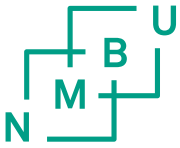
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"Exploring the tension between short term humanitarian interventions and adaptation to climate change: A case study of coastal Char Kukri Mukri union, Char fasson, Bhola, Bangladesh".

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(Noragric)

Master thesis in International development studies (14.08.2015)

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Student`s Declaration

I, Abdul Kadir Khan (MIDS- 980804), declare that this thesis is a result of my own research Investigations and findings. Sources of information other than my own have been acknowledged and a reference list has been appended. This work has not been previously submitted to any other university for award of any type of academic degree.

Signature: _____ Abdul Kadir Khan (980804)

Date **:** _____

Acknowledgements

First of all, I would like to extend my grateful appreciation to Almighty Allah. I am really grateful to my Supervisor *Dr. Lars Otto Næss*. This research paper would not be materialized without his valuable guidance, advice, and feedback. His dedication, patience, and understanding gave me the right direction and confidence to accomplish my study. Thank you very much Dr. Lars Otto!

I am also thankful to my study coordinator *Ingunn Bohman* for her kind support during the whole research period. The research was supported by a research grant from Noragric that must be highly acknowledged. I also would like to thank the Noragric staff and the Noragric Library for the support.

I would like to dedicate my thesis to my dearest Uncle *Shahjahan Khan* for assisting me in the entire field work. I also like to thank Kiron bhai (UNDP), Moon bhai (Muslim Aid), Bipul Bhai (UNDP), my friend and research assistant Sajal saha, Mithu bhai and the endless support from the villagers of Char Kukri Mukri. I would also like to thank Hafiz bhai, Reza bhai, Mohon bhai, Asad bhai, Tanin bhai, Lipu bhai, Suvo bhai, Shaon vai, Kamrul bhai , Sabuj Bhowmick and the other mates of Ås, for their excellent support, criticism, company and food. Special thanks to Chong Fann, my employer, for his endless support and keep faith in me. I really want to thank to my Ethiopian friend, Solomon Tesfaye Gabre and Ms. Sarah for their excellent support throughout the writing process.

Finally, I would like to thank my family and friends who are in Bangladesh because their good wishes always keep me safe and enthusiastic. Nevertheless, grateful appreciation to Norway, "I Love Norway"!!!

Abstract

The objective of this study was to investigate the determinants of livelihood vulnerability and exploring the connections between humanitarian interventions and adaptation response to reduce climate vulnerability in Coastal Char Kukri Mukri union, Char fasson, Bhola, Bangladesh. Predominantly, Humanitarian interventions are aimed to ameliorate the human suffering with the "build back better" response. However, humanitarian actors are increasingly focusing on short term humanitarian interventions rather adaptation to climate change. In the dilemma of short-term to long-term interventions play a critical role from saving lives to the capacity building of the community. To examine the interconnections between humanitarian interventions and vulnerability, the study used a framework combining adaptation, institutions and livelihood perspectives with elements of community based adaptation (CBA). Moreover, the study employed qualitative research methods and explored through both PRA based focus group discussions and climate risk screening tools of affected livelihood resources to gain insight into the process of short-term emergency humanitarian relief to long-term adaption to climate hazards. In the dilemma of emergency relief and adaptation response, there remains a gap in the understanding of how institutions influence the transformation of short-term coping capacities to long-term adaptation among different livelihood groups. Humanitarian interventions have important implications for livelihoods, yet long-term adaptation should involve more households in the adaptation processes to reduce the vulnerability to climate hazards in the community.

Findings suggest that, short- term humanitarian interventions have important implications for livelihoods; yet long term adaptation should involve more households to enhance adaptive capacity in the study area of Char Kukri Mukri. Nevertheless, interventions should support the adaptation process beyond emergency relief on saving lives.

Key words: Humanitarian interventions, Livelihood resources, vulnerability, Climate hazards, Community Based Adaptation, Local institutions.

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List of Abbreviations

AIL = Adaptation, Institutions and Livelihoods.

BBS = Bangladesh Bureau of Statistics.

BCCSAP= Bangladesh climate change strategy and action plan.

BFRI = Bangladesh forest research Institute.

BMD = Bangladesh meteorological department.

BNCU = Bangladesh national commission for UNESCO.

BWDB = Bangladesh water development board.

CBA = Community based adaptation.

CBACCCF = Community based adaptation to climate change through coastal afforestation.

CBO = Community based organization.

CCA = Climate change adaptation.

CFW = Cash for work.

CFT = Cash for training.

CLS = Community legal service.

CNRS = Center for natural resource studies.

COAST = Coastal association for social transformation.

CRI = Climate Risk Index.

CRiSTAL = Community Based Risk Screening tool- Adaptation and livelihoods.

CVCA = Climate vulnerability and capacity analysis.

C4D = Community for development.

DFID = Department for international development.

DORP = Development organization of the rural poor.

DRM = Disaster risk management.

DRR= Disaster risk reduction.

ECo = European commission.

EPS = Early disaster preparedness for safer community.

FFF = Forest, fish and fruit.

GO = Government organization.

HYV = High yielding variety.

INGO = International non-governmental organization.

IPCC= Intergovernmental panel on climate change.

IUCN = International union for conservation of nature and natural resources.

MDG = Millennium development goal.

MoEF = Ministry of Environment and forest.

NAPA = National adaptation programs of Action.

NGO = Non-governmental organization.

OECD = Organization for economic cooperation and development.

PRA = Participatory rural appraisal.

RCS = Red Crescent Society.

SAARC = South Asian association for regional cooperation.

SPRING = Strengthening partnerships, results and innovation in nutrition globally.

UCG = Unconditional cash grant.

UDMC = Union disaster management committee.

UMCOR = United Methodist committee on relief.

UNFCC = United Nations framework convention on climate change.

UNHCR = United Nations high commissioners for refugees.

UNICEF = United Nations International Children's emergency fund.

WASH = Water, Sanitation and Hygiene.

WFP = World food program.

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Chapter 1

1.0 Introduction

Humanitarian practices are ideally aimed to ameliorate human suffering or improving the human conditions (Khasalamwa 2009). Humanitarian interventions, however, usually comprised of immediate relief and emergency assistance to reduce climate risk (O'Brien et al. 2006). Most of the funding tends to go to helping people in the immediate aftermath of any climate extreme, whereas only a small portion goes to a long-term adaptation response (Khasalamwa 2009). In the dilemma between short-term relief and long term adaptation, there remains a gap in the understanding of how institutions influence the transformation of short-term coping capacity (Davies 1993) to long-term adaptation (Berman et al. 2012). The response needs to consider "build back better" to prevent people from becoming increasingly vulnerable in the face of increased climate hazards. The research area of Char Kukri Mukri union is prone to frequent climate hazards due to its geographical location that puts a large number of people at risk. Therefore, the area conjugates more implications of humanitarian interventions ranging from the provision of emergency relief to adaptation to climate change. Yet, there is little evidence whether this has made a difference on the ground due to inadequate funding and institutional access in such initiatives to climate change.

Climate change is likely to have significant effects on hydrology and water resources in the Bay of Bengal basins and lead to more serious hazards in Bangladesh (Mirza 2002). Bangladesh contributes very little to global greenhouse gas emissions (Rawlani & Sovacool 2011), but as a low-lying country it is considered one of the most vulnerable countries in the world to the effects of rising sea levels resulting from climate change (IPCC 2007). Almost 15% of its 162 million people live within a one-meter elevation from high tide in Bangladesh (Rawlani & Sovacool 2011). According to the German watch Climate Risk Index (2011), Bangladesh has been the most vulnerable country to extreme climate events in the world, during the period 1990–2009 (Harmeling 2010; Hossain & Huq 2013). Over the past 100 years, Bangladesh has warmed up by 0-5°C where the maximum and minimum temperatures show an increasing trend annually with a rate of 0.05° C and 0.03°C respectively (Ahmed & Alam 1999).

The increased trends affect to the coastal areas in Bangladesh directly. The coastal areas comprise almost 32% of the country's total land where more than 35 million people live in coastal areas less than 1 meter above sea level (Karim & Mimura 2008). Therefore, coastal areas are considered as the most prioritized sector in terms of uncertainty, emergency, and severity of climate related impacts (Rawlani & Sovacool 2011). There is some clear evidence of a prominent increase in the intensity of many extreme events in coastal areas such as floods, erosion, tropical cyclones, intense rainfall, tornadoes, storm surges, salinity intrusion, and others (Hossain et al. 2012). At least one major tropical cyclone strikes the Bangladesh coast each year with a powerful tidal surges making the region more unsafe than the other regions of the world (Paul & Routray 2011). Moreover, the coastal areas of Bangladesh have already been facing salinity problems which is expected to be exacerbated by climate change and sea level rise, as sea level rise is causing an unusual height of tidal water (Shamsuddoha & Chowdhury 2007).

The research area is facing tremendous recurrent climate hazards that affect directly and indirectly the livelihoods of the community. Humanitarian agencies have become better at saving lives, but there are persistent gaps in saving livelihoods. Thus, much disaster relief and recovery intervention fails to address the need to support livelihoods, dealing with immediate needs of the people (Cannon 2006). The need to focus on livelihood arises because climate change is already altering the productivity of the ecosystems of the rural poor (Bapna et al. 2008; Uy et al. 2011). Therefore, long-term adaptation policy response should be more effective to reduce climate vulnerability and to protect the livelihood of the community. Adaptation is about strengthening communities to cope with climate change and empowering them to participate in the development of climate change policies (Reid et al. 2007).

In practice, Community-based adaptation enhances the adaptive capacity and reduces the climate risk in community led processes that prioritize needs, knowledge and capacities to empower people in the community dealing with climate change (Reid et al. 2009). In fact, the humanitarian organizations are increasingly looking to integrate long-term adaptation responses, yet it is not clear whether and how this is happening. In addition to, reduction of vulnerability or adaptation requires longer term measures related to strengthening local institutions and economic opportunities for all inhabitants (Eriksen & Naess 2003). Therefore, prevailing empirical evidences in the study is examining linkages between

humanitarian interventions and determinants of livelihood vulnerability in Char Kukri Mukri union.

1.2 Objectives of the study and research questions

Char Kukri Mukri union of Char-fasson is one of the nearby coastal islands in the Bay of Bengal, Bangladesh. Due to geographic location the area is very vulnerable to climate hazards and has faced repeated cyclones and storm surges quite significantly. Hence, the research has the following two objectives

Objectives

1. To examine the determinants of livelihood vulnerability to climate hazards in the study area.

2. Exploring the connections between humanitarian interventions and determinants of vulnerability to climate hazards in the study area.

Research Questions

1) What are the key drivers behind livelihood vulnerability to climate hazards?

> 1.1 What are the most important livelihood resources that are affected by the climate hazards?

2) What are the major humanitarian interventions and to what extent do they address adaptation response that reduces livelihood vulnerability?

> 2.1 To what extent humanitarian do interventions address drivers of vulnerability at local and household level?
>
> 2.2 What role do local institutions play in relation to humanitarian interventions and drivers of livelihood vulnerability?

The study employed qualitative research methods and explored through PRA-based focus group discussions that included open ended guided questions on the local and household level. Both risk summary analysis and PRA activities address the key drivers behind livelihood vulnerability and the role that local institutions play in relation to humanitarian

interventions. Emergency relief needs to "build back better" to prevent people from becoming increasingly vulnerable, yet institutional access may be considered to fill the gap between long-term adaptation and short-term humanitarian assistance.

1.3 Thesis structure

The next section, Chapter 2, covers the literature of the different key concepts used in the study outlines and the theoretical framework of the study. The framework is focused on exploring adaptation practices and livelihood outcomes with the reconciliation of external humanitarian interventions. Additionally, livelihood outcomes will be described within CBA framework on the local and individual level of the community.

Chapter 3 is the methodology part which describes the research area, context and qualitative research. In addition, the chapter also describes the data collection methods, interviews, focus group discussions, and other research processes.

Chapter 4 provides an overview of the Study area and background of the area. The chapter also maps different types of humanitarian organizations and their interventions to mediate and shape the transformation to adaptation. The chapter also includes the meteorological data and secondary data used to assess the climate variability and vulnerability of the area.

Chapter 5 is the result and analysis part of the collected data that will be explained by qualitative research methods.

Finally, the chapter 6 is the discussion and conclusion part that will be explained by focusing on the key objectives of the study.

Chapter 2

2.0 Concepts and Theory

2.1 Vulnerability and Adaptive capacity

Vulnerability has been defined as the inability to cope (Chambers 1989) or broadly defined as the potential for loss (Mitchell 1989). This is an essential concept in hazard research and the core concept to the development of hazard mitigation strategies at a national, local, and international level. Vulnerability is the threat of hazardous materials where people are exposed (Gabor & Griffith 1980) and acts adversely to the occurrence of hazardous events(Timmerman 1981). It is the degree of loss to a given element or set of elements at risk (Cutter et al. 2003), and the potential to be adversely affected by an event or change (Kelly, P. & Adger, N. 2000; Kelly, P. M. & Adger, W. N. 2000) with different classes at risk .

According to Blaikie et al (2004), vulnerability is the characteristics of a person or group to anticipate, cope with, resist, and recover from the impact of natural hazards. Moreover, it involves a combination of factors in terms of adaptive capacity that determines the degree to which someone's life and livelihood are put at risk by a discrete and identical event in nature or in society (Blaikie et al. 2004). IPCC (2007:781) defines vulnerability as

"*the degree to which a system is susceptible to and unable to cope with adverse effects of climate change*" (IPCC 2007); p781.

In all aspects, the key parameters of vulnerability are the stresses to which a system is exposed, its sensitivity, and its adaptive capacity (IPCC 2007). Exposure is the nature and intensity to which a system faces environmental, social, and political stresses, which includes their magnitude, frequency, duration, and the extent of the hazards (Adger 2006).

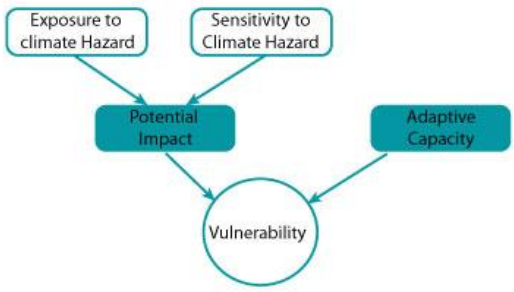


Figure 1: IPCC defined vulnerability (IPCC 2007)

On the other hand, sensitivity is the degree to which a system is modified or affected by exposures of climate hazards. Adaptive capacity is the ability of a system to evolve to involve for including environmental hazards and expanding its range of variability to cope. It is the ability to prepare, in advance, for stresses and changes; to adjust, respond, and adapt to the effect caused by the stress associated with future climate change (Berman et al. 2012; Engle 2011).

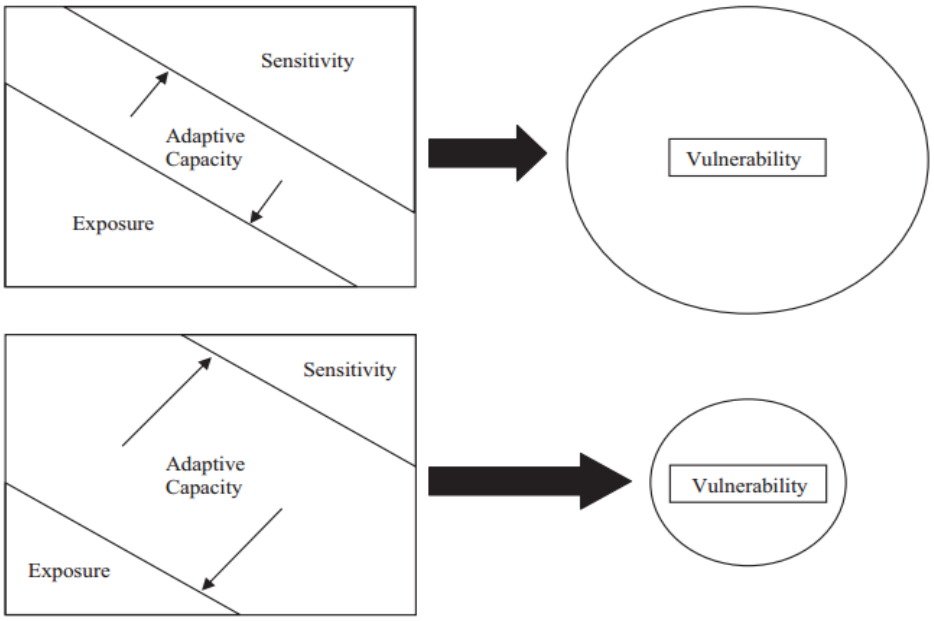


Figure 2: Adaptive capacity affects a system's vulnerability through modulating exposure and sensitivity. source : (Engle 2011)

The figure above described the role of adaptive capacity in influencing vulnerability. Adaptive capacity has a great impact over the system of vulnerability through modulating exposure and sensitivity. Adaptive capacity comprises adjustments in behavior, resources, and technologies (Adger, W Neil et al. 2007). The adaptive capacity of a system highlights the integral role of institutions, governance, and management, which emphasizes the socio-economic factors of a state (Adger, W Neil et al. 2007; Engle 2011). Moreover, the adaptive capacity of a system can be distinctly structured by human actions, behavior, and influences in both biophysical and social elements of a system (Seneviratne et al. 2012) . It is fundamentally recognized as a desirable property or positive feature of a system for reducing

vulnerability. The basic role of adaptive capacity in influencing outcomes is the more a system is able to adjust, the less vulnerable it is to future climate change and variability (Engle 2011).

Thus, adaptive capacity should be enhanced to reduce vulnerability and increase resilience. As the study area of Char Kukri Mukri is vulnerable to climate hazards, it needs to increase adaptive capacity on both a community and household level. A very small push up from the humanitarian assistance may be effective for transforming towards adaptation. Additionally, vulnerability can be summarized by different classifications and intellectual traditions. Cutter et al (2003), classified vulnerability research into three formulations. Firstly, vulnerability as exposure (people or places vulnerable to hazard) ; Secondly, vulnerability as a social condition (resilience to hazards) ; and last, potential exposures and societal resilience in places or regions (Cutter et al. 2003). Moreover, O'Brien et al. (2007) also classified with similar trends in " vulnerability as outcome " and " Contextual vulnerability " as two opposing research trends within the climate change area (O'BRIEN et al. 2007).

2.1.1 Outcome vulnerability

Outcome vulnerability is also known as the " end point"; that is a residual of climate change impacts minus adaptation (Kelly, P. M. & Adger, W. N. 2000). Here, vulnerability defined as the net impact of climate change which serves as a means of defining the extent of the climate problem and climate costs (O'Brien et al. 2004). Outcome vulnerability considers vulnerability as the potential impact of climate change on a specific exposure unit. The outcome approach combines information on net biophysical climate impacts to the socio-economic capacity to cope and adapt (Fellmann 2012), (O'BRIEN et al. 2007).

2. 1.2 Contextual vulnerability

In contrary, Contextual vulnerability is also known as the "starting point" - where vulnerability is characterized by the multiple social and environmental processes of climate change (Kelly, P. M. & Adger, W. N. 2000). In this concept, vulnerability defines the distribution of climate change impact and to identify how vulnerability can be reduced (O'Brien et al. 2004). Contextual vulnerability is a concept that refers the vulnerability as the present inability of a system to cope with changing climate biophysical conditions that involve dynamic social, political, technical, economical, and institutional structures and processes. In this process, vulnerability is considered as an aspect of socio- ecological systems that are determined by multiple factors (Adger 2006; O'Brien et al. 2006). In Char

Kukri Mukri, vulnerability can be conceptualized by the contextual conditions included institutional and socio-economics.

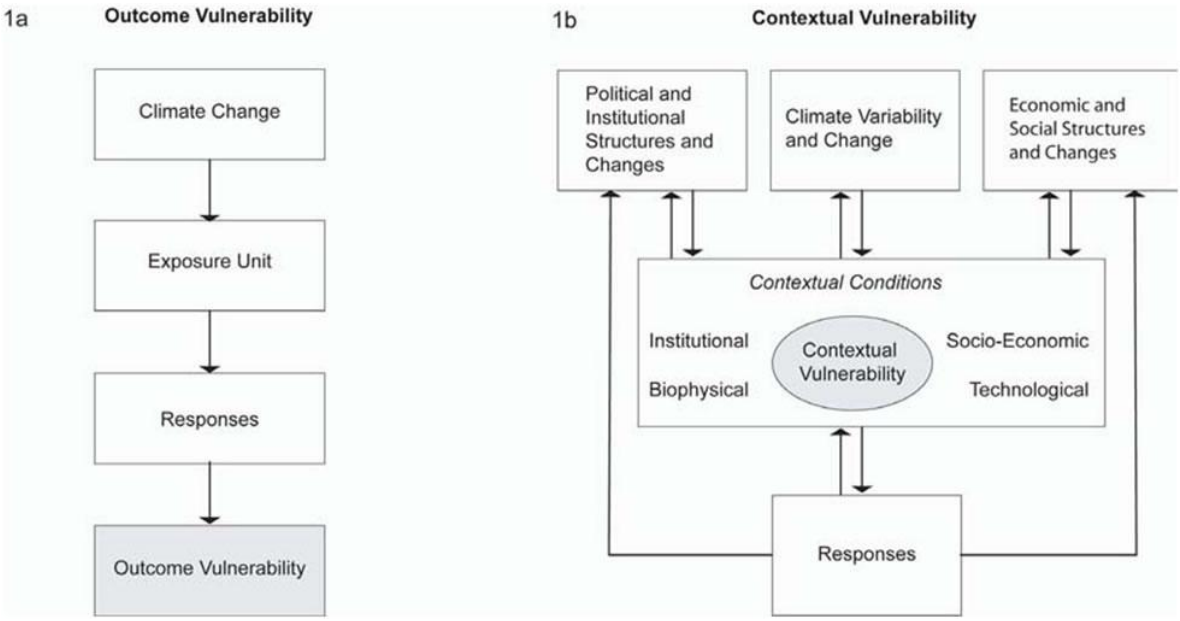


Figure 3: Frameworks depicting two interpretations of vulnerability to climate change: (a) outcome vulnerability; (b) contextual vulnerability. Source : (Füssel 2010; O'BRIEN et al. 2007)

The study describes the vulnerability through a contextual approach (known also "starting point"), where it is explained by socio-ecological context. In this approach climate change occurs within the context of a climate biophysical context of social, cultural, political, institutional, and technological process. The contextual approach also describes the conditions of livelihood resources that have an effect on a local or community level and a household's exposure to climate variability and change in Char Kukri Mukri, Bhola Bangladesh.

2.2 Dilemma of short term humanitarian Interventions and long term adaptation

Humanitarian responses and climate change adaptation have separate policy spheres (Agrawal & Perrin 2009). Some humanitarian organizations are considering the challenges in a more sustainable way by reducing the future impact of climate hazards in lieu of only addressing the immediate effects of climate extremes. Thus, they implicitly and explicitly

address such issues like poverty reduction and long term development (Khasalamwa 2009). However, in a dilemma of coping and adaptation, there remains a gap in the understanding of how institutions influence the transformation of short term coping capacity (Davies 1993) to long term adaptation (Berman et al. 2012).

Humanitarianism has been defined as providing emergency assistance to alleviate misery, sufferings and mostly saving lives during and in the aftermath of emergencies. The core focus is vulnerability reduction in terms of potential that is adversely affected by the climate extremes. The efforts mostly highlight on short term emergency and distress relief (Macrae 2002). However, the short-term relief has not always been concerned with the root causes of vulnerability and may to consider the facts of why people are unable to cope nor creates opportunity through social, environmental and structural processes (Chambers 1989). Additionally, funding of humanitarian interventions is mostly devoted to meeting short term relief as opposed to long term development. Additionally, the rehabilitation and recovery phases of the adaptive cycle (Holling & Gunderson 2002) also have been funded insufficiently and it is often claimed to be the responsibility of the affected states where the states are too poor to support this funding (Walker et al. 2005).

Moreover, development agencies are likely considering vulnerability because of traditional emphasis on economic development. Humanitarian actors are sharply under pressure to address risk in relief operations through so called "development- relief ". However, the short term funding cycles and the complex interactions between vulnerability and development discourages consistent and concerted responses (Christoplos, I. 2003).

2.3 Transforming short term coping response to long term adaptation

According to Kelly and Adger (2000), coping is the ability to respond to an occurrence of harm and avoid its potential impacts. Whereas adaptation is the ability to transform structures, functions or organizations to survive under hazards threatening existence (Kelly, P. M. & Adger, W. N. 2000) . It is the immediate response to hazards as well as adaptation that produces long term strategies for changes in institutional framework (Birkmann & von Teichman 2010).

Climate change adaptation is an adjustment in natural and human systems in response to actual and expected climate stimuli or their effects. This mitigates harm and exploits benefit opportunities (Parry et al. 2007). Climate change adaptation aims to reduce vulnerability to expected climate change, but the concept is very broad and the strategies exist by local and global scales from community level responses through to local, national, and international government interventions. The strategies include improvement in agriculture and climate resilient livelihoods, such as crop diversification, hazard resistant crop varieties, high yielding varieties, risk assessments and associated plans, the protection of livelihood resources, early warning systems, disaster risk reductions, capacity development and the consideration of underlying causes of vulnerability through development efforts or other externally initiated activities (Mercer 2010).

Adaptation in the context of anthropogenic aspects of climate change refers to a process, action or outcome in a system (national, local, household level) that can manage, cope or adjust to changing conditions, hazards or risks. Smit et al (2000:225), refers adaptation in the climate change context as *" adjustments in ecological and socioeconomic systems in response to actual and expected climatic stimuli, their effects or impacts*" (Smit et al. 2000) ;p225 . According to Pielke (1998:159) defined adaptation as- "*adjustments in individual groups and institutional behavior to reduce the vulnerability in the society to climate change*" (Pielke Jr 1998);p159.

Furthermore, the term "adaptation" to human systems has been used both explicitly and implicitly in the social sciences to include natural hazards, political ecology, entitlements, and food security. Some scholars, defined adaptation by concerning the concepts regarding biophysical and ecological change, focusing on the flow of matter, energy and information that acknowledge the related concepts of resilience, equilibrium, rehabilitation and adaptive management (Holling & Gunderson 2002). Others define that natural adaptation is implicit in the political ecology, where the relationships between ecosystems and the political economy are often treated as issues of adaptive management of risks that address political and social power relations, resource uses and global economies(Blaikie et al. 2004; Walker et al. 2005). Additionally, entitlements and food security consider adaptation as a stress response that focuses on resources and the abilities of people to cope(Adger & Kelly 1999; Adger, W. N. et al. 2007). The key feature of the field is its demonstration of how the adaptive capacity of

individuals or households is shaped and constrained by social, political, and economic processes at higher scales (Smit & Wandel 2006).

Climate change adaptation is an adjustment in natural or human systems. It is generally perceived to include an adjustment in social–ecological systems in response to actual, perceived, or expected environmental changes and their impacts through prevention, mitigation, and preparedness (Hossain & Huq 2013). In addition to reduction of vulnerability and increased adaptation requires longer term measures related to strengthening local institutions and economic opportunities for all inhabitants (Eriksen & Naess 2003).

Thereafter, resilience is considered as a process of transformation (Cutter et al. 2003) and it is as moves beyond coping strategies towards enhancing longer term development (Béné et al. 2012). The important measure of resilience is the magnitude or scale of a disturbance which can be absorbed within the system structure and the processes that control the system behavior. Systems are seen to be complex, non-linear, multi equilibrium and self-organizing that is constructed by uncertainty and discontinuities. Thus, resilience is a measure of the robustness of the buffering capacity of the system to changing conditions (Folke et al. 2002).

2.4 Community based adaptation to climate change

Community based adaptation to climate change is a community led process that prioritizes needs, knowledge, and capacities that should empower people for and to cope with the impacts of climate change (Reid et al. 2009). Community based adaptation involves poverty reductions and livelihood benefits as well as reducing vulnerability to climate change and disasters. It is difficult to distinguish additional "adaptation components" by identifying communities that are most vulnerable to climate change and required assistance for the communities. It may also promote working with communities to cope with a disaster. International development organizations and donor funding usually works with local partners and community groups that already have the trust of local communities (Kelman et al. 2009).

Community based adaptation (CBA) supports and builds on autonomous adaptation to climate variability and change. Most importantly, CBA is a participatory process that involves both local stakeholders, development and disaster risk reduction practitioners for building local capacity towards resilience that contribute to climate vulnerability (Brooks 2003). Adaptation does not facilitate overnight or instantaneously, a high level of adaptive

capacity that will reduce vulnerability to hazards occurring in the future or the hazards that involves slowly change over a relatively long period of time. Community based adaptation (CBA) considers that adaptation strategies must be participatory, involving local stakeholders and disaster risk reduction practitioners in vulnerability reduction by the local knowledge of climate variability and extremes (Ayers & Forsyth 2009). It is a community driven agenda for planned adaptation, which emerged from the "top down" managerial approach. The approach tends to be more the remit of NGOs and civil society organizations in community development within developing countries. CBA emphasizes empowering local communities to identify and pursue their own needs for climate change adaptation and acknowledges the linking of national and international funds for local adaptation (Coirolo 2013).

Both climate change and development initiatives are, indeed, emphasized on the participation of the communities to formulate and implement the disaster and poverty reduction measures. Generally, disaster is not natural, but a complex interplay of social, political, environmental, and economic factors, strongly linked to development and can interact with hazards to become disasters (Blaikie et al. 2004). According to IPCC 2007, there currently exists a huge wealth of knowledge in relation to "*adapt to change*" and " *dealing with disaster*". However, vast arguments exist that climate change resulting from human activity is likely a significant long term global disaster (Parry et al. 2007).

The "bottom up" practice is termed as Community based adaptation (CBA) where the participation and involvement of the community members are viewed as the core in considering the factors that render them vulnerable and the needs and opportunities for reducing those vulnerabilities (Huq et al. 2006; Huq & Reid 2007; Pouliotte et al. 2009; Smit & Wandel 2006). In lieu of implementing predetermined stimuli and theoretical responses to climate change adaptation, CBA emphasis on understanding community experiences of vulnerability and adaptation strategies that address that particular community (Huq & Reid 2007).

The CBA Framework presents a range of “enabling factors” in household/individual, community/local levels for effective community-based adaptation. The Community based adaptation (CBA) framework is as follows:

Table 1: CBA framework for the community level and household level.

	Climate-Resilient Livelihoods	**Disaster Risk Reduction**	**Capacity Development**	**Addressing Underlying Causes of Vulnerability**
Local Government/ Community Level	* Local institutions have access to climate information * Local plans or policies support climate resilient livelihoods * Local government and NGO extension workers understand climate risks and are promoting adaptation strategies	* Local institutions have access to disaster risk information * Local disaster risk management plans being implemented * Functional early warning systems in place * Local government has capacity to respond to disasters	* Local institutions have capacity to monitor, analyze and disseminate information on current and future climate risks * Local institutions have capacity and resources to plan and implement adaptation activities	* Local planning processes are participatory * Women and other marginalized groups have a voice in local planning processes * Local policies provide access to and control over critical livelihoods resources for all
Household/ Individual Level	* People are generating and using climate information for planning * Households are employing climate resilient agricultural Practices. * Households have Diversified livelihoods, including non-agricultural strategies * People are managing risk by planning for and investing in the future	* Households have protected reserves of food and agricultural inputs * Households have secure shelter * Key assets are Protected * People have access to early warnings for climate hazards * People have mobility to escape danger in the event of climate Hazards.	* Social and economic safety nets are available to households * Financial services are available to households * People have knowledge and skills to employ adaptation strategies * People have access to seasonal forecasts and other climate information	* Men and women are working together to address challenges * Households have control over critical livelihoods resources * Women and other marginalized groups have equal access to information, skills and services * Women and other Marginalized groups have equal rights and access to critical livelihoods resources.

Source : CVCA handbook by Care (Dazé et al. 2009)

2.4.1 Disaster Risk reduction

Disaster risk reduction(DRR) is an essential criteria of effective disaster risk management that includes early warning systems, disaster preparedness programs, response, and recovery (Mercer 2010) . DRR is multidisciplinary in nature and includes hazard, vulnerability, and capacity assessment. Moreover, these strategies promote a community's ability to reduce their own disaster risk, by identifying those hazards and their solutions (Blaikie et al. 2004; Mercer 2010).

DRR strategies view disasters as socioeconomic and political in origin, reflecting a school of thought established in the 1970s, determining that disasters are unavoidable " natural events" that need to be managed as opposed the prior management of risk reduction(Blaikie et al. 2004). In Bangladesh, strong funding is allocated to social safety nets that might be a potential area of DRR for enhancing resilience in community based integrated interventions for vulnerability reduction(Islam & Sumon 2013).

2.4.2 Climate resilient livelihoods

A key element of future adaptive capacity is for people to have a range of options available for sustainable livelihoods. A livelihood can be defined as the capabilities, assets, and activities that are required for means of living (Chambers & Conway 1991). The concept of sustainable livelihood brings together the critical factors of assets and activities that affect the vulnerability or strength of household strategies (Ellis 2000). People can access, build, and draw upon capital assets or resources as human, natural, financial, social and physical by combining and transforming those assets through relationships with other humanitarian actors. Livelihood strategies are the range and combination of activities and choices that people make in order to achieve livelihood outcomes (Badjeck et al. 2010)

2.4.3 Capacity development

Capacity development is particularly focused on institutional effectiveness and community preparedness in the process of adaptation. Income generating activities train the communities to enhance their adaptive capacity. The table below shows how capacity development contributes in Community based adaptation by the UNDP project CBA-CCCF in Bangladesh.

Table 2: The contributions of the CBACC-CAF to adaptive capacity in Bangladesh

Major contribution	Sectors	Descriptions
Infrastructural adaptive capacity	• Protection Physical resources.	• Community driven Coastal Afforestation of over 6000 ha.
	• Food security	• Developing climate-resilient cropping systems and technologies for food security.
Institutional adaptive capacity	• Emergency planning	• Improvement of early warning systems for climate extremes.
	• Strengthening the institutions and Capacity building.	• Revising national and local policies to "build back better" response.

		• Raising public awareness on climate change and training to enhance capacity.
Enhancing community and social adaptive capacity	• Technology transfer	• Disseminating appropriate technologies and practices in the livestock, fisheries and health sectors.
	• Livelihood protection	• Identification and targeted assistance for vulnerable socio-economic groups and climate resilient livelihoods.

Source: CBACCCF adaptation project, Bangladesh (Rawlani & Sovacool 2011)

In essence, capacity development links both institutional and community strengthening through adaptation to climate change. Capacity development enhances different sectors of development that will also reduce the cost and assistance in the immediate aftermath of any climate hazards.

2.4.4 Underlying causes of vulnerability

Underlying causes of vulnerability to climate also include poverty, gender, power relations, voice, and other social aspects. Climate change is a major concern for the poorest people in developing countries (Adger et al. 2003). Disasters only happen only when a natural hazard impact negatively on vulnerable people (Cannon 2002) and vulnerability in Bangladesh, particularly, is linked with poverty and gender. Moreover, the power relations and conflict over common-pool resources or the conflict between the community and the government are also been addressed in the adaptation process.

In addition to access to physical resources and critical infrastructures, such as roads, cyclone shelters and telecommunications, play a role in the adaptive capacity of the people. However, conflict and stresses associated with climate change and environmental degradation can limit people's ability to facilitate adaptation in the context of climate change (Dazé et al. 2009).

2.5 Institutions and organizations to promote adaptation

Humanitarian organizations and institutions play a major role in keeping acute human suffering on the global agenda due to early warning systems and disaster risk reductions. However, disaster risk management must be practiced by concerning both development and humanitarianism (Christoplos 2003). Humanitarian assistance mainly focusing to reduce

human suffering and improve livable life conditions, like emergency assistance in a conflict, natural hazards or complex emergencies (Khasalamwa 2009).

The existing gap between short term and long term humanitarian assistance are in the understanding of how institutions influence the transformation of short term coping capacity to long term adaptation. Undeniably, some humanitarian actors are gradually shifting from only addressing the immediate effects to dealing with the challenges in a more sustainable way by reducing the future impact of climate hazards. Thus, they implicitly and explicitly address such issues like poverty reduction and long term development (Khasalamwa 2009). Donor states are also considering humanitarian action through the political effects of saving and protecting lives. The more comprehensive nature of humanitarianism demonstrates a growing belief that the value of saving lives supports a truer meaning if these lives are also spared from the deprivations that made them vulnerable in the first place (Macrae 2002).

Indeed, institutions provide the rules of the game in a society and it is these humanly operated constraints that shape human action (North 1989). Institutions are the ‘‘*regularized patterns of behavior between individuals and groups in society*’’ whereas organizations are defined as ‘‘*the players, or groups of individuals bound together by some common purpose to achieve objectives*’’(Hossain & Huq 2013);p172, (Leach et al. 1999). It is also very important for fostering adaptive capacity (Adger & Vincent 2005; Berman et al. 2012; Brooks 2003). North (1989), defined institution as the formal legal rules and informal social norms that govern the behavior and shape individuals and organizational interactions (North 1989). Thus, institutions are characterized by rules, norms and cultural beliefs (Scott 1995) .

Agarwal (2010:8) claimed that understanding the role of institutions in shaping adaptation is very important. He also said that,

> "*Adaptation to climate change is highly local and its effectiveness depends on local and extra local institutions through which incentives for individual and collective action are structured*". (Agrawal 2010); p8).

The study and exploration the dilemma of humanitarian interventions and adaptation in Char Kukri Mukri should be considered by Government organizations, NGOs, and cooperatives partners or stakeholders who are implementing the interventions and shaping the adaptation responses to protect livelihoods.

2.6 Role of local institutions for reconciling humanitarian interventions and adaptation

According to Agarwal (2010), adaptation to climate change is inevitably local and institutions influence adaptation and climate vulnerability in three critical ways. Firstly, local institutions structure the climate change impacts and vulnerability. Second, they mediate between individual and collective response to climate impacts and consequently shape outcomes of adaptation. Last, they act as the means of delivery of external resources to facilitate adaptation and thereby govern access to such resources (Agrawal & Perrin 2009) . The proposed framework of Adaptation, Institutions and Livelihood (AIL) by Agarwal (2009) should be a effective framework for the study that will explain local institutions compiling external interventions or humanitarian interventions in facilitating adaptation practice and livelihood outcomes of the Households and collectives (Agrawal & Perrin 2009). The framework will be explored through a social and ecological context (Institutions that shape risk output) for adaptation practices and livelihood outcomes.

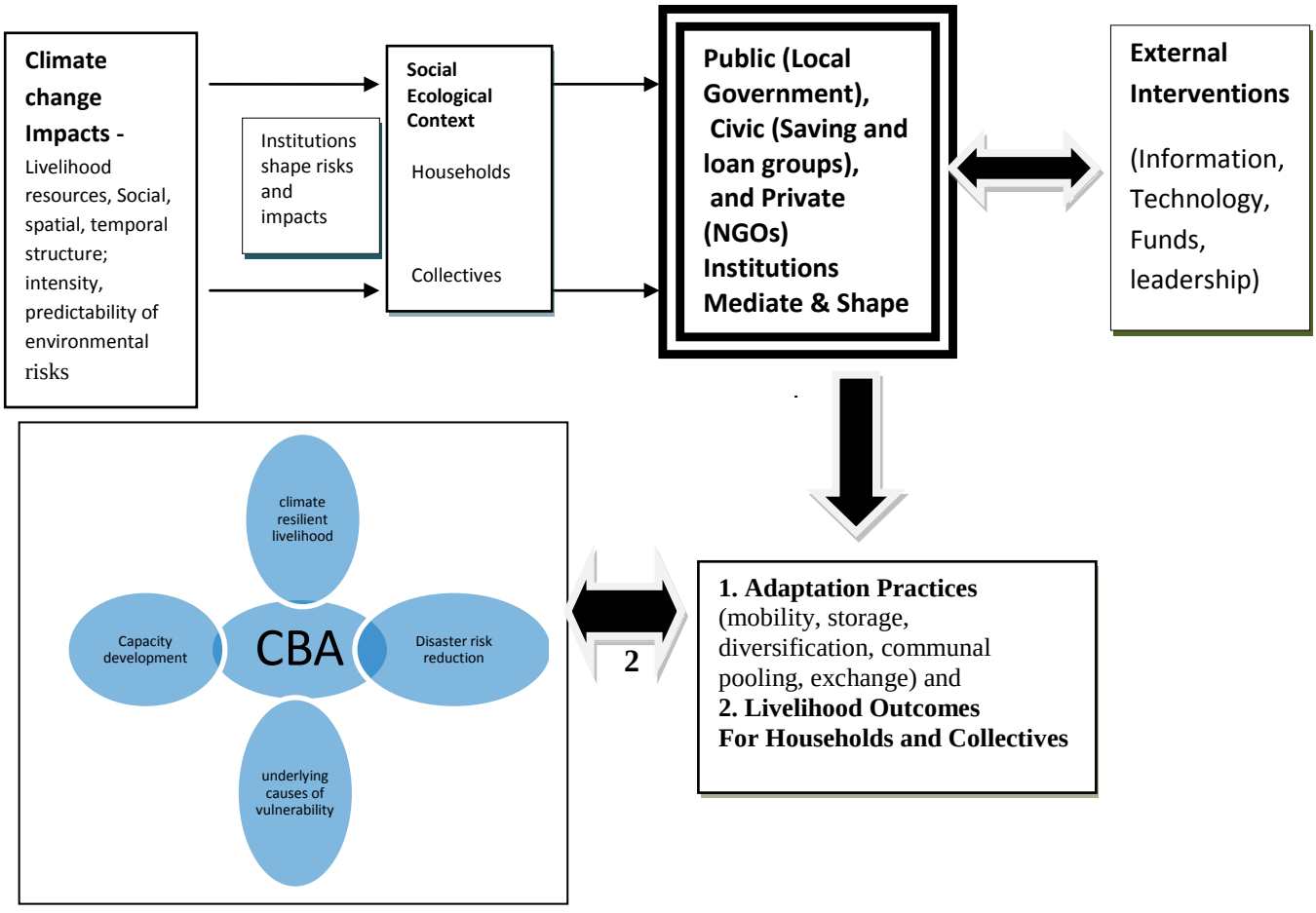


Figure 4: combining adaptation, institutions and livelihood perspectives (Agrawal 2010) with elements of a community based adaptation (CBA) framework of Care (Dazé et al. 2009).

According to the framework, local institutions along with external interventions (information, technology, funds, and leadership) mediate and shape adaptation practices and the livelihood outcomes in the community. External interventions or humanitarian interventions are very effective to mediate and shape the climate risks. Agarwal (2010) claimed that adaptation practices are successive on five specific strategies of institutional arrangements (Agrawal 2010); firstly, *mobility,* is a common strategy predicted by local communities and households. Secondly, *storage is* considered an effective measure against future livelihood failures or livelihoods lost. Thirdly, *diversification* of livelihood opportunities, consumption, productive or non-productive assets should remain in the practice. Fourthly, *communal pooling* which refers to adaptation responses of sharing wealth; incomes across households; mobilization of resources; equality and distribution collectively during emergencies. Finally, *market exchange* considers the most dynamic mechanisms for adaptation requiring well developed markets, exchange instruments and the widespread access of weather related insurance schemes for market-based adaptation to climate change.

Local institutions shape the impacts of climate hazards on livelihood through various institutional functions such as information gathering, disseminating climate information, mobilization, capacity building and linking to other stakeholders, and providing leadership in social groups or within the community (Agrawal 2010). Agarwal (2010) also contends that institutional linkages are critical to adaptation because of the flow of resources amongst themselves and towards households and social groups. He also referred institutional linkages are comprised of *institutional access* and *institutional articulation* **(**Agrawal & Perrin 2009) . *Institutional access* and *Institutional articulation* of Institutional linkages, both are very important to analyze the way local institutions shape adaptation practices and responses of climate hazards in any given context (Agrawal 2010). Thus, the linkages of humanitarian interventions and adaptation response will be explored by the combination of the AIL and CBA frameworks to reveal the implications of long term adaptation policy response.

Chapter 3

3.0 Methodology

The chapter will discuss the research methods that were used for data collection and address the objectives of the study. The outline of the research methods will be discussed thoroughly with a relevance to the research assumptions of the study. The chapter will present the research methods, study area and population, data collection, analysis, data presentation and the research process. The study draws on qualitative social research to describe the key research questions.

3.1 The qualitative research approach

A qualitative research approach has been chosen in order to provide a more in-depth study of the vulnerability of the local livelihood resources and the humanitarian interventions for protecting livelihood and building capacity against climate hazards in the study area. Qualitative research emphasizes words rather quantification in the collection and analysis of data, where the strategies are broadly inductive, constructionist and, interpretive (Bryman 2012). Bryman and Burgess (1999) described that, "qualitative research" has been taken sometimes to imply and appears to social research, where quantitative data has not been collected or generated (Bryman & Burgess 1999).

Berg and Lune (2012) claimed that, qualitative research methods collect and analyze data that focuses on words and includes interview and discourse analysis. It is often characterized by proximity and closeness to a small number of carefully selected respondents (Berg 2012). Sometimes the numbers and figures will not incorporate into account the situation needs and issues of vulnerability in social context. The main objectives of the research is to understand the major causes of climate vulnerability within livelihood resources and how different interventions helped local institutions to shape and mediate adaptation practices and livelihood outcomes.

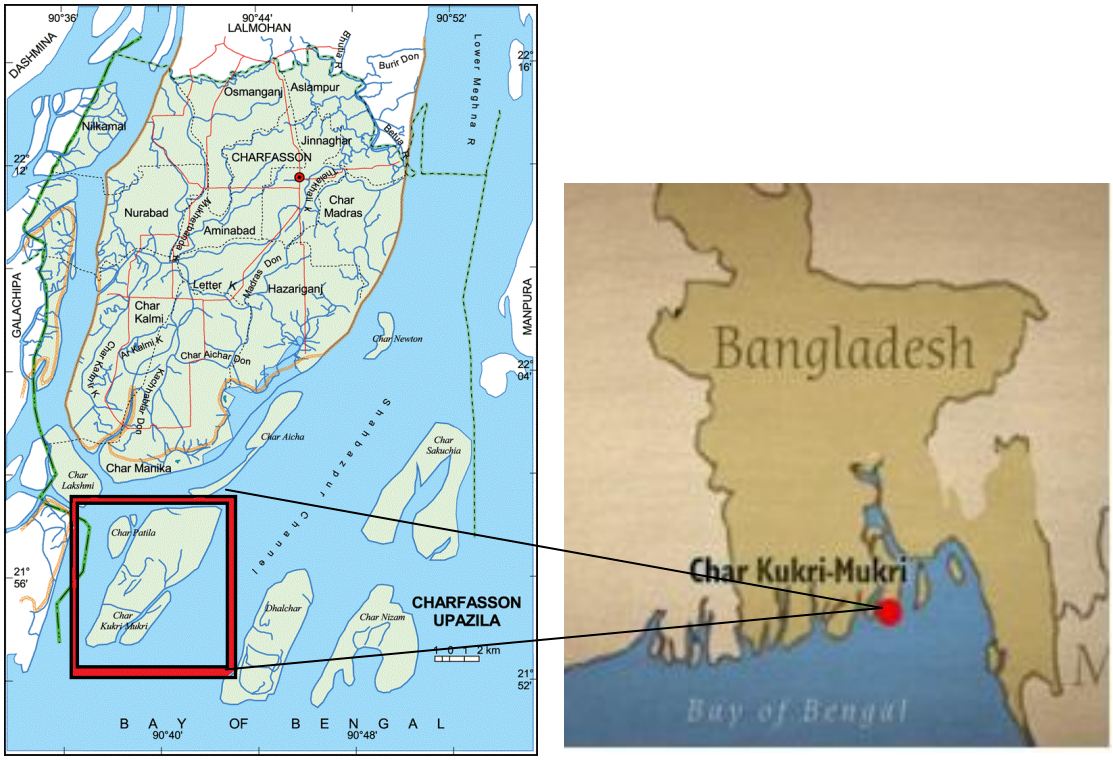
3.1.1 Case study research

Case study research is based on an intensive and detailed examination of a single example within a real life context (Yin 2013). It involves in-depth, place-based research that focuses on a particular exposure unit to characterize vulnerability and its determinants (Ford et al. 2010). Case study research has widely been used to address climate change impact on biophysical systems (Brooker et al. 2007). As well as focusing on climate vulnerability and long term adaptation responses, case study research should be considered to explain the

current impacts of policy response. Moreover, the case study research aims to at provide a detailed understanding of processes which are not adopted from other methods. It provides a methodological value through a focus on depth and enables a deep understanding of a phenomenon based on outcome or problems in a normal setting (Ford et al. 2010; Yin 2013).

3.1.2 Site selection and description

The study area is located in the Char Kukri Mukri Union, Charfasson Upazilla (sub district) of the Bhola district in Bangladesh. The study area is situated in a very risky coastal geographic location that faces gradual and sudden climate hazards. Thus, the livelihoods of the marginalized groups are also vulnerable to climate extremes. Accordingly, the humanitarian actors do more emergency assistance rather than recovery efforts focusing on the wider development projects towards adaptation. Therefore, the study area of Char Kukri Mukri is particularly suitable for exploring the linkages between short term humanitarian interventions and long term adaptation responses on both the local and household level.



Map 1: Char Kukri Mukri union in Bangladesh.

Bhola, is the largest deltaic island, off the coast of Bangladesh, which is located between 21° 54’ and 22° 52’ North latitude and 90° 34’ and 91° 01' East longitude at the adjacent border

of the Bay of Bengal Sea (Map 1). Bhola district has 7 Upazillas (Sub districts) and Charfasson is one of the sub districts which is constituted by more than 100 small *char* or newly accredited lands (IUCN 2011; MoEF 2005). The total land mass of Char Kukri Mukri is 36.79 square kilometers (BBS) and the climate of Charfasson is largely humid and tropical. According to the 2010 population census, the total population of Char Kukri Mukri is 11,214 inhabitants where 5713 persons are male and 5501 persons are female. Almost 99% of the people are Muslim where Hindus are the minority group in the community.

Most of the people in Char Kukri Mukri union are involved in fishing and agriculture for their livelihood. Others are also involved in day labor and forest-based livelihoods. Most of the livelihood resources have been affected directly or indirectly due to extreme climate hazards.

3.2 The research process

The qualitative research method is explained by collecting and analyzing the data and exposed to existing theory. The study addresses the objectives and research questions to evolve new insights from data collection and analysis. Both participatory tools and risk analysis tools have been used for vulnerability and adaptation assessment. In addition, the research process covers a discussion of data collection, interviews considering ethical practices and presentation of data quality.

3.2.1 Interviews

Interviewing is a particularly useful method for examining the social world of the research participants (Silverman 2010). PR (participatory research) based discussions in the *focus group* and *semi- structured* interview methods that were conducted during the data collection (Chambers 1994). According to Sue Wilkinson (1998), focus group research is a collecting method of qualitative data, which essentially involves a small number of people in an informal group discussion (Wilkinson 1998). In the group discussion, a particular tightly defined topic is emphasized within the group and achieves a joint construction of meaning (Bryman 2012). PRA (participatory rural appraisal) based tools were used to find the key results of the research question which, in the climate context, helps to understand the key drivers of livelihood vulnerability in Char Kukri. Participatory research tools and risk screening tools (CRiSTAL) were used for a better understanding of vulnerability to livelihood resources. The study had a *semi-standardized* interview for both the household and local/ community levels that have been adopted from the CVCA handbook (Dazé et al. 2009)

guiding questions. The study had topic list, some research questions for findings an *open-ended* questionnaire, free sequence and wording of responses within a *face to face* medium of communication.

3.2.2 Vulnerability and adaptation assessment

To assess the vulnerability and adaptation, PRA based discussions were conducted during data collection. The term (PRA) participatory rural appraisal (Mascarenhas et al. 1991) is being described as a growing approaches and method to enable local people to share, enhance, and analyze their knowledge to act (Chambers 1994). Chambers (1994:953), also referred that,

"*PRA is an approach and methods of learning about rural life and conditions from, with and by rural people*"(Chambers 1994);p953.

PRA has two dimensions - *sharing knowledge* and *sharing experience*. Sharing knowledge takes three main forms (Chambers 1994) such as,

- Local people share knowledge among themselves through group analysis and visual presentation.
- Local people share that knowledge with outsiders who restrain themselves from putting forward their own ideas.
- Outsiders, themselves, share what they have learned with each other and with local people.

Some of the significant methods of PRA are participatory mapping and modeling, transect walks, matrix scoring, calendars, change and analysis, well-being grouping and ranking by the local people (Chambers 1994). The following PRA activities were conducted by the focus group in discussing for assessing adaptation and livelihood outcomes, such as,

I. Vulnerability Matrix

II. Venn diagram

III. Seasonal calendar

IV. Hazard mapping

V. Historical timeline

The study conducted four focus group discussions in Char Kukri Mukri where two male and two female groups were utilized in the focus group discussions. The male groups were

comprised of both farmers and fishermen, whereas the female focus groups were comprised of minority Hindu religious groups (who are involved with CBACCCF project) and households groups. The focus groups were considered to differ by gender as the conservative social structure in the rural area of Char Kukri and to ensure that participants felt free to talk openly. The PRA based discussions aimed to explore the connections between humanitarian interventions and the drivers of vulnerability in the study area.

The vulnerability matrix shows the major resources that have been affected by climate hazards. Venn diagrams are the diagrams pertaining to the humanitarian organizations that have been oriented interventions in the study area. The seasonal calendar is a tool to quantify key events and the climate context in the area. Hazard mapping is a geographical representation of the Char Kukri Mukri union that maps the risk intensity of the climate hazards in the study area.

Guiding questions and suggested tools for gathering and analyzing data on a local level and on a household level were conducted in the study area. These guiding questions provide very useful insights for local government structures and the implementation of local policies and programs. The key interviewees for these guiding questions are local government representatives, chiefs of the local government, representatives of CBOs (Community based organizations), NGO extension workers and others who have face value in the community. The guiding questions were asked to almost thirteen interviewees (twelve men + one woman) in the study area for the local level. Before, asking these guiding questions, institutional mapping and secondary data were already collected.

3.3 Data collection

3.3.1 Design planning tool

The table below shows the methods of data collection that address the objectives of the study.

Table 3: Data collection methods that address the research questions of the study.

RQ sub-questions or main issues	Data needed to answer/cover these	Methods for collecting these data	Sample. Unit categories/sizes; site, setting
Determinants of livelihood vulnerability.	What types of resources are included to livelihood in the community What types of climate hazards the	Background, secondary data, PRA, Open ended questions.	- Non probability sampling. - Risk analysis summary (Appendix 8.1)

	community are facing		
	How the climate hazards affect livelihood resources.	Open ended guiding questions to household and community level.	-13 interviewers in local level. - 30 household interviews. - Risk analysis summary (Appendix 8.1).
Key Humanitarian Interventions which address climate vulnerability	- Which Humanitarian organizations are involved in the development of Char Kukri Mukri.	- PRA (Venn diagram).	- PRA based discussions in the focus group.
	How the interventions address the drivers of vulnerability at household level.	Guiding questions (Appendix: 8.3) interview of Household and Community level.	- 13 interviews in the community level and 30 household interviews.
	Role of local institutions by exploring the connections with livelihood vulnerability.		- Secondary data.

Source: Fieldwork 2014, Author

3.3.2 Analysis of data for the results

According to Bryan (2012), the main difficulties with qualitative research is that it relies very highly on prose in the form of media field notes, interview transcription or documents (Bryman 2012). The interviews and the focus group discussions had been conducted in the local language "Bengali" (Appendix 8.3). The guiding questions adopted from CVCA handbook (Dazé et al. 2009) were translated to Bengali in order to ask questions of households and local representatives.

After transcribing all types of data, coding has been done for categorizing the sequences. Coding is the starting point for most of the qualitative data analysis (Bryman 2012). In addition to, the data will be analyzed further by "narrative analysis". Narrative analysis is an approach to elicitation and analysis of data to the sense of temporal sequence of the people by which the interviewers or providers of the accounts or stories about themselves or events by which they are affected notifying in their lives and surroundings (Bryman 2012). The aim of narrative interviews is to extract interviewees and reconcile the events and context (Bryman 2012). Narrative analysis should be an appropriate approach for data analysis.

3.3.3 Presentation of data

The table below shows the process of data collection obtained from the field work during mid-October 2014 to the beginning of December 2014. During the field work, four focus group discussions were conducted and PRA based discussions revealed the key objectives of the study. The risk analysis summary (CRiSTAL) was also generated during participatory activities and discussion sessions. The presentation of collected data and methods are as follows,

Table 4: Presentation of data, collected from the field work

Types of Method	Gender	Livelihood Groups	Description
PRA based focus group discussions and risk assessment tools for the vulnerability assessment.	Male	Farmers	10 Farmers were attended in the discussion sessions. One of chief farmers (Md Habibullah Ponchayet) led the discussions in Union Parishad building.
	Male	Fishermen	8 Fishermen were participated in the Participatory activities during focus group discussions in a village shop, where the shop is considered the centre of the hazard mapping.
	Female	Housewives (Hindu minor groups)	Most of the women were UNDP led CBACCCF project beneficiaries and Hindu minor group. 12 women were attended in a school building.
	Female	Day labors / widows / Elderly poor women.	14-15 women participated in the discussion sessions. Most of them were elderly widowed women and extremely poor people.

Guiding Questions	12 Men + 1 Women	(Community level) Local government representatives, NGO extension workers, Political leaders, Chief of the livelihood groups.	These respondents were the core of the study. The humanitarian interventions and the updated project planning information had been collected in these sessions. Besides, the institutional mapping was checked by the NGO extension workers.
Guiding questions	20 Men + 10 Women	Households level (Diversified livelihood groups)	Transect walk and randomly selected households were asked these guiding questions for data collections.

Source: Fieldwork 2014

3.4 Triangulation

Triangulation is a method to construct validity and enhance quality and objectivity in the research process. Triangulation entails more than one method to source data for a particular study. It is an approach of using multiple observers, theoretical perspectives, and sources of data and methodologies. However, the emphasis has tended to be on methods of investigations and sources of data (Bryman 2012). During this study, in-depth triangulated by multiple scientific and research sources, academic articles, IPCC reports, government reports of Bangladesh, NGOs data and reports, research books, informant interviews, transaction walks and observations were all used to enhance the validity of this study.

Moreover, participating with humanitarian organizations (UNDP, Muslim aid, COAST trust, DORP) during their regular field visits and CBO meetings were very important for the data collection. Additionally, participating with these organizations also gave opportunities to understand the key problems, limitations, and adaptation needs. People in the field, or in the boat, shared their experience which was also important to figure out the underlying causes of vulnerability in the area. The field visit with NGOs also made the atmosphere more conducive to talking openly within the community and they did not hesitate to share their ideas in Focus group discussions, participations and interviewing on the local level and household level.

3.4.1 Ethical considerations in the Participatory research

Ethics in the research process was an acknowledged understanding that the researcher should not harm (Bryman 2012) anyone involved in the research process. Hence, the study considered three principles throughout the research process which are as follows:

1. Honesty, trustworthiness, and openness about research intent and activities.

2. Privacy of the informants was considered highly by letting them know that their acquaintances should be anonymous or confidential. The interviewers were informed about the research and the confidentiality.

3. Giving credit to the author of the secondary data and resources.

Large concerns about research ethics involved several issues of harm, consent, privacy, and confidentiality of data (Berg 1995; Punch 1994). Privacy can be replaced by anonymity. Bruce L Berg (Berg 1995), claimed that anonymity and confidentiality have quite distinct meanings. Most of the qualitative research subjects are known to the investigators, so anonymity is virtually nonexistent. Thus, it is important to provide the subjects with a high degree of confidentiality. Other scholars of research ethics believe that any kind of research should be conducted with the principles of respect for people, beneficence, and justice (Orb et al. 2001).

However, the data from the Focus group discussions were noted and checked the accountability of the data by cross checking answers with the guiding questions. However, I was careful to avoid mentioning the discussion with other interviewees in order to protect the confidentiality of the responses. On the other hand, some data was published in all focus group discussion in order to gather the best quality data.

3.4.2 Trustworthiness

The trustworthiness of qualitative research is mainly questioned by positivism , possibly because of their concepts of validity and reliability cannot be addressed in the same way in naturalistic work (Shenton 2004). Moreover, the trustworthiness, strength and transferability of the qualitative research are associated with the norms of validity, reliability and accountability of the research (Kvale & Brinkmann 2009). Validity refers to whether a method investigates what it was intended to investigate, reliability refers to the consistency and trustworthiness refers to whether findings can be reproduced by using the same methods (Kvale & Brinkmann 2009).

Guba and Lincoln (1994) proposed that it is necessary to specify the terms and ways of establishing and assessing the quality of qualitative research that provides an alternative to reliability and validity. They propose two types of primary criteria for assessing qualitative study such as *trustworthiness* and *authenticity* (Bryman 2012; Guba & Lincoln 1994). Moreover, *trustworthiness* is made up of four criteria such as *credibility, transferability , dependability,* and *confirmability (Guba & Lincoln 1994). Credibility* ensures that research is conducted to both the canons of good practice and submitting research findings to members of the social world. Lincoln and Guba claimed that ensuring credibility is one of the most important factors in establishing trustworthiness. The key criteria addressed by the positivists researchers to ensure the actual needs of the research (Shenton 2004).

T*ransferability* makes it easier for researchers to develop a preoccupation. Eventually, the results of a qualitative study must be understood within the context of particular features of organizations and geographical areas where the field work carried out. In the positivist work, the concern often lies in demonstrating that the results of the work can be applied to a wider population (Shenton 2004).Lincoln and Guba proposes the idea of *dependability* to the establishment of trustworthiness where researchers must adopt on " auditing approach" to keep all phases of research process such as problem formulation, study population, transcribing data, data analysis and so on (Lincoln & Guba 1990).

Confirmability emphasizes to ensure the understanding that complete objectivity is impossible in social research as long as the researcher can be shown to have acted in good faith (Bryman 2012). The term confirmability is the comparable concern to objectivity where the work findings are the result of the experiences and the ideas of the informants rather than the characteristics and preferences of the researchers (Shenton 2004)

3.5 Limitations

The study covers adaptation response on both the local level and household level. The primary data for the national level was not been conducted, rather secondary data will be utilized for national governance. In addition, the meteorological data of climate variability and precipitation is based on the Bhola district, as the specific data of Char Kukri Mukri is not available in the system. Besides, the hazard mapping of the study was performed in the first focus group discussions only and revised the mapping was used in the rest of the focus group discussions for the best result.

Chapter 4

4.0 Background

4.1 Geographical Background

Bhola is the largest river surrounded the deltaic district in Bangladesh. It is located between 21054’ and 22052’ North latitudes and 90034’ and 91001' East longitudes on the fringe of the Bay of Bengal (IUCN 2011). Charfasson is one of the sub-districts of Bhola and the Char Kukri Mukri is one of the unions of Charfasson sub-district. It is located in the southern part of Bangladesh next to the Bay of Bengal Sea. The area has been affected by cyclones, tidal surges, salinity and other climate hazards for a long time. Recently, the area faced three major cyclones, SIDR, AILA and Mohasen in the years of 2007, 2009 and 2011.

4.2 Climate variability and Climate change

Char Kukri Mukri is located in a remote area and the metrological data shows the climate variability in both rainfall and temperature patterns of the area.

4.2.1 Climate variability

4.2.1.1 Rainfall

The month of July has the highest average rainfall (471.3 mm), followed by June (445.3) and August (392.7) (Table 6). The maximum rainfall (2500 mm) occurs during the monsoon season (June, July, August & September).

Table 5: Average normal (from 1966-2013) rainfall (in mm) for Bhola.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Rainfall in mm	7.1	24.5	52.4	117.2	250.2	445.3	471.3	392.7	305.2	187.2	68.0	8.6

Source: Bangladesh Meteorological department (BMD 2014).

The figure below shows, the total annual average rainfall calculated over a 47 years period (1966 - 2013) with 2354.7 mm per year as the highest rainfall recorded as 3493 mm in 1971 and lowest value is in 1968 about 1255 mm (Figure 5). The data suggests a declining trend in rainfall patterns in the coastal areas of Bangladesh (Iqbal 2008).

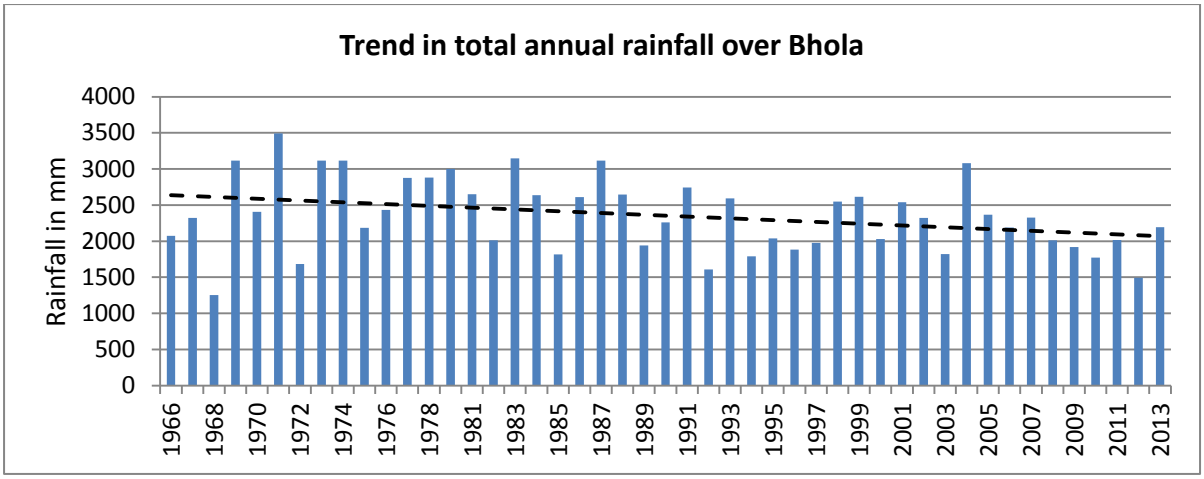


Figure 5: Trend in total annual rainfall over Bhola , Source: (BMD 2014).

The study of Quadir and Iqbal (2008) shows a very significant declining trend for all seasons in four relevant stations among the nine coastal stations. The data shows (Table 7) that the annual rainfall trend in Bhola district declined very sharply in all periods (winter, pre-monsoon, monsoon and post-monsoon) where the annual declining trend was (-66). He also suspected that changes in rainfall patterns can affect fishing communities by the movement of fishing boats and catching fish. Moreover, the changes also affect agriculture based livelihoods in the study area.

Table 6: Trends of differing seasonal rainfall (mm/10 years; 1951-2007) of four stations.

Station	Winter	Pre-monsoon	Monsoon	Post-monsoon	Annual
Bhola	-4.1	-9.4	-52.2	-1.05	-66
Barisal	4.35	20.3	-10.5	-5.05	8.7
Chittagong	7.03	39.17	-14.32	-2.51	-5.25
Hatia	4.75	24.94	83.52	-0.51	140
Note: Shaded box shows decreasing trend, white boxes shows increasing trend					

Source: Secondary data adopted from (Iqbal 2008; IUCN 2011)

4.2.1.2 Temperature

The temperatures of the coastal area are usually hot and humid. Hence, data of Bhola obtained from the Bangladesh Meteorological Department (BMD) shows an increasing trend of maximum temperature. The average maximum temperature rose up to 35.6°C in May whereas the lowest temperature is 9.4°C in January.

Table 7: Normal maximum and minimum temperature (1966 to 2013)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Maximum Temperature	28.6	31.9	35.2	35.5	35.6	34.5	33.3	33.7	34.2	34.2	32.3	29.4
Minimum Temperature	9.4	11.2	15.2	19.3	20.7	22.7	23.6	24.0	23.6	20.7	15.2	10.9

Source: Secondary data adopted from Bangladesh Meteorological department (BMD 2014).

The figure below shows the analysis of annual average maximum and minimum temperatures indicating an increasing trend along with the annual average minimum temperature (Figure 6). Analysis of the temperature data shows that between the years of 1966 to 2013, the temperature has increased by an average of 0.6º C (Iqbal 2008). The figure below also shows the deviation of 5 years moving average of maximum temperature of 47 years (1966- 2013) that indicate the climate variability of the area.

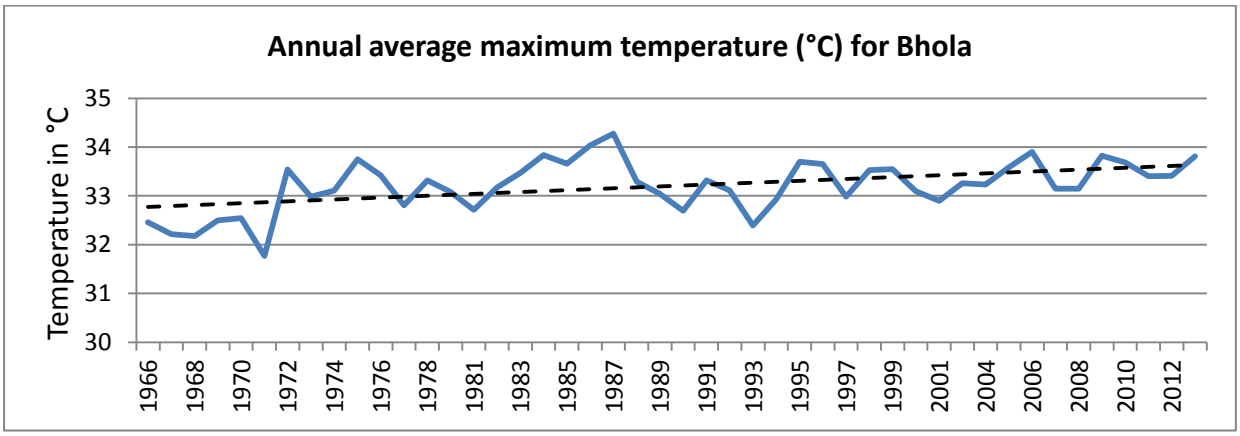


Figure 6 : Trend in annual average maximum temperature (°C) over Bhola (IUCN 2011)

Quadir & Iqbal (2008) in the report on tropical cyclones and coastal livelihood data analyzed for last 57 years (1950-51 to 2006), found increasing trends of maximum and minimum temperatures for 5 coastal stations (Table 9). They found that the annual trend in minimum temperature is higher than that of maximum temperature in the Bhola station, even in the winter and pre-monsoon period (Iqbal 2008).

Table 8: Trend of Minimum and Maximum Temperature of five selected stations in the Coastal zone of Bangladesh (1951-2006) (trend is in the unit of °C/10years).

Stations	Winter		Pre-monsoon		Monsoon		Post-monsoon		Annual	
	Tmin	Tmax	Tmin	Tmax	Tmin	Tmax	Tmin	Tmax	Tmin	Tmax
Bhola	0.32	0.15	0.27	0.07	0.23	0.28	0.08	0.27	0.24	0.19
Barisal	*-0.26*	0.03	*-0.12*	*-0.07*	-0.08	0.11	*-0.09*	0.26	*-0.13*	0.07
Patuakhali	0.03	0.18	0.18	0.41	0.34	0.4	-0.15	0.14	0.11	0.3
Chittagong	0.12	0.25	0.03	0.09	0.08	0.2	0.14	0.38	0.09	0.2
Hatia	-0.12	0.18	-0.02	0.21	0.18	0.29	*-0.1*	0.28	0.01	0.23

Note: The shaded boxes indicate the warming trends. The dark blue shaded boxes with italicized numbers indicate cooling trends. The rest of the boxes do not indicate a significant trend.

Source: Secondary data adopted from (Iqbal 2008)

4.3 Climate vulnerability

According to IPCC (2001) the definition that characterizes vulnerability to climate change as a function of a system`s exposure and sensitivity to climate stimuli and its capacity to adapt to adverse effects (IPCC 2001). The climate vulnerability of Char Kukri Mukri can be explained through the IPCC defined vulnerability to investigate the determinants of vulnerability of the study area.

4.3.1 Exposure and sensitivity

The repeated climate extremes, especially cyclones, make the area very vulnerable. Moreover, the tidal surge, salinity intrusion, drought, erosion, rising sea levels, etc, also threaten the ecological conditions of the area. The current and the observed climate hazards are as follows:

4.3.1.1 Tropical Cyclones

Generally, tropical cyclones are considered the deadliest of all natural calamities (Susmita das gupta 2004). The Bay of Bengal is an ideal breeding ground for tropical cyclones and depressions. The funnel-shaped geographic configuration makes the coastal area very hazard prone (Hossain et al. 2012). Cyclones forming in the Bay of Bengal contribute only 5–6% of the world total Cyclones, but they are the deadliest of all cyclones (Paul 2009). Thus, the study area of Char Kukri Mukri is situated beside the Bay of Bengal and is prone to climate hazards due to geographic location.

In the Bay of Bengal, for a period of 131 years (1877-2007), a total of 539 tropical cyclones were formed (Iqbal 2008). Among them 154 cyclones with cyclonic storms and tropical depressions hit the coastal area of Bangladesh within a period of (1877-1995) 200 years (Hossain et al. 2012). In 1970, one of the deadliest cyclone hit the Bhola coast of Bangladesh (Cyclone Bhola) and the next one hit in 1991 (Cyclone Gorky) that had the return period of 21 years. The last one is Sidr, which hit the coast of Sundarban, Patuakhali on 15 November 2007 and had the return period of 8 years. However, cyclone Aila in 2009 and cyclone Mohasen in 2013 were also very extreme, but not deadly, where the wind speed was less than 100 km/h. In 2007, cyclone Sidr had an average wind speed of 223 Km/h and caused almost 4234 deaths and 55,282 causalities. After a 20 months return period, cyclone Aila caused 190 deaths with an average wind speed of 95 Km/h. The estimated loss of assets is USD $270 million and 3.9 million people were been affected by the cyclone (Susmita das gupta 2004).

4.3.1.2 Sea level rise

The meteorological research council of the SAARC investigated further on sea level rise in the Bay of Bengal Basin on 22 years` worth of empirical data. The research council observed that, the sea levels in the southern coast of Bangladesh had been rising by almost 6 mm/ year in the last century (Karim & Mimura 2008). The result shows that the rate of sea level rise along the coast of Bangladesh is higher than the global rate of 1-2 mm in the last century. Based on IPCC reports and sea level rise available studies, the NAPA of Bangladesh predict a sea level rise of 14, 32 and 88 cm for the years 2030, 2050, and 2100, respectively (Karim & Mimura 2008; Shamsuddoha & Chowdhury 2007). In addition, sea level rise is causing increasing risks of flood, water logging, and tidal surges. Almost 18% of the total land mass might be inundated by a 1 meter sea level rise and tidal surges (Shamsuddoha & Chowdhury 2007).

Moreover, the coastal farmers are changing their cultivation patterns due to a heavy inundation of sea level rise. The secretary of Char Kukri Mukri union council reported that,

> "*Four years back, farmers cultivated chili plants and got the matured production on time. The water rose in the field after the cultivation. Three years back, the water rose in the field when the chilies were raw. However, recently the water rose in the agricultural land where they have very young chili plants. The water inundation affects the agricultural land due to tidal surge*".

The statement above explains that the water inundation washed the plants drastically before the expected time of the season. The respondents claimed that sea level rise can be observed to inundate the area. Some respondents also claimed that sea water is salty and the inundated

water that washed out their cultivation was also salty. The water from the river or canal is not especially salty and they can observe that saline water in their surroundings is a sign of rising sea levels.

4.3.1.3 Saline intrusion

The coastal areas of Bangladesh have already been inundated by salt water which is spread by climate change induced rising sea levels (Shamsuddoha & Chowdhury 2007). The salinity is less during the rainy season and high in the dry season. Dry soil salinities are generally classified into the following numbers based on electric conductivity (IUCN 2011).

Slightly saline	=	< 4 dS/m
Slightly to moderately saline	=	4-8 dS/m
Moderately to highly saline	=	8-15 dS/m
Highly saline	=	>15 dS/m

In Charfasson, the salinity level of the soil in soil is more than >15 dS/m, which indicates high soil salinity. Usually, salinity of less than <4 dS/m are within the tolerance of the commonly grown crops and the vegetation of the area. The salinity level of 4 dS/m is considered the threshold level (for soil salinity). Moreover, the tolerance limit for (surface water) fresh water vegetation and aquatic communities by electric conductivity is 5 ds/m. The salinity of the ground water in Char-fasson is > 10 ds/m and the ground level salinity in Char-fasson is about 2 to 5 ds/m which is beyond the threshold limit (Kaudstaal 2003).

Salinity intrusion on the Bangladesh coast is seasonal. During the rainy season (June-October), intrusion of saline water is minimal because of the extreme flow of water. In addition, salinity intrusion directly affects directly to estuaries and contaminates the ground water as sea level rise and river flow decrease. Consequently, water supplies for agriculture, daily consumption, and industrial uses had been severely affected (Rawlani & Sovacool 2011).

4.3.1.4 Tidal surge

Tidal surges are atmospherically fluctuated by the water level in coastal or inland water systems. The surges are usually generated by wind stresses and atmospheric pressures that produce a rise in water level. Naturally, the tide is an astronomical phenomenon which is caused by the gravitational attraction of the sun and moon on the earth system. Whereas,

storm surges are a meteorological phenomenon (Mirza 2002). The storm surges usually happen along with the tropical cyclones. In Bangladesh, the maximum height of a storm surge had been reported up to 13.6 m in 1970 during Cyclone Bhola (Chowdhury 2003). The villagers of Kukri Mukri reported that "*the vegetation and the agriculture farm or even the trifles had been diminished from Kukri due to tidal surge*".

Cyclone Bhola, in 1970, also affected the Char Kukri Mukri union dreadfully with tidal surges where almost 80% of the surroundings and lives had been washed out. Tidal surge inundated the salinity of the water with tremendous current flow that destructs the resources and surroundings.

4.3.1.5 Drought and erosion

Drought and erosion are the new observed climate hazards in the Char Kukri Mukri. The participatory hazard mapping shows that, drought usually affects huge land areas, especially Babugonj, Hajipur and Shahbajpur village in Char Kukri Mukri union. The phenomena of drought had been introduced after the Cyclone Aila in 2009. The frequency and intensity of drought covers four wards of the union. On the other hand, erosion can be seen in the wards no 8 and 9 (Char Patila) is in Char Kukri Mukri.

4.3.2. Humanitarian interventions for enhancing adaptive capacity

Humanitarian interventions and practices include the activity which aims to ameliorate of human suffering and enhancing the human condition by promoting emergency assistance (Khasalamwa 2009). The more inclusive humanitarian assistance nature emphasizes an emerged belief that the value of saving lives has the true meaning (Macrae 2002). The more adaptive capacity of any state determined the ability to adjust with the system as well as less vulnerable to climate change and variability (Engle 2011).The short term funding of the complex interactions between vulnerability and resilience debates discourage concerted and consistent efforts (Christoplos 2003; Khasalamwa 2009). However, humanitarian agencies and NGOs play a major role by focusing on the human miseries through both early warnings and disaster risk areas to improve the quality of humanitarian response (Khasalamwa 2009).

The humanitarian organizations which worked in the study area are UNDP, Muslim Aid, DORP, COAST, Actiona aid, Sushilon, Ujjibito, Red Crescent (Netherlands), WFP (world food program), Disaster and relief ministry Bangladesh, Forest ministry Bangladesh, Ma Moni, and others. Among them, UNDP, Muslim aid, COAST trust and DORP are the four organizations that have major adaptation response. These responses also include

humanitarian interventions in the respect to technical support to reactivate water reservoirs, shelter support with the provision of resettlement, emergency medical services and sanitation programs, and economic safety nets for protecting the livelihoods in Char Kukri Mukri. The table below shows the humanitarian interventions and adaptation responses that mediate and shape the policy response of adaptation in Char Kukri Mukri union.

Table 9: Humanitarian interventions and adaptation response to climate hazards in Char Kukri Mukri

Humanitarian Organizations	**Humanitarian Interventions**	**Adaptation response or Development projects**
UNDP (United nation development program)	➢ 2 Km Street plantation ➢ 4.07 Km coastal embankment that incorporate Bangladesh Water development board ➢ Input distribution ➢ Emergency relief	➢ CBACCF Community based adaptation to climate change through coastal afforestation) project. ➢ The "Auto reservoir model" and " Ditch and Dyke model" both are structured by "FFF" (Fish, forest and food) model. ➢ capacity development
Muslim Aid	➢ Short term emergency relief after cyclone Aila. ➢ CFW (Cash for work) ➢ CFT (Cash for training) ➢ UCG (Unconditional cash grant) ➢ Food distribution ➢ Shelter distribution ➢ Sanitation ➢ Tropical distribution	➢ Early disaster preparedness for safer community (UMCOR-EPS) project. ➢ School management committee reestablishing as disaster management committee. ➢ Skill development
COAST trust (coastal association for social transformation)	➢ Input distribution ➢ Medical assistance ➢ Emergency relief distributions. ➢ Temporary shelter distribution ➢ voluntary assistance ship	➢ Credit program (Micro credit, Livestock loan, Seasonal loan). ➢ CLS (community legal services) Provides free consultancy on women and children rights ➢ C4D (Community for development) also Promotes eleven messages for sanitation and health. ➢ Paramedics
DORP (Development organization of the rural poor)	➢ Water , sanitation and hygiene promotion ➢ Nutrition for the child and	➢ Wash Plus ➢ Spring (nutrition)

	pregnant women ➢ Sinking Tube-well for drinkable water (15). ➢ Sanitary latrine building in the communities (Sato pan distribution). ➢ Hand washing device (Drum / tape), Water container distribution in the school and Madrasa.	
Red crescent Society	➢ Early Warning system ➢ Disaster preparedness program ➢ Voluntary assistance to move the people in an emergency.	➢ Disaster preparedness committee.

Source: Field work 2014 by Author

The humanitarian actors are trying to disseminate adaptation as a policy response in Char Kukri Mukri. Short-term humanitarian relief in the immediate aftermath of any hazards plays a critical role within the provisions of recovery efforts. However, long term adaptation focuses on wider development strategies for helping people survive, rebuild, and restore their livelihoods. Consequently, the humanitarian agencies played a role in both emergency assistance and adaptation response to enhance adaptive capacity and protect livelihoods of the area. Most of the humanitarian agencies reported on their assistance in Char Kukri Mukri after Cyclone Aila in 2009. The humanitarian organizations like UNDP, Muslim aid, COAST trust, DORP have their adaptation projects within the study area, but these actors also do interventions in respect for both humanitarian prospect and development prospects.

For instance, UNDP led a coastal adaptation project to increase the adaptive capacity of the area where the supporting interventions protect the livelihood of the marginalized groups. Hence, the adaptation responses that included disaster risk reduction and capacity development also increased the adaptive capacity of the area and reduced the climate vulnerability. Therefore, the developmental components of the adaptation response presume to reduce the emergency assistance in the immediate aftermath of any hazards. Muslim Aid, Coast trust, DORP and other humanitarian agencies promoting adaptation and development based response that will reduce the concern of humanitarian assistance in the study area.

Chapter 5

5.0 Findings of the study

The chapter is comprised of two parts with regard to findings of the study. The first part is an investigation of affected livelihood resources, particularly on the main drivers of climate vulnerability in the study area. The second part explores the implications of humanitarian interventions and adaptation response adaptation that addresses the determinants of livelihood vulnerability at the local and household level.

5.1 Impacts of climate hazards on livelihood resources in Char Kukri Mukri

The section will address the first major research question where livelihood resources are vulnerable and identifying the key drivers behind livelihood vulnerability to climate hazards in Char Kukri Mukri within the view of social ecological context.

5.1.1 Climate focused PRA activities: Socio-ecological context

The primary results of the field work are comprised of the outcomes of the focus group discussion at the local and household level by using PRA activities. Consequently, few guiding questions were asked to both local and household level respondents (Appendix 2). The table below illustrates the key findings obtained from the PRA activities in the focus group discussions among different livelihood groups.

Table 10: key findings of participatory tools in the study area

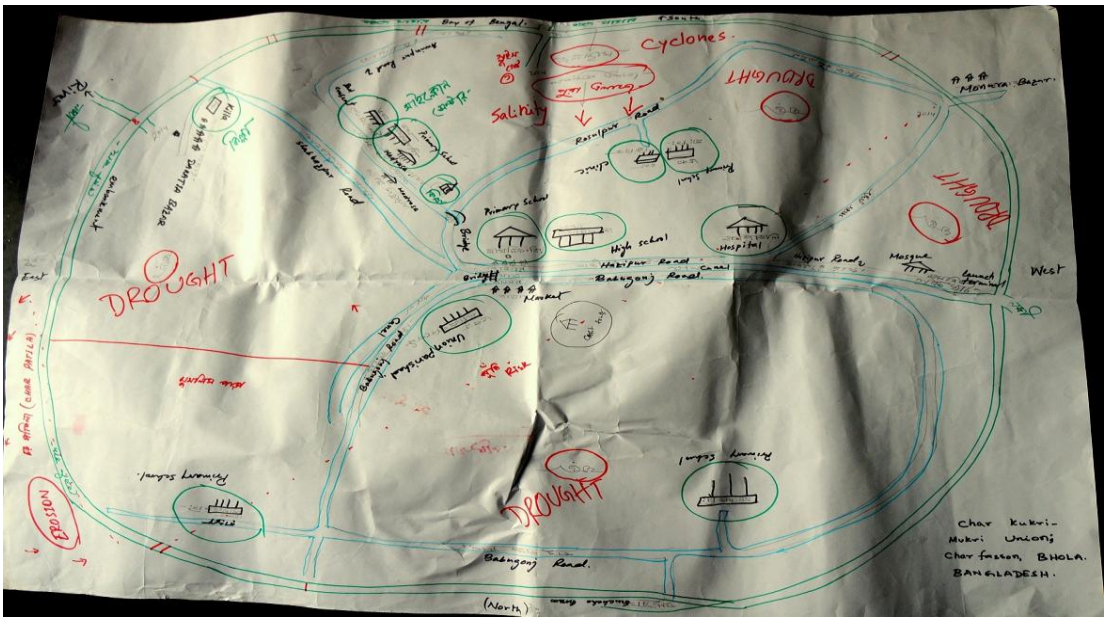
Participatory practice Tools	Findings
Hazard mapping	• The southern part (Aminpur, Rosul-pur village) of Char Kukri Mukri is most vulnerable villages to climate hazards. • The key hazards are cyclones, tidal surges and salinity. • The Kukri union is covered by the coastal embankment except wards 8 and 9 (Abdullah pur and Sharifpara village consecutively). Besides there are no sluice gates to control saline water access to the area. • Drought is new type of gradual hazards which has an indirect affect on resources.

Seasonal calendar	• Rice farming is seasonal for one period. • Those who are farmers are also fishermen but people are unemployed in the summer due to lack of diversified livelihood. • People also migrate to nearby cities in the critical periods.
Historical timeline	• The Char Kukri Mukri is very hazard prone. • The intensity of climate hazards have been very frequent in the recent years. • Cyclones and tidal surges are the key hazards in the area.
Vulnerability matrix	• Cyclones and tidal surges are the most severe sudden hazards in the area. • Salinity, drought, sea level rise have indirect impact on livelihood resources.
Venn diagram	• The area is divided by short time and long term interventions by different institutions and organizations. • UNDP, Muslim aid, COAST, DORP, Red Crescent have the key interventions in both adaptation and development aspects.

Source: Field work 2014 by Author

The hazard map of the Char Kukri Mukri indicates the intensity of climate hazards in different villages in the study area. The most hazard affected areas in the union are AminPur and RasulPur, as these areas are located in the South near the Bay of Bengal Sea. The geographic location makes the villages comparatively risky among the villages.

The participatory Hazard map (Picture 1) also indicates that while the whole area is affected by drought, the northern part Babugonj region is more affected by drought in the area. Geographically, the Char Kukri Mukri union is very vulnerable to sudden climate hazards. However, the aftermath of the sudden hazards like Cyclones and tidal flooding hit the area and affect the area through more gradual means like saline intrusion, drought, and erosion.



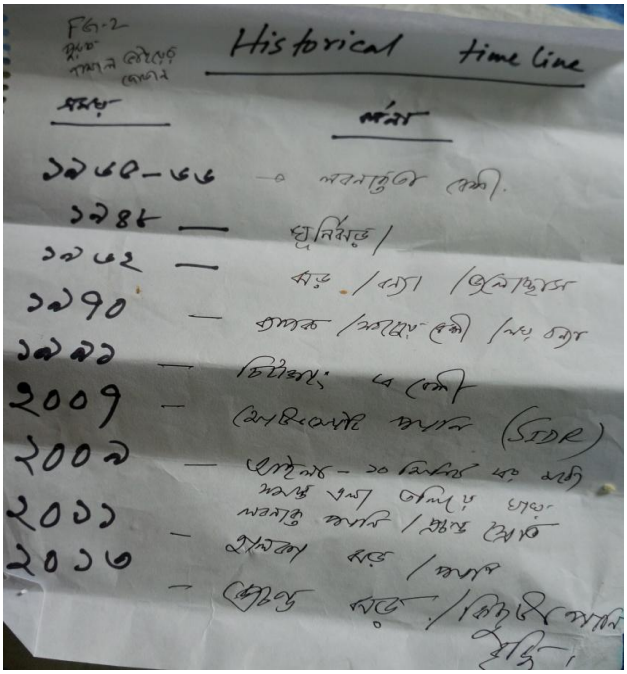
Picture 1: Example of Hazard mapping in Char Mukri Mukri (Source: Author)

According to the institutional mapping, the most vulnerable livelihood groups were fishermen and farmers. However, local government representatives reported farmers are most vulnerable groups in the community. One of the NGO extension workers of Muslim Aid said that,

> "*Both farmers and fishermen are mainly living on natural resources, but farmers are the most vulnerable livelihood groups in the area due to climate hazards*".

The salinity level of the soil makes the land infertile for agricultural farming. The farmers do not get sufficient production from the fields. Moreover, the area only has the capacity of single period of rice farming. Thus, the livelihoods of the farmers become vulnerable to climate context. On the other hand, extreme cyclones destroy the boats and nets of the fishermen. The livelihoods of the fishermen are also vulnerable as the nets and boats are the only assets of some of the fishermen. The loss of these assets can be considered as a loss of livelihood. Both farmers and fishermen are vulnerable to climate hazards in the area. Some villagers claimed that migration to nearby cities is very common due to lack of diversified livelihood options that mostly depending on natural resources.

The participatory historical timeline (picture 2) in the focus group discussion shows that the climate extremes, especially Cyclones are occurring more frequently in the last decades.



Picture 2: Example of participatory Historical timeline (Source: Author)

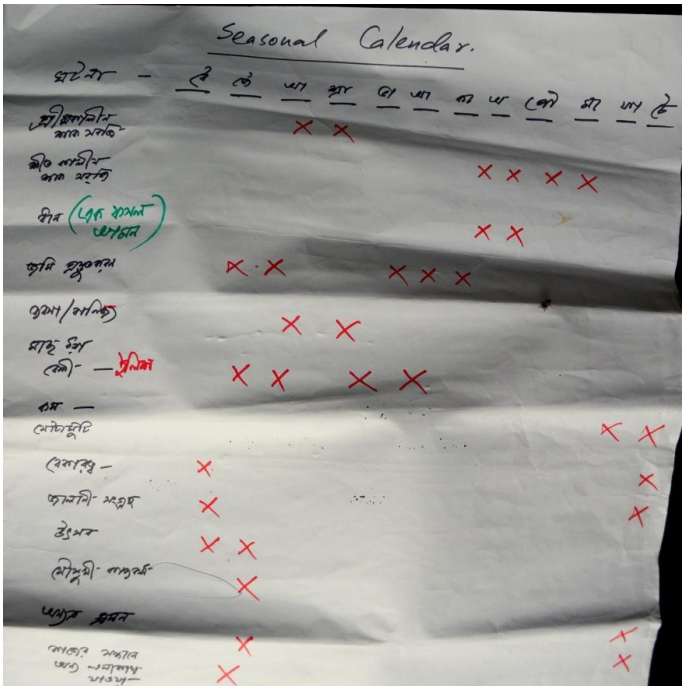
One of the participants mentioned the cyclone of 1948 and the next cyclone hit the area in 1962, then after 8 years the most devastating and deadly cyclone hit the area in 1970. The elderly participants said that the Cyclone washed out most of the inhabitants; livestock and poultry as well due to extreme tidal surge. However, the disaster risk management or early warning systems were not in place and the people were not aware of impending natural calamities. Afterwards, in 1991, almost 21 years later, another cyclone hit the area and it was less deadly compare to 1970. The cyclone Sidr, in 2007, was devastated the southern region, but fortunately it did not have much effect in Char Kukri Mukri. Cyclone Aila in 2009 was very dreadful. The intensity of cyclone Aila was very extreme, the whole Kukri area was inundated by tidal surges and heavy winds destroyed the houses and vegetation of the area. In fact, the cyclones in the last decades have had an increasing trends compared to past decades.

The aftermath of the cyclones was also devastating due to saline water intrusion which destroyed agriculture and inundated fresh water reservoirs. The chairman (local government chief) of the study area mentioned that,

> "*Nonetheless, climate extremes have had a very devastating impact on livelihood resources in the community. I did not get much cultivation of rice after cyclone Aila, due to extreme salinity intrusion in the aftermath of the cyclone*".

The statement above defines that the climate hazards always affect the livelihood of coastal areas. Agriculture production decreased dramatically due to saline intrusion and farmers invested less on agriculture farming. One can easily observe the salinity in the paddy fields where soil salinity have reduced the production of rice and increased the cost of fertilizer because salty soil demands a special type of fertilizer that reduces the level of salinity of the soil.

According to seasonal calendar (Picture 3), most of the farmers cultivate land from Bengali month Jaistha (May-June) to Magh (December - January). Usually, the farmers only get one rice season (Amon) in Bengali months of Ograhayon and Poush (September - November) due to coastal flooding and saline intrusion. The types of crops vary between seasons as summer crops and winter crops. Different types of pulses, chilies, rabi crops (beans), nuts, etc, are cultivated in the winter season. However, climate variability has resulted in changes in the production and in the timeline.

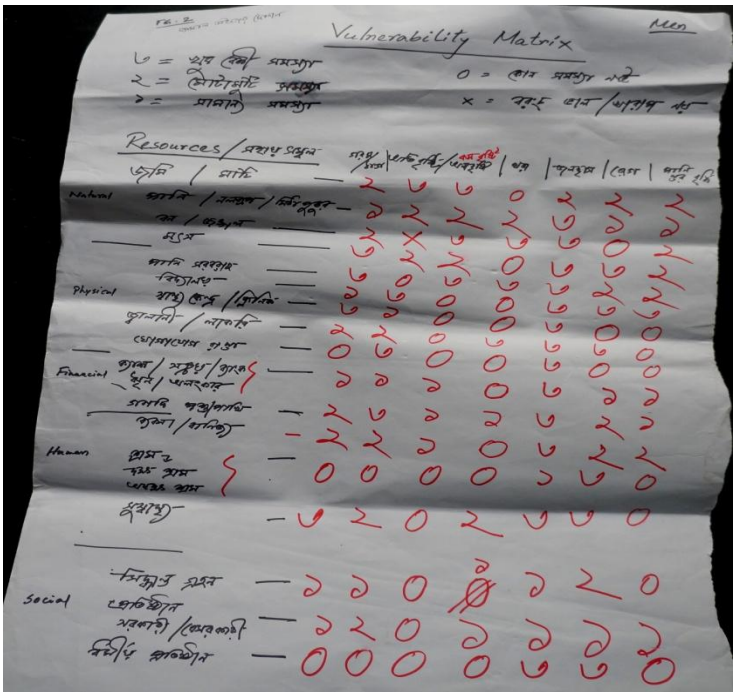


Picture 3: Example of participatory Seasonal calendar (source: author)

Fishermen have been restricted to catch fish in the month of October during the Hilsha fish breeding seasons. There are several types of nets and nets-based fishermen in the community. There are two types of fishermen - Chhoto Jele (moderate/ poor fishermen) and Boro jele

(rich fishermen). Choto Jele is the fishermen who have no boats or Hilsha fish nets. Most of the time they are using different types of fishing nets , such as Jhaki Jal, Borshi (hook), Bendi Jal, Thela Jal, Khuchuni Jal ,Tanki Jal. But, Boro Jele use Hilsha nets (3-6/7 Inch wide hole nets) and Coral nets (5 - 8/10 inch wide hole nets) and they have their own boats. Boro Jele (rich fisherman) also hire other fishermen for catching fish in the deep sea and creates more livelihood opportunities. However, unemployment can be seen in Bengali during the two months of Chitra and Baishakh (March -May). Those two months are very critical for the livelihood groups and migrations to nearby cities or to the capital happen to create alternative livelihoods.

The vulnerability matrix assessed vulnerability of different livelihood resources in Char Kukri Mukri Union. Thus, the study used a five dimension scale such as 3 for *very much*, 2 for *moderate*, 1 for *not much*, 0 for *not at all*, and x for *no effect* to measure the intensity of vulnerability and to construct the vulnerability matrix. The participatory task has scaled the impact of several climate hazards on different livelihood resources.



Picture 4: Example of participatory vulnerability matrix (Source: Author)

The vulnerability matrix shows that heavy rainfall, less rainfall, and cyclones affect the livelihood resources greatly. The matrix investigates that, the physical and natural capitals have been affected the most due to cyclones and tidal surges in the community.

5.1.2 Livelihood resources and drivers of livelihood vulnerability

Livelihood resources are the basic materials of social, tangible, and intangible assets that people use for building and enhancing their livelihoods, which are conceptualized as different types of "capital" to stress their roles as a resource base. (Scoones 1998).

The resources those are important to adaptive capacity and which are affected by climate hazards in the participatory communal vulnerability matrix are listed below

Table 11: Different Resources that has been used for vulnerability matrix

Resources	Resource types
Natural Capital	Reliable water source, productive land, forests, fisheries. Natural stocks.
Physical Capital	Irrigation infrastructure, seed and grain storage facilities, physical structures and material substances.
Social Capital	Decision making, marginalized loan groups, farmer-based organizations, institutions and organizations.
Human Capital	Knowledge of climate risks, conservation agriculture skills, good health to enable labor, skills.
Financial Capital	Micro-insurance, diversified income sources, banking, loans and funds, income, cash flow of money.

Source: CVCA hand book (Dazé et al. 2009).

The major livelihood groups are living on natural resources. The impacts of climate hazards on the social ecological context are also very significant. Ecosystems such as clean water, air, food production, fuel, etc., can be transferred into more and less desirable conditions by human activity. Vulnerability refers to the propensity of social and ecological systems to suffer harm from exposure to external stresses and shocks (Folke et al. 2002).

Char Kukri Mukri has two main livelihood groups in the community, namely farmers and fishermen. The secretary of the local government claimed that,

> *"Fishermen are the most vulnerable groups in the community, because they buy their boats and nets with loans. If he loses his assets due to sudden climate hazards, he will be unable to repay the loan and be unable to buy it again. Consequently, he and his family will be suffer an unsecured life"*

To the contrary, the project field officer of Muslim Aid said that,

> "*Farmers are the most vulnerable group to climate hazards. As sudden climate hazards can destroy their harvest instantly a moment and gradual climate hazards like salinity make the farming land Infertile and reduces the production of seasonal crops.*"

According to the respondents on both a household and local level, most of the interviewees referred to both livelihood groups of farmers and fishermen as vulnerable to climate change.

The summary analysis for understanding livelihood vulnerability, assessed by risk analysis tool (CRiSTAL) in Appendix- 8.1 illustrate the exposure, sensitivity and the additional responses would reduce the livelihood vulnerability of the area. The focus group discussions also mandated that natural capital and physical capital are the most important livelihood resources that have been affected by the climate extremes. The key drivers of livelihood vulnerability and the most affected livelihood resources should be discussed thoroughly.

5.1.2.1 Natural Resources

Natural resources are natural stocks, environmental stocks, ecological services from which resources flow and services are useful for livelihoods (Kollmair & Juli 2002; Krantz 2001). It is one of the most important livelihood resources because people get most of their livelihood from these resources. The importance of natural resource exceeding the benefit to only livelihood, as we cannot live without these resources (DFID 1999). It is important for those who derive all or part of their livelihoods from natural resource based activities. Cyclone Aila, in 2009, washed out the area and destroyed many natural resources. One of the villagers describe the severity of the damage,

> "The *tremendous wind destroyed many trees, houses and livestock; the storm surge washed out the fishes from the pond and filled the reservoir with saline water. It*

washed out the rice and agriculture farming. The effect of saline water after cyclone Aila was so devastating, that even trifle died due to intensive salinity in the soil ".

Cyclone Aila (2009) was devastating to the coastal people and their livelihoods (Cyclone 2009). The major toll on the livelihoods of Char Kukri Mukri was in the livelihood resources. There was no coastal embankment in the area and the tidal water washed over the area with extreme current. The villagers lost their agriculture, livestock, poultry and fisheries, several fruit trees and could not cultivate vegetables due to intensive salinity in the soil. They could not get feed for their livestock and the surrounding area became polluted and created many water borne diseases. The whole area became vulnerable and many household migrated to the nearby cities.

5.1.2.2 Physical / Infrastructural resource

Physical/infrastructural resources are material and structural objects that are made by anthropogenic interventions for the betterment of human being. The resources are basically comprised of infrastructure (drinkable water, sanitation, energy, transportation, roads, houses, cyclone shelters, killa etc) , tools and technology (tools, equipment for production, access to information) are also needed to support livelihoods (Kollmair & Juli 2002) .

In Char Kukri Mukri, Cyclone Aila in 2009 and Cyclone Mohasen in 2013 destroyed large amounts of infrastructural resources. Some respondents claimed that since the union was not covered with an embankment and that the intensity of the tidal surge and storm had direct affect to physical structures. Thereafter, the extreme winds destroyed many houses and trees, tidal water destroyed the muddy roads, and broke down the side of *gher (shrimp farming reservoir).* Livelihood resources have are not been protected from the climate extremes, stresses, shocks, or thresholds. One of the villagers pointed out, during the interview, that

> *"Although, the coastal embankment around the Char Kukri Mukri was built, the sluice gates in 8/9 points were not built yet. So, we will not be benefit from the coastal embankment until the sluice gates have been built. Yet, we do not have sufficient cyclone shelters or Killas (livestock shelter), or even hospitals for emergencies. "*

The above statement reveals that the physical resources have a significant impact over livelihood resources, which are not protected yet. The coastal embankment was built after cyclone Mohasen (2013) but the livelihood groups could not maximize the benefits due to the

unavailability of sluice gates. The community does not have adequate cyclone shelter or killa for livestock. The average capacity of each cyclone shelter is almost 500 people where the total population of Kukri is more than 12000. In addition, the fishermen lose their boats and nets in these sudden natural hazards which is also a loss of a physical resource for the livelihood resource.

Furthermore, climate variability and change also have a direct impact on physical resources. One of the common phenomena in the area is lack of availability of water or too much salt water in the winter season. One of the leaders of the fishing communities denoted that,

> *"Shrimp farming is very sensitive and needs sufficient water. However, I did not get sufficient water to control salinity levels and the extremely hot conditions badly affected my gher (shrimp farming reservoir), I lost almost 1 million taka".*

Shrimp fry are very sensitive while growing. Specially, the fry needs a very controlled salt water and ph level in the water. Last year, the fishermen did not get water on time and therefore they lost much economically.

5.1.2.3 Human Resource

Human resource is a widely used term in the field of development studies. It represents skills, knowledge, health , capabilities, ability to perform labor etc., (Majale 2002) and that together enable people to track several livelihood strategies and livelihood objectives (DFID 1999). However, it varies greatly on different levels of governing be it at a household, national or local level. At the household level, it varies depending on household size, skill levels, leadership potential, and health status which appear to be a critical factor (Kollmair & Juli 2002).

The human resources of the community have also been affected by climate events. The early warning systems and disaster risk management (DRM) are available in the study area. However, the policy implications over the management of these systems are not adequate to disseminate the human resources. Health issues can be a concern due to both climate events and the aftermath of the extreme events. The water borne morbidity rate increases in the area due to saline water intrusion for both human and animals.

5.1.2.4 Social Resource

The social resources are the considerations of livelihood outcomes, such as networks and connectedness that increase trust and the ability of the people in more formalized groups and their system of rules, norms, and sanctions (Kollmair & Juli 2002). It grows within the relationship of social networks, interactions, socializations, membership of the groups, social gathering, access to wider institutions and participation in decision making (Majale 2002). One of the poor farmers said that,

> *"We can get recent news and alerts every day when we all gather in the village market every evening. Our friends and neighbors are also cooperative and keep us updated on whether we need to go to cyclone shelter in an emergency*"

The statement above reveals the social networks and connectedness of the villagers. As, the social gatherings in the village market are a very important way of social networking that keep the villagers updated. In addition the lack of availability of electricity restricts the villagers from accessing multimedia communication like television, the internet or radios. Climate extremes have a significant impact on social networking and well being in the study area.

5.1.2.5 Financial Resource

Financial resources are one of the most important capitals for the study area that are affected by climate hazards. The financial resources that people use to achieve their livelihood objectives are comprised of two types of resources, such as - available stocks of cash, bank, deposits, or liquid assets (livestock, jewelers) and the regular influx of money consisting of labor income, pensions, remittances which are mostly dependent on others and need to be reliable (Kollmair & Juli 2002). Credit , loans and grants are also considered as a financial capital (Majale 2002). Among all types of resources, financial capital is the most versatile as it can be transformed into other types of capital or it can be used for direct achievement of livelihood outcomes. However, it is the least available asset to the poor that makes other capitals important as substitutes (DFID 1999).

There is no bank, financial institutions or not even a post office in Char Kukri Mukri union. People have to go back and forth to the nearest city Char fasson for bankings. Some NGOs provide small scale microcredit loans with low interest rates. However, some use *dadon which a type* of loan where the agreement is that the borrower (fishermen) will give his catch to a particular Mohajon or lenders (businessman). *Dadon* is a form of temporary or long term

working capital that affirms continuing trade relationships between borrower and lender. Actually, it is an advance taken or given to ensure supply of a commodity by giving the lender exclusive rights to supplies produced by the borrower (Islam et al. 1994). The rich businessman also takes advantage by fixing the price. One of the local government representatives commented that,

> "We *do not have any banks, where we can do some finance. Some NGOs are providing small loans with interest. However, the poor fishermen are forced to take "dadon" from the rich businessman because of situation needs and involved themselves an unwritten inhumane agreement*"

The comment truly reveals the fate of the poor inhabitants of char Kukri Mukri. Flow of money is the key to economic development. Microcredit schemes provided by the COAST trust in the community are one of the most important services for the households and are provided by a small interest payback. However, there are some mixed reactions among the villagers. Some villagers claimed that, "*Microcredit loansfrom COAST trust is a business (social enterprise) rather than humanitarian assistance*"; whereas some others argued that "*microcredit is far better than dadon* ".

During the unemployed season of March - April (Bengali chaitra / Baishakh months), the poor fishermen take conditional loans from the rich farmers. Some local government representatives claimed *dadon* as a non-climate hazard in the socio economic context. The system cannot be protested or prohibited due to lack of availability of financial resources and financial institutions in the area. Paradoxically, the area really needs more financial resources to sustain their livelihood or make some substitutes for other types of resources.

In Char Kukri Mukri, women and marginalized group have access and participation in decision making. The local government also consists of three women representatives directly selected from the election and voting by the villagers. During the hazards, the local government, along with local leaders and stakeholders, work together in decision making, protecting the natural assets, and saving lives. Some respondents claimed the political nepotism lies behind the social vulnerability of the study area.

The PRA and risk analysis summary in this section reveal that both farmers and fishermen are the key livelihood groups where natural resources and physical resources are the key livelihood assets in the community. Other resources like political, financial and human capital

have an indirect impact on livelihood resources. Political resources are also considered very important for development. It enhances the human and social capital through political participation, access in decision making, equality for marginalized groups, and democracy. The key drivers over livelihood vulnerability are both climate and non-climate hazards that have an effect over a range of different livelihood resources. However, non climate hazards like dadon (conditional loan), small loans, unemployment, poverty, lack of access to technology, nepotism etc., are considered the key drivers of livelihood vulnerability of the area.

5.2 Humanitarian interventions and adaptation response in Char Kukri Mukri

The key humanitarian interventions in Char Kukri Mukri deal with the emergency relief and immediate assistance for saving lives. The humanitarian actors working for development projects in the area also have the provision of emergency assistance in the area. Humanitarian interventions are usually act to provide immediate relief and long term development to resist disaster (O'Brien et al. 2006). However, humanitarian relief needs to consider "build back better" to prevent people from becoming increasingly vulnerable in the face of increased hazards due to climate change. Adaptive capacity can reduce the sensitivity of the climate hazards that also reduce both the money and time needed for further assistance in the area.

The section will discuss the key humanitarian interventions and adaptation responses from humanitarian agencies in Char Kukri Mukri. The discussion further addresses how institute mediate and shape the adaptation practices and livelihood outcomes for a long term development in the coastal area of Char Kukri Mukri, Bhola. More precisely, the section will explore the connections between humanitarian interventions in the development project the role of institutions for facilitating adaptation in the study area.

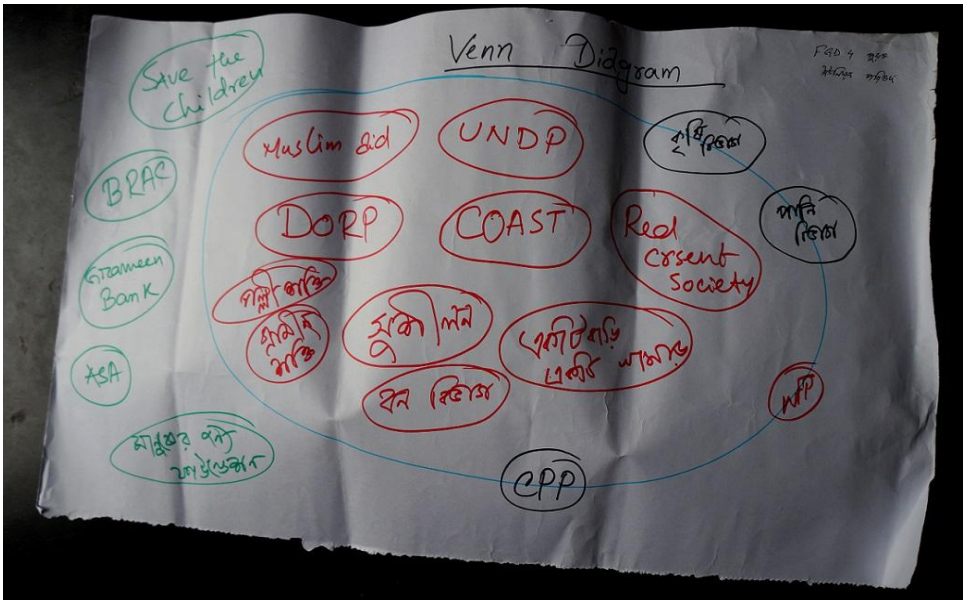
5.2.1 Humanitarian assistance and capacity development

The key humanitarian assistance in char Kukri Mukri mostly deals with capacity development to climate hazards that address disaster risk reduction to reduce climate vulnerability. The development projects are clearly focusing both short term humanitarian relief and long term capacity building against climate hazards.

Predominantly, the nature of more inclusive humanitarian assistance nature emphasizes with an emerging belief that the value of saving live is the true meaning (Macrae 2002). The success of disaster management plan determined by the way, how it reduces the loss of lives

due to climate hazards. The comparison of the death rate between Cyclone Gorky in 1991 and Cyclone Sidr in 2007 reveals that disaster management saved more lives against climate extremes (Paul 2009). In fact, disaster management is a factor of Community based adaptation (Dazé et al. 2009) . Humanitarian agencies and NGOs have been advocating for better disaster preparedness to improve the quality of humanitarian response (Khasalamwa 2009).

The *venn-diagram* of participatory appraisal below shows the active humanitarian organizations in the study area and are marked inside the circle in red. The organizations which are working secondarily or cooperatively are written in black on the circle, and those organizations or agencies that have responded irregularly in the immediate aftermath of any hazards have been marked outside the circle in green.



Picture 5: Example of Participatory Venn diagram during focus group discussions (Source: author).

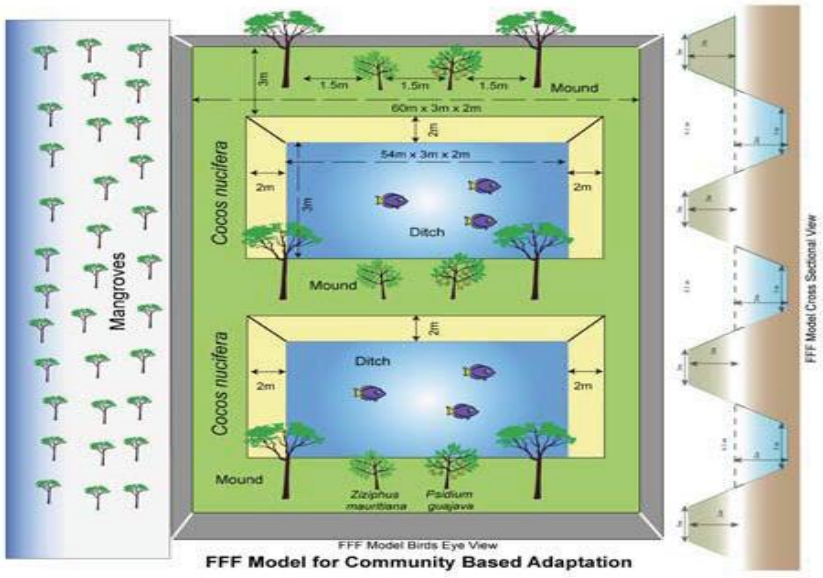
However, the *venn-diagram* illustrates that UNDP, Muslim aid, COAST trust, DORP, Palli-shakti and Grameen shakti (solar panel loan providers), Susheelon, Ekti Bari ekti khamar (one house, one farm project of Bangladesh government), and the Red Crescent Society have undertaken key developmental interventions with the adaptation project in the research area. However, UNDP, Muslim aid, COAST trust, DORP have their own active adaptation projects, whereas, Red Crescent society has both humanitarian and developmental interventions.

The terms adaptation and development can be defined in the socio-ecological context. Adaptation can be proclaimed as a regulatory process that aims at preventing harm or receiving benefits from current and future environmental changes (Cannon & Müller-Mahn 2010). However, development initiatives promote more livable conditions with higher incomes or longer lives (Ben Wisner 2003) whereas, adaptation does not necessarily make life better but simply renders it possible under anticipated changes. Adaptation and development projects are also assisting the community to reduce vulnerability of the area. The initiatives that also address the key humanitarian intervention in the area are as follows:

5.2.1.1 CBACCCF of UNDP

The most effective adaptation project that addresses the climate vulnerability and resilience of Char Kukri Mukri is the CBACCCF (community based adaptation to climate change through coastal afforestation) project. The project is a multi-scale adaptation through NAPA priority project (MoEF 2005) through the Forest, Fish and Fruit (Triple F) Model. It is the first priority project of NAPA Bangladesh which has introduced the triple F livelihood model for enhancing adaptation capacity in Char Kukri Mukri union of Bhola district. Seven active wings of the government are the collaborative partner of UNDP project of CBACCCF, these are the Agriculture Ministry, Livestock Ministry, Fisheries Department, Environment and Forest Ministry, BWDB (Bangladesh Water Development Board), BFRI (Bangladesh Forest Research Institute), UDMC (Union Disaster Management Committee).

The main objective of the project is to expand the livelihood options for coastal communities in a way that supports the conservation of coastal resources, enhances adaptive capacity to climate induced threats and change and mitigation the effects of climate change. The project has two integrated components; the first one is to establish 6100 hectares of mangrove plantation on 14 Kilometers of newly accreted (Char) lands. By planting mangroves, the land and the people living on it are extremely protected from climate extremes (Nandy et al. 2013) . The mangrove plantation has an intensive role to play in the second component of the project; FFF model in the ditch and dyke.



Picture 6: FFF model imply in the ditch and dyke. adopted from (Alam et al. 2013)

Each ditch is 54 m length × 6 m Width × 2m depth whereas a dyke is 60m length × 3m width × 2 m height. Eight ditches and nine dykes can be constructed in 1 hectare of land where ditches are convenient for irrigation and fresh water fish cultivation. One of the project field managers of CBACCCF explained the selection and distribution of the ditch and dyke (FFF model) among the community. He stated that,

> "The *beneficiaries of Ditch and Dyke are selected from the CBO. One Auto- reservoir will be distributed to 20 people whereas one household will get one ditch and dyke each. The stake holders of the project UDMC and BWDB also distributed the auto-reservoir and ditch- dyke to almost 200 households in Char Kukri Mukri*"

The model utilizes the ditch and dyke properly among the CBO beneficiaries. By cultivating a ditch a family can produce almost 150- 200 Kg of fresh water fishes annually that secure the household`s protein consumption and provides additional income by selling them in the local markets (Alam et al. 2013). Stocking of rain water in the ditches also supports regular water supply, irrigation to plantations on the dyke, increases fresh water security, and doubles as a reservoir (IUCN 2011).

The dyke is planted with high yielding fruit varieties, especially addressing the salt tolerant plants like Bau-kul (*Ziziphus mauritiana*) , Bau guava (*Psidium guajava*) and other types of fruit varieties that can be harvested twice in a year for the household`s consumption. Different types of seasonal vegetables are also cultivated in the dyke (Alam et al. 2013;

IUCN 2011). In Char Kukri Mukri, another project field manager of UNDP based CBACCCF project claimed that,

> *"Before the project, the Char Kukri People barely tasted the seasonal vegetables because of extreme salinity in the soil. However, the beneficiaries of ditch- dyke (FFF Model) get vegetables growing in both the rainy and the winter seasons and irrigates the plants from the ditch water".*

Since the surroundings of the study area are affected by high level of salinity, the ditch and dyke plantation in Char Kukri Mukri is very effective as a long term adaptation in the community. Trees and palms (*Cocos nucifera*), Mehegoni are planted on the dyke and will produce timber, fuel-wood and food for the villagers.

The CBACCCF project provides a salt tolerant HYV rice variety (BR 47) in Char Kukri Mukri assisted by the stake holders of agriculture. The BR-47 rice has increased the annual rice production in comparison to the last few years after cyclone Aila in 2009 (Alam et al. 2013). After introducing the new HYV of rice farmers are planning a double cropping pattern that reduces seasonal risks and adapts to food crisis` that require less water for cultivation.

Furthermore, the Input distribution of UNDP is one of the productive interventions that helped the affected people in the community in the aftermath of cyclone Aila and Cyclone Mohasen. One of the local farmers denoted that,

> "Cyclone *Aila washed away my 3 cows and 5 poultry and I lost all my assets. After the input distribution from UNDP, I got a cow and also got involved in the CBO to be a beneficiary of Ditch - Dyke (FFF model). Now, the assistance from UNDP has changed my economic conditions* ".

The statement above illustrates how humanitarian interventions helped the victims of Cyclone Aila in 2009. Moreover, the adaptation strategy of the project helps the area to be more protected from any particular hazard. Coastal livelihoods are not only pillared with few departments rather than the role of other stakeholders (Alam et al. 2013; Rawlani & Sovacool 2011). The major institutional engagements are attempted by four departments of forest, agriculture, fisheries, and livestock (Alam et al. 2013). These departments have used the opportunity to share and transfer knowledge and resources to the community and local stakeholders for integrated livelihood management.

5.2.1.2 UMCOR- EPS of Muslim Aid

Muslim Aid is a humanitarian organization which is mainly funded through partnerships, wings, or stakeholders like UNICEF, Save the Children, UNESCO, WFP for disaster management programs. Disaster management is one of the strategies of adaptation response in the area of Char Kukri Mukri. The key interventions are focusing on maternal health, water, sanitation, and hygiene in the aftermath of any hazards. Two major components of the disaster management program by Muslim Aid in Char Kukri Mukri are 1) *Emergency response and humanitarian assistance; 2) Disaster risk reduction and climate change adaptation.*

Thus, the organization uses both short term interventions and adaptation to climate change in the area. The long term project (EPS), Early Disaster Preparedness for Safer Community, is a development project especially for safe water, hygiene promotion, and sanitation. The EPS project has reactivated the SMC (School Management Committee) where they are planning to distribute disaster tool kits, rain coats, life jackets, Hand mikes, sirens etc. In 2013 the Kukri was affected by a tidal surge with the intensity of cyclone. Muslim Aid worked with ECHO, Christian aid, Dan- church aid, CARE, UNHCR, UNDP, UNICEF and several other local NGOs (Muslim-aid). The organizational activity promoted CFW (cash for work) where they built a road with the community members, CFT (cash for training), UCG (unconditional cash grant), food distribution, shelter and sanitation.

The project has been prolonged to ensure the basic food security (households groceries) of 2700 households and has employed of 1500 people through cash for work for road and embankment construction (Muslim-aid 2012). Disaster risk reduction (DRR) and climate change (CC) under this program continues with ongoing development projects are as follows,

1. Skill training on washing that will be used among 120 people by three different sectors such as (a) safe water, (b) Hygiene promotion and (c) Sanitation.

2. UMCOR- EPS (United Methodist committee on relief - emergency preparedness for safer community) project is organized for capacity building training on school based disaster preparedness in district, Upazilla and on the Union level and includes reactivating the school management committee as a disaster management committee for emergency situations.

The major interventions of Muslim Aid are to reestablishing the fresh water reservoir by changing out the salt water that inundated it by the tidal surge of Cyclone Mohasen in 2013.

5.2.1.3 WASH plus of DORP

DORP has been working on the capacity building and hygiene of Char Kukri Mukri in Bangladesh since 2013. DORP has 2 development projects and 4 options that address the hygiene and nutrition of the community. The first project "Wash Plus" determines safe water, sanitation, and hygiene. The second project promotes nutrition for the child and pregnant women called SPRING (Strengthening partnerships, results and innovation in nutrition globally) Bangladesh project.

The key concern of the *Wash Plus* project is to provide hygiene promotion, access to safe drinking water, sanitation and hygiene promotion etc (DORP). The specific aim of the project of WASH (Water sanitation and hygiene) is to use the locally appropriate approaches and technologies, and to strengthening evidence based guidance for integrated washing and nutrition programs (DORP 2013). According to the project, the interventions contributed 15 tube-wells for fresh drinkable water, distribution of 500 sato-pans for sanitary latrines and 43 hand washing devices distributed among five primary schools and one high school in Char Kukri Mukri. One of the local political leaders in the area stated that,

> "*The villagers suffered very much from a lack of drinkable water, especially in the winter season when the water level stepped down too much andbecame salty. There were collisions and conflicts among the women for collecting drinkable water* ".

The conflict within the community has been reduced because of the sinking of adequate tube-wells for the villagers. The interventions are helping the community to get access to drinkable water even in the emergency periods.

The second project is the nutrition project " SPRING" (Strengthening partnerships, results and innovation in nutrition globally) that is concerned with distributing seeds and other agricultural inputs, establishing homesteads gardens and poultry practices to ensure the maternal health and the health of new born babies (DORP).

5.2.1.4 Micro credit of COAST trust

COAST (coastal association for social transformation) is currently working with several developmental projects in Char kukri Mukri. The project promotes capacity development among the villagers and addresses the underlying causes of vulnerability. COAST trust is a UK aid funded organization working in Char Kukri Mukri. The Community Legal Service (CLS) advocates any sort of violence against women law by a free consultations. The credit

program of COAST trust is debatable because of the requirement to repay the loan. Some of the respondents described that,

> "COAST *trust is profitable organizations that give the villagers loans for their entrepreneurship rather than unconditional cash grants to the ultra-poor inhabitants*"

Microcredit is the extension of very small loans (microloans) to those in poverty designed to help poor borrowers with small entrepreneurship. As, there is no bank or other financial institutions, the organizations is providing the loan flow to activate the financial resources in the area. Their loan scheme from COAST trust is 45 installments with 12.5% interest for 10 months. Livestock loans should be repaid back after six months with only 0.5% interest. Therefore, the loans are really helping the community with capacity development with access to financial resources. The programs of the COAST trust in the Char kukri Mukri are as follows:

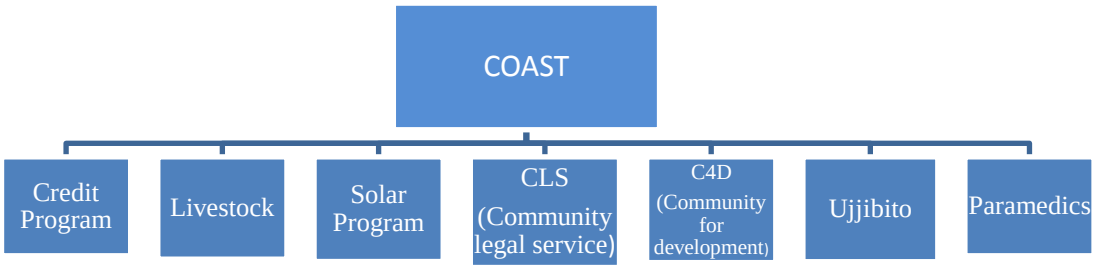


Figure 7: The interventions of COAST trust in Char Kukri Mukri.

The C4D (Community for development) program is a developmental initiative that promotes 11 messages about sanitation, hygiene, nutrition, hand washing, early warning systems, and so on. The union Facilitator of CLS (Community legal service) stated that,

> "CLS *in working actively to assist to protect women to protect early marriage, the dowry system, and violence as well as to provide free legal action to address the underlying causes of vulnerability in the area*".

The inhabitants of the study area are very poor and the society is patriarchal in its decision making. Community legal services (CLS) assist women in addressing the underlying causes

of vulnerability by raising a voice on violence against women, the dowry system, divorce law, and other social insights in the community.

5.2.1.5 RCS (Red Crescent society)

The International Red Crescent Society (RCS) is another organization working since 1977-78 (Renamed from Red Cross) in Char Kukri Mukri. It is the oldest and only organization that operates an early warning system in the area. The team leader warns the villagers by using a siren, red flags and contributes to update the warnings to the community. The current intervention in Char Kukri Mukri by the Red Crescent society is the CPP (Cyclone preparedness program) which is very effective for the community. It is an early warning system that is the key to a disaster management program in the coastal areas that reduce the loss of human life of dreadful cyclones in the coastal areas (Paul 2009). The team leader of the Red Crescent society of Char Kukri Mukri spoke about the limitations of the kits and tools, saying that,

> "We *start playing the Siren when the signal arises to 5-6. However, the siren and hand mike are not working very well and we have to send our volunteers door to door to let the people know where their safe shelter is in the cyclone centre*".

The interventions of RCS are the most effective interventions for disaster risk management. Moreover, the volunteers of the RCS are also very skilled and experienced in working towards assuring the safe shelter among the villagers. The wireless updates of the weather forecast are the one way the early warning system that needs to be developed with the modern technologies.

5.2.2 Community based adaptation to livelihood outcomes

The section discusses community based adaptation and explores the institutional linkages at the local and household level. In a dilemma of short-term humanitarian assistance and adaptation, there remains a gap in the understanding of how institutions influence the transformation of short term coping capacity (Davies 1993) to long term adaptation (Berman et al. 2012).

Furthermore, the government of Bangladesh prepared the Bangladesh climate change strategy and action plan (BCCSAP) in 2008. It is a ten year (2009- 2018) program plan to build the capacity and resilience of the country to meet the challenge of climate change (MoEF 2008). Bangladesh is the first country that submitted the NAPA (National adaptation program of

action) document to UNFCCC in November 2005. The CBA framework is combined with four enabling factors of climate resilient livelihoods, disaster risk reduction, capacity development, and underlying causes of vulnerability. The table (Appendix 8.4) was conceptualized by the CBA framework on Local and Household levels in the context of Char Kukri Mukri Union.

5.2.2.1 Local Level/ Community Level

The local level has limited capacity with technological access and climate information. Local institutions do not have the capacity to support the community to deal with natural hazards. It is important to improve institutional access and institutional articulation to improve the planning and monitoring of climate data. Local institutions must involve private and civic institutions for planning and decision making.

5.2.2.1.1 Climate resilient livelihoods

The resilient livelihoods are mostly promoted through income diversification and capacity building for planning and improved risk management. On the local level, the respondents of Char Kukri Mukri mentioned that climate projections are not available except through early warning system and the elderly local knowledge. The Chief of the community stated that,

> "The *climate projections are not available and we do not get climate information on time. We mainly depend on local climate knowledge and NGO extension worker information for long term planning* ".

Climate information is very important for implementing local plans that support climate resilient livelihoods. The local public institutes do not get climate information centrally and rely on the interventions of civic and private institutions. Public institutions do not have the capacity to protect livelihoods to climate hazards.

5.2.2.1.2Disaster risk reduction

Local government does not have climate information and depends on the Red Crescent Society for early warning system. However, the assistance on the national level and interventions from civic and private institutions has a good capacity to respond to disaster. Disaster risk reduction has a very successive measurement in saving lives, but still is progressing in saving the loss of livelihood resources. Disaster risk management needs more physical or infrastructural resources for implementing adaptation response.

5.2.2.1.3 Capacity Development

Local institutions do not have the capacity to monitor, analyze, and disseminate information on current and future climate risks. The area does not have stable electricity that could provide access to electronic devices for immediate and future climate information immediately. The local institutions have limited resources to implement adaptation for all inhabitants. Therefore, these adaptation or developmental projects may not cover a large number of beneficiaries as the institutional access is limited due to funding. However, the skill and training programs are available in the area.

5.2.2.1.4 Underlying causes of vulnerability

Local planning process is participatory and marginalized groups have the same rights in the planning process. However, women are conservative and are still dominated by any decision in the patriarchal society. In fact, some of the women do not want to involve themselves in local planning process and participate in the communal meetings. Additionally, local planning processes do not have access and control over livelihood resources because of unpredictable climate nature. The political landscape in the Char Kukri Mukri, where political nepotism among the political leaders is common, may be considered a negative aspect of planning. However, the political leaders and other chiefs of the local government borrow conditional loan (dadon) that plays a critical role over financial resources in the area.

5.2.2.2 Household / Individual level

Livelihoods of the coastal Char Kukri Mukri people are facing both direct and indirect impacts of climate change to their assets. Local institutions have shown positive interest in support capacity building of the community and preparing them to respond to climate hazards. To the contrary, there is still some gap in understanding the way to adapt and for to adapt on the individual / household level.

5.2.2.2.1 Climate resilient livelihoods

Households are not using the climate information for planning. They used the local climate knowledge that they have been observed in the last few years, but the predictions do not provide the accurate information of climate information. One of the chiefs of the farmers group responded that,

> "The *water inundated our cultivating land earlier than the expected season for last few years; it is because of rising sea levels. I personally had a big economic loss and I do not cultivate much seasonal crops due to the unpredictable nature of climate* ".

The traditional weather prediction systems are not working because of issues such as rising sea levels that inundate the agricultural land with salt water. Therefore, the households are trying to become familiar with climate resilient agriculture practices. The CBACCCF project helps the farmers to evolve towards climate resilient agriculture practices. As a result, the farmers are expecting to cultivate rice twice in a year due to HYV rice. The coastal embankment has been built, but sluice gates are not in place to control the water access and inundation. In 2013, cyclone *Mohasen* destroyed the fresh water reservoir and was filled with the salt water. Muslim Aid reactivated the reservoir by refilling it with fresh water. The developmental approach may create more opportunities for the farmers to produce more crops.

5.2.2.2.2 Disaster risk reduction

Early warning systems of DRM (disaster risk management) play a crucial role to protect lives. However, the households do not have protected reserves of food or agriculture inputs. Some villagers claim that they live on hand to mouth and cannot plan for food reserves in the house. Some others said that, they keep dry food but not a sufficient amount for an emergency period. In the Char Kukri Mukri, approximately 12,000 people are living but they have only 3 cyclone shelters. The schools and raised buildings are also used as cyclone shelter. Overall, they have almost 10 buildings which are not sufficient for securing shelter. Moreover, the physical resources are not protected due to lack of sluice gates in the coastal embankment to maximize the benefit of coastal embankment.

5.2.2.2.3 Capacity development

Women are marginalized groups and the poorest of the poor in the Char Kukri Mukri union. Social safety nets for women are not available. While, Muslim Aid provides cash for work, unconditional cash grants, skill development program for the villagers, that program are not particularly for the women. UNDP also provided input distribution for the poorer livelihood groups and provided them skill training for sustainable livelihoods. However, financial services are not available to enhance their capacity on the household's level.

5.2.2.2.4 Underlying causes of vulnerability

Women and other marginalized groups have equal access to information, skills and services. Households do not have access or control over critical livelihood resources. For instance, the drivers behind the underlying causes of vulnerability are mostly physical and financial, lack of women empowerment, lack of alternative livelihoods, poor decision making, power

relations, social awareness, lack of government planning, early marriage, polygamy, dowry system, education, diseases, and so on.

5.3 Institutional linkages for adaptation practices

Local institutions shape the impacts of climate hazards on livelihood through various institutional functions such as information gathering, disseminating climate information, mobilization, capacity building, linking to other stakeholders and providing leadership in the social groups or community (Agrawal 2010). Institutional linkages are comprised of *Institutional access* and *Institutional articulation*.

Institutional access is influenced by the degree of connectedness in households and social groups whereas *institutional articulation* includes collaborations among the local institutions that influence adaptation practices (Agrawal & Perrin 2009). In the case study, the union-parishad (local government), government stake holders of different ministry and department of environment and forestry, agriculture, livestock, fishery, water development board and other government organizations (working in cooperation with each other) have the institutional articulation for adaptation response.

Uphoff and BucK (2006) classified two types of civic institutions (membership organizations and cooperatives of partnerships for improved economic outcomes) and two types of private institutions (service organizations such as NGOs and charities, and private business) The table (Appendix 8.5) shows the local institutions in the context of Char Kukri Mukri (Uphoff & Buck 2006) .

The external interventions box is the right half of the AIL framework (Figure 4) where the domain is related to external interventions or humanitarian interventions that represent four external components to reinforce adaptation practice such as information, technology, funds, and leaderships. The connectedness of public and civic institutions is very important to explain the institutional linkages that fill the gap of long term adaptation response. According to Agarwal (2010), local institutions shape climate hazards in three important ways Such as how households are affected by climate impacts, respond to climate impacts by pursuing different adaptation practices, and how they mediate the flow of external interventions in the context of adaptation (Agrawal 2010).

5.3.1 Local institutions shape the impacts of climate change on communities

Institutions play an important role in shaping the degree of vulnerability on the livelihoods of the community depending on local governance and local institutional arrangements (Agrawal 2010). For instance, salinity intrusion in Char Kukri Mukri is very extreme due to increasing trends of Cyclones and tidal surge. So, the response for the adaptation in the particular area must consider the key determinants of vulnerability of the area. The study area was affected by tidal surge and the local institutions built the coastal embankment to protect the union from climate extremes.

5.3.2 Local institutions shape the response strategies of the communities to climate change

Institutions reconciled households and local levels to adaptation practices. Strong institutional norms of labor sharing will increase the ability of households to adapt to climate change rather migrating or diversifying. Muslim Aid in Char Kukri Mukri has the early disaster preparedness program, where local government also cooperates with the program due to manage community response to climate change. The villagers who have a lack of access to capital and infrastructure may be unable to use storage and exchange to cope with environmental risks.

5.3.3 Local institutions are the mediators for external support to adaptation

Institutions are the intermediaries of external interventions and adaptation practices. In Char Kukri Mukri union in Bangladesh, UNDP funded project of CBACCCF (community based adaptation to climate change through coastal afforestation) mediate the local institutions and the institutional articulation of different government stakeholders and help shape the adaptation and livelihoods. However, funding is one of the main factors of mediating adaptation practices in the community.

Chapter 6

6.0 Discussions and conclusion

The main aim of the study was to explore the key drivers of livelihood vulnerability in relation between humanitarian interventions and adaptation response. The area of Char Kukri Mukri has been selected as a case study area because it is extremely hazard prone and has a large number of humanitarian interventions and developmental project for adaptation. The study area is under the special focus of humanitarian organizations that work for capacity development or "build back better" in the aftermath of any climate hazards. Most of the external interventions were focused on food security and first aid that neglect the long term adaptation response.

For instance, in the study area Australian Aid, International Federation of Red Cross and Red Crescent societies, Care, Save the Children, Hope 87, Concern Worldwide, Dan Church Denmark and other international agencies do the interventions where most of the assistance focused on ameliorating human sufferings with basic needs. The argument relies on that, the interventions must be supportive to facilitate adaptation for long-term benefits and local institutions must address the gap of policy implications. The study further examines the role of local institutions to address the gap of policy implications in short-term humanitarian interventions towards supporting long term adaptation. In this respect, the chapter aims to discuss the key research questions in the context of study area.

6.1 Drivers of vulnerability over livelihood resources

Char Kukri Mukri area is geographically situated in a hazard prone area. Geographical location itself does not make the area vulnerable. Both climate and non-climate hazards are the determinants of livelihood vulnerability of the area. The key drivers of vulnerability to climate hazards and non-climate hazards are identified as follows

6.1.1 Climate hazards affecting livelihood vulnerability

The livelihood resources of Char Kukri Mukri are mostly vulnerable due to climate hazards. Since, the livelihoods of the area are mainly depending on natural resources and the sensitivity of the particular capital is extremely high. The main livelihood groups in the area are farmers and fishermen where both of them are vulnerable to climate hazards. The climate vulnerability of the Char kukri Mukri can be described by the IPCC`s three contributing factors of - exposure, sensitivity and adaptive capacity.

i. Exposure

As earlier mentioned in the Chapter 4, the hazards of the areas are Cyclones, tidal surges, salinity intrusion, drought, sea level rise, and erosion. The exposure of the people`s risks differ by the class, gender, immigration status, as well as human action (Ben Wisner 2003). The villagers of the study area are very poor and most of them are immigrants from nearby areas. The intensity of climate hazards included the magnitude and frequency that tend towards the climate risks of the study area.

ii. Sensitivity

Sensitivity is the degree to which a system is modified or affected by exposure (IPCC 2007). The sensitivity of the area covers the affected resources due to exposure. According to the risk analysis summary (Appendix 4.1), the sensitivity modulates the provisions of food, soil, health, water, sanitation, and hygiene. The natural and human capitals are the most sensitive resources of the study area that also have an effect on livelihoods of the area.

iii. Adaptive capacity

Adaptive capacity is the ability to adjust, respond and adapt to the effects caused by the stress associated with future climate change (Engle 2011). The main concern of adaptive capacity in the assessment of vulnerability is the capacity of the area to adapt to the climate exposure and reduce the sensitivity of the state. The adaptation strategies of humanitarian organizations like UNDP, Muslim Aid are increasing the adaptive capacity of the area. However, the lacking of physical resources affects the DRR and other adaptation strategies. Lack of physical resources will also increase the gap between sensitivity and adaptive capacity. Emergency relief may save lives but that might not be effective for long term development of the certain state.

For instance, the emergency reliefs consist basically of foods, household utensils, dry foods, medicines, and even unconditional cash grants. However, theses emergency interventions are not very effective when considering long term adaptation or enhancing adaptive capacity of the area to cope with more shocks or stress. Moreover, adaptation supportive interventions will also reduce the climate vulnerability of the exposed area.

Climate variability and precipitation change

Climate variability has a significant impact on natural resources. The observed climate data reveals that the agriculture production has been drastically reduce due to extremely hot and humid temperatures. Fishermen do not get much fish in the nearby river due to extremely hot weather. They must take additional risks by going to deep sea fishing. The study area has

been affected by drought due to less rainfall in the area. Drought is spreading in the eastern and western parts of Char Kukri Mukri. The irrigation systems cannot diminish the effect of drought as the reservoirs of water are mostly filled by salty water. Thus, the area tends to be vulnerable to climate hazards due to climate variability and changes in the rainfall pattern.

6.1.2 Non-climate hazards affecting livelihood vulnerability

Non climate hazards mean the physical and social factors that have an effect on livelihood resources. Chapter 5 discussed the key livelihood resources and the components of livelihood vulnerability. This section discusses the non-climate determinants of livelihood vulnerability. The key concern over livelihood of Char Kukri Mukri is as follows:

Lack of physical infrastructure

The study area does not have sufficient cyclone shelters and Killas serving as safe shelters for people and livestock. There are no hospitals or clinics for the emergency situations. Additionally, the coastal embankment was built after Cyclone Mohasen (2013), yet there are no sluice gates in place to control the access of water. The area needs more schools and colleges for human capital, post offices, and banks for financial resources.

Lack of diversified livelihood options

There are only two major livelihood groups in the community and both of them are living on natural resources. So, the less diversified livelihood options make the livelihood vulnerable to climate change.

Unavailability of climate information

Climate information is barely available for the future projections of the area. The early warning system is totally depends on the Red Crescent Society. The unavailability of reliable electricity restrains the use of modern technological tools including internet based information. However, battery operated radio and electronic devices may announce the early warning system, but it does not cover the future climate information. For instance, investing for agriculture is very risky and uncertain for the farmers of Char Kukri Mukri. Future climate information may assist the farmers to calculate the risk of the investment.

Geographic location

Cyclones forming in the Bay of Bengal are contribute only 5–6% of the world total, but but they are the deadliest of all cyclones (Paul 2009). Shamsuddoha and Chowdhury (2007, founded six distinct physical features of the Bay of Bengal that occur frequent hazards along the Bangladesh coast. The features are : (1). concave shape of the Bay of Bengal, (2) funnel shape converges toward the Meghna river estuary, (3) the large continental shelf bordering

on the Bangladesh coastlines, (4) the large tidal water influence , (5) the complex coastline, (6) the vast amount of long and narrow shorelines or inlets from the land of the bay (Shamsuddoha & Chowdhury 2007). The study area is located in the southern part in the complex coastline that makes the area prone to frequent climate shocks and stresses.

Dadon (Conditional loan)

Char Kukri Mukri does not have any banks for finance or financial institutions for the flow of cash. *Dadon* is a form of temporary or long term working capital that affirms continuing trade relationships between borrower and lender. Actually, it is an advance of to ensure the supply of the commodity by giving the lender exclusive rights to supplies produced by the borrower (Islam et al. 1994). The conditional loan system is claimed to create social vulnerability in the area and indirectly affect livelihood. The poor borrowers invest the entire loan for investing on boat and nets. The risk involved with the asset may affect the livelihood of the farmers. Moreover, Pirates and robbers are very often robbing the assets of poor fishermen and climate hazards may also destroy the entire assets of poor farmers. Additionally, the conditional loan must be repaid to the lender despite economic conditions even including repaying the loan by borrowing more money with more interest from the same Mohajon (rich businessman).

Political nepotism

Political nepotism is another driver of social vulnerability in the study area. The respondents claimed that the political nepotism negatively affects the selection process of relief and input distributions among the victims. Sometimes, ultra poor people have been neglected and the political people get extra favor from the local government.

Seasonal unemployment

The PRA activities identified the seasonal unemployment for both farmers and fishermen. The study area got only has one annually cultivation due to inundation on agricultural land. So, the farmers become unemployed in those particular periods. The restricted season of catching fish for the fishermen also make them unemployed during the fish breeding season.

Deforestation

The major source of fuel-wood is the forest and vegetation of the area. Deforestation is the key concern in the ecological context of the area. Moreover, the area does not have much alternative renewable energy which also leads to vulnerability in the ecological context.

Lack of modern technology

The area does not have a reliable electric infrastructure. Generators, solar panels and batteries are the only source of electricity. However, villagers use the electricity in the evening. Therefore, they are not using the modern technology of science. Some rich farmers and fishermen use mobile phones to communicate with others. However, the modern technology is not much available in the area. So, the instant forecasts or news cannot be published or disseminate climate information. In addition, the communication gap also has a direct impact over social capital and well being in the area.

6.2 Adaptation, Institution and Livelihood (AIL) and CBA framework

Figure 8 summed up key findings from the study and shows the implications of external interventions to support local institutions to shape adaptation responses that may address livelihood outcomes and adaptation practices to reduce the vulnerability of the area. The structured framework was modified from AIL (Adaptation, institutions and livelihood) (Agrawal 2010); p10) and include the CBA framework (Dazé et al. 2009);p10) on the local level and household level. The figure summarizes that, different types of institutions are engaged in policy making and adaptation practice in Char Kukri Mukri. The major contributors are private and civic institutions which are collaborating with Public institutions.

The framework explores the relation of institutions to shape adaptation response with the influence of external interventions and climate change in the socio-ecological context. The framework described the interconnections between humanitarian interventions and vulnerability where the framework combines adaptation, institutions, and livelihood perspectives with elements of community based adaptation (CBA). The adaptation response has been categorized by adaptation practices and livelihood outcomes. The CBA will be described by the livelihood outcomes of the area. The framework is linked with the interventions to promote adaptation response where institutions have the provision to mediate and shape the adaptation response that will reduce vulnerability in both climate and livelihood context.

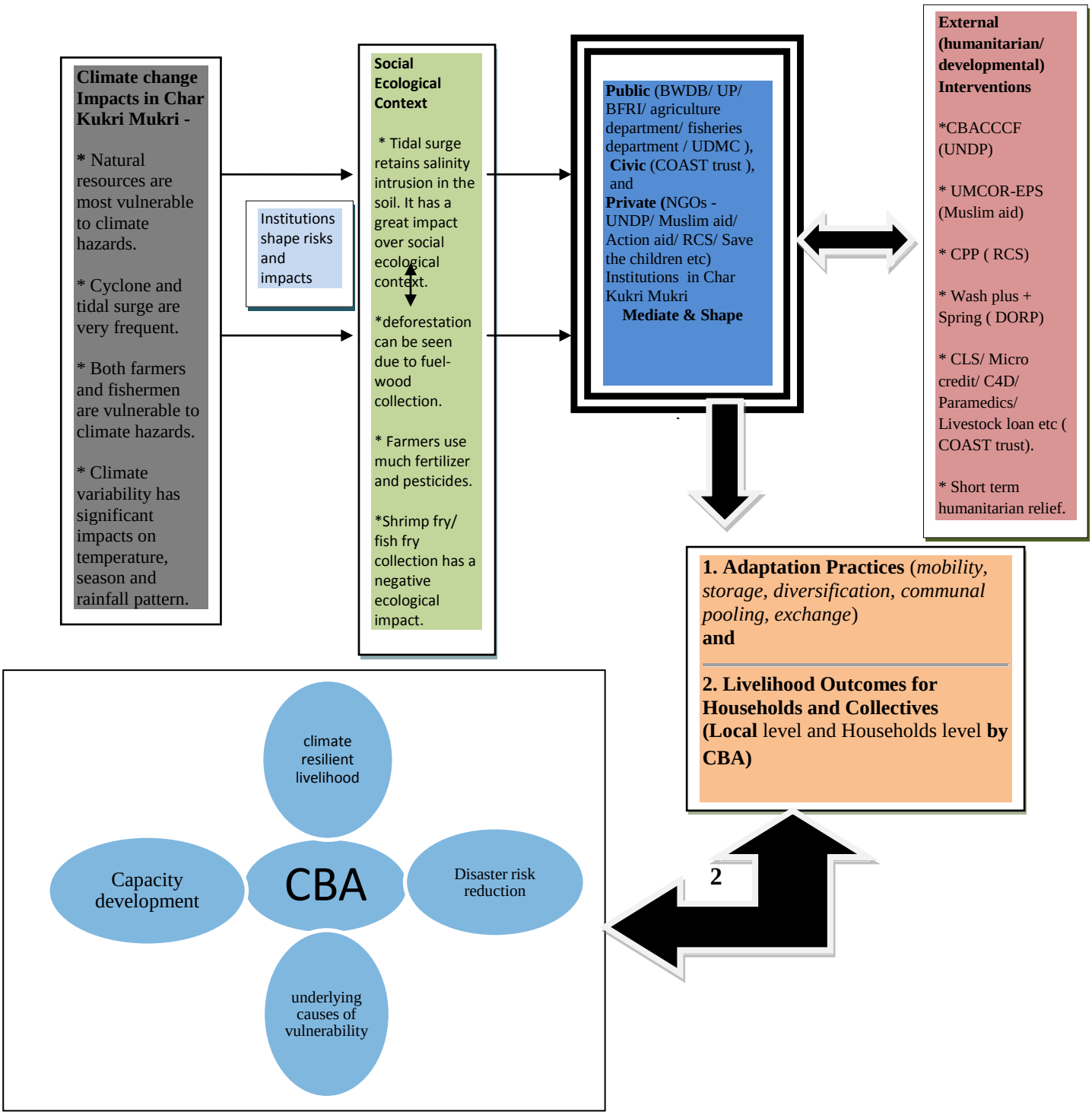


Figure 8 : Long term adaptation response combining adaptation, institutions and livelihood perspectives with elements of community based adaptation in Char Kukri Mukri; AIL Framework (AIL) (Agrawal 2010) + CBA framework (Dazé et al. 2009).

According to the framework, local institutions, along with external interventions mediate and shape the adaptation practice and the livelihood outcomes in the community. The *gray* box in the figure illustrates the climate change impacts in Char Kukri Mukri Union. The box represents the result summary of livelihood resources (appendix 1) of climate hazards and the climate variability impact in the area. As stated early in the background chapter, climate vulnerability has a negative impact over the farming patterns of the area. The respondents in the interview observed more disorder on seasonal forecasts and rainfall patterns. The next *olive colored* box represents the socio-ecological conditions of the area. Deforestation, climate extremes, use of pesticides, shrimp fry collection, and sanitation are the key problems in social ecological context. The *blue* shaded middle area is the institutional linkages in the area that mediate and shape the adaptation response. After that, the *pink* box represents the humanitarian or developmental interventions that can assist institutions to shape adaptation. The *orange* box illustrates the long term adaptation response and is categorized by adaptation practices and livelihood. Finally, the livelihood outcomes have been framed by the CBA framework whereas adaptation practices have been discussed by five distinct categories of mobility, storage, diversification, communal pooling, and market exchange.

6.2.1 Humanitarian interventions and Institutional governance for capacity building

Humanitarian interventions should focus on capacity building along with focusing on saving lives and food relief after any climate hazards. Undoubtedly, short-term humanitarian assistance and relief helps saving lives, prevents hunger, and assists in escaping from absolute poverty. However, long term adaptation will reduce the quantity of humanitarian relief and assistance. Enhancing the ability to cope with stress and shocks will increase the adaptive capacity among the population of the state. For instance, according to Terry Canon (2008), "natural disaster" only happens when a hazards has an impact on vulnerable population (Cannon 2008). Additionally, adaptive capacity of any state determines the ability to adjust within the system and reduces the vulnerability to climate change (Engle 2011). Therefore, humanitarian interventions should support adaptation strategies to reduce the sensitivity to climate exposure by enhancing adaptive capacity. Both the PRA activities and risk analysis summary (Appendix 8.1) examines that long term humanitarian interventions in the community and calls on adaptation response to enhance the adaptive capacity to climate hazards.

Governance of the institutions is the process of interaction and distribution of power among the actors and stakeholders. Mostly, the institutions involved in governance must be resilient

in its influences upon the livelihood outcomes in household and collectives (Cannon 2008). Hence, local institutions play a vital role in shaping the policy response for adaptation and implementation of developmental initiatives. For instance, public institutions built almost 11 kilometers coastal embankment and after a shortage of funding, UNDP funded the rest of the 4.7 Kilometers embankment to protect the area. Building the coastal embankment is also a process of adaptation that will help to protect the villagers from the tidal surge and help the farmers to control the saline water in the winter season.

The adaptation strategies might be different, based on the degree of connectedness, intensity of climate hazards, and resources, even though there are multiple local institutions. The better understanding of institutional linkages have pointed to co-management, public- private partnerships and private - civic partnerships as highly relevant to adaptation to climate change (Agrawal & Perrin 2009). For instance, the CBACCF project has been covering a few households in the area and the beneficiaries have enhanced capacity development on their livelihood. In fact, the inequality is also high towards involving the households in adaptation response. Also, long term adaptation strategies for livelihood outcomes can reduce vulnerability, if inequality is high there will be more poor people with weaker and less resilient livelihoods (Cannon 2008). Hence, the institutions must reduce the inequality among the villagers for more resilient livelihoods.

6.2.2 Adaptation practices

Figure 8 shows in the (orange shades) box that, local institutions mediate and shape the adaptation practices. Thus, the community of Char Kukri Mukri union has developed a range of adaptive responses using local knowledge and humanitarian assistance. Agarwal (Agrawal 2010) classified adaptation responses to climate variability in five distinct categories such as mobility, storage, diversification, communal pooling, and market exchange.

1. Firstly, *Mobility* is a common adaptation strategy practiced by local communities and households. RCS (Red Crescent Society) in Char Kukri Mukri is very active on early warning system and disaster preparedness program. Besides, Muslim Aid has initiated the UMCOR-EPS project for reactivating the school managing committee for early preparedness for a safer community. UNDP has UDMC (union disaster management committee) and DORP also has advocacy and discussion meetings on disaster

preparedness programs tri-annually. These initiatives increase mobility of the community.

2. Secondly, *storage* is considered an effective measure against future livelihood failures or livelihood lost. The disaster management program always addresses the storage of foods and seeds for critical periods. The household interviewees responded that the poor households cannot store food or seeds for critical periods. However, some of the villagers' store dries food, first aid, and a fire box for the emergency period.
3. Thirdly, *diversification* of employment opportunities, productive and non-productive assets, and consumptions. This response has been promoted mainly by UNDP and Muslim Aid in Char Kukri Mukri. The farmers and fishermen are the main livelihood activities in the area. The CBACCCF project of UNDP involved beneficiaries in diversified and alternative livelihood activities with (FFF) model, where the CBO members are involved in diversified income generating activities. Similarly, the cash for work program of Muslim Aid also creates opportunities for the inhabitants of Char Kukri Mukri.
4. Fourthly, *Communal pooling*, refers to adaptation responses of sharing wealth, incomes across households, mobilization of resources, equality, and collective distribution during times of scarcity. The local representatives and households said that communal pooling is available and the villagers share their stored food and share the roof of the house with others. For instance, in the emergency period, the villagers stay in cyclone shelters and share their food. Moreover, those who have secured shelter can share the space with other neighbors. The strategy will enhance the social capital that also has an indirect impact on vulnerability reduction.
5. Finally, *Market exchange* considers the most dynamic mechanisms for adaptation response. The response strategy is not available for poor farmers or fishermen but for the rich farmers and mohajon. Agarwal says that it requires well developed markets, exchange instruments, and widespread access of weather related insurance schemes for market based adaptation to climate change (Agrawal 2010). Conversely, in Char Kukri Mukri the market exchange response is not available for households. The access to financial resources is also not accessible for local livelihood groups. The market is a *monopoly* and syndicated by some rich businessman. Moreover, the poor farmers get "dadon" loans that sustain the monopoly market in the community.

6.2.3 Livelihood outcomes

Local institutions have a noteworthy impact over livelihood outcomes. It emphasizes on the livelihood strategies of protecting the livelihoods from climate shocks and stresses. The study described the community based adaptation for livelihood outcomes in the context of livelihood protection. Adaptation is often used in the analysis of two concepts of resilience and vulnerability. Resilience is being extended beyond the scope of disasters and the environment into the wider context of adaptation to the climate change and the concept of vulnerability (Cannon & Müller-Mahn 2010). The livelihood of the community is vulnerable because most of the livelihood groups are living on natural resources and the community does not have diversified resilient livelihood alternatives.

Climate change has contributed to frequent climate extremes in the study area that originated in the Bay of Bengal Sea. The community must cope with stress and shocks where "coping" is the ability to respond to an occurrence of harm and avoid its potential impacts to transform structure (Cutter et al. 2003; Dazé et al. 2009). In fact, the study area has been affected more by non-climate hazards. The livelihood resources have been affected negatively due to climate hazards but the non climate hazards make the livelihood resources vulnerable to climate change. Adaptation is the ability to transfer structure, functions, or organizations to survive under hazard threatening existence (Kelly, P. & Adger, N. 2000). It can be understood as a regulatory process of preventing harm and receiving benefits from current and future environmental changes (Kelly, P. & Adger, N. 2000). Thus, the inhabitants must adopt themselves to cope with such climate hazards as the climate change is uncertain and the future climate projections are not available in the area.

Local institutions, especially public institutions, are responsible for policy implications where private and civic organizations also contribute towards the practice of response strategies. The CBA-CCCF project of UNDP has a significant role in long term adaptation and enhancing adaptive capacity in the area. The project is also considers the resilient livelihoods to address the livelihood security in the affected area. The HYV of salt tolerant rice and ditch -dyke model is a successful example of community based adaptation as a long term policy response. Moreover, the disaster risk management and capacity development also been addressed by the adaptation and developmental project. Both tangible (unconditional cash grants, input distribution etc) and intangible (endowments and entitlements of ditch and dyke distribution) have contributed towards capacity building among the beneficiaries. However,

there is limited funding and access of institutions limit the benefits of community based adaptation in the study area.

The input distribution and cash grants of the projects are also short-term interventions and afterwards the beneficiaries involved in the FFF model of ditch-dyke can enhance their capacity over livelihoods. The beneficiaries can cultivate vegetables and farm the fresh water fishes that help their food demands. Water and sanitation project also enhance the capacity of the community and reduce the vulnerability. So, community based adaptation may strengthen the adaptive capacity among the villagers in Char Kukri Mukri.

6.2.3.1 Local level

Community based adaptation is facilitated by the community based organizations in Char Kukri Mukri, where the major developmental interventions are from UNDP oriented CBACCCF projects. The major concern is capacity development and enhancing adaptive capacity in the community. Capacity development contributes to infrastructural (protecting livelihood resources, food security), institutional (capacity building), and social (technology transfer, livelihood protection) adaptive capacity (Rawlani & Sovacool 2011). The mangrove plantation and coastal embankment built by the local institutes also provide a shelter belt around the study area. Rebuilding of fresh water reservoirs by Muslim aid also creates more opportunities for farmers and reduces the vulnerability from drought. The COAST trust and DORP are working to build capacity and reduction of underlying causes of vulnerability. To the contrary, there are no sluice gates in the entry point of several rivers and canals. The local representatives and NGOs extension worker presume that the villagers will get more climate resilient livelihoods after the completion of sluice gates. Thus, the embankment must have the sluice gates in place to control the salinity level for better agriculture farming. Most of the local villagers also want to be involve in CBO of the UNDP project, but less funding and institutional access has reduced livelihood outcomes on the local level.

6.2.3.2 Household/ Individual level

The major livelihood groups in Char Kukri Mukri are farmers and fishermen. However, the interviewees of the poor community responded that the interventions and institutional linkages are mainly assisting the farmers and fishermen. Farmers are now cultivating rice twice in a season due to HYV rice. The respondents hope that they will cultivate more production compared with recent years due to the new coastal embankment and irrigation from fresh water reservoir. Moreover, input distribution among community based organization members helps them to be self-reliant. Rigorous institutional access is very

important to enhance capacity in the community. Some women respondents claimed that social safety nets like cash grants, subsidies for food, Unconditional Cash Transfer (UCT) are not available for women, as the community is male dominated and political nepotism can be seen in the area.

The response to climate stresses is very critical due to current and future compromising gains, especially in the poor communities like Char Kukri Mukri. Blakie et al (2004) argued that susceptibility is often a recurring process due to disruption of assets and livelihoods by one event or hazard which makes the community or households more vulnerable to future hazards or even disaster (Blaikie et al. 2004). Furthermore, the promotion of technology in traditional farming may alter more livelihood opportunities in the households.

6.2.3.3 Institutional management in National level

Bangladesh is extremely vulnerable due to climate related impacts, thus adaptation is necessary for the political and economic survival of the country (Ali 1999). As developing countries are less responsible for the emissions that cause climate change, the developed countries must take responsibility to finance the cost of adaptation to development aid commitment (*UNFCCC* 1992). The United Nations Convention on Climate Change (UNFCCC) supports adaptation and made national adaptation programs of Action (NAPA) for all least developed countries (LDCs) for providing community level inputs in adaptation policy making (Ayers & Forsyth 2009). Bangladesh government Ministry of Environment and Forests (MoEF) with the United Nations Development Program (UNDP) provided funding of NAPA priority project and the fund is almost $10.8 billion for the coastal afforestation project (MoEF 2005), where the Char Kukri Mukri is one of the project site of that project sites.

The process included consultation with local level stakeholders, representatives of local government, NGO extension workers, community chiefs and villagers through regional consultation workshops (MoEF 2008). However, the politically powerful dominate the discussions to the exclusion of less powerful stakeholders where the most vulnerable were not involved in NAPA preparation process (Ayers 2011). The proposed distress short term relief has not been concerned with the root causes of vulnerability and is unable to consider the fact of why people are unable to cope or are able to create opportunities through social, environmental and structural processes (Chambers 1989).

Though, the NAPA project in Bangladesh emphasizes community participation on the impact of climate change, vulnerable communities should be given more opportunities to maximize the benefits of adaptation to climate change.

6.3 Conclusion

The objective of the study was to identify the determinants of livelihood vulnerability and to explore the connections between humanitarian interventions and the determinants of vulnerability. Moreover, the discussion further explores the connections between institutions and adaptation response with the external interventions. Predominantly, short-term humanitarian interventions and adaptation response have different policy implications of enhancing adaptive capacity and livelihood beyond saving lives, but the aim is to ameliorate human suffering. The study area is very hazards prone and results of the study suggest that, *Natural resources* are the most important livelihood resource in the community that is directly connected to the main livelihood groups in the study area. The major livelihood groups in the area (farmers and fishermen) are depending on natural resources. Other livelihood groups such as honey collectors or day labors are also depending on it. However, other livelihood resources indirectly affected by climate hazards and also lead to livelihood vulnerability in the Char Kukri Mukri union. In summary, the effects on natural resources affect livelihood that can be protected by also protecting the natural resources.

Non-climate hazards in the study area also make the area vulnerable to livelihood security. Lack of physical resources directly has an effect on DRR as well as adaptation to climate hazards. Likewise, the lack of financial resources also reduces the market exchange or investment of income flow. Hence, the diversified livelihoods also depend on the market and investments. As, the area has only a monopoly market for exporting fish, the villagers will not be able to be involved in other diversified and resilient livelihoods. In fact, *dadon* or other types of small loans will not help the livelihood conditions of the community.

Furthermore, humanitarian interventions must be aimed to mitigate the future impact of hazards and protecting the livelihood of the community. Short-term humanitarian relief or assistance may recover the instant losses but cannot reestablish livelihoods, but long term interventions will enhance adaptive capacity to protect livelihoods in the study area. The case study suggests that adaptation to climate change increase capacity among the project beneficiaries. The humanitarian interventions in the case study are mainly focusing on food

security and life saving drugs. However, the respondents claim that the villagers get aid from some agencies even after a year or more. Consistently, the area does not require such humanitarian aid, rather rebuilding the livelihoods and protecting the area. In addition, developmental interventions in the case study area promote community based adaptation focusing on disaster risk reduction (DRR), climate resilient livelihoods, capacity development and social vulnerability in both local and household level.

Regardless, the reconciliation of local institutions to promote long term community based adaptation reduces social vulnerability in the area and strengthens capacity development between individuals and collectives. Yet, the livelihood resources are not secured and sustainable to individual use and need additional assistance for infrastructure development. The adaptation policy response can be initialized on the national level, but climate change adaptation is truly local where adaptation practices and livelihood outcomes are materialized on the community and individual level. The CBACCCF of UNDP, UMCOR-EPS of Muslim Aid, WASH plus of DORP and microcredit of COAST trust are the long term adaptation responses for the study area. The results further demonstrate that the roles of local institutions are vital in the reconciliation of policy response and livelihood protection in the state. Local government, alone, does not have capacity to protect the livelihood from climate and non-climate hazards. Local government along with private and civic institutions might be able to address the drivers of livelihood vulnerability and improve the policy response against vulnerability.

Short- term humanitarian interventions have important implications for livelihoods, yet long term adaptation should involve more households in the adaptation processes to reduce the vulnerability to climate hazards in the community. Additionally, short-term interventions should promote the components of adaptation in the vulnerability reduction process or in the process of disaster risk reduction. The study examines that to protect livelihood vulnerability, humanitarian and developmental interventions must protect the natural resources in the study area because both major livelihoods of the area depend on natural resources. Moreover, the area requires more infrastructural resources like cyclone shelters, Killas, hospitals, sluice gates, weather station, more roads, and transportation to increase the service of DRM. The beneficiaries of different adaptation projects say it that they are now self reliant and ready to face climate hazards. Adaptation practice should involve more people for capacity development. Nevertheless, the system requires more adaptation strategies beyond short-term humanitarian relief.

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8 Appendices

Appendix 8.1:

Table12: CRiSTAL risk screening tools Summary analysis

FGD	Sensitivity to Resources	Resource Type	Access	Control	Exposure/ climate hazards	IMPORTANCE TO RESPONSE STRATEGIES
Men: 1 (Fishermen)	Land, water, forest, rivers, fisheries.		Fishermen, Farmers, honey collectors, Firewood collectors.	Coastguard, forest guard, Pirates, Mohajon(rich fishermen), local government, Political leaders, Police.	Cyclones, Tidal surge, Salinity, Drought	yes
. Men : 2 (Farmers)	Land, water, agriculture, fisheries, forests	**Natural**	Farmers, Fishermen, Honey collectors, firewood collectors, day laborer etc	Local government, political leaders, community chief, government organizations and rich people in the community have the control.	Cyclones, Tidal surge, Salinity, Drought, Erosion	Yes
Women : 3 Housewife	land, water, forest, fisheries, livestock, agriculture		Local people have access over these resources.	Local government, political leaders, NGOs, GOs , community chief and others.	Cyclone, Tidal inundation or tidal surge, Salinity, Drought	yes
Women : 4 (Hindu / minority group)	land, water, forest, fisheries, livestock, agriculture.		Local people have access .	Local government, political leaders, government institutes , community chief have the ability to control over these resources.	Cyclone, Tidal inundation or tidal surge, Salinity, Drought	yes
Men: 1 (Fishermen)	Roads, schools, Hospital, Infrastructures, Cyclone shelter, Killa (shelter for livestock) .	**Physical/Infrastructure**	Villagers, fishermen, farmers.	Local government, NGOs.	Cyclones, Tidal surge	Yes
.	Roads, high raised buildings, schools, cyclone shelter, Killa,		Different communities and social groups in the Kukri have the	The local government, Non government organizations (Red crescent), political	Cyclones, Tidal surge, Erosion	yes

Men : 2 (Farmers)	Transportations.		access over these resources.	leaders, government representatives, Community chief and the elderly people have the control over these resources.		
Women : 3 Housewife	Roads, schools, cyclone shelter, Killa, embankment, sluice gates		The community people have the access over these resources.	Government and non government organizations have control over the resources.	Cyclone	yes
Women : 4 (Hindu / minority group)	Roads, school, Killa (Livestock shelter), infrastructure, Cyclone shelter center, electricity, Hospitals		The households and the inhabitants of the locality take advantages of these resources.	Local government, non government organizations have the ability to control the access of these resources within the community. Red crescent has one cyclone shelter and they control it.	Cyclones, Tidal surge, storm surge	yes
Men: 1 (Fishermen)				COAST trust provide short loan with some interest to pay back,		Yes
	Bank, regular inflow of money, loans, grants, cash transfer		Fishermen, farmers, households as well as the villagers.	"Ekti Bari, Ekti Khamar " project of Housing and public works ministry of Bangladesh also provide small scale loan with 8% of interest repaying the loan.	Cyclones, Salinity	
. Men : 2 (Farmers)	Bank, Loans, grants, transactions.	**Financial**	The poor villagers and the clients of the COAST trust have the access of financial resources.	COAST trust, local government , Mohajon (Rich fishermen/ businessmen) have the control over financial resources.	Cyclones, Tidal surge, Salinity	yes
Women : 3 Housewife	savings, cash, loans, banking, grants, regular flow of income		agent and beneficiaries both have access over financial resources	Non government and government organizations , stakeholders, Mohajon (rich businessmen) have the control over financial resources.	(none)	no
Women : 4	Cash, money transactions ,		The local villagers have access over	The coast trust provides small micro	Cyclones, Tidal surge,	yes

(Hindu / minority group)	Bank deposits, regular inflow of money. livestock		financial resources. Basically, rich mohajon (businessman of fish stocks) , community chiefs, rich people have some good access of financial resources in the area. The poor fishermen , get some small loans and grants from the NGOs and most negatively they take small loans called Dadon from the Mohajon.	credit loans with very small interest. The rich farmers who also provide loans but they have some conditions and bonds with the poor fishermen. There is no governmental institutions or service except a project " Ekti bari ekti khamar " (one house one farm) project . The poject also provide loans for households but the amount of loans and beneficiaries are very limited. The interset rate for the loan repayment is 8%.	storm surge, Salinity	
Men: 1 (Fishermen)	Weather forecasting , employing adaptation, Disaster preparedness, participation, Hygiene and sanitation		Villagers of Kukri have access to weather forecasting and signals, Some households are involved with the project CBACCCF by UNDP, School going children, Mother and pregnant women.	UNDP, Muslim aid, COAST trust, DORP, Suheelon, WFP, Red crescent, local government		yes
. Men : 2 (Farmers)	Weather forecasting, Disaster risk management, Cyclone preparedness program, adaptation strategies.	**Human**	Different livelihood groups of people and the extreme poor people have access on human capital. The Red crescent society always provide the early warning system for the local people. Moreover, NGOs are working for enhancing human capital toward the community.	The NGOs, local government and national government stakeholders and institutions have control over human capital.	(none)	yes
Women : 3 Housewife	adaptation , early warning systems, Disaster risk management.		Different social groups, agents, organizations, government and the stakeholders have the access on	Non government organizations, political leaders, Local government, community chief have control over these		yes

			these resources.	resources.		
Women : 4 (Hindu / minority group)	weather forecasting and adaptation strategies, Early warning systems, Disaster preparedness program		The households and the villagers of the area and communities benefit from these resources. The fishermen benefits from the early warning systems very much. Moreover, the households and farmers get much benefitted from the climate resilient sustainable development and adaptation.	Muslim aid is promoting the CPP (cyclone preparedness program), Red crescent is working on early preparedness and disaster risk management, UNDP has a project on community based adaptation to climate change through coastal afforestation (CBACCCF) which is involving more people to facilitate adaptation. Some other organizations are also working like forest ministry, DORP, Susheelon for enhancing human capital and capacity development.		yes
Men: 1 (Fishermen)	Social interaction, Meetings and gatherings, social networks, socialization		Households, Fishermen, Farmers as well as villagers	Local government, Community chief, Political leaders, Occupational leaders, NGOs representatives and others	Cyclones, storm surges	yes
. Men : 2 (Farmers)	Social interactions, meetings, participations, social networks	**Social**	The local people have access on social capital. Moreover, the clients of NGOs have also the access to social resources.	UNDP, Muslim aid, DORP, COAST trust, Susheelon other NGOs, Political leaders, community chief, religious prominent faces, elderly people have control over social resources.	(none)	no
Women : 3 Housewife	Social networking, cooperation, social interactions and meeting, well being		The villagers have access on social resources.	Political leaders, occupational chief, elderly people, local government have control over these resources.	(none)	no
Women : 4 (Hindu / minority	Social interactions and networks, meetings and disseminating		Local government and the villagers have the benefit with social resources. The	Local government, Non government organizations are very important agents to control these	Cyclones, Tidal surge, storm surge	yes

group)	information		interactions between top - bottom and bottom - up are balanced by social resources.	resources in the area.		
Men: 1 (Fishermen)	Access of women participation, access in decision making and planning, Power relations		Both men and women (those who are voters in the area)	Local government, political leaders, community chief, Mohajon.		no
. Men : 2 (Farmers)	Power relations, conflict over power, decison making		The local people specially the men have the access on political resources. However, political faces and rich business men have more access over the resources.	Political leaders and political activists.		no
Women : 3 Housewife	Political impact	**Political resources**	Local people, political leaders, community chief have the access over the resources.	local and national government, political leaders have the control over these resources.	(none)	no
Women : 4 (Hindu / minority group)	Conflict over power relations, access of decision making, equity and rights		The villagers both men and women have the access over political resources. Both men , women and other marginalized groups have the same rights over decision making. However, women participation and their voice are limited because of religious belief .	The chief of the community, Chairman or chief of the local government, community leaders, political groups and political leaders, stake holders, Mohajon, rich farmers have the control over political resources.		no

Appendix 8.2

8.2.1 : Guiding questions for Local Government/Community Level Char Kukri Mukri

2.1.1 Resilient Livelihoods

* Are scaled-down climate projections available?

* If so, what are the observed and predicted impacts of climate change for the region and/or

Ecological zone?

* Do local institutions have access to information on current and future climate risks?

* What livelihood groups or economic sectors are most vulnerable to climate change?

*Do local plans or policies support climate-resilient livelihoods?

* Do local government and NGO extension workers understand climate risks and promote adaptation strategies?

2.1.2 Disaster Risk Reduction

* What are the most important climate-related hazards the region and/or ecological zone faces? Non-climate related?

* How are hazards likely to change over time as a result of climate change?

*What groups within the community are most vulnerable to disasters?

* Do local institutions have access to disaster risk information?

* Are local disaster risk management plans being implemented?

* Are functional early warning systems in place at the local level?

* Does the local government have the capacity to respond to disasters?

*Which other institutions are engaged disaster risk management at local level?

2.1.3 Capacity Development

* What institutions (governmental and non-governmental) are involved in research, planning and implementation of adaptation?

*What are the most important institutions in facilitating or constraining adaptation?

* Do local institutions (governmental and non-governmental) have capacity to monitor and analyze information on current and future climate risks?

* Are mechanisms in place to disseminate this information?

* Do local institutions have capacity to plan and implement adaptation activities?

* Are resources allocated for implementation of adaptation-related policies? What is the budget?

Where are the resources coming from?

* What are the existing capacity and resource needs and/or gaps for climate change adaptation?

* What new capacities may be needed to address changing circumstances due to climate change?

2.1.4 Addressing Underlying Causes of Vulnerability

*What social groups within the community are most vulnerable to climate change?

*Are local planning processes participatory?

* Do women and other marginalized groups have a voice in local planning processes?

* Do local policies provide access to and control over critical livelihoods resources for all?

* What is the other factors constraining adaptive capacity of the most vulnerable groups? Do vulnerable communities and groups have any influence over these factors?

Appendix 8.2.2: Guiding questions for Household/ Individual Level in Char Kukri Mukri

2.2.1 Resilient Livelihoods

* What are the most important livelihoods resources to different groups within the community?

* What changes in climate is the community observing? Are traditional weather prediction systems working?

* What coping strategies are currently employed to deal with shocks and stresses?

* Are people generating and using climate information for planning?

* Are households employing climate-resilient agricultural practices?

* Do households have diversified livelihoods strategies? Does this include non-agricultural strategies?

* Are people managing risk by planning for and investing in the future?

2.2.2 Disaster Risk Reduction

* What are the biggest climate-related hazards faced? Non-climate related hazards?

* How are hazards likely to change over time as a result of climate change?

* Do households have protected reserves of food and agricultural inputs?

* Do households have secure shelter?

* Are key assets protected from hazards?

* Do people have access to early warnings for climate hazards?

* Do people have mobility to escape danger in the event of climate hazards?

2.2.3 Capacity Development

* Are social and economic safety nets available to households?

* Are financial services available to households?

* Do people have knowledge and skills to employ adaptation strategies?

* Do people have access to seasonal forecasts and other climate information?

2.2.4 Addressing Underlying Causes of Vulnerability

* Are men and women working together to address challenges?

* Do households have control over critical livelihoods resources?

* Do women and other marginalized groups have equal access to information, skills and services?

* Do women and other marginalized groups have equal rights and access to resources?

* Are there other social, political or economic factors which make particular people within the community more vulnerable than others?

* Do these vulnerable groups have any influence over these factors?

Appendix 8.3: Guiding questions (in Bengali)

Local / Community Level

(স্থানীয় /সম্প্রদায় ভিত্তিক)

Resilient Livelihoods:-

স্থিতিস্থাপক/পূর্বাবস্থায় ফেরতযোগ্য জীবিকা ঃ-

* জলবায়ু বিষয়ক অনুমান কি আনুপাতিকভাবে কমছে? মানে যা অনুমান করছেন তা কি ঠিক হচ্ছে?

* যদি তাই হয় তবে অনুমান ও বাস্বতার মধ্যে ব্যবধান কেমন আপনার এলাকায়?

* স্থানীয় প্রতিষ্ঠান সমূহ কি বর্তমান ও ভবিষ্যৎ জলবায়ু সম্পর্কিত তথ্য সহজেই পেতে পারেন?

* জলবায়ু পরিবর্তনের কারণে কোন জীবিকার সম্প্রদায় এবং অর্থনৈতিক ক্ষেত্র সবচেয়ে বেশী বিপন্ন?

* স্থানীয় পরিকল্পনা ও নীতি সমূহ কি জলবায়ু স্থিতিস্থাপক জীবিকার উপর লক্ষ্য রেখে করা হয়?

* স্থানীয় সরকার/ বেসরকারী সংস্থায় নিয়োজিত কর্মকর্তা কর্মচারীরা কি জলবায়ু কেন্দ্রিক বিপদসমূহ ভালভাবে জানেন? তারা কি অভিযোজন কৌশল কে সমর্থন করেন?

Disaster Risk Reduction:-

দুর্যোগ বিপদ প্রশমন ঃ-

* কোন এলাকাটি সবচেয়ে বেশী দুর্যোগ প্রবণ? জলবায়ুর দরুন? জলবায়ুর দরুন নয়?

* জলবায়ু পরিবর্তনের সাথে সাথে কি দুর্যোগের ধরন পরিবর্তিত হচ্ছে? হলে তা কিভাবে?

* আপনাদের সম্প্রদায়ের মধ্যে কোন দলটি সবচেয়ে বেশী বিপন্ন?

* দুর্যোগঘটিত বিপদসমূহের তথ্য কি স্থানীয় প্রতিষ্ঠানের কাছে রয়েছে?

* স্থানীয় দুর্যোগ নিয়ন্ত্রণ ব্যবস্থা বা পরিকল্পনা কি প্রয়োগ করা হয়েছে?

* স্থানীয় সরকারের কি দুর্যোগ মোকাবিলা করার ক্ষমতা রয়েছে?

* স্থানীয় পর্যায়ে দুর্যোগ নিয়ন্ত্রণ ব্যবস্থাপনায় অন্য কোন প্রতিষ্ঠান সমূহ কি সম্পৃক্ত?

Capacity Development:-

ক্ষমতা উন্নয়ন ঃ-

* সরকারী ও বেসরকারী কোন সংস্থাসমূহ গবেষণা পরিকল্পনা এবং অভিযোজন প্রক্রিয়া প্রণয়নে সম্পৃক্ত?
* অভিযোজন প্রক্রিয়াকে ত্বরান্বিত করতে কোন প্রতিষ্ঠানটি সবচেয়ে বেশী কাজ করে যাচ্ছে?
* অভিযোজন প্রক্রিয়াকে সুসাধ্য করতে এর ক্রিয়া কৌশল গুলো কি সবার কাছে ছড়ানো হচ্ছে?
* অভিযোজন প্রক্রিয়াকে এবং কার্যক্রমকে বেগবান করতে স্থানীয় সরকারের কি ধরনের ক্ষমতা রয়েছে?
* অভিযোজন কার্যক্রম বাস্বায়নে কি কোন ধরনের সম্পদ বরাদ্দ করা হয়েছে? বাজেট কত? সম্পদ কোথা থেকে আসে? আপনি কি এই ব্যাপারে কিছু বলতে পারবেন?
* জলবায়ু পরিবর্তন অভিযোজনের ক্ষেত্রে ক্ষমতা ও সম্পদের মাঝে কি ধরনের ব্যবধান রয়েছে? ক্ষমতা উন্নয়নে বরাদ্দকৃত সম্পদ কি পর্যাপ্ত?
* জলবায়ু পরিবর্তনের ফলে পরিবর্তিত পরিস্থিতি মোকাবিলার জন্য নতুন কোন ধরনের ক্ষমতার প্রয়োজন রয়েছে কি?

Addressing Underlying Causes of Vulnerability:-

বিপন্নতার অর্ন্নিহিত কারণ সমূহ আমলে নেয়া ঃ-

* সম্প্রদায়ের মধ্যে জলবায়ু পরিবর্তন জনিত কারণে কোন সামাজিক দলটি সবচেয়ে বেশি বিপন্ন?
* স্থানীয় পরিকল্পনা পদ্ধতি কি অংশগ্রহণমূলক?
* স্থানীয় পরিকল্পনা প্রনয়ণ ও বাস্বায়নে অন্যান্য প্রান্তিক দলসমূহ এবং মহিলাদেরকেও সম্পৃক্ত করা হয় কি?
* জটিলতা সংক্রান্ত জীবিকা সম্বলের ক্ষেত্রে স্থানীয় নীতি সমূহের কি নিয়ন্ত্রণ এবং প্রবেশাধিকার রয়েছে?
* অভিযোজিত ক্ষমতা থাকা সত্ত্বেও বিপন্ন দলসমূহ কোনগুলো? এই ক্ষেত্রে বিপন্ন দল এবং সম্প্রদায়ের মধ্যে কি কোন প্রভাব রয়েছে?

Household/Individual Level

পরিবার/ব্যক্তিগত বিষয়ক

Resilient Livelihoods (স্থিতিস্থাপক জীবিকা):-

* এলাকার মধ্যে বিভিন্ন জীবিকাসম্পন্ন দল সমূহের মধ্যে উল্লেখযোগ্য জীবিকা সম্বল কি কি?
* এলাকার মধ্যে কোন ধরনের প্রাকৃতিক দুর্যোগ বিদ্যমান? গতানুগতিক/সনাতন ভিত্তিক আবহাওয়া সম্পৃক্ত অনুমান পদ্ধতি কি কার্যকর?
* স্থানীয় জনগণ কি তাদের বার্ষিক পরিকল্পনায় জলবায়ু সম্পর্কিত তথ্য ব্যবহার করে?

* গৃহস্থরা কি জলবায়ু সহায়ক কৃষি অনুশীলনে সম্পৃক্ত?

* গৃহস্থের কি বিভিন্নতা সম্পন্ন জীবিকা কৌশল রয়েছে? সেগুলো কি কৃষিকাজ ভিন্ন অন্য সকল কাজে লিপ্ত?

* জনগণ কি বিপদ প্রশমন ব্যবস্থার ভবিষ্যৎ বিনিয়োগ এবং পরিকল্পনায় সংযুক্ত?

Disaster Risk Reduction:

দুর্যোগ বিপদ প্রশমন ঃ-

* সবচেয়ে বড় জলবায়ু সম্পৃক্ত দুর্যোগ কোনটি? জলবায়ু সম্পৃক্ত দুর্যোগময় কোনটি?

* জলবায়ু পরিবর্তনের ফলে দুর্যোগ কিভাবে রাতারাতি পরিবর্তিত হচ্ছে?

* গৃহস্থের কি খাদ্য ও কৃষি মজুদ রয়েছে?

* গৃহস্থের কি নিরাপদ আশ্রয় রয়েছে?

* মূল সম্পদ সমূহ কি দুর্যোগ থেকে নিরাপদ?

* জলবায়ু জনিত দুর্যোগ প্রশমনে পূর্ব সতর্কীকরণ ব্যবস্থা কি জনগণের কাজে আসছে?

* দুর্যোগ মোকাবিলায় জনগণের কি গতিশীলতা রয়েছে?

* বিগত ২০০০ সালের পর থেকে কাব্য জনগণের উন্নয়নে পরিবেশ ও জলবায়ু নিয়ন্ত্রণে কাজ করছে?

* কি কি ধরনের কার্যক্রম নেয়া হয়েছিল?

* সেগুলো কি কার্যকর ভূমিকা পালন করছে?

Capacity Development:-

ক্ষমতা উন্নয়ন ঃ-

* গৃহস্থরা কি সামাজিক ও অর্থনৈতিক নিরাপত্তা পাচ্ছেন?

* অর্থায়ন সেবা কি গৃহস্থের জন্য পাওয়া সহজ?

* অভিযোজন কৌশল আয়ত্ত্বে আনতে জনগণের কি জ্ঞান ও দক্ষতা রয়েছে?

* জনগণের কি মৃত্যুকালীন ঘোষনা এর অন্যান্য জলবায়ু তথ্যের প্রবেশাধিকার রয়েছে?

Addressing Underlying Causes of Vulnerability:-

বিপন্নতার অর্ন্নিহিত কারণ সমূহ আমলে নেয়া ঃ-

* এ সকল বাঁধা মোকাবিলায় পুরষ এবয় মহিলারা কি একত্রে কাজ করে?

* জটিল জীবিকা নিয়ন্ত্রণে গৃহস্থরা কি কাজ করছে?

* তথ্য, দক্ষতা ও সেবা সমূহের ক্ষেত্রে মহিলা ও অন্যান্য প্রান্তিক দল সমূহের কি সমান প্রবেশাধিকার রযেছে?

* সামাজিক, রাজনৈতিক এবং অর্থনৈতিক কর্মকান্ড ব্যতীত অন্য কোন কর্মকান্ড রয়েছে কি তা এলাকা/সম্প্রদায় আরও বেশী বিপন্ন করে তোলে?

* সে সকল কর্মকান্ডে অন্য সকল বিপন্ন দলসমূহের কি কোন প্রভাব রয়েছে?

Appendix 8.4 CBA framework in the context of Char Kukri Mukri union.

Table 13: CBA framework in Local and household level in the context of Char Kukri Mukri union.

	Climate resilient Livelihoods.	**Disaster risk reduction(DRR)**	**Capacity development**	**Underlying causes of vulnerability.**
Local Level/ Community Level	- Local institutions usually do not have access to climate information. - Local government support climate resilient livelihoods but do not have specific local plans and policies. - Local government depends on NGO extension workers and they promote adaptation strategies.	- Local institutions barely have access to disaster risk information. - Local disaster management plan are been implemented but lacking physical resources and funds for implementation. - Early warning systems are traditional but in place. - Local government does not have capacity to respond to disaster. - Local government does not have adequate Killa and cyclone shelter for safer	- Local institutions do not have capacity to analyze and monitor future climate risks. - Local institutions are implementing adaptation activities with fewer beneficiaries due to lack of resources and funds. - The market infrastructure is very weak and the communication gap is very high. - Proper skill and training are available for capacity development.	- Local planning processes are participatory but women are conservative. - Women and other marginalized groups have voice and participation in planning process. - Local policies do not provide access to and control over critical livelihood resources. - Political nepotism has been considered in selection process.

movement.

Households / Individual Level	- Households are using practical climate information / local knowledge based. - Households have less diversified livelihood opportunities. - Households are trying to be familiar with climate resilient agriculture practices. - Inhabitants are not managing risk by planning for and investing in the future.	- Households do not have protected reserves of food and agriculture inputs. - Households do not have secure shelter. - Key assets are not protected due to lack of physical resources (Killa/ cyclone helter). - Households have access to early warning systems provided by RCS (red crescent society). - People do not have mobility to escape danger from climate hazards because of Sluice gates are not available in the embankment.	- Social safety nets are not available for the women. - Financial services are not available. - People have only local knowledge and skills to employ adaptation activities. - People do not have access to seasonal forecasts and other climate information.	- Women are conservative but working together in an emergency. - Households do not have control over critical livelihood resources. - Women and marginalized groups have equal access to information, skills and services. - Conditional loan "dadon" has negative impact on poor fishermen. - Lack of school, hospital and Bank has negative impact on human capital.

Appendix 8.5:

Table 13: Types of local institutions in Char Kukri Mukri.

Local Institutions	Public	Private	Civic
Types of institutions	- **Local agencies** (BWDB, BFRI, Livestock department, disaster and relief department, agriculture department, fisheries department, forest department , UDMC etc)	-**Service organizations** (UNDP, Muslim aid, DORP, Action aid, RCS, WFP) - **Private businesses** (COAST, Palli shakti, grameen shakti, DBBL mobile banking)	- **Membership Organizations** (UNDP, UNESCO, save the children, ECHO, UMCOR, UNHCR etc) - **Cooperatives** (nongovernmental partnerships or wings of stakeholders)

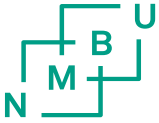
	- Local governments (Union Parishad)		

Source: Uphoff and BucK (2006)

Appendix 8.6: Pictures of the field visit

Picture 6: Focus group discussion 1

Picture 7: Focus group (Women) discussion 3



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