous comparison of alternatives and a value maximizing choice, considering the existence of professionals, governing bodies, international donors and organizations and other kinds of entities, with their commitments to global agenda, national and international concerns/agreements/targets. Each body will bring its important knowledge and justifications to define and analyze problems and finalize strategies to solve those problems. The strategic plan, as the deliberative and disciplined effort to produce fundamental means and ways that shape and guide development, is based on targeted vision and the mission of an organization or other entity (Bryson, 2011; Bryson, et al, 2011). This plan will mainly follow the rational planning paradigm with the flexibility of updating, changing and altering strategies based on the outcomes from other stages. It consists of four stages:

- Stage 1: Value Setting
- Stage 2: Vision and Missions
- Stage 3: Goals/Strategic Issues
- Stage 4: Strategies Formulation

The plan will start with defining a broad value for the organization and its intended program. The value should be broad enough, so that it can accommodate the possible needs and concerns of all kinds of stakeholders, feedback from previous activities and future challenges, considering uncertainties. The value will guide its vision of success and mission of implementation. The next phase will finalize broad strategic issues and goals and specific strategies will be formulated based on a comprehensive, rational approach. There are two kinds of environments that will influence strategic issues and formulate strategies. These are internal environment as the strength and weakness of the organization. These include quality and qualifications of manpower, the organizational culture of operation, available resources and information. External opportunities and challenges can be identified as an external environment that includes national and international socio-political forces, national and international development targets, available funding, national and local administrative systems and the presence of other NGOs as competitors and partners.

Strategies are not the product of conscious choice, but rather the external (sometimes internal) result of interactions among various actors possessing different information and adhering to different values. These are groups, i.e., the communities, decision makers in NGOs, national bureaucratic bodies, international bodies. Broadly, the community is on one side and all others are on another side. Groups are formed to advance the collective interests or shared preferences of individuals. Incrementalism aims to ensure the equilibrium of the contending groups and will be a function of the balance of forces active on the issue. Disagreement is usually accommodated through bargaining and compromise, and problems may be acted upon without ever being fully defined. Constraints on time and information preclude a comprehensive examination of all alternative solutions. Top-level decision makers somehow have to limit their attention to a manageable number of options and do so in a way that screens out alternatives unlikely to be adopted. At the same time, they need to accommodate feedback, which will be received from communities or groups of beneficiaries. The most fundamental way in which incrementalism departs from the rational-comprehensive ideal lies in its rejection of the idea of strategies as decisions.

The next stage will allow communities or groups of beneficiaries to participate, and the strategic plan will transform into an operational plan. The transition from strategic to operational plan will be organic, as the community participation will play a strong role in influencing or updating or altering goals or strategic issues and formulated strategies. This is a process of mutual anticipation and adaptation, as mutual adjustment virtually guarantees incremental planning strategies. This is the main positive contribution of linear-non-linear planning approach for incremental adaptation that will dilute the dogmatic rational planning paradigm into a participatory planning paradigm. This research identified six levels of community participation: convincing, community as the informer, consultation, partnership, empowerment and controlled by the community. In the case study communities, community manipulation was also observed in terms of convincing communities. But, this framework expects that communities' ideas, concerns, needs and demands will not be manipulated in any given circumstances. The communities can be convinced to make them aware of their rights, other kinds of needs, legal laws, ecosystem, new knowledge, advanced technology and other relevant issues. Awareness and training are necessary for the desired level of human development, which is targeted by either local or national government and international bodies. The goals or strategic issues and formulated strategies can be updated, changed and altered after getting information from communities and consulting and

partnering with communities. Two advanced levels of community participation - empowerment and controlled by the community - do not need to contribute to update, change or alter outcomes of previous stages, as while the communities are empowered, they can directly decide what is necessary for them and what needs to be done for those identified problems. An empowered community may take control over the whole development activity, where local people will determine objectives and tactics and will manage all necessary forms of resources.

The second level of operational plan encompasses five stages:

Stage 5: Community Participation

Stage 6: Objectives

Stage 7: Activities or Tactics

Stage 8: Implementation

Stage 9: Evaluation

The goals or strategic issues will guide specify objectives and formulated strategies will fix the detailed activities to achieve the desired objectives. The intermediate stage of community participation will play the role in updating, changing and altering outcomes of stages 3, 4, 6 and 7. The next stage is the implementation of the specific project and its evaluation report will provide feedback for deciding values, vision, mission, objectives and activities in the future. The evaluation report will also provide feedback for the internal and external environments.

Chapter 9 : Conclusion

This research, through a lens of political ecology, explores perceptions of community flood resilience from a perspective of change in the surrounding environment, with structural mitigation measures as an outcome of development planning and queries the relationship and tension between rational and participatory planning paradigms and their political dimensions. The empirical studies, conducted within haor communities, provide a suitable context to explore such perceptions, particularly where communities are isolated, marginalized, located in areas of significant flood risk, have limited financial resources, affected by the political dynamics of NGOs' involvements and are generally dependent on NGO supports. The research finds that communities' perceptions of their vulnerability and resilience are highly influenced by their experiences working with NGOs and the consequences of NGO-initiated infrastructure development activities.

Twelve factors were identified by haor communities as contributing factors for enhancing community flood resilience. These factors included appropriate structure, external finance, external organizational supports, favorable location, vegetation, self-financial capacities, local knowledge and skills, local experiences, local awareness, communal unity, interdependibility and local leadership, with the first four factors prioritized by the communities. These four factors denote the communities' preference for a favorable location for their settlement, with protection from flooding provided by appropriate mitigation structures, preferably built with NGO supports.

Among the eight factors (inappropriate structure, risky location, local financial incapability, unmitigated wave activity, external harmful decision, limited local knowledge and skill, communal disagreement, and local inexperience) which exacerbate flood vulnerability, inappropriate structure, risky location and local financial incapability were prioritized by communities. Each of these factors is directly associated with the settlement's built-environment and exposures to hazards. While an inappropriate structure may fail to offer protection, a risky location for the settlement facilitates the initial exposure, and financial incapability restricts options for communities to resolve problems themselves. Community perceptions of flood resilience and vulnerability are linked to condition of their built environment, and colored by their awareness of both the positive and negative impacts of structural flood mitigation measures. The communities expressed their clear understanding

about the anthropogenic aspects of a disaster incident. According to them, a disaster is not a mere event but the way it is made to affect their lives and livelihoods and it is associated with development. Achieving resilience requires communities to experience developments as adaptation which will ultimately be able to reduce vulnerability. Such development will enhance resilience through providing freedom, reducing sources of 'unfreedom', being those conditions, which hinder aspects of desired lives. Prioritizing freedom should therefore be prioritized in infrastructure-based development programs as not only the end but also the means of achieving resilience. Resilience as the outcome and process of freedom will enable communities to prove their capacity to live with danger. In this way this research answers the first research question and addresses related objectives which were designed to discover the impacts of structural mitigation measures, as outcomes of development activities, on community perceptions of community flood resilience.

NGOs are often promoted as 'magic bullets', with aid agencies and the governments of the industrialized West asserting that NGOs are able to address the problems of the Third World (Vivian, 1994). Where communities and local governmental organizations lack capacity to solve their problems independently, NGOs may be able to assist, particularly as they may have access to expert knowledge and experience in complex settings (Brinkerhoff, 2003). However, this external support tends to impose constraints on recipient communities, and NGOs may be resistant to innovation in their practices because of the perseverance of the traditional aid paradigm and thereby provide a 'security blanket' for current practice (Edwards, 2008). This applies to current components of aid reform, including the modified version of Millennium Challenge Accounts, Poverty Reduction Strategy Papers, and International Finance Facilities, as well as historic initiatives.

The second research question and related objectives focused on the scope and impacts of incorporating community concerns and priorities in the selection and implementation of externally supported development activities for mitigating flood adversities. Empirical evidence from this research shows that as priorities for realizing measurable poverty reduction increase, NGOs have shifted away from engagement with social movements, moving towards more narrowly drawn and specifically targeted development improvements. NGOs have not sufficiently changed power relations in terms of community participation with regard to class, gender and race (Edward, 2008) and have increasingly turned to contract work and fees for services. The development path and growth paradigms, followed by NGOs, are tightly connected to available funds and organizational and global interests. The power imbalances

that determine who pays the price, remain unacknowledged in the aftermath of development activities which is not targeted for adaptation. Extended periods of NGO involvement entrap communities into the cycle of dependency by establishing a patron-client relationship, and fosters expectations among communities for continued support, exacerbating vulnerability. The relevancy and success of development aid depend on allowing acceptance of risks as the essential venture for regeneration and real innovation (Derksen & Verhallen, 2008). This is only possible where development can act as adaptation and communities can participate actively in decision making process and their concerns and demands are prioritized. The three case studies attest to the importance of the involvement of NGOs and to the extent of human suffering for extended period that could be avoided by recognizing the value of treating development as adaptation through prioritizing local knowledge. The historical continuity in developing dependency on external supports through suggested development activities, which is reflected by these case studies, sounds a strong and alarming signal. This study emphasized the continued epistemological and political importance of development by beneficiary communities as a field of enquiry, during the planning process, which requires alertness to the various ways in which development is undermined and/or made invisible, if it is not directly associated with adaptation. This research proposed the linear-non-linear planning approach for incremental adaptation as a concept has been proposed for mitigating disasters as uncertain events, considering the need to accommodate community concerns and priorities into the dogmatic format of rational planning. This paradigm will transform the ritualistic community participation, 'which lacks political clout, into a struggle for rights and an engagement with welfare claims' (Sahoo, 2013, p. 270). Prioritizing community concerns and support and investment accordingly can lead the community to break free from the support dependency cycle and can offer opportunities for increased resilience within marginalized communities. This research is not developed as a 'lesson to be learnt' or a simple invention of tools for enhancing community flood resilience. Rather, it highlighted the need to associate development with adaptation, through evaluating the consequences of development activities in a context where a disaster appears as an uncertain but socio-natural event and it provided more nuanced understandings of perceptions about resilience, exploring power/ knowledge dynamics within the planning process.

9.1. Research Contributions

9.1.1. Methodological Contributions

This grounded theory research adopts a method which is ‘dialogic’ and ‘transformative’ in nature and it adopted an innovative combination of tools, which made the whole method ‘communicative’ and ‘participatory’ in nature. It primarily employs explanatory single context, multiple case-study approaches. In situ data collection from case study communities incorporated focus group discussions, historical timeline preparations, transect walks, participatory community cognitive mapping, pair-wise comparison and ranking. Besides involvements with community members, relevant key informants were interviewed, and documents were reviewed to collect diversified data on the same issue from multiple sources. It was imperative to explore the causal relations and inter-dynamics to understand community perceptions about flood mitigation and community flood resilience in a development context, where external supports for various sectors were available.

The research design is replicable for other grounded theory research which requires experientially derived data from marginalized communities. The format has been shown to be successful in meeting the ontological need to construct the assumptions of how the world is perceived and the epistemological need to understand the realities of a particular case. It enables researchers to study things in their natural settings, through attempting to make sense of or interpreting phenomena, in terms that the people bring to them. Specifically, a sequential combination of cognitive mapping, transect walks and focus group discussion sessions can be utilised to overcome communication barriers. This research demonstrates this method as an effective means to elucidate community perceptions, as participants are enabled to share the information they acquire, store, recall and decode about their everyday spatial environment, even where individuals have low literacy levels.

9.1.2. Empirical Contributions

This research provides empirical evidence to understand the process of constructing perceptions of community flood resilience, especially in a scenario where the environment has been changing because of external actors’ interventions. It has discovered eight factors that exacerbate community flood vulnerability and twelve factors that enhance community flood resilience, and these are broadly categorized into four groups: ecological feature, built environment feature, communal capacities and involvement of external bodies (Table 9-1).

Comparative ranking of these factors has provided the evidence for proving communities' dependency on NGOs' assistance.

The relationship between two dynamic forces, community capacities and external involvements, has been investigated to evaluate the nexus of rational and participatory planning paradigms in the resolution of technically and administratively complex problems, particularly in developing countries. This research has unveiled the planning practices of NGOs as external involvements, where the practice of community participation in most of the cases is just ritualistic and communities find themselves in a captive condition to agree with NGOs' pre-decided development goals and means of achieving those goals. Although it is true that NGOs' usual projects have tried to bring changes in the social, educational and economic spheres, the question is how long these communities will need this kind of support.

The haor communities have developed dependency on external supports because of NGOs' involvement for an extended period and for not treating development as adaptation for enhancing resilience, which has established a patron-client relationship between NGOs and communities and created expectations among communities for receiving better support in future.

Table 9-1 List of factors

Factors that Exacerbate Community Flood Vulnerability	Factors that Enhance Community Flood Resilience	Categories of Factors
Unmitigated Wave Activity	Vegetation	Ecological Feature
Inappropriate Structure Risky Location	Appropriate Structure Favorable Location	Built Environment Feature
Lack of Knowledge Communal Disagreement Inexperience Financial Incapability	Knowledge & Skill Communal Unity Experience Self-Financial Capacity Interdependibility Awareness Local Leadership	Communal Capacities
External Harmful Decision	External Finance External Organizational Support	Involvements of External Bodies

9.1.3. Theoretical Contributions

Theories are not static entities. They attack other theories, and they defend their own arguments. After engaging in heated theoretical debates, they can transform themselves into better research tools than they were before. The field of development offers a perfect example of the dynamics of change in the theoretical perspectives (So, 1990, p.12).

This research primarily contributed to existing theories through introducing three ideas: Resilience as freedom, Development as adaptation and Support dependency. It explained resilience based on how community members perceive their environment and their resilience as an inner strength to intervene and interact with the surroundings. The perception of community flood resilience is not sufficiently investigated, considering the fact that community resilience is not only combinations of tangible properties, but also includes intangible properties like knowledge, skills and experiences as well as socio-political, socio-cultural, and psychological aspects. The surrounding environment, including both natural and built, with their changed attributes, shape community perceptions. The communities have limited choices because of the presences of factors that exacerbate vulnerabilities in various scales. Each factor as a source of ‘unfreedom’ hinders the possibility to enjoy the desired level of freedom. This research viewed attempts in enhancing community flood resilience as a process of expanding the real freedom as both (i) the primary end and (ii) the principle means of achieving it. This is defined respectively as the ‘constitutive role’ and the ‘instrumental role’ of freedom in the process of adaptation for enhancing resilience. The constitutive role of freedom relates to the importance of substantive freedom in enriching human life. The ‘instrumental role’ owns the idea of the effectiveness of freedom as means – not just as the end. Development, in this view, is the process of adaptation that expands human freedoms. Development as adaptation is expected to be more concerned with enhancing the quality of lives they live and the assessment of development has to be informed by this consideration.

The theory of support dependency, which explains the reasons of prolonged underdeveloped condition of marginalized communities and this condition is associated with external supports that communities receive from external bodies, mainly from NGOs. NGOs are considered as the alternative development partner, who can give ‘voice’ to the poor, encourage public-private cooperation and participatory approaches and generate social capital at the community level (Ditcher, 1986). But, NGOs’ involvement as providing external supports is dominated by the top-down process, where the ‘upward accountability’ controls development initiatives and ignores community concerns and priorities. NGOs’ involvement for an extended period with support not as per community concerns, entraps the community into a cycle of support dependency, whereas the prioritization of community concerns through active community participation can assist to getting free from this dependency cycle.

In the nexus of two radically opposite planning paradigms, rational planning and participatory planning, this research has also introduced the concept of linear-non-linear planning approach

for incremental adaptation, considering the reality of limited information, changed scenario and uncertainties, associated hazard-events. Conceptually, it allows to admit all potential failures, and to grow incrementally by accommodating inputs from active community participation in a timely manner. The concept of incremental adaptation, as a post-positivist paradigm within the field of disaster mitigation planning, significantly contributes to allowing flexibility within the scope of rational planning approach for having effective anticipatory and responsive adaptation.

9.1.4. Practical Contributions

This research practically contributed through providing insight about community participation in NGO projects and proposing a planning format for ensuring effective community participation. It has questioned the consequences of NGO supported development activities for an extended period, whereas, Brinkerhoff (2003) states, NGOs are usually considered as successful for addressing seemingly unsolvable challenges of development. This research has discovered the ritualistic picture of community participation in their projects, where the community concerns and demands are not usually prioritized. Communities have the impression that NGOs have power and resources to solve all kinds of problems and one day they will do that. Instead of empowering the communities, NGOs have disempowered them in some cases and made them dependent on external supports. Through discovering the reasons of support dependency of marginalized communities, this research has proved the necessity of practicing community participation at a meaningful level and prioritizing community concerns and demands in the planning process. This discovery has contributed to enrich decision makers' understanding of NGOs and their ways of practice. This research will also influence NGOs to rethink their whole process of community participation. Considering the existing practice of the dogmatic rational planning paradigm and the need for a more meaningful level of community participation, this research has proposed to follow the linear-non-linear planning approach and provided a nine-staged format (Figure 8-3) for practising this approach.

9.2. Policy Recommendations

The empirical study has identified some limitations on the part of external bodies while they are involved in the process of planning and implementing their programs and projects in the *Haor* region. The governmental policy remains focused on disaster risk management without any specific concern for the flood adversities of *haor* communities. This research highlights the need for an increased understanding of community concerns and priorities regarding the

gradual upgradation of their living standard, especially targeting to enhance community flood resilience. Accordingly, it recommends expanding the scope of meaningful participation of communities in the decision-making and implementation phase and to allow the flexibility in the planning process to address community concerns and priorities in an incremental way. Based on the findings of this research, the following suggestions are put forward as possible ways of achieving these goals through policy interventions: a) by allowing to incrementally plan for addressing uncertainties; b) by treating every development as adaptation for enhancing community resilience c) through practicing the nonlinear way for accommodating outcomes from community participation within rational planning process of disaster governance; d) by targeting the goal for empowering the communities so that they can control over the decisions and develop independently; and e) by investigating and evaluating alternatives means or measures to address the issues which are prioritized by communities.

- ***Allowing the disaster governance to incrementally plan for addressing uncertainties***

Disaster governance should allow planning for natural disasters as planning under uncertainty or planning for uncertainty. Planning task should allow the flexibility to discover, assess, and address uncertainty by confronting the problem at hand and assessing conditions of uncertainty, rather than applying pre-decided solutions, derived from comprehensive planning. Planning for disaster risk management will offer chances to overcome, or at least reduce uncertainties, by matching planning processes to problem characteristics through combining community participatory process with comprehensive rational planning in an incremental way. The incremental process will accommodate real-life situations where prescribed static procedure cannot be followed because of various reasons, like lack of information, changed scenario, unforeseen conditions etc. Incremental planning process for adapting with natural disasters is needed to accept as a pragmatic policy action for responding towards high uncertainty by shifting the focus to developing consensus on how to proceed, as opposed to holding out for consensus on possible future.

Treating every development as adaptation for enhancing community resilience

A disaster is not a mere event but the way it is made to affect the lives and livelihoods of a community and it is associated with development. Every development activity has impacts on live and livelihoods and it affects community perceptions of resilience and vulnerability, as perception is associated with surroundings and every change in surrounding. Achieving resilience requires communities to experience developments as adaptation which will ultimately be able to reduce vulnerability. Adaptation is a continuous process of changing

status to live with risks or threats. If adaptation to any natural hazard is the target, necessary capacities or abilities are required to be built within a community, which can make it resilient to that particular hazard. Development as a process of adaptation will allow to moderate, cope with and take advantage of the consequences of climatic events or hazards.

- ***Practicing the non-linear way for accommodating outcomes from community participation within rational planning process of NGOs***

Chapter 7 highlighted the limitation of current practice of community participation in the planning process of NGO-initiated projects and programs, whereas Bangladesh is considered as special case in having well-established NGOs providing supports to a huge population in parallel with state services (Thomas, 2008). This research has questioned these NGOs' operational procedures and found a direct connotation for developing dependency on external supports among marginalized communities. NGOs' involvements are dominated by the linear process of rational planning where the ritualistic nature of community participation fails to accommodate community priorities and concerns for finalizing goals and tactics for achieving those goals. The bottom-up process of community participation, which is also linear in nature, does not get a chance to contribute in the current situation, whereas NGOs are frequently seen as the ideal entity for engaging the beneficiary communities in the planning process. Considering these facts, this research recommends NGOs outline their programs in a way which can allow them to alter or modify thematic priorities of programs through accommodating community concerns and priorities in a non-linear way. The community participation will be meaningful when it will be able to contribute not only the later stages but also the previous stages of planning process. The scope of combining both linear and non-linear process can also grow incrementally towards 'participative' policy making and allow local communities to contribute to decisions which will affect them.

- ***Targeting goals for empowering the communities so that they can control over the decision and develop independently***

Community participation is always highlighted in NGO projects and empirical evidences have been found in limited cases where the community has chances to practice the higher level of participation. (For example, empowerment and controlled by community (figure 8-2). This research has stressed on the idea of targeting to achieve such condition when the community will not need any further supports from external bodies. It will ensure the ultimate condition of community participation when the empowered community will plan and implement projects

for their self-development without external assistance. NGOs who are working as development alternatives, need to target, when and how the community will achieve that autonomous quality. The community participation is needed to be evaluated through the lens of power analysis, where the unequal power sharing should be targeted to be converted in to unequal from other direction. It is needed to be realized that, the

‘participation’ in a particular space does not necessarily result in the transformation of power inequalities, unless it is targeted to do so. NGOs should not work in a particular location for an extended period. This research has shown the incorporation of community priorities and concerns can lead the community to reach that level from where they can get rid of being dependent of external supports.

- *Investigating and evaluating alternatives means or measures to address the issues which are prioritized by communities.*

A single issue can be addressed in multiple ways. Self-confidence about scientific and technical progress often serves to legitimize risks. Alternative means of building houses and settlements or protecting settlements are needed to be investigated and evaluated. The development with appropriate infrastructure is evidently not what the communities are looking for. If another type of structure or any another measure can ensure the desired level of safety the community might not hesitate to embrace that. They are longing for such an environment that can ensure their desired level of freedom. Targeting this condition as an ultimate end several other alternative measures are needed to be invented, evaluated and implemented. The national housing policy has scopes to put stress on conducting research on housing typologies based on innovative technologies and materials for naturally challenged conditions and necessary supports are required to be planned for aiming to improve local knowledge and skills.

9.3. Future Research

This research has investigated the community perceptions of flood resilience and its annotation with structural mitigation measures in a specific context, where external support is provided for an extended period for various development activities. However, it is important to point out that perception is highly context-specific; hence the analysis has been at the micro-level, investigating the interactions between communities and external bodies (NGOs) that underline the community involvement in the process of flood mitigation planning. This micro-analysis of consequences of external support and practiced planning paradigms are

important advancements in the body of knowledge for disaster mitigation planning for marginalized communities. Scope remains for extending this research to marginalized communities in other contexts, which are vulnerable to any other natural hazards.

This research has built on the 'support dependency theory' that explained how external support, not as per community concerns, entraps the communities into the support dependency cycle, and how the external support as a community concern can end the expectation for external support. This theory needs to be further tested and evaluated in another context, which may validate, nullify or discover limitations of this theory. The nature of external support may differ among situations depending on the geographical and political contexts, which require extensive understanding of historical and socio-cultural context. Similarly, the concept of linear-non-linear planning approach for incremental adaptation also needs to be tested and evaluated in another context.

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Appendices

APPENDIX A: Participant Information Sheet for Key Informant Interview

 <p>PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT – Key Informant Interview –</p>
Impacts of structural mitigation measures on perceptions of community flood resilience: Experiences from Haor communities of Bangladesh QUT Ethics Approval Number 1500000378

Research Team

Principal Researcher: Mr. Imon Chowdhoree PhD Candidate

Associate Researchers: Ms Mellini Sloan Principal Supervisor

Professor Les Dawes Associate Supervisor

Civil Engineering and Built Environment

Science and Engineering Faculty

Queensland University of Technology (QUT), Australia

Description

This project is being undertaken by Imon Chowdhoree, a PhD Candidate at QUT Australia.

The settlements of Haor region are at risk of being washed away or collapsing due to effects of base –erosion, flash flood, and strong waves of the vast water-body during monsoon period and pre-monsoon period. Protecting the edges of the elevated base-ground of Haor settlements from wave attacks is the main challenge for the households. Traditional means for protecting elevated base-grounds with bamboo poles, reeds, mats, sand bags or bags of waterhyacinth have been found to be ineffective. Several external bodies (e.g. CARE Bangladesh, POPI) provide financial and technical support to fortify the settlements with different forms of wave protection walls (e.g. brick wall, concrete block wall). This research

will investigate the impacts of these ventures on community abilities and capacities to deal with floods and community's views and reactions about these ventures. The research will support the flood risk management planning for naturally vulnerable rural communities.

Your organization has been identified as being involved in the process for protecting the Haor settlements from natural adversities. I am eager to know some details of your project for protecting settlements from you and the experiences of the whole process of the project.

Participation

Your participation in a semi structured in depth interview will involve an audio-recorded interview at any convenient location that will take approximately 1 hour 30 minutes of your time.

Questions will include: How do you first get the idea about your project?

How do you select a settlement to implement your project?

How do you approach the local people with your project?

Your participation in this interview is entirely voluntary. If you do agree to participate you can withdraw from the project without comment or penalty. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT.

Expected Benefits

You will not be directly benefitted by this research. This research will contribute to decisionmaking regarding options for long-term community planning in the Haor region and other areas facing similar challenges.

It is not expected that participation will involve any expense to you, and you will be offered some food to the value of AU\$ 5.00 as a token of appreciation.

Risks

You may find some difficulties to understand technical concepts / sophisticated language and terms. If this is the case please tell the researcher so that he can say things another way to assist your understanding.

You may feel some physical stress for sitting extended period of time. It should be noted that if you do not wish to participate, you can withdraw from participation at any time during the project without comment or penalty.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law. The names of individual persons are not required in any of the responses but, name of other organizations/ institute are required to mention.

The project involves audio recording and you will have the opportunity to verify your comments and responses prior to final inclusion. Only this research team will have access to the audio recording and the recording will be destroyed after transcription.

Please note that non-identifiable data collected in this project may be used as comparative data in future projects or stored on an open access database for secondary analysis.

The data collected through this process will form part of a PhD thesis and findings will be reported in academic publications.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate.

Questions / Further Information about the Project

If have any questions or require further information please contact one of the researchers listed below.

+8 801 552 426 203 or +614

Imon Chowdhoree imon.chowdhoree@hdr.qut.edu.au 5062 2402

Mellini Sloan mellini.sloan@qut.edu.au +617 3138 4003

Concerns / Complaints Regarding the Conduct of the Project

QUT is committed to research integrity and the ethical conduct of research projects. However, if you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Unit on +61 7 3138 5123 or email ethicscontact@qut.edu.au. The QUT Research Ethics Unit is not connected with the research project and can facilitate a resolution to your concern in an impartial manner.

If you experience distress as a result of being involved in this study, or have any other concerns or complaints, please contact:

Khondaker Hasibul Kabir

Assistant Professor, Department of Architecture

BRAC University

66 Mohakhali, Dhaka-1212, Bangladesh

PABX: +880-2-882 4051-4, ext. 4003

Mobile: +880-1-717 0008-64

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APPENDIX B: Participant Information Sheet for Community Participants

<p>PARTICIPANT INFORMATION FOR QUT RESEARCH PROJECT</p> <p> Queensland University of Technology – Community Participants – Brisbane Australia</p>
<p>Impacts of structural mitigation measures on perceptions of community flood resilience: Experiences from Haor communities of Bangladesh</p> <p>QUT Ethics Approval Number 1500000378</p>

Research Team

Principal

Researcher:

Associate

Researcher:

Description

This project is being undertaken by Imon Chowdhoree - a PhD Candidate at the Queensland University of Technology, Australia.

The settlements of Haor region are at risk of being washed away or collapsing due to effects of base –erosion, flash flood, and strong waves of the vast water-body during monsoon period and pre-monsoon period. Protecting the Haor settlements from wave attacks is the main challenge for the households. Traditional means of protecting settlements with bamboo poles, reeds, mats, sand bags or bags of water-hyacinth have been found to be ineffective. Several external bodies (e.g. CARE Bangladesh, POPI) provide financial and technical support to fortify the settlements with different forms of wave protection walls (e.g. brick wall, concrete block wall). This research will investigate the impacts of these ventures on community abilities and capacities to deal with floods and community's views and reactions

about these ventures. The research will support the flood risk management planning for naturally vulnerable rural communities. .

Your settlement has been identified as a Haor settlement that experiences natural adversities of the Haor region and has some form of protection walls to reduce the flood-damages.

I am eager to know some details of your area from you and your experiences and reactions before and after having the latest protection walls.

Participation

You will be invited to attend an introductory meeting, a focus group discussion session, three sessions of mapping and two sessions of semi-structured in-depth interview.

- In an initial 30 minutes meeting you will get to know the aims and objectives of the research, and you may express your intention to participate in a data collection process.
- In a 2 hours long focus group discussion session with same gender, you will participate (1 session, 2 hours, audio-recorded) talk about your flood experiences and Identify significant events and changes of your settlement and impacts of identified changes. You will also talk on causes of flood-risk and effective measures to reduce damages. This session will be audio recorded.
- For mapping your community you will attend 3 consecutive sessions of 2 hours each. You will be divided into small groups of same gender and relative age. Each small group will individually talk about the flooding condition before and after having the latest protection measures (walls) and draw 2 flooding maps of your settlements from your memory
 - (i) Map showing flooding damages before building the latest protection measure (wall)
 - (ii) Map showing flooding damages after building the latest protection measure (wall).

Each group will explain the map to the researcher and will have a walk through the settlement to relate every feature, shown in the map with reality. After this walk each group may edit their maps. Finally, each group will share its map with others and will have a discussion on success and failure of the latest protection measure (wall). This session will be

mainly audiorecorded and partially video-recorded and photographed without revealing participants' identity (faces). Maps will be collected as documents.

- In 2 consecutive semi-structured in-depth interview sessions of 2 hours each, you will be invited to give elaborative answers of questions, related to your capacities and abilities to deal with flood, your involvement in building the latest protection measures (walls), your reaction and views about the process of building the latest protection measures (walls) and your reaction and views about the success or failure of the latest protection measures (walls). This session will be audio-recorded and the outcome will be recorded in form of write-up, list, chart and table.
- Your participation in this project is entirely voluntary. If you do not agree to participate you can withdraw from the project without comment or penalty. If you withdraw, on request any identifiable information already obtained from you will be destroyed. Your decision to participate or not participate will in no way impact upon your current or future relationship with QUT.

Expected Benefits

You will not be directly benefitted by this research. This research will contribute to decision-making regarding options for long-term community planning in the Haor region and other areas facing similar challenges.

It is not expected that participation will involve any expense to you.

Every participant will be offered a small food stuff of AU\$ 5.00 as a token of appreciation.

Risks

This research involves some technical concepts / sophisticated language and terms. If there is anything you do not understand, please let research staff know and he can say things another way to assist understanding.

You may feel some physical stress for sitting extended period of time.

The interviews may bring back memories of previous floods that impacted you or people close to you. If you feel uncomfortable, you may withdraw from the study at any time. Should you experience discomfort during the study, you are advised to contact Mr. Khondaker Hasibul Kabir(BRAC University) on +8801717000864 or email at khkabar@bracu.ac.bd. Counselling services, if required, are available through Kishoreganj General Hospital.

You can withdraw from participation at any time during the project without comment or penalty if you no longer wish to participate.

Privacy and Confidentiality

All comments and responses will be treated confidentially unless required by law. The names of individual persons participating in the research and any identifying information contained in their contributions will not be reported or released. However, the name of your settlement will be identified.

Participants will have opportunity to review the outcome transcripts prior to final inclusion in the research, Recordings and transcripts will be available to the project team only, will not be used for any other purpose and will be destroyed on completion of the research.

The data collected through this process will form part of a PhD thesis and findings will be reported in academic publications.

Consent to Participate

Please confirm you:

- Have read and understood the information document regarding this project.
- Have had any questions answered to your satisfaction.
- Understand that if you have any additional questions you can contact the research team.
- Understand that you are free to withdraw at any time without comment or penalty.
- Understand that you can contact the Research Ethics Unit on +61 7 3138 5123 or email ethicscontact@qut.edu.au if you have concerns about the ethical conduct of the project, or contact Khondaker Hasibul Kabir on 01717000864 or email khkabir@bracu.ac.bd or if you have other concerns or complaints.
- Understand that the project will include an audio recording and partially video-recording and photographed.
- Understand that non-identifiable data collected in this project may be used as comparative data in future projects.
- Agree to participate in the project.

- Due to the nature of the project a verbal consent mechanism will be used. Your presence and responses will be accepted as an indication of your consent to participate in this project.

Questions / Further Information about the Project

If have any questions or require further information please contact one of the research team members below.

Principal Contact

Imon Chowdhoree – PhD Candidate

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Concerns / Complaints Regarding the Conduct of the Project

QUT is committed to research integrity and the ethical conduct of research projects. However, if you do have any concerns or complaints about the ethical conduct of the project you may contact the QUT Research Ethics Unit on +61 7 3138 5123 or email ethicscontact@qut.edu.au. The QUT Research Ethics Unit is not connected with the research project and can facilitate a resolution to your concern in an impartial manner.

If you experience distress as a result of being involved in this study, or have any other concerns or complaints, please contact:

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Mobile: +8801717000864

Email: khkabir@bracu.ac.bd

Thank you for helping with this research project. Please keep this sheet for your information.

বন্যা মোকাবেলায় সামাজিক সক্ষমতা-বোধের উপর অবকাঠামো মূলক প্রশমন ব্যবস্থার প্রভাবঃ বাংলাদেশের হাওড় সমাজ
অভিজ্ঞতা কিউইটি নীতিগত অনুমদন ক্রমিক নম্বরঃ ১৫০০০০৩৭৮

গবেষক দল

প্রধান গবেষক: ইমন চৌধুরী, পিএইচডি প্রার্থী
সহকারী গবেষক: মেলিনি স্লোন, প্রভাষক
ডঃ লেস ডাওয়েস, অধ্যাপক

বর্ণনা

এই প্রকল্প ইমন চৌধুরী, পিএইচডি প্রার্থী দ্বারা পরিচালিত।

হাওড় অঞ্চলের বসতিগুলো বর্ষা মৌসুমে, এমনকি এর আগে ও পরে বিভিন্ন কারণে বিধ্বস্ত হওয়ার ঝুঁকিতে থাকে। কারণগুলো হল স্বাভাবিক বন্যা, পাহারী ঢল, ভূমি ধ্বস, নদীর ভাঙন, বিশাল জলরাশির প্রমত্ত ঢেউ ইত্যাদি। এর হাত থেকে বসতিগুলোকে রক্ষা করা অত্যন্ত কষ্টসাধ্য ব্যাপার। বাঁশ, বেড়া, চটাই, লতা, বাগির বন্যা, কচুরিপানার বন্যা ইত্যাদি সহজলভ্য উপকরণ দিয়ে তৈরি ঐতিহ্যগত পন্থাগুলো খুব বেশি কার্যকরী ভূমিকা রাখতে পারছে না। এমনত অবস্থায় বিভিন্ন বাইরের সংস্থা (যেমন, কেয়ার বাংলাদেশ, পিপি ইত্যাদি এন জি ও) তাদের অর্থনৈতিক এবং কারিগরি সহায়তা নিয়ে এগিয়ে এসে বসতি রক্ষার জন্য বিভিন্ন প্রকারের বসতি-রক্ষাকারী দেওয়াল (যেমন, ইটের দেওয়াল, কনক্রিট ব্লকের দেওয়াল) তৈরি করে দিচ্ছে। এই গবেষণা পত্র বন্যা মোকাবেলায় সামাজিক সক্ষমতার উপর এসকল কর্মকাণ্ডের প্রভাব পরীক্ষা করে দেখবে এবং এসকল কর্মকাণ্ডের প্রতি জনগণের প্রতিক্রিয়া পর্যালোচনা করবে। এই গবেষণা গ্রামীণ বন্যা প্রবণ অঞ্চলের বন্যা ব্যবস্থাপনা পরিকল্পনায় সহায়ক ভূমিকা রাখবে।

আপনার বসতিটিকে এই গবেষণার জন্য একটি উপযুক্ত ক্ষেত্র হিসেবে চিহ্নিত করা হয়েছে, যেখানে আপনার রয়েছে বন্যা মোকাবেলা করার অভিজ্ঞতা এবং এর জন্য নির্মিত অবকাঠামো।

আমি আপনার বসতির বিভিন্ন তথ্য এবং বন্যার ক্ষতি প্রশমনের উদ্দেশ্যে নির্মিত অবকাঠামো সম্বন্ধে আপনার অভিজ্ঞতা এবং প্রতিক্রিয়া জানতে আগ্রহী।

অংশগ্রহণ

আপনাদেরকে একটি প্রারম্ভিক সভা, একটি দল-ভিত্তিক আলোচনা, তিনটি নকশা প্রণয়ন অধিবেশন এবং দুটি অর্ধ-নির্ধারিত সুগভীর সাক্ষাৎকারে অংশগ্রহণ করার জন্য আমন্ত্রণ জানানো হচ্ছে।

- ৩০ মিনিটের একটি প্রারম্ভিক সভায় আপনারা এই গবেষণার বিষয় এবং উদ্দেশ্য সম্বন্ধে জানতে পারবেন এবং এর তথ্য সংগ্রহ কার্যক্রমে অংশগ্রহণ করার আগ্রহ প্রকাশ করার সুযোগ পাবেন।
- একটি দল-ভিত্তিক আলোচনা অধিবেশনে একই লিঙ্গের সমবয়সীদের সাথে আপনারা আপনার বন্যার অভিজ্ঞতা এবং আপনার বসতির পরিবেশে সংঘটিত সকল পরিবর্তনের প্রভাব/কার্যকারিতা নিয়ে পরস্পরের সাথে কথা বলবেন। এছাড়াও আপনারা বন্যা সমস্যার কারণ এবং এর থেকে পরিত্রাণের কার্যকরী পন্থা নিয়ে কথা বলবেন। ২ ঘণ্টাব্যাপী এই অধিবেশনটির শব্দধারণ করা হবে।
- আপনার বসতির নকশা প্রণয়নের জন্য আপনাদেরকে ২ ঘণ্টাব্যাপী তিনটি অধিবেশনে অংশগ্রহণ করতে হবে। প্রথমে আপনাদেরকে বয়স এবং লিঙ্গভেদে ছোট ছোট দলে ভাগ করা হবে। এরপর প্রতিটি দল বসতি রক্ষার সর্বশেষ অবকাঠামো (দেওয়াল) টি তৈরির পূর্বের এবং পরের অবস্থা নিয়ে গবেষকের সাথে আলোচনা করে দলীয় ভাবে তাঁদের স্থিতি নির্ভর দুটি নকশা প্রণয়ন করবে।
 - (i) প্রথম নকশাটি বসতি রক্ষার সর্বশেষ অবকাঠামো (দেওয়াল) টি তৈরির পূর্বের বন্যা অবস্থা চিত্রিত করবে।
 - (ii) দ্বিতীয় নকশাটি বসতি রক্ষার সর্বশেষ অবকাঠামো (দেওয়াল) টি তৈরির পরের বন্যা অবস্থা চিত্রিত করবে।
 প্রতিটি দল তাঁদের প্রণীত নকশা দুটি গবেষককে বোঝাবে এবং গবেষককে তাঁদের বসতিটি ঘূড়িয়ে দেখিয়ে নকশায় উল্লেখিত সকল বিষয় ব্যাখ্যা করবে। এরপর তাঁরা চাইলে তাঁদের নকশা পরিমার্জন করতে পারবে। সবশেষে প্রতিটি দল তাঁদের নকশা দুটি সকলকে দেখিয়ে বসতি রক্ষার সর্বশেষ অবকাঠামো (দেওয়াল) টির উপযোগিতা এবং অনুপযোগিতা নিয়ে আলোচনা করবে। এই অধিবেশন তিনটির শব্দ ধারণ করার পাশাপাশি কিছু কিছু অংশের চলচ্চিত্র এবং আলোকচিত্র ধারণ করা হবে। চলচ্চিত্র এবং আলোকচিত্র এমনভাবে ধারণ করা হবে যেন অংশগ্রহণকারীদের মুখাবয়ব(পরিচিতি) প্রকাশিত না হয়। প্রণীত নকশাগুলো তথ্য হিসেবে সংগ্রহ করা হবে।
- দুটি দুই ঘণ্টাব্যাপী সাক্ষাৎকার অধিবেশনে আপনারা বিভিন্ন বিষয়ে প্রশ্ন করা হবে। বন্যা মোকাবেলায় আপনারা সামাজিক সক্ষমতা এবং সামর্থ্য, সর্বশেষ অবকাঠামো নির্মাণে আপনারা ভূমিকা, এই অবকাঠামো নিয়ে আপনারা অভিজ্ঞতা এবং অনুভূতি এবং এর সাফল্য-ব্যর্থতা নিয়ে আপনাদেরকে প্রশ্ন করা হবে। এই অধিবেশন দুটির শব্দধারণ করা হবে এবং কিছু তথ্য লিখিত দলিল হিসেবে সংগ্রহ করা হবে।

APPENDIX C: Pair-wise Comparison of Factors that Exacerbate Flood Vulnerability

		↑	0.0	≈	0.5	←	1.0				
		a	b	c	d	e	f	g	h		
	Factors that exacerbate Community Flood Vulnerability Nayahati	Structure	Location Risky	Skill	Unity	Experience of Lack	incapability Financial	Decision	Activity Wave	score	
a	Inappropriate structure		≈	←	←	←	←	←	←	6.5	23%
b	Risky Location	≈		←	←	←	≈	←	←	6	21%
c	Lack of Knowledge & Skill	↑	↑		←	≈	≈	≈	←	3.5	13%
d	Lack of Communal Unity	↑	↑	↑		↑	↑	≈	≈	1	4%
e	Lack of Experience	↑	↑	≈	←		≈	←	←	4	14%
f	Financial Incapability	↑	≈	≈	←	≈		←	←	4.5	16%
g	External Harmful Decision	↑	↑	≈	≈	↑	↑		↑	1	4%
h	Wave Activity	↑	↑	↑	≈	↑	↑	←		1.5	5%
										28	

		a	b	c	d	e	f	g	h		
--	--	---	---	---	---	---	---	---	---	--	--

	Factors that exacerbate Community Vulnerability Concern	Structure Inappropriate	Location Risky	Skill	Unity	Experience Lack	Incapability Financial	Decision	Activity Wave	score	
a	Inappropriate structure	≈	←	←	←	←	←	≈	←	6	21%
b	Risky Location	≈		←	←	←	≈	≈	←	5.5	20%
c	Lack of Knowledge & Skill	↑	↑		←	≈	≈	↑	←	3	11%
d	Lack of Communal Unity	↑	↑	↑		↑	↑	↑	↑	0	0%
e	Lack of Experience	↑	↑	≈	←		≈	←	←	4	14%
f	Financial Incapability	↑	≈	≈	←	≈		←	←	4.5	16%
g	External Harmful Decision	≈	≈	←	←	↑	↑		←	4	14%
h	Wave Activity	↑	↑	↑	←	↑	↑	↑		1	4%
										28	

	a	b	c	d	e	f	g	h		

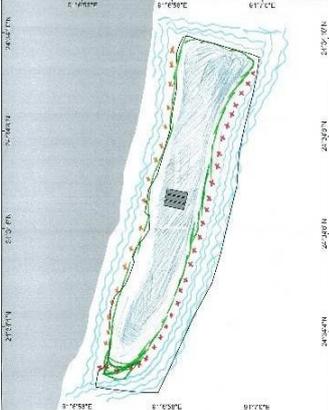
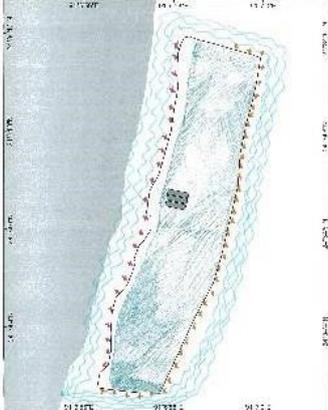
	Factors that exacerbate Community Flood Vulnerability Nakusha-Dashkusha	Structure	Location Risky	Skill	Unity	Experience of Lack	incapability Financial	Decision	Activity Wave	score	
a	Inappropriate structure		≈	←	←	←	←	←	←	6.5	23%
b	Risky Location	≈		←	≈	←	←	≈	≈	5	18%
c	Lack of Knowledge & Skill	↑	↑		≈	≈	≈	≈	≈	2.5	9%
d	Lack of Communal Unity	↑	≈	≈		≈	↑	≈	←	3	11%
e	Lack of Experience	↑	↑	≈	≈		≈	↑	←	2.5	9%
f	Financial Incapability	↑	↑	≈	←	≈		←	←	4	14%
g	External Harmful Decision	↑	≈	≈	≈	←	↑		←	3.5	13%
h	Wave Activity	↑	≈	≈	↑	↑	↑	↑		1	4%
										28	

APPENDIX D: Pair-wise Comparison of Factors that Enhance Flood Resilience

	a	b	c	d	e	f	g	h	i	j	k	l		
Factors that Enhance Community Flood Resilience Nakusha-Dashkusha	Appropriate Structure	Favourable Location	Knowledge & Skill	Communal Unity	Experience	Self Financial Capacity	External Finance	External Organizational Support	Vegetation	Interdependibility	Awareness	Local Leadership	score	
a Appropriate Structure		↔	↑	↑	↑	↑	↑	↑	↑	↑	↑	↑	9.5	14%
b Favourable Location	↔		↑	↑	↑	↔	↔	↔	↑	↑	↑	↑	9	14%
c Knowledge & Skill	↑	↑		←	←	↑	↑	↑	↑	←	←	↔	4.5	7%
d Communal Unity	↑	↑	↑		←	↑	↑	↑	↑	↔	↔	←	3	5%
e Experience	↑	↑	↑	↑		↑	↑	↑	↑	↔	↔	↔	1.5	2%
f Self-Financial Capacity	↑	↔	←	←	←		↑	↑	←	←	←	←	7.5	11%
g External Finance	↑	↔	←	←	←	←		↔	←	←	←	←	9	14%
h External Organizational Support	↑	↔	←	←	←	←	↔		←	←	←	←	9	14%
i Vegetation	←	↑	←	←	←	↑	↑	↑		←	←	←	7	11%
j Interdependibility	↑	↑	↑	↔	↔	↑	↑	↑	↑		↑	↔	1.5	2%
k Awareness	↑	↑	↑	↔	↔	↑	↑	↑	↑	↑		↔	2.5	4%
l Local Leadership	↑	↑	↔	↑	↔	↑	↑	↑	↑	↔	↔		2	3%
													66	

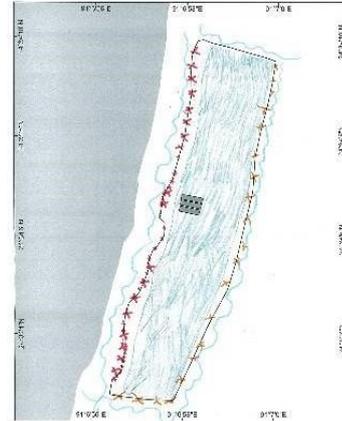
APPENDIX E: List of Cognitive Maps with Detail Descriptions

Cognitive maps of Nayahati settlement

Group	Previous condition Pre-protection wall condition (circa 2010)	Current condition Post-protection wall condition
Senior Men		
<p>Identified features</p> <ol style="list-style-type: none"> 1. Through green coloured, broken boundary lines, the map of previous condition shows the previous size of settlement which was smaller than the current size of the settlement, shown as the current condition. 2. The red cross symbols, shown in the previous condition map convey the idea that those areas of edges were severely prone to be damaged. These locations are identified as moderately risky in current condition, as these edges are now protected with non-traditional structural mitigation measures 3. The western edge, which was identified as moderately risky (using orange cross symbols) in the previous condition, is identified as severely risky in current condition. It does not mean the risk of the western edge had been increased in the post protection wall condition. This side which is protected with traditional fencing, even in the post protection wall condition, has the same possibility of being collapsed/damaged partially or at a slow pace. But this possibility of partial or slow-paced damage is considered as a severe risk, as the participants' level of expectation has been raised. 		

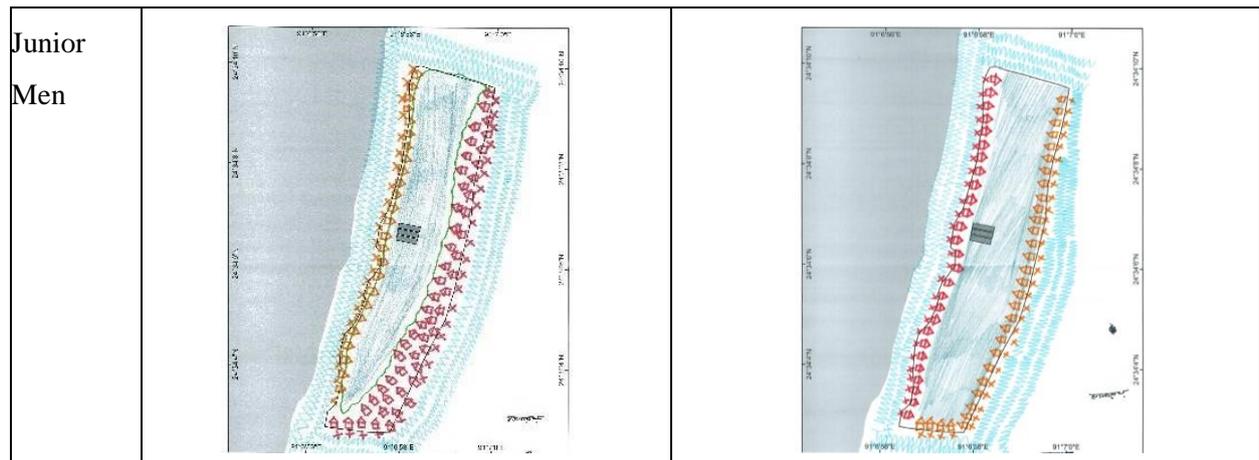
4. A bigger chunk of area is marked (with green patch) as safe to live in the current condition in comparison with the area marked in the previous condition map. Almost the whole island is marked as safe, leaving a small strip of land along its western edge, where it does not have any non-traditional structural mitigation measure.

Senior
Women



Identified features

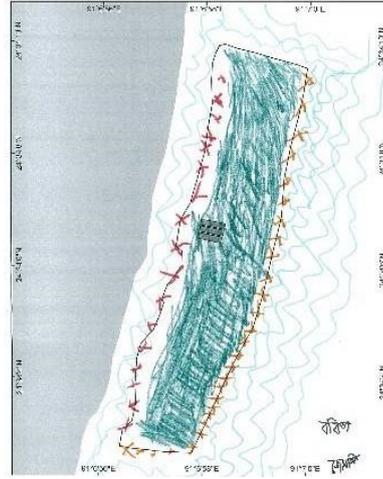
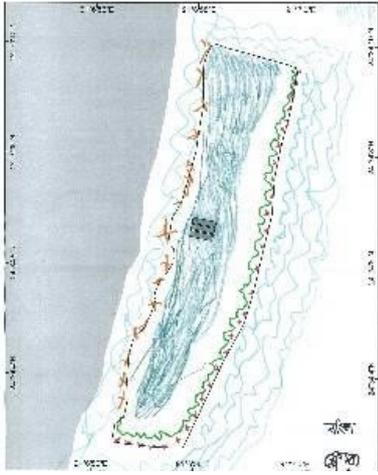
1. Through green coloured, broken boundary lines, the map of previous condition shows the previous size of settlement, which conveys the idea that in current condition though it has gained some lands on eastern and southern edges, it has lost some lands from its western side, as the western side is not well protected in current condition.
2. Same as previous group's maps
3. Same as previous group's maps
4. Same as previous group's maps



Identified features

1. Same as senior men group's maps
2. Along with red cross and orange cross symbols, red house and orange house symbols are used in these maps. These house symbols were invented and used by the group members to express their ideas more legitimately. Series of red houses, shown the previous condition map conveys the idea that those areas or edges were severely prone to be damaged. With three lines of red house symbols it expresses that, the highest amount of houses had been evicted from the southeast corner. These locations are identified as moderately risky (with orange cross and orange house symbols) in current condition, as these edges are now protected with non-traditional structural mitigation measures
3. The western edge, which was identified as moderately risky (using orange house and cross symbols) in the previous condition, is identified as severely risky in current condition. It does not mean the risk of the western edge had been increased in the post protection wall condition. This side which is protected with traditional fencing, even in the post protection wall condition, has the same possibility of being collapsed/damaged partially or at a slow pace. But this possibility of partial or slow-paced damage is considered as a severe risk, as the participants' level of expectation has been raised.
4. Same as previous groups' maps.

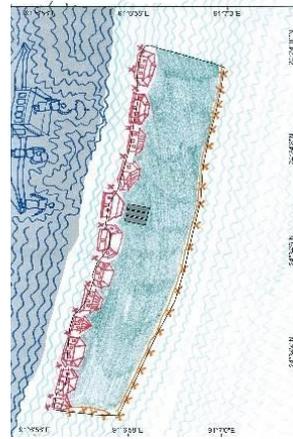
Junior Women 1



Identified features

1. Same as previous group's maps (except senior women group)
2. Same as previous group's maps (except junior men group)
3. Same as previous groups' maps.
4. Same as previous groups' maps.

Junior Women 2

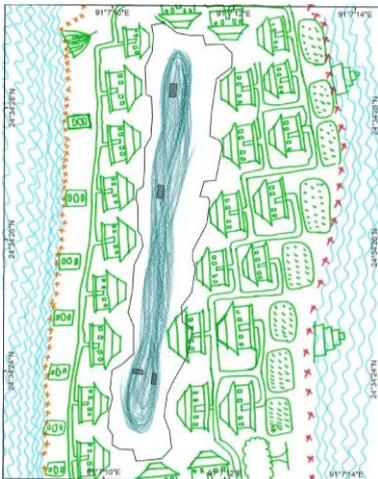
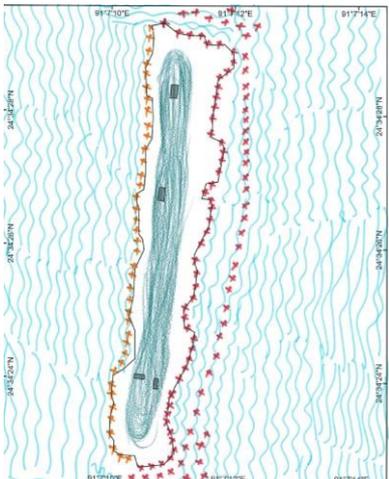


Identified features

1. Same as senior women group’s maps
2. Like, junior men’s group this group also invented and used red and orange house symbols to express their ideas more legitimately. One row of red houses, shown on the southern and eastern edges on the previous condition map conveys the idea that those areas or edges were severely prone to be damaged. These locations are identified as moderately risky (with orange cross symbols) in current condition, as these edges are now protected with non-traditional structural mitigation measures
3. Same as junior men groups’ maps.
4. Same as previous groups’ maps.

Cognitive maps of Concernpara settlement

Group	Previous condition (While the settlement was first established	Current condition
-------	---	-------------------

	(circa1990)	
Senior Men		

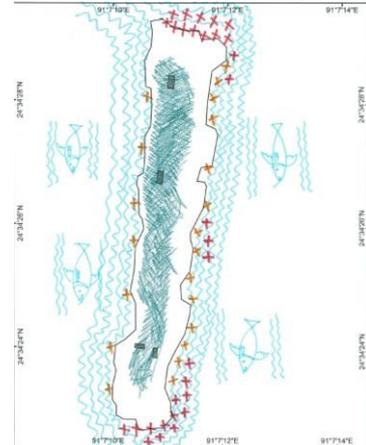
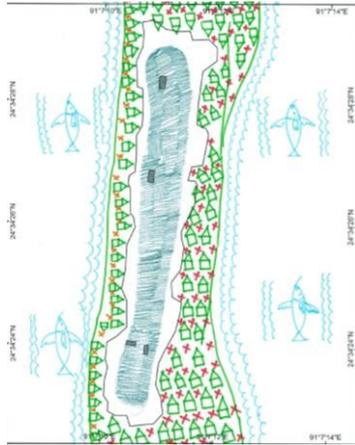
Identified features

1. For depicting the initial condition of the settlement this group drew two rows of houses with internal walkways, vegetable gardens and steps on the eastern side and one row of house with internal walkways and series of sanitary latrines on other sides, which are the outside of

current boundary of the settlement. Through these green symbols, the map of previous condition tries to convey the idea that the settlement was bigger in area while it was established and it has lost most of its lands from eastern sides, as shown in the map of current condition.

2. The red cross symbols, shown in the previous condition map convey the idea that those areas or edges were severely prone to be damaged. These locations are also identified as severely risky in current condition and for expressing the severity, two to three rows of red crosses were put in the map of current condition. It shows the two corners-north-east and south-east are the most prone to be damaged, despite having the remaining of concrete block revetment.
3. The western edge, in both maps, is marked as moderately risky, using orange cross symbols.
4. Almost similar size of central areas, close to western edge is marked as safe in both maps.

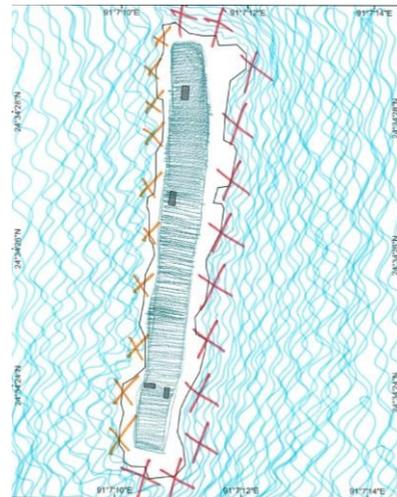
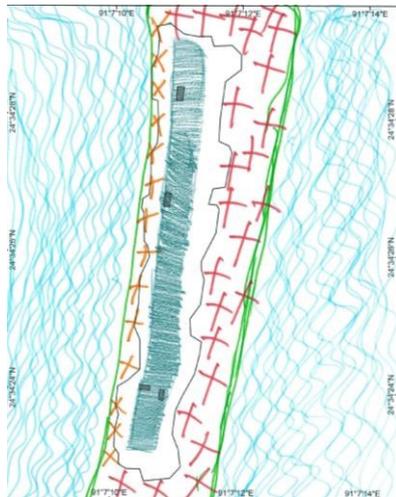
Senior
Women



Identified features

1. For depicting the initial condition of the settlements this group drew multiple rows of houses on the eastern side and its two corners and one rows of house on the western side, which are the outside of current boundary of the settlement. Through these green house symbols and green boundary line the map of previous condition tries to convey the idea that the settlement was bigger in area while it was established and it has lost most of its lands from eastern sides, more dominantly from south-east and north-east corners.
2. The multiple rows of red cross symbols, shown in the previous condition map convey the idea that those areas or edges were severely prone to be damaged. In map of current condition red cross symbols are concentrated in three areas: These locations are also identified as severely risky in current condition and for expressing the severity, two to three rows of red cross are put in the map of current condition. It shows the two corners-north-east and south-east are the most prone to be damaged, despite having the remaining of concrete block revetment.
3. Some selected spots of western and eastern edges are shown as moderately risky with orange cross symbols.
4. Same as previous group's maps

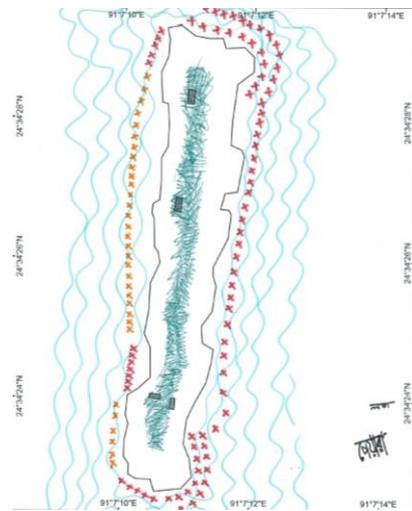
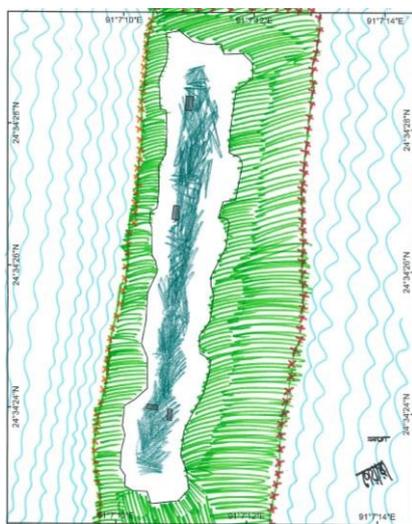
Junior
Men



Identified features

1. With green lines the map of previous condition conveys the idea that the settlement's land area was larger than its current area and it has lost most of its lands from eastern sides, more dominantly from south-east and north-east corners.
2. The red cross symbols on north, east and south sides, shown in the previous condition map convey the idea that those areas or edges were severely prone to be damaged. These locations are also identified as severely risky in current condition
3. The western edge, which is identified as moderately risky (using orange cross symbols) in the previous condition, is also identified moderately risky in current condition.
4. Same as previous groups' maps.

Junior
Women
1



Identified features

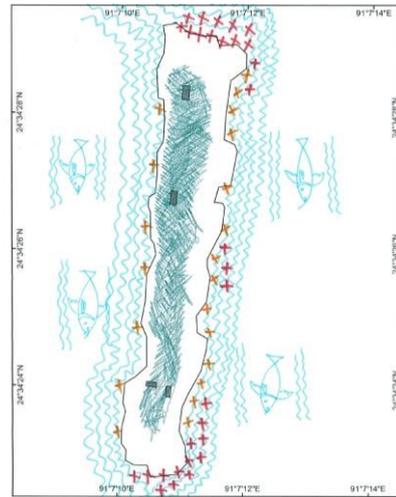
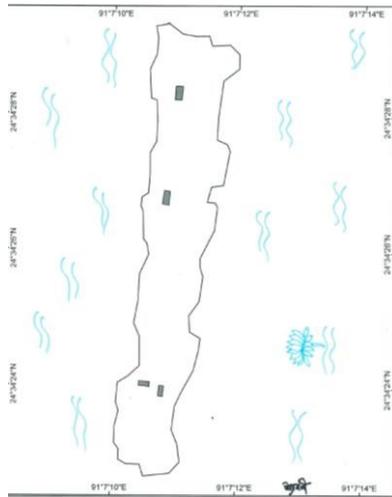
1. With green hatch lined area the map of previous condition conveys the idea that the settlement's land area was larger than its current area and it has lost most of its lands from eastern sides, more dominantly from south-east and north-east corners.
2. While this group was very generous to mark severely and moderately risky locations in the map of previous condition, it became very specific to mark severely and moderately risky locations in the map of current condition. Two rows of red cross symbols on two corners express its extreme severity. Along with the eastern edge, two specific depressed spots on the

estern edge are marked as severely risky (using red cross symbols) in the map of current condition.

3. Except two spots on western edge, rest of the area is identified as moderately risky (using orange cross symbols) in the map of current condition.

4. Same as previous groups' maps.

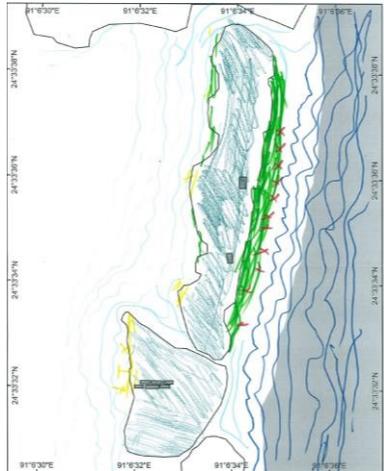
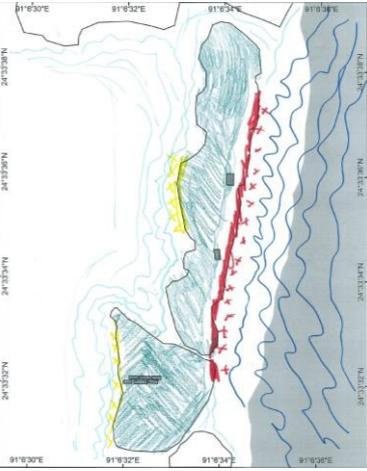
Junior
Women
2



Identified features

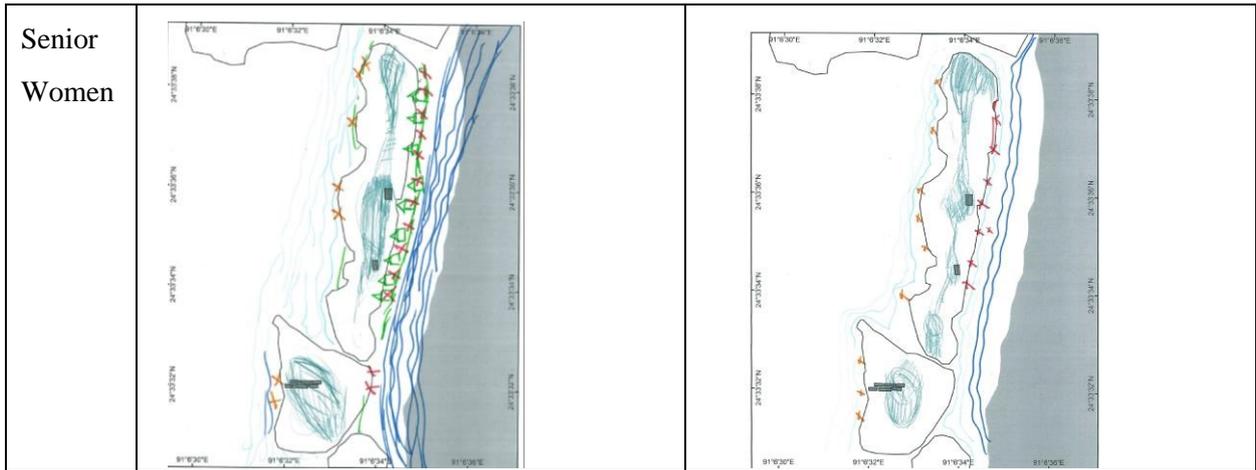
1. This group refused to identify any feature of previous condition because of not having any lived experience of that period.
2. This group was also very diligent to mark severely and moderately risky locations in the map of current condition. Two rows of red cross symbols on two corners and northern edge express its extreme severity. The central area of eastern edge is marked as severely risky (using red cross symbols).
3. Selected protruded parts of western edge and selected depressed parts of eastern edge are identified as moderately risky (using orange cross symbols) in the current condition map.
4. The central part, close to western edge is marked as safe area with dark green hatch in the map of current condition.

Cognitive maps of Nakusha-Dashkusha settlement

Group	Previous condition (Initial condition of settlement (circa 1990))	Current condition
Senior Men		

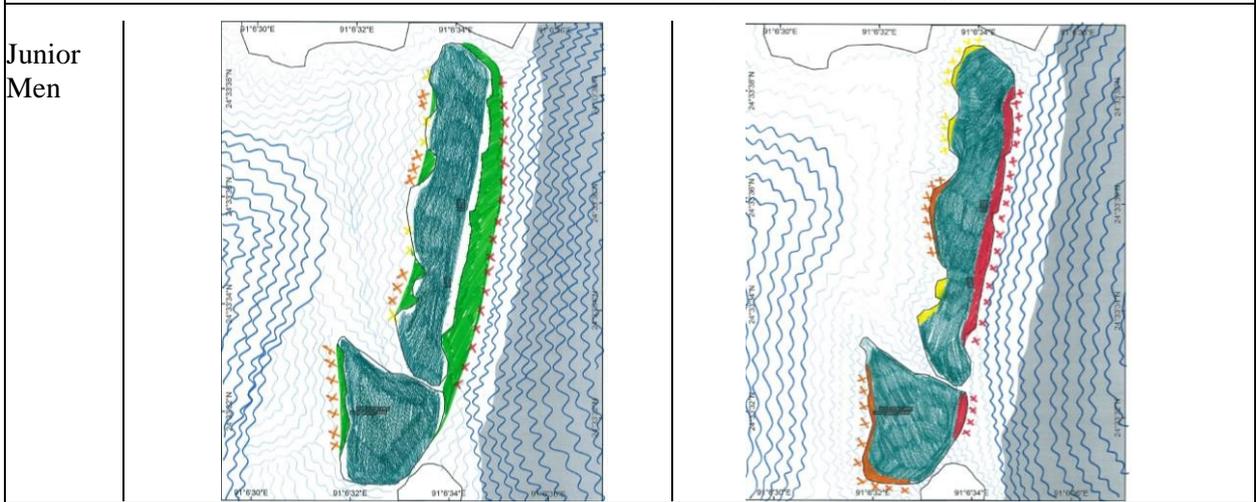
Identified features

1. With green lined patch mostly on the eastern side and slightly on the western side of Nakusha (northern) part, this group conveyed the idea that this part of the settlement has lost lands over time period.
2. The red cross symbols, shown in the previous condition map on the eastern side convey the idea that those areas or edges were severely prone to be damaged. These locations are also identified as severely risky in current condition.
3. The western edge, in both maps, is marked as slightly risky, using yellow cross symbols.
4. Almost similar size of central areas, close to western edge is marked as safe in both maps.



Identified features

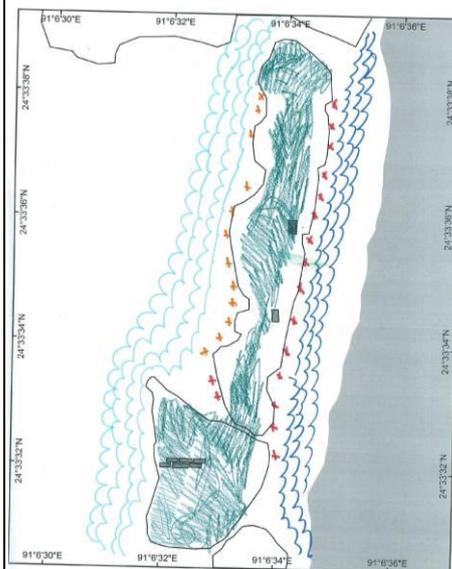
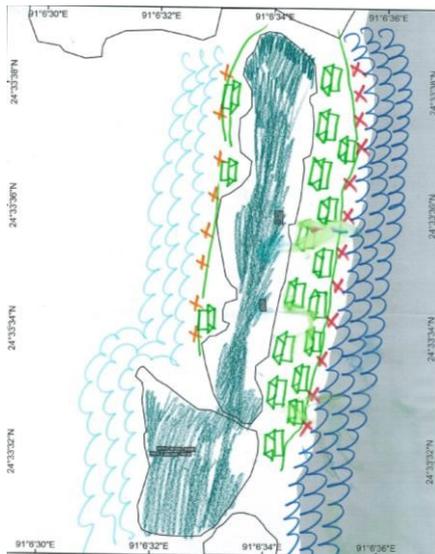
1. For depicting the initial condition of the settlements this group drew one row of green houses on the eastern side which are the outside of current boundary of the settlement. Through these green house symbols and green boundary line the map of previous condition tries to convey the idea that the settlement was bigger in area and it has lost most of its lands from eastern sides of Nakusha part.
2. Red cross symbols, shown in the previous condition map convey the idea that the eastern side of Nakusha part was severely prone to be damaged. In map of current condition red cross symbols are concentrated in three areas: These locations are also identified as severely risky in current condition.
3. Some selected spots of western and eastern edges are shown as moderately risky with orange cross symbols.
4. This group was very conservative in case of marking safe area for living



Identified features

1. With green patch mostly on the eastern side and slightly on the western side of Nakusha (northern) part and slightly on the western side of Dashkusha part, this group conveyed the idea that this part of the settlement has lost lands over the period.
2. The red cross symbols along with red coloured patch, shown in the previous condition map on the eastern side convey the idea that those areas or edges were severely prone to be damaged. These locations are also identified as severely risky in current condition. Additionally the north-eastern corner of Dashkusha is also marked as severely prone to be damaged.
3. The western side of Dashkusha part and some selected spots of western side of Nakusha part are identified as moderately risky with orange cross symbols in the map of previous condition. Additionally some specific spots in western side are also marked as low risk area with yellow cross symbols. In the map of current condition, from western to south-west corner of Dashkusha part is marked as moderately risky with orange cross symbols and orange patch. Leaving one protruded part on the western side of Nakusha part, other protruded parts are marked as areas of low risk, with yellow cross symbols and yellow patch and that one protruded part is marked as moderately risky with orange cross symbols and orange coloured patch.
4. This group was very generous to mark safe area (using green patch) in both maps.

Junior
Women
1



Identified features

1. With two rows of green house symbols, the map of previous condition conveys the idea that the Nakusha part has lost most of its lands from the eastern side. Few green house symbols shown on the western side conveys the idea that even this side was not totally free from erosion.
2. The red cross symbols, shown in the previous condition map on the eastern side convey the idea that those areas or edges were severely prone to be damaged. These locations, along with south-western corner of Nakusha and north-eastern corner of Dashkusha are identified as severely risky in current condition.
3. Western side of Nakusha is identified as moderately risky, using orange cross symbols in both maps.
4. The central strip of Nakusha and leaving north-western and north-eastern corner, rest of the area of Dashkusha are identified as safe to live in both maps.