

Management of Climate-Stressed Wetlands to Create Climate Resilience of Bangladeshi Wetland Communities

Syed Mohammad Aminur Rahman

MS (Economics), Yamaguchi University, Japan

M.Com (Accounting), University of Dhaka, Bangladesh

Department of Geography, Environment and Population
School of Social Sciences
The University of Adelaide



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Table of contents

Table of contents	vii
List of Tables	xii
List of Figures	xiii
Abstract	xiv
Declaration	xvi
Acknowledgement	xvii
Abbreviations and Acronyms	xix
Chapter 1: Research Background and Problem Statement	1
1.1 Introduction	1
1.2 Problem statement	3
1.3 Research questions	10
1.4 Rationale of the research	10
1.5 Thesis Structure	13
Chapter 2: Literature Review	15
2.1 Introduction	15
2.2 Wetland Management Systems	15
2.2.1 <i>Wetland Management: Top-down/Bottom-up Approaches and Nature-based Solutions</i>	17
2.2.2 <i>Existing Wetland Management</i>	22
2.2.3 <i>Management in the Context of Climate Change: Adaptation Approaches</i>	25
2.3 Community-based Adaptation (CBA)	28
2.3.1 <i>CBA and Community-based Natural Resource Management (CBNRM)</i>	31
2.3.2 <i>Benefits of CBA</i>	32
2.3.3 <i>Barriers to CBA</i>	33
2.3.4 <i>Differentiating CBA from Other Development Projects</i>	36
2.3.5 <i>Issues for CBA as a Multi-stakeholder and Multi-scale Approach</i>	37
2.4 Resilience and Building Community Resilience	38
2.4.1 <i>Resilience</i>	38
2.4.2 <i>Adaptive Capacity</i>	41
2.4.3 <i>Community Resilience</i>	44
2.4.4 <i>Measuring Community Resilience Using Community Resilience Assessments</i>	48
2.4.5 <i>Using Drivers to Develop Community Resilience</i>	50

2.4.6 <i>The Role of Community-based Adaptation (CBA) Projects in Building Community Resilience</i>	54
2.5 Conclusion	57
Chapter 3: Research Methodology	58
3.1 Introduction	58
3.2 Research Design: Case Study Approach	59
3.3 Research Philosophy, Methodology, and Methods	60
3.4 Qualitative Data Collection	62
3.4.1 <i>Document, Literature, and Archive Record Review</i>	63
3.4.2 <i>Semi-structured Interviews</i>	64
3.4.2.1 <i>Interviews with Local Beneficiaries</i>	66
3.4.2.2 <i>Interviews with Administrative Officials and Local Representatives</i>	67
3.4.2.3 <i>Interviews with NGO Officials</i>	68
3.4.2.4 <i>Interviews with Experts</i>	69
3.4.2.5 <i>Focus Group Discussion</i>	69
3.4.2.6 <i>Field Observation</i>	72
3.5 Quantitative Data Collection	76
3.6 Data Analysis	77
3.6.1 <i>Analysis of Qualitative Data</i>	79
3.6.2 <i>Quantitative Data Analysis</i>	80
3.7 Research Rigour and Ethical Considerations	80
3.7.1 <i>Ensuring Data Validity and Reliability</i>	80
3.7.2 <i>Triangulation</i>	81
3.7.3 <i>Ethical Considerations</i>	81
3.8 Limitation of the Study	82
3.9 Conclusion	83
Chapter 4: Climate Change-Related Policies in Bangladesh and Case Study Project Details	84
4.1 Introduction	84
4.2 Bangladesh Policies on Climate Change	84
4.2.1 <i>National Adaptation Programmes of Action (NAPA)</i>	87
4.2.2 <i>Bangladesh Climate Change Strategy and Action Plan (BCCSAP)</i>	88
4.2.3 <i>Bangladesh Climate Change Trust Fund (BCCTF)</i>	90
4.2.4 <i>Bangladesh Climate Change Resilience Fund (BCCRF)</i>	92
4.2.5 <i>Intended Nationally Determined Contribution (INDC)</i>	93
4.2.6 <i>Bangladesh Delta Plan 2100</i>	94

4.2.7 <i>Wetland Management Policies in Bangladesh</i>	95
4.3. The role of the Ministry of Environment, Forest, and Climate Change (MoEFCC) and the Climate Change Unit (CCU)	99
4.4 Project-related Information	101
4.4.1 <i>Project Site</i>	101
4.4.2 <i>Ecological Description</i>	102
4.4.3 <i>Projects Implemented in Hakaluki Haor</i>	103
4.5 Key Components of the CBA-ECA Project	104
4.5.1 <i>Village Conservation Groups (VCGs) and Ecologically Critical Area (ECA) Management Committees</i>	105
4.5.2 <i>Village Conservation Centres (VCCs)</i>	108
4.5.3 <i>Building Awareness and Capacity</i>	109
4.5.4 <i>Submersible Embankment Construction and Tree Planting</i>	111
4.5.5 <i>Excavation and Re-excavation of Beels and Fish Sanctuary Management</i>	112
4.5.6 <i>Wetland Swamp Forest Protection/Conservation</i>	114
4.5.7 <i>Micro Capital Grants (MCGs)</i>	115
4.5.8 <i>Endowment Fund</i>	116
4.6 Conclusion	117
Chapter 5: Components Positively Influencing the Building of Community Resilience Through the Management of Climate-stressed Wetlands Under the CBA-ECA Project	118
5.1 Introduction	118
5.2 Components Enhancing the Human Drivers.....	119
5.2.1 <i>Awareness Building</i>	120
5.2.2 <i>Management Skills Training</i>	121
5.2.3 <i>Crop Diversification Skills Training</i>	123
5.2.4 <i>Disaster Preparedness Training</i>	125
5.2.5 <i>Leadership Skills Training</i>	126
5.3 Components Enhancing the Social Drivers	129
5.3.1 <i>Village Conservation Groups (VCGs) – Internal Relationships</i>	129
5.3.2 <i>Village Conservation Groups (VCGs) – External Relationships</i>	131
5.3.3 <i>Village Conservation Groups (VCGs) – Social Networks and Social Cohesion</i>	132
5.4 Components Enhancing the Natural Drivers	136
5.4.1 <i>Swamp Forest Restoration Programme</i>	136
5.4.2 <i>Other Factors Enhancing Natural Drivers</i>	139
5.5 Components Enhancing the Physical Drivers	140
5.5.1 <i>Submersible Embankments</i>	141

5.5.2 <i>Excavation and Re-excavation of Beels</i>	143
5.5.3 <i>Village Conservation Centres (VCCs)</i>	146
5.6 Components Enhancing Financial Drivers	147
5.6.1 <i>Micro Capital Grants (MCGs)</i>	148
5.6.2 <i>Alternative Income Generation Activities (AIGA)</i>	150
5.6.3 <i>Other Factors Enhancing Financial Drivers</i>	152
5.7 Conclusion	155
Chapter 6: Factors Impeding the Building of Community Resilience Through the Management of Climate-Stressed Wetlands Under the CBA-ECA Project	156
6.1 Introduction	156
6.2 Factors Impeding Human Drivers	157
6.2.1 <i>Social Inequality</i>	158
6.2.2 <i>Inappropriate Training</i>	160
6.2.3 <i>Lack of Market Access for Diversified Crops</i>	163
6.3 Factors Impeding Social Drivers	165
6.3.1 <i>Internal and External Conflicts</i>	165
6.3.2 <i>Ineffective Conflict Resolution Processes</i>	168
6.3.3 <i>Lack of Collective Voice</i>	170
6.4 Factors Impeding Natural Drivers	172
6.4.1 <i>Ignorance of Local Knowledge and Values</i>	172
6.4.2 <i>Elite Capture and Adverse Impacts of Power Dynamics</i>	175
6.5 Factor Impeding Physical Drivers: Lack of Consideration of Stakeholder Opinions	179
6.6 Factors Impeding Financial Drivers	181
6.6.1 <i>Insufficient Funding and Other Management Issues</i>	181
6.6.2 <i>Communication Problems: Information Gaps and Problems of Access</i>	183
6.7 Conclusion	186
Chapter 7: Governance Factors Undermining the Participatory Wetland Management System of the CBA-ECA Project	188
7.1 Introduction	188
7.2 Problems with the Selection of Village Conservation Group (VCG) Members	190
7.2.1 <i>Nepotism</i>	190
7.2.2 <i>Project Opponents</i>	191
7.2.3 <i>Exclusion of Beel Leaseholders</i>	194
7.3 Lack of Community Participation in the Design of Project Activities	195
7.4 Lack of Community Participation in the Implementation of Project Activities	200

7.5 Lack of Community Ownership of and Responsibility for the Management of the Project	202
7.6 Lack of Synergy Between Government and Non-government Agencies	206
7.7 Inadequate Governance of Climate Finance	210
7.7.1 <i>Lack of Accountability and Transparency</i>	211
7.7.2 <i>Poor Institutional Capacity</i>	212
7.7.3 <i>Coordination Challenges at Central Level</i>	214
7.7.4 <i>Ineffective Monitoring Systems</i>	216
7.8 Conclusion	218
Chapter 8: Discussion	219
8.1 Introduction	219
8.2 Important Components that Contribute to Building Community Resilience	222
8.3 Nil Impacts/ Key Factors Impeding the Building Resilience	225
8.3.1 <i>Problems of Participation and Representation</i>	226
8.3.2 <i>Problems of Cultural Disconnect</i>	228
8.4 Proposed Solutions and Improvements:	229
8.4.1 <i>Replace Top-down Decision-Making with Democratic Devolution</i>	230
8.4.2 <i>Priorities in Project Design</i>	232
8.4.3 <i>Develop Community Drivers for Successful CBA Projects</i>	234
8.4.4 <i>Implement Projects with an Understanding of Local Culture</i>	237
8.4.5 <i>Improve Coordination</i>	239
8.4.6 <i>Understand the Local Power Structure</i>	241
8.5 Conclusion	243
Chapter 9: Conclusion	246
9.1 Introduction	246
9.2 Summary of Findings	248
9.3 Contributions to Knowledge	253
9.4 Policy Implications and Recommendations	254
9.5 Limitations of the Research and Future Research Directions	255
9.6 Concluding Statement	256
References:	259
Appendix 1: Ethics Approval Letter	311
Appendix 2: Household Survey Questionnaire	336
Appendix 3: Permission from the CNRS for Using Maps of Hakaluki Haor	344
Appendix 4: Permission from Rahman et al. (2015) for Using Figure	345

List of Tables

Table 1: Status of bird species in Hakaluki haor, according to multiple surveys	7
Table 2: Status of fish species in Hakaluki haor, according to multiple surveys	8
Table 3: Decline in plant biodiversity in Hakaluki haor between 2005 and 2011 (year of most recent study on plant biodiversity)	8
Table 4: Drivers of community resilience as identified and defined in the literature	52
Table 5: Type and number of in-depth interview participants	65
Table 6: Actors in focus group discussions and number of focus groups for each category of participants	71
Table 7: Key drivers for building community resilience and associated definitions	78
Table 8: Climate Change and Wetland Management Related Major Policies in Bangladesh	85
Table 9: Budgeted funding across BCCSAP thematic areas	89
Table 10: BCCRF investment projects disbursements as of December 31, 2016	93
Table 11: Examples of completed projects in Hakaluki <i>haor</i>	103
Table 12: Estimated funding contributed to the CBA-ECA project by funding source, in lakh taka*	104
Table 13: VCG Executive Council Officers	105
Table 14: ECA management committees	106
Table 15: Fish sanctuaries in Hakaluki <i>haor</i> area	113
Table 16: Survey Participants' Perceptions of Resources Influenced by Natural Drivers Associated with Components of the CBA-ECA Project (N=346)	139
Table 17: Participation in selection of CBA-ECA project activities	196
Table 18: Participation in implementing CBA-ECA project activities	200
Table 19: Summary of the contribution of the CBA-ECA project interventions for building resilience	220
Table 20: Research Questions and Key Findings	246
Table 21: Summary of Findings	249

List of Figures

Figure 1. Map of Hakaluki haor.....	3
Figure 2: A framework to assess the resilience of a local wetland community that has gone through a development intervention	51
Figure 3: AIGA project beneficiaries with their sewing machine and mat-making materials received from the project (Author’s taken during field work, 2019).	74
Figure 4: Fish at local market (Author’s taken during field work, 2019).	75
Figure 5: Exterior of village conservation centre (VCC) (Author’ taken during field work, 2019).....	75
Figure 6: Climate-relevant allocation (%) across BCCSAP thematic areas in financial year 2020–2021	90
Figure 7: Bangladesh wetlands management structures by area	97
Figure 8: Impacts of existing wetland management policy	98
Figure 9: Extent to which leadership training increased motivation for conservation?	127
Figure 10: The Role of Social Networks in Reducing the Impact of Natural Disasters	133

Abstract

In Bangladesh, wetland areas are ecologically and socio-economically important. Half of the total land area of the country is occupied by wetlands. The protection of wetland ecosystems is of special concern in Bangladesh as they are richly biodiverse, support various types of fisheries, and give shelter to both domestic and migratory birds. Adverse effects such as drought, early rain, and reduced rainfalls have already become a problem due to climate change. Like other wetlands in Bangladesh, the once ecologically rich Hakaluki *haor*, situated in the northeastern part of the country and the biggest freshwater wetland area of the country, is now in a critical condition. Therefore, local communities, especially the fishers who were once dependent on this *haor*, are now threatened by the prospect of losing their livelihoods.

To address this urgent issue, the government of Bangladesh and various international organisations have invested in various projects to facilitate community-based climate change adaptation and resilience. The community-based adaptation (CBA) approach is popular because it helps to build the resilience of the vulnerable residents of climate-stressed areas through activities that based on local knowledge and experience. The Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project, which was implemented from 2010-2015 to manage the Hakaluki *haor*, was the case study of this thesis.

The overarching aim of this dissertation was to explore what factors contributed to whether this project was successful or not to manage climate-stressed wetlands and build climate resilience. The study found that the overall impact of the project was positive in the short term, while the project was being implemented, but showed long-term promise for only some of the interventions. Local people can now explain the impact of climate change in their community. They can face natural disasters more confidently and in a more united way than they were able to before the project. One of the most significant impacts of the project was on gender equity with women reporting they feel more capable than they did before joining the project. These interventions also helped to increase the financial capacity, as well as the resilience of the local household members and the overall community.

On the other hand, the study found that the project faced several challenges in its attempt to fulfil the principles of CBA. The foremost challenge was to ensure democracy in the design and implementation of the CBA-ECA project and results demonstrated that this participation was ‘tokenistic’ or ‘for show’: community people were ‘heard’ but their opinions were not followed in the decision-making process. Another major challenge arose from the interference of ‘community elites’ who exploited the natural resources for profit and interfered with the decision-making process to benefit themselves, to the detriment of the poor and marginalised non-elites. Further, while the fish diversity and the plant diversity initially increased due to the participatory wetland management activities, the benefits associated with this, both for the ecosystem and the people whose livelihoods depended upon it, have diminished over time.

This dissertation contributes to the literature by empirically identifying the challenges and constraints this CBA approach faced in practice in the context of managing climate-stressed wetlands in a developing country. Recommendations include that CBA projects need to be redesigned, and that decision-making should be democratically devolved to CBOs whose members are representative of the community and empowered to participate actively. In addition, the capacity and livelihood of local people should be built through more appropriate training and cash investment, with trainers from the same region and social class of the trainees preferred and realistic loans and grants offered. Members of the CBOs should be legally, socially and, if necessary, physically protected from elite capture, and NGOs should serve as outside expert advisors supporting community mobilisation and collaborative effort.

[Key words – Wetlands, *Haor*, Bangladesh, Critical conditions, Resilience, Participatory wetland management, Community-based Adaptation (CBA), Projects, Elite capture, Gender equity]

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint award of this degree.

I give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library Search and also through web search engines, unless permission has been granted by the University to restrict access for a period of time.

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Signature

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Abbreviations and Acronyms

ADP	Annual Development Programme
AIGA	Alternative Income Generation Activities
BCCT	Bangladesh Climate Change Trust
BCCTF	Bangladesh Climate Change Trust Fund
BCCRF	Bangladesh Climate Change Resilient Fund
BCCSAP	Bangladesh Climate Change Strategy and Action Plan
BDP 2100	Bangladesh Delta Plan 2100
CBA	Community-Based Adaptation
CBA-ECA	Community-Based Adaptation in Ecologically Critical Areas through the Biodiversity Conservation and Social Protection (CBA-ECA) Project
CBFM-II	Community-Based Fisheries Management
CBNRM	Community-Based Natural Resource Management
CBO	Community-Based Organisation
CCA	Climate Change Adaptation
CCU	Climate Change Unit
CEO	Chief Executive Officer
CFF	Climate Fiscal Framework
CIP-EFCC	Country Investment Plan for Environment Forestry and Climate change
CNRS	Centre for Natural Resource Studies
CREL	Climate Resilient Ecosystems and Livelihood Project
CWBMP	Coastal and Wetland Biodiversity Management Project
CSOs	Civil Society Organisations
DoE	Department of Environment
DoF	Department of Fisheries
EC	Executive Committee
ECA	Ecologically Critical Area
ECNEC	Executive Committee of National Economic Council
ERD	Economic Relations Division

FAP	Bangladesh Flood Action Plan
FGD	Focus Group Discussion
GCF	Green Climate Fund
GEF	Global Environment Facility
GoB	Government of Bangladesh
HREC	Human Research Ethics Committee
IMED	Implementation, Monitoring and Evaluation Division
INC	Initial National Communication
INGO	International Non-Governmental Organisation
IPAC	Integrated Protected Co-management/the Project
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
LDC	Least Developed Countries
MACH	Management of Aquatic Ecosystem through Community Husbandry
MCG	Micro Capital Grant
MoEFCC	Ministry for Environment, Forests and Climate Change
NAPA	National Adaptation Programme of Action
NDA	National Designated Authority
NDC	Nationally Determined Contribution
NGO	Non-Governmental Organisation
NRM	Natural Resource Management
PCMoP	Planning Commission of the Ministry of Planning
PKSF	Palli Karma Sahayak Foundation
SEMP	Sustainable Environment Management Programme
SMI	Semi-structured Interview
TIB	Transparency International Bangladesh
UNFCCC	United Nations Framework Convention on Climate Change
UNO	Upazila Nirbahi Officer
UP	Union Parishad
USAID	United States Agency for International Development
VCC	Village Conservation Centre
VCG	Village Conservation Group

Chapter 1: Research Background and Problem Statement

1.1 Introduction

Wetlands play critical roles in biodiversity conservation, water transport, and sedimentation (Fischlin et al., 2007; Tsoi et al., 2022; Wang et al., 2022). They are considered very productive ecosystems as they provide various goods and services including fresh water, floodwater storage, protection of adjacent land from severe flooding, control of sedimentation, and biomass and food production (National Research Council, 1995; Mitsch & Gosselink, 2000; Keddy, 2010; Moomaw et al., 2018; Islam et al., 2021; Maua et al., 2022). Around half of the world's population consumes rice (Desta et al., 2021), and most of this crop is produced in wetland areas (Tobore et al., 2021). The ability to store a great deal of fresh water enables wetlands to support the production of a wide variety and large quantity of both fish and crops (Scholz, 2015; An & Verhoeven, 2019). The wetlands serve many critical functions for global ecology, providing habitat and food for numerous species, purifying water, and recharging groundwater. For the above reasons, wetlands are referred to “the kidneys of Earth” (Cui et al., 2021, p. 1). They have also been called the “biological supermarket” (Rijal et al., 2021, p. 39) as people living near wetlands who are unable to afford meat can harvest the freshwater and saltwater fish of the wetlands to satisfy their need for the protein and vitamins required for health and growth (Kibria et al., 2010). Wetlands carry even further significance, representing an important part of the national heritage and spirituality of the countries and cultures within which they exist (Haroon & Kibria, 2017; Gardner & Finlayson, 2018; Davies et al., 2020).

Bangladesh is blessed with enormous wetland areas (Chowdhury et al., 2018), including rivers, freshwater lakes and marshes, human-made reservoirs (such as Kaptai Lake in Chittagong Hill Tracts), *haors* (bowl-shaped large tectonic depressions), *baors* (oxbow lakes), *beels* (sizeable depressions in which water remains all year long), mangrove swamps, and extensive floodplains that are seasonally inundated (Akter, 2011; Mamun et al., 2013; Islam & Islam, 2014; Iqbal et al., 2015). Wetland areas occupy around half of the total land in Bangladesh (Khan et al., 1994; Islam et al., 2018); they have special importance in this country for ecological and socio-economic reasons (Islam & Gnauck, 2007; Oakkas et al., 2020).

Wetlands hold numerous benefits for the people of Bangladesh – with fish production being one (Islam et al., 2021). In 2016, Bangladesh was ranked third in the world, behind China and India, for inland capture fisheries production (FAO, 2018). The fisheries sector thus plays a vital role in the country’s economy, contributing 3.61% and 3.57% to the national GDP in the fiscal years 2015–2016 and 2017–2018, respectively. In terms of export, this sector is the second largest for the nation (DoF, 2017, 2019). The fisheries sector creates employment opportunities for about 1.31 million full-time and around 16.69 million part-time fishers (DoF, 2016). In Bangladesh, capture fisheries and aquaculture that supply protein-rich food also contribute significantly to national food security and rural diets (DoF, 2018; Haque et al., 2021). Clearly, the lives and livelihoods of millions of people in Bangladesh, directly and indirectly, are dependent on the fishery sector (DoF, 2018; Hasan et al., 2021).

Capture fisheries production in Bangladesh relies largely on various open water resources such as rivers, *haors*, and floodplains, with *haors* alone contributing approximately 10% of the nation’s total capture fisheries production (DoF, 2018; Aziz et al., 2021). Due to their rich biodiversity and the natural resources, which they offer for human use, *haors* are considered essential ecosystems (Muzaffar & Ahmed, 2007). Among the freshwater wetlands in Bangladesh, the Hakaluki *haor*, depicted in Figure 1, is vital for various reasons.

Located in Moulvibazar and Sylhet Districts, the Hakaluki *haor* is the biggest freshwater wetland in Bangladesh and is one of the most prominent in Asia (CNRS, 2002; IUCN, 2004; Newaz & Rahman, 2022). The extensive ecological diversity and valuable raw materials found in the Hakaluki *haor* make this area particularly ecologically important (Muzaffar and Ahmed, 2007; Islam et al., 2021).

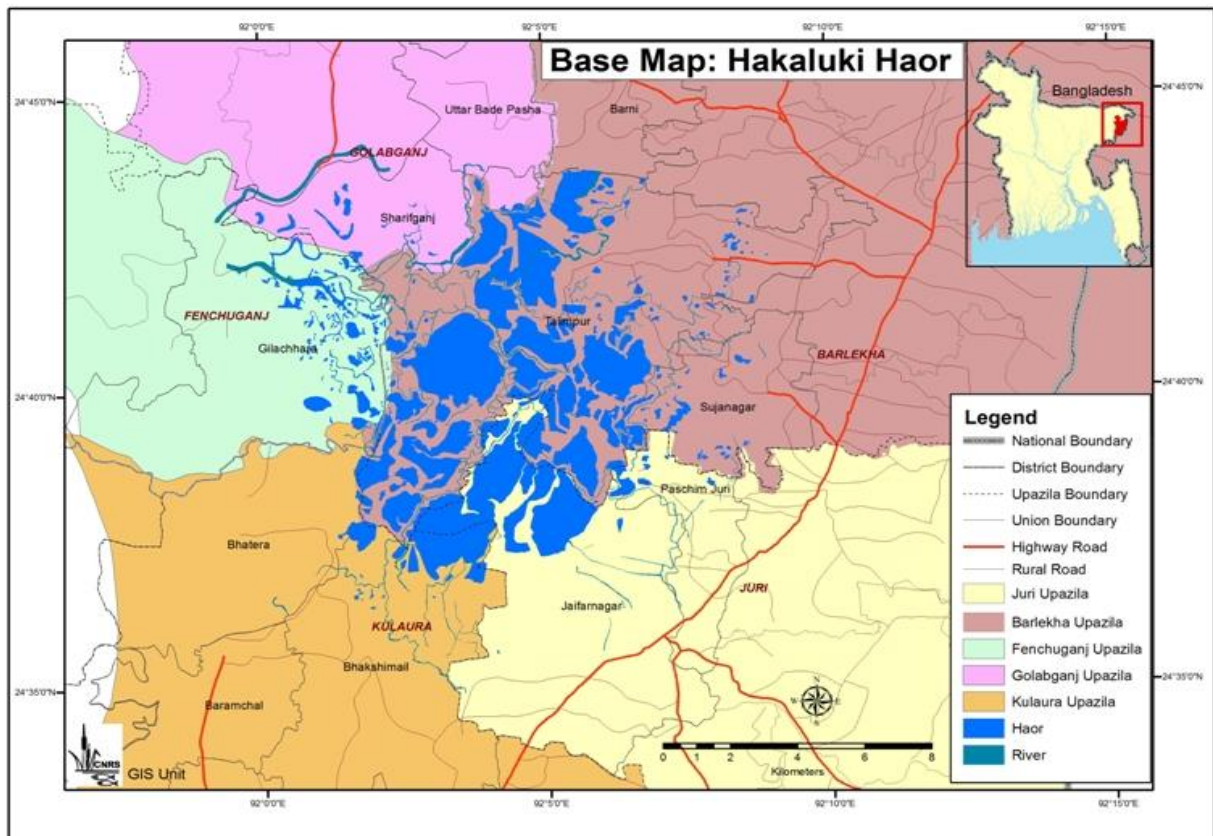


Figure 1. Map of Hakaluki haor

Source: The Center for Natural Resources Studies (with permission).

This *haor* – which has traditionally served as one of the most important ‘mother fisheries’ (breeding grounds) in Bangladesh (Choudhury & Faisal, 2005) – has the characteristics of a standard wetland and provides resources of global significance (Teeffelen et al., 2001; Ahmed et al., 2008). It also serves as a breeding place for endangered fish species (Islam et al., 2021). People of this area depend on this *haor* for their livelihood. As, for example, fishers catch fish from it or as farmers engage in agricultural activities that depend on it for irrigation and soil nutrients (Rahman et al., 2018b). While fishing occurs all year round, agricultural activity predominates in the dry season (Rahman et al., 2015).

1.2 Problem statement

Wetlands have been considered lifesavers against the threat of climate change, because they are known to trap a third of the world’s carbon (DoEE, 2019), slow global warming, and bond

greenhouse gases to the water within (IPCC, 2021). Even as they serve to protect the planet, the wetlands are threatened by climate change.

Wetlands are transition zones between land-based and aquatic ecosystems (Salimi et al., 2021), which experience high levels of hydrological fluctuation. Therefore – although wetlands are known to be resilient to climate change in general – they are vulnerable to rapid fluctuations in water type and level (salt/fresh, and flooding/drought), as well as to having their entire ecosystems impacted by pollution, urbanisation, and changes in land use (IPCC, 2007). Climate change is considered to be the biggest threat to wetlands (Salimi et al., 2021) because these ecosystems degrade more rapidly in response to the adverse effects of climate change than others (Thamaga et al., 2021). Changes in the flow regimes of rivers and wetlands have already occurred due to climate change (Rivaes et al., 2022); these changes have had severe biodiversity impacts (Habibullah et al., 2022) as well as significant socio-economic impacts on the human communities that live upon wetland resources (Lemly et al., 2000; McMichael et al., 2006; Khatun et al., 2022).

Researchers have found evidence of the effects of climate change on wetlands around the world. Reduced snowpack and early snowmelt have been demonstrated to have an adverse effect on freshwater wetlands in North America: the vegetation structure of that area has been reported to have been transformed by permafrost melts (Lawler, 2009; Malhotra & Roulet, 2015; Heijmans et al., 2022). As illustrated by Middleton and Souter (2016), wetlands are likely to lose their ability to provide various services – including water quality maintenance, water supply, fish production, and other aquatic services due to megadroughts, predicted to threaten overall ecosystem services and biodiversity. Gharagheshlagh wetland, near Urmia Lake in the northwest of Iran, provides another example of the impact of such changes in climate on a wetland ecosystem. Gharagheshlagh wetland has been suffering from a shrinkage crisis (Alizadeh-Choobar et al., 2016; Dashti et al., 2018) that renders it unusable: the ecosystem and the community people who need its water are under threat (Ghale et al., 2019). South Asia – where most poor people are dependent on local resources for their livelihood – has also experienced the degradation of wetland ecosystem functions and its consequences (Birkhofer et al., 2015; Adhya et al., 2022).

All issues for wetlands under the climate change stress described above are exemplified in the wetland areas of Bangladesh. The supply of natural resources, as well as the livelihood

activities of wetland residents in this country, are in a perilous condition due to droughts, flash floods, and changes in upstream river flows (UNDP, 2012; Alam et al., 2018; Dey et al., 2021). The wetlands of this country are becoming vulnerable for climatic and anthropogenic reasons (MoEFCC, 2016; Islam, Rakib, et al., 2018; Sunny et al., 2020). Rises in temperature have been shown to have a significant effect on wetland water quality and biodiversity, reducing dissolved oxygen in the water, and causing massive damage to the aquatic ecosystem (Kibria et al., 2010; Khatun et al., 2022). Apart from the rise in temperature, climate-induced disasters including cyclones, frequent storm surges, the intrusion of salinity, and the disturbance of the rainfall patterns affect the wetlands of Bangladesh (Rabbani et al., 2013; Haque, 2022). Erratic rainfall in particular affects fish breeding activity and diversity (Chowdhury et al., 2010; Alam & Mallick, 2022). As a result of these impacts of global climate variability and change, the fisheries sector of Bangladesh is particularly vulnerable (Islam et al., 2020). The wetlands of Bangladesh, which offer employment opportunities and provide dietary protein, are rapidly being destroyed (Noman, Islam, and Shoaib, 2021) due to the changing climate and its associated extreme events, and the livelihoods of wetland-dependent people are under threat.

These issues are particularly evident in the Hakaluki *haor* area. Once, this *haor* served as an important mother fishery, but this is no longer true to the same extent (Iqbal et al., 2015; Islam et al., 2021). Changing sedimentary patterns related to climate-driven changes in rainfall have had serious consequences for the *haor* ecosystem (Rahman et al., 2022). Hills surround this *haor*; sediment flows down from them in the rainy season. As weather patterns have changed and more rain has fallen on these hills, this flow of sediment has become increasingly damaging to the fisheries. Breeding systems have been hampered, fish production has decreased tremendously (Chowdhury & Chowdhury, 2011); several fish species, such as the elongate glassy perchlet, the river shad, the mola carplet, and the kuncho river prawn (a freshwater shrimp whose presence suggests its habitat is healthy) have declined dramatically or – as is the case with the knifefish – become extinct due to the destruction of their habitats (Aziz et al., 2021). Another critical issue arising from sedimentation is temperature fluctuation due to changes in depth and water clarity from increased biological production, which also hampers ecological processes and contributes to the decline in fish species diversity (Gagliano et al., 2007; Islam et al., 2021). Every year, in the monsoon season, Hakaluki *haor* basin loaded with a huge amount of sediment from upstream rivers (Polash et al., 2021).

It is worth noting the consequences of the aforementioned regularly occurring floods, extreme rainfall events, droughts, and flash floods, all of which affect livelihoods and are climate stressors for fishing and farming communities (Nowreen et al., 2015). In 2005, Romilly (2005) contended that such irregularity would change even more in the future; it would continue to disrupt the *haor* ecosystem, reduce agricultural and piscine productivity, as well as threaten the sustainability of the region's economic development. Studies suggest that Romilly was right. For example, according to Rahman et al. (2018a), droughts and flash floods occur increasingly unpredictably throughout the year in the Hakaluki *haor* and affect the agricultural activities of the residents. While irregular rainfall affects Boro rice production, sudden flash floods are the main cause of food insecurity (Alam et al., 2020).

Swamp forests and the biodiversity of the *haor* area are in further danger from Anthropocene-epoch activities; only two patches of these forests were found there (Uddin et al., 2013; Islam et al., 2018). The Hakaluki *haor* was previously ecologically rich, as there were various kinds of plant species, including swamp forests; these provided shelter for wildlife and protected fish against illegal netting during breeding periods (Choudhury & Faisal, 2005). However, these swamp forests have been degraded due to inefficient conservation practices (Iqbal et al., 2015; Aziz et al., 2021). Moreover, the conversion of wetlands to rice fields and the cutting of swamp trees for fuel have been found to have adverse impacts on migratory birds and other wildlife species (Uddin et al., 2013; Islam, Rakib, et al., 2018). Many species from this ecosystem have become extinct following the loss of their habitats (DoF, 2016; Islam et al., 2021). In addition to the above threats, the use of pesticides and chemical fertilisers has caused severe environmental problems (Khan et al., 1994; Halim et al., 2018). The water quality of the Hakaluki *haor* has been degraded by the run-off of farms using these chemicals (Akter et al., 2017).

Another reason for the downturn in fish production pertains to the failure in preventing illegal fishing in the Hakaluki *haor* (Iqbal et al., 2015; Oakkas & Islam, 2020). Sultana and Islam (2016) demonstrated that ineffective monitoring allowed the widespread employment of such ecologically harmful fishing technology in the Hakaluki. Islam et al. (2021) reported that one of the methods used by people engaged in illegal fishing, within *haor* regions, involves the use of large-scale fishing technology that incorporates the use of engine boats and seine nets.

In 1993, 125 bird species and 107 fish species (32 considered nationally threatened) were found in the Hakaluki *haor* area. However, by 2009 (the year of the most recent study to count birds) and 2018 (fish/shellfish), these figures had decreased to 41 and 63, respectively (sources listed below Tables 1 and 2).

The following tables document the reported ecological destruction of the Hakaluki *haor* over the past generation. Table 1 reveals the dramatic decline in the number of bird species.

Table 1: Status of bird species in Hakaluki haor, according to multiple surveys

Year of survey	Number of bird species
1993	125
2006	49
2008	45
2009	41

Sources: FAP, 1995; CWBMP, 2005; IPAC, 2009.

As Table 2 shows, the number of fish species initially decreased from 107 in 1993 to 75 in 2009, then increased to 83 in 2015 (an increase that could be attributed to including shellfish in the count). However, the trend then reversed to reach a low of 63 total fish and shellfish in 2018.

Table 2: Status of fish species in Hakaluki haor, according to multiple surveys

Year of survey	Number of fish species
1993	107
2009	75
2015	83 (fish and shellfish)
2015	82 (as above)
2016	75 (as above)
2018	63 (as above)

Sources: IPAC, 2009; Iqbal et al., 2015; Rahman et al., 2016; Aziz et al., 2021.

Plant biodiversity also decreased significantly over a six-year period, as illustrated in Table 3.

Table 3: Decline in plant biodiversity in Hakaluki haor between 2005 and 2011 (year of most recent study on plant biodiversity)

Plant type/number of species	Year of survey	
	2005	2011
Trees	20	11
Shrubs	28	15
Herbs	120	38
Climbers	10	5

Source: CWBMP, 2005; Islam et al., 2011.

The biodiversity of the Hakaluki *haor* is deteriorating in response to both climate and human influences (Polash et al., 2021). Declining water quality in the Hakaluki *haor* is a grave concern. The water quality of a body of water relies mainly on the interactions of a number of physiochemical factors (Momtaz et al., 2010). The application of pesticides and chemical fertilisers causes severe environmental problems to soil and air (Khan et al., 1994); when these

chemicals enter water, they degrade its quality (Akter et al., 2017). Alterations in weather patterns arising from climate change affect the temperature and balance of biological life in bodies of water – two other key physiochemical factors which further influence water quality. Human-made and climate factors interact in the Hakaluki *haor* to give rise to the consequences documented in the tables above, which present the *haor* people with critical challenges in terms of the natural resources and livelihood activities on which they depend (Romilly, 2005; UNDP, 2012). Recent research shows that due to anthropogenic activities, land use practice has been changed significantly over the last 19 years from 2000 to 2019. Increased human settlement was the main reason for reducing water body, dense vegetation area, bare land, and cropland (Polash et al., 2021). Ineffective wetland management and inadequate alternative income generation activities were also responsible for the reducing fish diversity (Islam et al., 2021).

Effective wetland management systems, which can be compromised by both human and climate pressures (Erwin 2009), are crucial to addressing these problems and maintaining the sustainability and resilience of human settlements in these areas. With alterations in the environment due to climate change, it is very likely negative alterations in the environment will be reflected in the wetlands, impacting the livelihoods they support (Hughes, 2011; Capon et al., 2013). This is especially the case if wetland management systems are not developed to face these challenges.

The Government of Bangladesh has not been blind to these developments in the wetlands and has taken multiple actions to manage this resource. In 1999, the Hakaluki *haor* was declared an “Ecologically Critical Area” (ECA) under the relevant legislation (CNRS, 2002). Since then, the central government of Bangladesh, donor agencies, and non-government organisations (NGOs) have undertaken projects in the *haor* areas, to improve the health of the ecosystem itself, as well as protect the livelihoods of those who depend on wetlands. However, there has been a lack of research into the extent to which these measures, taken to help local residents, have been successful. This study is bound up with an intent to fill this research gap. Indeed, the issue – that is, how to measure the success of such climate adaptation measures in wetlands – is one of the key concerns of this dissertation.

1.3 Research questions

This dissertation focuses on the overarching question: “What impact has the use of community-based adaptation (CBA) had on the management of climate-stressed wetlands and the development of the resilience of communities in the northeastern wetland areas of Bangladesh?” The question will be answered using an in-depth case study of a project undertaken (2010–2015) in the largest climate-stressed wetland area of Bangladesh, the Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project in the Hakaluki *haor* area. The specific research questions are as follows:

1. Was the implementation of the project, with its community-based adaptation approach, effective in realising its goals of achieving better community adaptation and resilience to climate impacts? If not, what factors impeded effectiveness?
2. In what ways did the project include community participation and with what outcomes?
3. What lessons can be learnt for the building of community resilience in climate stressed wetlands in developing and climate vulnerable countries?

1.4 Rationale of the research

Geographic location made Bangladesh as one of the most natural climatic-affected countries in the world (Coirolo et al., 2013; Islam et al., 2022; Nomani et al., 2022). Many climate change projects have been implemented in Bangladesh with the aim of overcoming this vulnerability (DoE, 2015); it is vital that the impact of such projects be measured to determine whether or not they, in fact, meet their objectives. The objective of the case study that is the subject of this research was to build the resilience of the target population around the Hakaluki *haor* to the impacts of climate change.

Both the Government of Bangladesh and international agencies have acknowledged the importance of the wetlands of northeastern Bangladesh to its people and economy and have taken the initiative to improve the sustainability of these climate-stressed wetlands, implementing many projects between 1998 and 2018 that attracted large-scale funding from local as well as international and joint funds (DoE, 2015). These projects were: the Sustainable Environment Management Programme implemented between 1998 and 2005; the Community-Based Fisheries Management Project, 2001–2007; the Nishorgo Supported Project, 2003–2008; the Coastal and Wetland Biodiversity Management Project, 2003–2011; the Integrated Protected Area Co-management Project, 2009–2012; the Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project, 2010–2015, and the Climate Resilient Ecosystems and Livelihood Project, 2013–2018. Most of these projects were implemented using top-down management approaches that have arguably failed to ensure the conservation of these environmentally critical areas (Byomkesh et al., 2009; Barkat et al., 2019): such centralised approaches have been criticised for ignoring both local knowledge as well as the needs of local people when developing and implementing ways to deal with risks associated with climate change (Ayers & Forsyth, 2009; Mansuri & Rao, 2013; Rastegar & Ruhanen, 2021; Phong et al., 2022).

Over the last few decades, community-led participatory management approaches have become increasingly popular (Pender, 2008; Terzano et al., 2022). Among the more recent adaptation approaches, community-based adaptation (CBA) – described below and, in greater detail, within section 2.3 – has attracted a great deal of attention throughout the world. The initiatives that come out of CBA are intended to emerge either autonomously (i.e., local individuals and community people spontaneously develop ways to meet a specific need) or with the help of external organisations (‘planned CBA’) (Ayers & Forsyth, 2009). External and international agencies (multilateral and bilateral) and national and international NGOs play a vital role in planned CBA by facilitating the involvement and support of local communities through various stages of the adaptation.

A CBA approach – related to political concepts of devolution and decentralisation of government – engages community members as the prime actors driving the management process. Following its introduction CBA attracted the attention of policymakers, academicians, and practitioners (Smit & Wandel, 2006; Dumar, 2010; Forsyth, 2013; Ensor, Abernethy et

al., 2018). Analysis of the literature reveals that CBA has established itself as an alternative to the traditional top-down approach and has a better record of creating climate change resilience among vulnerable communities in the wetlands of the global south (Ayers & Dodman, 2010; McNamara & Buggy, 2017; Masud-All-Kamal & Nursey-Bray, 2022).

As an approach to increasing the climate change resilience of a vulnerable community, CBA is unique in that: (1) it engages the local community in the identification of its own needs (Masud-All-Kamal & Nursey-Bray, 2022); (2) it takes sociocultural factors into consideration; and, (3) it focuses on enhancing adaptive capacity (McNamara & Buggy, 2017). However, CBA has been criticised for failing to take into consideration local risks and uncertainties (Dodman & Mitlin, 2013; Eriksen et al., 2021). Where CBA may differ from a top-down approach – as it actively seeks to involve local people in decision-making (Ayers, 2011; Kirkby et al., 2018), it may not eliminate concerns over uneven power distribution. For instance, researchers have argued that there is a chance that, within a CBA project, community participation will be tokenistic and unequal power relations will develop between outsiders and local community members, potentially hampering the furnishing of adaptive capacity and people's resilience – both of which the project purportedly aims to assist (Yates, 2014; Ford et al., 2016; Galvin, 2019; Westoby et al., 2021). Despite these criticisms, the establishment and implementation of CBA activities continues to expand globally, especially in developing countries (such as Bangladesh).

As noted above, the Hakaluki has a history of hosting wetlands management projects driven by top-down approaches, which have not shown much apparent success. The CBA-ECA Project (2010–2015) attempted to address that lack of success by employing community-based adaptation (CBA) methods. At its core, the purpose of this research is to find out whether the deployment of a CBA method of management worked in the Hakaluki to build community resilience, why or why not, and to consider the implications of these findings for CBA-based wetlands management as a climate change adaptation strategy for wetlands in the global south generally.

To date, there has been little research aimed at understanding whether community-based adaptation as a tool for managing climate-stressed wetlands, in fact, contributes to enhancing

the resilience of vulnerable communities. Moreover, very few research projects have examined the impact of climate change projects implemented in wetland areas in Bangladesh per se. What studies there are – such as those conducted by Hussain et al. (2019, 2020), Masud-All-Kamal and Nursey-Bray (2021), as well as Rawlani and Sovacool (2011) – have focused on coastal wetlands in the southern part of Bangladesh. Minimal research has been done in the freshwater wetlands, within northeastern parts of the country, which are considered to be among the most climate-vulnerable places in the country (Rahman et al., 2018a). It is essential that in-depth analyses are undertaken of projects targeting these northeastern wetlands to understand the processes, strengths, and weaknesses of CBA interventions for climate-stressed wetland management in freshwater wetlands like the Hakaluki.

1.5 Thesis Structure

Chapter 1 has provided the problem statement and research questions; furthermore, it has outlined the rationale of the research.

Chapter 2 offers a review of the literature on various aspects of wetland management systems, ecologically critical areas, community-based adaptation, nature-based solutions, adaptive capacity, resilience, and community resilience. The chapter focuses on literature related to climate-stressed wetland management and critically examines the theoretical underpinnings of community-based adaptation. Moreover, the chapter presents an in-depth examination of the concepts of resilience and community resilience as found in the literature. The final section of the literature review investigates the roles of actors, who are typically involved in participatory wetland management projects and in the building of community resilience.

Chapter 3 discusses the approaches taken in this research. This chapter begins by presenting the overall research design, then describes the research methodology and methods – interviews, surveys, focus group discussions, and observations – used to collect data for this dissertation. It goes on to address how these were designed to collect information related to the community drivers (human, social, natural, physical, financial, and governance) that constitute sources of community well-being and resilience and against which the success of the CBA-ECA approach

was analysed. This chapter also provides justification for the chosen mixed methods approach taken in the research, outlines the processes by which the data was analysed, and addresses the validity and reliability of the research, ethical issues, as well as the research timeline. It describes the originality of my work and illuminates how my approach differs from existing investigations in the study area.

Chapter 4 provides a background context of the study area and highlights the reasons for selecting it. This chapter also describes the policies of the Government of Bangladesh regarding climate change and wetland management. It then discusses some important components of the Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project and the selection and implementation system of its interventions.

Chapters 5 to 7 present the results of the analysis. Chapter 5 highlights the findings with respect to the aforementioned community drivers, to identify the extent to which the project addressed each driver. Chapter 6 focuses on an analysis of the factors that affect the various dimensions of these community drivers in a participatory wetland management system, particularly in the context of the Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project. The objective of Chapter 7 is to explore the factors that negatively affected the governance drivers of community resilience.

Chapter 8 provides an overall discussion of the results presented in Chapters 5 to 7 and highlights the implications of the findings on participatory wetland management theory and on its implementation in Bangladesh and in other countries. The concluding chapter (Chapter 9) presents a summary of the key findings, addresses the limitations of this study, and presents some prospective areas for future research.

By focusing this study on both community-based adaptation and how the ecologically critical areas – of a freshwater wetland areas of Bangladesh, previously neglected by researchers – are managed, I expect to generate new insights that can inform future attempts to improve the climate resilience of the people who depend on such areas for their livelihoods.

Chapter 2: Literature Review

2.1 Introduction

This chapter reviews the literature on wetland management, ecologically critical areas (ECA), adaptation, community-based adaptation (CBA), resilience, and community resilience to set the context for the research project. The aim of this chapter is to understand what I learn from published literature and to determine where the gaps in knowledge which my dissertation can try to fill. The chapter begins with a focus on the literature related to various aspects of climate-stressed wetland management, including top-down/bottom-up approaches, nature-based solutions, and the declaration of an area as an ecologically critical area. It then critically examines the theoretical underpinnings, benefits, barriers, and uniqueness of, as well as issues associated with, community-based adaptation– an approach which seeks to facilitate the development of community resilience to the effects of climate change through the building of the adaptive capacity of community members. This is followed by an in-depth examination of the concepts of resilience and community resilience, whilst also identifying challenges. This section outlines the relationship between community drivers and community resilience, identifying also how these drivers can be used to both contribute to and assess resilience. The final section aims to investigate the extent to which CBA activities have been found to foster community resilience.

2.2 Wetland Management Systems

An ecosystem, such as a wetland, is an essential natural resource. Historically, the primary reason driving the prioritisation of wetland preservation around the world has been the recognition of the great variety of plants and animals for which wetlands provide habitats. Researchers have made a strong case that wetlands are the most critical of Earth's ecosystems

(Mitsch & Gosselink, 2000; Van Andel & Aronson, 2012; Kumar & Singh, 2020; Singh et al., 2022), owing to the rich and specialised diversity of lifeforms that live within and around them (Keddy, 2010). The benefits provided by wetlands are many and highly significant, not only in terms of biodiversity, but also because they sustain the livelihoods of people. Despite their importance, these critical areas are affected by a host of human activities, including earthworks (drainage), cultivation, pollution, defragmentation of the water table, and alteration of flow regimes (Postel & Richter, 2003; Reis et al., 2017; Dixon et al., 2021). International agreements, such as the Ramsar Convention and the International Convention of Biological Diversity, have specifically addressed the need to take wetland protection seriously (Verhoeven et al., 2006).

Like the stewardship of other natural resources, the management of wetlands has been found to be tied to and to reflect the modes of governance that operate where they are located (Ruíz et al., 2011; Newaz & Rahman, 2019). Wetland governance has been described as “the interaction between policies, laws and other norms, as well as institutions and processes, through which society exercises power and allocates responsibilities to make and implement decisions affecting wetlands and wetland users and to hold decision-makers accountable” (IUCN, 2013). As such, it is necessary to examine the wider legal context in which wetland management practices are implemented.

Policymakers around the world – in recognising the ecological and socio-economic significance of wetlands (Chuma et al., 2022) and the vulnerability of these areas to climate change – have taken a number of approaches to wetland management. Attempts have prioritised resilience building (Pittock et al., 2013; Capon et al., 2013; Oza et al., 2021; Hemmerling et al., 2022) as well as ecosystem restoration (Capon et al., 2013; Ellison et al., 2020; Littles et al., 2022). Because climatic stress was deemed hard to predict and control, and as scholars argued for wetlands to be actively managed to reduce human-made stresses (Pittock et al., 2008; Olds et al., 2014; Goldberg et al., 2020; Nazneen et al., 2022), non-climatic stressors, such as pollution, were also focused upon (Robertson & Funnell, 2012). More recently, the top priorities have included the following: to strengthen the network of protected areas, restore the connectivity between biodiversity and human livelihood, as well as increase the adaptive capacity of the community, including that of stewardship organisations (Finlayson, 2017).

2.2.1 Wetland Management: Top-down/Bottom-up Approaches and Nature-based

Solutions

Many approaches are taken to the management of natural resources. The most relevant to consider – within the context of this research into the management of wetland areas – are top-down/bottom-up approaches and nature-based solutions. These are briefly described and discussed below.

Top-down/bottom-up management. Top-down management approaches, as formulated by the decision-makers in an organisation or government, are generally broad and framed at a comprehensive macro level; further, the leaders of organisations or governments seek to manage all functions and structures of the system (Reis et al., 2017). In most countries, top-down management is typically implemented via a governance system; that is, bureaucratic in nature (Wood, 1991), mostly controlled by political elites (Golebie et al., 2022), and often communicated through statutory language (i.e., technical, not intuitive), such that the management arrangements often remain ambiguous to most people (Matland, 1995). Top-down approaches are usually designed by outsiders to address perceived community needs; they do not offer any scope for the community members to involve themselves (Danielsen et al. 2009; Seak et al. 2012). The key benefit of the top-down approach, it has been postulated, pertains to its cost effectiveness: it requires less input; instead of alternatives, decisions can be made by experts (Lorenzo-Sáez et al., 2022).

Typically, the objectives and purposes of top-down policies are highly quantitative (Margules & Pressey, 2000; Kukkala & Moilanen, 2013). According to my observations, when such policies are applied to the care of wetland areas, quantitative targets are used, such as how much to increase the fish population by, how much riparian flow to achieve, and how much biodiversity to maintain. Broader questions are rarely addressed, specifically as it relates to how people and resources can interact to achieve social, economic, ecological, and similar goals. Regardless of the long-term outcomes, which may include unanticipated negative consequences, management is seen to be successful if all quantitative targets are met. Reis et al (2017) contend that top-down approaches to wetland management are more policy-driven

and the targets are sometimes set without realistic consideration of socio-political feasibility; they thus have a long history of resulting in the exploitation of the natural resources (theoretically under protection), as well as a limited effect in terms of conserving and protecting the area for the future. Since the top-down approach arguably deals with less contextual input, the quality of the results associated with taking top-down approach are considered to be lower than those achieved through the bottom-up approach (Jing et al., 2016; Pla et al., 2021).

On the other hand, bottom-up decision-making approaches – originating at the local community level – are considered to be democratic and grounded in reality (Danielsen et al., 2009; Commodore et al., 2017), responsive to the local situation (Danielsen et al., 2017), and better able to achieve specific goals for environmental change in the local context (Ison, 2008). Bottom-up initiatives offer scope to the local actors to use their indigenous or local knowledge to express their own priorities based on their local needs (Brown, 2003; Guerrero et al. 2015; Eicken et al., 2021). Such community-driven efforts have been undertaken to address climate change adaptation challenges (Armitage et al. 2011, Danielsen et al. 2021). In the field of environmental governance, these approaches have been presented as remedies for cases in which problems have arisen from actions taken by poorly aligned social institutions (Enqvist et al., 2020). Arguably, bottom-up natural resource management approaches provide more democratic results that also better protect the ecosystem (Carwardine et al., 2009); importantly, decisions taken within such an approach are often more acceptable to affected persons than those made from the ‘top’. According to Callesen et al. (2022), bottom-up approaches prioritise stakeholders in decision-making over bureaucrats.

However, in practice, especially in the context of wetland management, bottom-up decision-making also has a number of shortcomings. Wetlands are usually classified according to their environmental features, natural settings, soil types, biota, and socio-economic contexts (Pressey & Adam, 1995; Walker et al., 2022). To effectively manage a wetland area, in-depth classifications of wetlands are a prerequisite, regardless of approach (Pressey & Adam, 1995). NGOs and government departments may have the time and resources to conduct such classification, as well as collect and assess data; this often cannot be done by locals due to how time-consuming and costly it is (Bullock & Acreman, 2003; Adeli et al., 2020; Pla et al., 2021). Furthermore, the design and implementation of bottom-up management approaches from wetland to wetland have been found to be inconsistent, given the uniqueness of the setting (natural, environmental, socioeconomic) of each wetland (Bullock and Acreman, 2003; Kotze

et al., 2008). This is further compounded by the fact that bottom-up approaches typically involve extensive effort and cost to collect region-specific data from locals (Lorenzo-Sáez et al., 2022).

The literature suggests that top-down approaches can deprive community people of the opportunity to engage themselves in a process that directly affects them (Dalimunthe, 2018; Tebet et al., 2018), despite the value local knowledge and participation can have for the conservation of natural resources. It has been argued that locals need to be involved in decision-making processes to ensure the fairness and relevance of the governance system (Maxwell, & Maxwell, 2020). On the other hand, bottom-up approaches can deprive locals of opportunities to receive scientific knowledge or expert opinions from experienced government officials working at higher levels; this is due to the fact that bottom-up approaches operate at the local level (Commodore et al., 2017) – if they exclude the assistance of outsiders. Poor integration between the parties involved can make the application of top-down policies at local level difficult (Rog & Cook, 2017). A lack of adequate resources available to local government and non-government organisations may hinder the effective implementation of their bottom-up conservation activities (Jones et al., 2015).

To overcome the drawbacks of both approaches, some scholars have recommended that they be combined (Wilby & Dessai, 2010; Ekström et al., 2013; Gaymer et al., 2014; Chowdhury, 2017). Linking top-down and bottom-up activities may provide substantial benefits by allowing for the incorporation of knowledge from both experts and locals (Borrini-Feyerabend et al., 2007; Eicken et al., 2021). Arguably, the successful integration of the two levels (‘top’ and ‘bottom’) and the engagement of multiple actors able to address the challenges – from varying perspectives and with complementary skills – are essential to ensure the proper management of natural resources (Webb et al., 2014; Feka, 2015). Collaboration with partners from a range of backgrounds can help to ensure the effective use of resources (Bodin et al., 2009); it provides the bedrock upon which institutions can be established – where these institutions are adapted to site-specific conditions, becoming (conceivably) more suitable (Brown 2003; Olsson et al. 2007; Galaz et al. 2008). While combining both approaches can generate the above benefits, associated with the inclusion of stakeholders from all levels in the whole process of governance (Golebie et al., 2022), it is crucial that transparency is ensured to support fair decision-making (O’Beirne et al., 2020).

Nature-Based Solutions to Wetland Management. The International Union for Conservation of Nature (IUCN) defined nature-based solutions (NbS) as “actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits” (Cohen-Shacham et al., 2016, p. 2). NbS are modelled upon nature itself, such that the solutions can be supported – by both the natural processes and the communities that the activities seek to restore and protect. A thorough knowledge of the natural system, as well as the context in which it operates, is critical. Considered as an umbrella approach, NbS incorporate ecosystem-based adaptation (EbA), ecosystem-based disaster risk reduction, natural infrastructure, green and blue infrastructure, integrated coastal zone management, as well as forest and landscape restoration, protecting both the environment and people (Cohen-Shacham et al., 2016, 2019; Pauleit, et al. 2017).

Nature-based solutions (NbS) have a number of advantages. For example, activities informed by this approach are holistic and aim to protect, restore, and manage ecosystems (Cohen-Shacham et al., 2016). Thus, they address societal challenges as part of working with and enhancing nature (Seddon et al., 2019), as well as prioritise the protection of biodiversity (Seddon et al., 2020). As part of their investigation into the effectiveness of nature-based interventions, Chausson et al. (2020) produced the first global systematic map of such evidence. According to them, most of the reviewed interventions in natural or semi-natural ecosystems had ameliorated the impact of climate change. Kiddle et al (2021) concluded – from their study of three Pacific Island States – that there was great potential for using nature-based solutions in a new urban design agenda, which could also be closely linked to indigenous understandings of well-being.

Contrariwise, researchers have identified several limitations of the nature-based solutions programmes they studied. Chausson et al. (2020), argues that there were omissions (e.g., with respect to cost-effectiveness) and biases (e.g., toward the global north) in the evidence. According to Kiddle et al. (2021), there were still inconsistencies in knowledge, policy, and practice to be worked through. Seddon et al. (2021) recommended that – during design and implementation stages – NbS projects ensure that indigenous people and local community members are engaged in the planning and implementation. Integration of nature-based solutions into national policies has been found to be limited (Seddon et al., 2019). Worldwide application of NbS remains uneven and fragmented (Li et al., 2021), with more focus given to

Europe and the Global North instead of the Global South and small island countries (Chausson et al., 2020).

The concept of nature-based solutions is still developing (Almenar et al., 2021). Smith et al. (2021) argue that, at this stage, it may be difficult for NbS alone to deliver full protection to communities from coastal and river flooding. Therefore, in this case, they recommended combining NbS activities with engineered defences for the development of effective hazard warning systems.

In Bangladesh, the government have started to incorporate specific aspects and approaches of NbS into policy documents, plans, and strategies for addressing the environment (Tasnim et al., 2020; Irfanullah, 2021a). Although they have not integrated NbS into all national policies affecting climate change across the board (Islam et al., 2021), the government has expressed growing policy interest in nature-based solutions (Irfanullah, 2020). Scholars like Huq et al. (2017) and Cohen-Shacham et al. (2019) argued for complete integration and advocated for the Government of Bangladesh to adopt NbS as a prominent part of Government climate change action policy; in November 2021 – at the United Nations Climate Change Conference of 2021 (COP 26) held in Glasgow – the Government of Bangladesh endorsed NbS as an integral part of climate change policy, not only for Bangladesh but for other climate-vulnerable developing countries, as well. At COP 26, the Government of Bangladesh presented its Mujib Climate Prosperity Decade 2030 draft plan, which seemed to point toward full adoption and integration of NbS as Bangladesh climate change policy. In its role as President of the Climate Vulnerable Forum of 48 developing countries for the period from 2020 to 2022, Bangladesh suggested that NbS represented the way forward for such countries (Irfanullah, 2021b).

According to Irfanullah (2021b), the Mujib plan proposes to integrate resilience policies (against climate change, disaster, economic crisis) with development policy to generate ecologically sustainable prosperity. This researcher reported that implementation of this plan has an estimated budget of USD 83.55 billion over the next ten years. By way of comparison, the most recent plan, Bangladesh's Delta Plan 2100, estimated the cost associated with the implementation of its 80 different projects at USD 37 billion. Irfanullah notes that funding to support the Mujib plan is expected to involve a large investment and scale of participation by the private sector and international donors, above and beyond the contribution of the State. The developers of the Mujib plan envision using nature-based methods – such as floating farming,

afforestation to replace deforestation, reviving the deltas' dying rivers, building ecologically sustainable agriculture- and fisheries-based supply chains, in addition to grey infrastructure, meanwhile creating industries and jobs, as well as resilience in lieu of climate change (Irfanullah, 2021b).

Nature-based solutions (NbS) have emerged as a prominent and popular approach to the management of natural resources. NbS require a significant level of community participation in the conservation of the ecosystem, due to the fact it seeks to both address the threats to the biodiversity of the ecosystem, as well as develop the resilience of the social system. The community-based adaptation approach, examined in this research, shares similarities with bottom-up and NbS approaches to natural resource management. Both aim to include local community members and enhance outcomes for them in addition to the environment. As such, my findings might be used to open pathways for future studies to assess the broader contributions of these approaches.

There are various governance approaches to natural resources, including participatory and representative. The main difference between participatory and representative democracy is that in participatory democracy, everyone can represent themselves whereas in representative democracy, people's interest is represented by elected persons (Mansfield and Winthrop, 2000). Participatory democracy seems to be effective where most of the community people are to meet face to face to discuss issues and make their own decisions (Child et al., 2014). According to democratic theorists, there are five criteria needed to achieve participatory democracy: effective participation, voting equality, enlightened understanding, control of the agenda and inclusion of all adults (Dahl, 1998; Tilly, 2007). However, Child et al., 2014 argue, that in practice, it is difficult to ensure the participation of majority of the people, especially in a large community.

2.2.2 Existing Wetland Management

Whatever resource management approach is taken in the wetlands, it must be comprehensive enough to deal with the uncertainties of climate change (Pauley et al., 2022). In a world in

which the climate is changing dramatically – driven in large part by anthropogenic activity – more integrated and horizontal approaches must be developed (Nichols et al., 2011).

One example that can be drawn from the management of the Kinwataka wetland near the Ugandan capital of Kampala; this example both exemplifies the failure of a top-down approach and attempts to ameliorate the resulting problems by taking a different strategy. Kakuba and Kanyamurwa (2021) demonstrated a clear correlation between the centrally adopted top-down wetland management system and the deterioration of the wetland, as well as the living standards of those who depend upon it for livelihood. Their study found that the attempt via top-down and centrally controlled state policies – the aims of which were to promote sustainable livelihood management – was not productive. To redress this, the government now endeavours to save the wetland, and those who depend on it, through the implementation of a horizontal approach (Kakuba & Kanyamurwa, 2021). However, it may be too late to truly save this wetland, which is why it is important to choose the right mix of management approaches from the beginning; in the context of climate change, mistakes arising from actions taken cannot always be undone. Nor can damage be reversed, simply by changing the system of management.

In Bangladesh, the wetland management system has long been revenue-driven: for many years, the government has provided leases for use of the wetland and earned revenue from this without engaging local communities in the decision of who will be granted leases (Thompson et al., 2003). The Jalmahal Act, 2009, which was part of the government's Water Resources Management Policy, established a system whereby specific bodies of water are leased to fishers for three years (Khan et al., 2016; Mamun et al., 2016). This system still operates without policing the fishing operations of those who are granted leases and allows influential leaseholders to maximise their profit by overfishing without considering the environment (Thompson et al., 2003; Islam et al., 2014). There is no collaboration between formal and informal institutions in this wetland management regime (Allison et al., 2012; Bennet & Dearden, 2014). The resulting situation, in which neither the wetland nor the poor fishers benefit from the system, is attributable to the top-down management approach by which it was developed (Barkat et al., 2019). As Byomkesh et al. (2009) found, top-down wetland management practice did not ensure the conservation of the environmentally critical areas they were intended to protect. The Jalmahal leasing policy itself restricted poor fishers to get the advantages from the wetlands because many poor fishers cannot pay the fee. Therefore, local

powerful people take the advantages, which thereby encourages poor fishers to form an association; meanwhile, powerful people invest money to acquire leases, capturing the benefit of the wetlands (Islam et al., 2018). This top-down policy exacerbated fisheries resources of the country. Researchers found this Jalmahal leasing system as improper (Sunny et al., 2020; Aziz et al., 2021; Islam et al., 2021).

Examples can be found in the literature of a small number of bottom-up initiatives taken by the Government of Bangladesh and international agencies which involved local beneficiaries in various stages of the projects (DoE, 2015). It is worth noting that Newaz and Rahman published an article, *Wetland resource governance in Bangladesh: An analysis of community-based co-management approaches* (2019), the study of which was conducted in a wetland (Tangur haor) similar to and in a district (Sunamgonj) near my study area. The authors identified key challenges of the co-management system employed in this area and proposed a number of recommendations for the sustainable management of wetland resources. What is missing from their study is an investigation of the extent to which the approach taken helped to build the resilience of the local people to climate change, which I argue is now a critical aspect of wetland management.

The Government of Bangladesh has put numerous conservation efforts in place in response to the challenges and threats posed by anthropogenic and natural drivers and pressures. The declaration that a place is to be considered an ecologically critical area (ECA) is one such conservation strategy that is practised globally to conserve the natural biodiversity of environmentally susceptible areas (Ahmed, 2016). An ECA is an area in which the ecosystem is believed to be in danger of deteriorating to a critical state and therefore must be protected from the negative impacts of human activities (IUCN, 2015; Sajal, 2018). In 1992, the National Conservation Strategy of Bangladesh identified 31 areas to be declared environmentally critical (Sajal, 2018).

With a view to ensuring the conservation of such critical areas, the Bangladesh Environment Conservation Act 1995 vested in the government – and, more specifically, in the Director General of Environment – the authority to declare ECAs based on their richness in biodiversity and their environmental significance (IUCN, 2015; Sajal, 2018). This Act also empowered the Bangladesh government to make rules to properly manage the ECAs. In 1999, the government,

considering the environmental degradation identified in coastal areas, islands, and wetlands, declared eight additional ECAs under the Environment Conservation Act: Cox's Bazar and Teknaf Peninsula, St. Martin's Island, Sonadia Island, Hakaluki *haor*, Tanguar *haor*, Marjat *baor*, Lake Gulshan-Baridhara, and the Sundarbans (IUCN, 2015).

In 2007, the government finalised and adopted the Ecologically Critical Areas Management Rules. These rules prohibited an extensive list of activities or processes in an ECA: the felling or collecting of trees; the hunting, catching, or killing of wild animals; the establishment of industry; fishing and other activities harmful to aquatic life; the dumping of waste; and any other actions that have the potential to destroy or change soil and water characteristics (BECA, 1995). In 2009, four rivers (Buriganga, Sitalakhya, Balu, and Turag) around Dhaka city were also declared ECAs (Ahmed, 2016; Karim, 2021).

The Government of Bangladesh has since established the Ecologically Critical Areas Rule 2016, which has created scope for the Department of Environment to manage the natural resources of the ECAs. In reality, however, the DoE is not equipped to handle these enormous areas and their complex ecosystems, the management of which actually require multi-sectoral involvement. Fortunately, the ECA Rule allows the inclusion of representatives from civil society, NGOs, as well as other professional societies as members of the various ECA committees at national, district, sub-district, and village levels (Karim, 2021).

Being declared an ECA attracts attention, assistance, and investment to the ecosystem of the chosen area and the people living in it. It is hoped that my examination of the extent and impact of community-based adaptation processes on the management of the 'ecologically critical' Hakaluki *haor* will inform future conservation attempts in other such areas.

2.2.3 Management in the Context of Climate Change: Adaptation Approaches

One way to manage wetlands and meet the needs of local communities in response to the impacts of climate change is through programmes that facilitate adaptation. The meaning of

‘adaptation’, as it relates to global climate change, varies across fields of study and in practice (Ekstrom et al., 2010; El Chami et al., 2022). The word ‘adaptation’ was originally associated with Charles Darwin (1859), who described it in his famous book *The Origin of Species*. In this instance, adaptation referred to the way in which species changed over time, through evolution, to adjust to ecological changes (Smithers & Smith, 1997; Smit & Pilifosova, 2001).

Later, the adaptation paradigm received considerable attention in the social sciences. In this field, Darwin’s ecological principles are seen to have themselves been adapted to describe human reactions to adjustments in the natural environment in which they live (Dovers & Handmer, 1991; Stern et al., 1992). Rather than comprising part of a process of evolution, adaptation is represented as the social, cultural, and economic changes humans make in response to the impacts they experience. The difference between biological and social interpretations of adaptation follows: biological systems can essentially only react to pressures from their environment, while human societies can be both proactive and reactive (Smithers & Smith, 1997; Klein, 2003).

As the literature of adaptation in the social sciences grew, so did the definitions and conceptions of ‘adaptation’, varying from author to author (Bassett & Fogelman, 2013). Nevertheless, an analysis of such literature reveals some common themes. Brooks described adaptation as “adjustments in a system’s behaviour and characteristics that enhance its ability to cope with external stress” (2003, p. 8). Smit et al. (2000), in the context of climate change, referred to adaptation similarly as “adjustments in ecological-socio-economic systems in response to actual or expected climatic stimuli, their effects or impacts” (p. 225). Another definition proposed in the context of climate change defined adaptation as the “adjustments in individual group and institutional behaviour in order to reduce society’s vulnerability to climate” (Pielke, 1998, p. 159). We can see here a common theme of adaptation as a human reaction to nature as “external stress,” “stimuli,” or, even directly, “climate” (see also Moser & Ekstrom, 2010; Ireland, 2012).

Guided by such definitions, many models of climate change adaptation were developed at the end of the 20th century (Carter et al., 1994; Smithers & Smit, 1997; Leary, 1999; Reilly & Schimmelpfenning, 2000). These models were based on the timing of the adaptive action; they posed adaptation as either proactive or reactive. Proactive adaptation anticipates the consequences of climate change and adjusts behaviour to meet these consequences, while

reactive adaptation takes place after the impact of climate change has been experienced (Klein, 2003). Nature is inherently reactive: it does not create anything in its own motion. Humans have choices: they can act upon their expectations or react to their circumstances. The choice people make to adapt proactively or reactively can be influenced by public or private interest, or both (Klein, 2003). Similarly, this choice can also be closely associated with governance practices at different levels (national, regional, or local).

This association between choices and governance practices is reflected in the framing of adaptation types by Smit et al. (2000), which suggested that adaptation processes could be either autonomous or planned (Carter et al., 1994). In autonomous adaptation, local community members take the initiative to make the necessary social, environmental, cultural, and economic changes to respond to the effects of climate change on their lives and livelihoods; in planned adaptation, a fundamentally responsive policy to the impacts of climate change, external agencies adopt adaptation strategies and extend their services to support, influence, and cooperate with locals to make the necessary adjustments (Osman-Elasha & Sanjak, 2008, Forsyth & Evans, 2013; Spires et al., 2014).

Some researchers have argued that autonomous adaptation may not be able to sufficiently overcome the impacts of climate change (Fenton et al., 2017; Rahman & Hickey, 2019), because these impacts are increasing at a tremendous rate (Dandotiya & Sharma, 2022; Naz et al., 2022). Furthermore, communities in developing countries, where many people are more vulnerable to climate change, do not have the resources to adapt autonomously (Cobbinah et al., 2022). In such cases, planned adaptation has been seen to play a vital role (Leary et al., 2007; Reid et al., 2009; Islam & Nursey-Bray, 2017). Considered able to overcome the shortcomings of traditional top-down approaches, planned community-based adaptation has gained its popularity in many developing countries including Bangladesh (Ayers & Forsyth, 2009; McNamara et al., 2020). Planned adaptation, however, can suffer from the disadvantages of top-down management approaches described above due to the fact it is driven by external agencies, rather than locals. In order to overcome these, during the development and implementation stages of planned adaptation, proper precautions need to be taken such that the local community is at least consulted and at best involved (Moser & Ekstrom, 2010). As many scholars – including Reid et al. (2009), Ayers and Haq (2013) and Okitasari and Katramiz (2022) – have pointed out, adaptation strategies have developed a more bottom-up, development-oriented approach. As a result, such researchers were confident that this approach

would see external agencies incorporating local priorities into planned adaptation actions, and community-based adaptation could be seen as one way in which this happening.

Most community-based adaptation (CBA) projects – seeking to make communities more resilient and capable of coping with the adverse effects of climate change – undertake planned adaptation: these projects are typically run by staff of government and non-government agencies who aim to work with representatives of local communities to create and implement a particular plan of action that will meet the needs of each community. For my thesis, I am closely examining a community-based adaptation (CBA) project as a case study because, in theory, CBA – an approach that engages community people in the decision-making process – is the most appropriate approach to take in Bangladesh. The details of CBA are discussed in the following sections.

2.3 Community-based Adaptation (CBA)

The term ‘community-based adaptation’ (CBA) was used for the first time in 2005 (Ayers & Huq, 2009), and, since its introduction, the theory and application of this approach has sustained the interest of researchers (Huq & Reid, 2007; Reid et al., 2009; Nursey-Bray et al., 2013; Ensor et al., 2018; Piggot-McKeller et al., 2019). Dumar (2010) traced the roots of CBA back to similar approaches that aimed to make development, resource management, and disaster risk policy more participative. Similarly, Dodman and Mitlin (2013) see CBA as part of an ongoing political struggle for development and well-being in the global south that is manifest in the field of economic development.

The focus of CBA has always been on the empowerment of the poor to decide their destinies by using their experience as the basis for driving change in their home areas. CBA, as an approach to development, values the views of the target population as essential to the planning and implementation of development activities; this approach prioritises the goals of locals over the visions of outsiders. Forsyth (2013) notes that one of the essential attributes of CBA is that it facilitates the community’s determination of its own “objectives and means” (p. 439) with respect to climate adaptation. According to him, CBA is focused on addressing the socio-political and economic determinants of vulnerability to reduce that vulnerability. As Dumar

(2010) asserts, CBA should enable people to act in ways that will reduce their susceptibility to the negative effects of climate change, taking into consideration their access to economic resources, information, skilled labour, technology, and infrastructure, upon which the ability to act depends. Adding to this, Reed et al. (2014) explain that CBA succeeds as an approach when it is used to teach groups to reorganise themselves and learn to form external networks for information and resources.

In theory, across the world, in both the Global South and North, CBA is seen as a community-led process, based on the priorities, needs, knowledge, and capacities of local groups, that is intended to empower communities to plan for and cope with the impacts of climate change (Reid et al., 2009). It is also perceived as an ideology that advocates for the active participation of community members in climate adaptation planning and in the implementation of such plans (Ayers, 2011; Lasage et al., 2015). For CBA projects to be effective and sustainable, scholars argue that local people – from all sections of the society – should be included in decision-making at every stage of the project (assessment, planning, implementation, and evaluation) (Reid et al., 2009; Sherman & Ford, 2014). Some scholars embrace the active participation of local institutions along with local people, particularly with respect to the assessment of climate-related risk, planning, implementation, and monitoring of adaptation projects (Barnett & Campbell, 2010).

Groups responsible for running CBA projects, therefore, typically use participatory approaches to increase the capacity of vulnerable people to make and implement choices about their own future climate change adaptation programmes and to engage them in the design and execution of activities. The participatory process is intended to not only empower members of the target communities but also increase their sense of ownership in order to enhance and sustain the outcome(s) of a given project beyond its life cycle (Reid, 2015; Rembling & Veitayaki, 2016). According to scholars – including McClymont Peace and Myers (2012), as well as Remling and Veitayaki (2016) – a CBA approach works well only if it first facilitates the social learning and the relevant education of the participants; this is through targeted training, learning by doing, capacity building, as well as knowledge- and skills-enhancing programmes. Scholars have also opined that community-based participatory research contributes to the determination of viable subsequent adaptation actions (Smit & Wandel, 2006; Khan et al., 2012; Lasage et al., 2015).

To run CBA projects, community-based organisations (CBOs) are often formed by the NGOs that have initiated the project. These CBOs are composed of local people, the majority of whom are the local poor (Datta, 2007). CBA projects generally provide a number of mechanisms to support and increase the ability of all CBO members – namely, in managing these organisations, through capacity-building programmes (training), awareness building, and financial and material support (Masud-All-Kamal & Nursey-Bray, 2021). In this way, via their involvement, it is hoped and expected that the members of CBOs will establish self-reliant organisations which can, in turn, help the members and their wider communities to face any future challenges related to climate change (Devine, 2006; Datta, 2007).

CBA has become a popular alternative among community organisers to a traditional top-down development management approach because it creates the scope to increase the ability of locals, at a grassroots level, to face the adverse effects of climate change (Ayers & Dodman, 2010; McNamara & Buggy, 2017). Moreover, CBA has gained the attention of international donors, both bilateral and multilateral; CBA projects in many developing and small island countries attract the support of donor agencies (Kirkby et al., 2018; Westoby et al., 2020; McNamara et al., 2020). Multiple actors are engaged in CBA initiatives, and people from external agencies, such as NGO members, generally work with local communities in the project planning and implementation process (Lewis, 2011; Westoby et al., 2020).

Five to eight years after the introduction of this approach, several authors noted that CBA was in its infancy and still developing (Dumaru, 2010; Forsyth, 2013; McNamara, 2013). In 2022, questions remain around how well CBA works in practice (Berrang-Ford et al., 2019; Dilling et al., 2019; Morgan et al., 2019; Schipper et al., 2020; Owen, 2020). Despite a lack of evidence to support the effectiveness of CBA, it is my expectation that the appearance of community participation in climate adaptation projects in the inland wetland, in the absence of evaluation, will grow and evolve by trial and error. My goal, in this research, is to closely examine CBA in order to identify strengths and weaknesses so that this approach can be developed more intentionally; this is done to create pathways for truly successful and sustainable participation as well as strong community resilience to climate change.

The literature offers a number of perspectives through which to develop a more complete picture of CBA and its capacity to build resilience, by considering its predecessor, its benefits, its challenges, and its processes, and to differentiate it from other approaches to development.

2.3.1 CBA and Community-based Natural Resource Management (CBNRM)

Community-based natural resource management (CBNRM) – a conservation and development approach which rose to prominence in the 1980s (Murombedzi, 1998) – is worth acknowledging as a forerunner to CBA (Chishakwe & Murray, 2012). CBNRM, like CBA, is a bottom-up approach that involves local communities in natural resource management, with the aim of ensuring sustainable outcomes (Poteete, 2009; Gruber, 2010). CBNRM also features the decentralisation of power from the central government to local-level institutions and local people, the facilitation of sustainable livelihoods, and the provision of economic incentives (Kellert, 2000; Jones & Murphree, 2004). While Agrawal and Gibson (1999) argue that the focus of CBNRM tends to be on institutions, community ownership is thought to be vital to the rate of effectiveness of any CBNRM project (Measham & Lumbasi, 2013). Berkes (2004) asserts that it is essential, when undertaking a CBNRM project, to understand the nature of people, communities, and institutions and how they interact at various levels. St. Jacques (2009) makes the case that participation in CBNRM projects should be flexible, and that there should be scope for social learning and a flow of information among stakeholders. Evidence suggests that the long-term success of CBNRM depends not only on community participation but also on ensuring the community members receive tangible benefits (Brooks et al., 2013).

It is clear from the literature that both CBNRM and CBA are participatory approaches (Armitage, 2005; Sabates-Wheeler et al., 2008) that work towards empowering local people to manage the resources on which they depend (Shackleton et al., 2002; Reid et al., 2009; Ensor & Berger, 2009). The CBNRM approach – implemented through projects in different sectors in various countries for about 40 years (Gooch et al., 2009; Milupi et al., 2017) – has been deemed both successful (Brosius et al., 1998; Gruber, 2010) and ineffectual (Fabricius, 2004; Fabricius & Collins, 2007). According to Measham and Lumbasi (2013), a CBNRM project's success or failure depended on whether power had been devolved from a central level to a

community level. Other scholars have found that the success or failure of CBNRM projects has depended upon the extent to which community members were involved in planning or decision-making, the distribution of benefits was equitable, and the resources were owned by the local people (Shackleton & Campbell, 2001; Sibanda, 2004; Milupi et al., 2017). In this thesis, given that the CBA project I examined is employed to support the management of a natural resource, I believe it is worth noting the similarities between CBA and models of CBNRM, particularly with respect to their strengths and weaknesses.

2.3.2 Benefits of CBA

According to the literature, the most commonly noted advantage of CBA pertains to the fact the adaptation actions – coming out of projects that take this approach – have been shown to be both more likely to succeed in the short term and potentially are more sustainable over the longer term; this is largely due to the community support engendered by the participation of locals in the design and implementation of such actions, and, importantly, because the actions tend to be consistent with community values and culture (Forsyth, 2013). Dumaru (2010) states that CBA generally works well because the facilitators taking this approach share the same language, culture, and customs as the communities in which they work. Dumaru further notes that CBA is particularly appropriate for climate adaptation work which, she argues, must be done at the community level.

Kirkby et al. (2018) acknowledges CBA for giving poor people, who lack the resources to make collective changes on their own, a way to participate in climate adaptation by working with outsiders who bring the necessary resources and skills to strengthen community-level adaptive capacity. This participation in development is considered a people-centred approach (Desai & Potter, 2013; Forsyth, 2013), which empowers communities to make appropriate choices based on traditional knowledge in a way that ultimately protects the interests of the people who typically exert the least influence (Kingsbury, 2004; Berkes, 2004).

Early and recent literature recognises CBA as a social process (Adger, 2003; Stott and Huq, 2014), in which social capital and networks can play essential roles (Sovacool et al., 2012;

Campos et al., 2014; Masud-All-Kamal & Nursey-Bray, 2021). Scholars have indicated that collective approaches like CBA can contribute to the ability of communities to face the challenges posed by the underlying political structure as a part of enhancing their adaptive capacity (Prior & Erikson, 2013; Dodman & Mitlin, 2013). In addition, it has been observed that practitioners in CBA projects work in the belief that local people have the skills, local knowledge, experience, and social networks needed to increase resilience as well as reduce the vulnerability to the impacts of climate change (Dodman & Mitlin, 2013). Therefore, CBA is considered as a participatory, community-led, and community-focused approach which enables community people to change the social norms that underpin their vulnerability and, in turn, increase their resilience (Reid and Schipper, 2014; Ensor et al., 2018; Patnaik, 2021).

Researchers agree that, for CBA projects to be successful, it is necessary for those implementing them to understand the structure, power, and governance system of the target community, all of which may influence adaptation (Cannon, 2008; Buggy & McNamara, 2016; Galvin, 2019).

2.3.3 Barriers to CBA

The literature demonstrates that the process involved in putting the CBA approach into practice is not smooth. Although the main aim of CBA is to facilitate local participation in climate-related decision-making, researchers have revealed both the difficulty of ensuring that the community remains involved as well as the consultation fatigue that organisers can experience (Smith, 2008; Forsyth, 2013; Reid, 2015; Dewan et al., 2015; Sultana & Thompson, 2017). Furthermore, while people from all sections of the community are meant to be included in a CBA approach, in many cases, certain segments of the population, such as women, are excluded (Agrawal, 2001). Three other key concerns with respect to participation are as follows. First, the CBA organisers themselves, perceiving people living in a particular area as a homogeneous group, may underestimate differences and face problems with participation and engagement (Dodman & Mitlin, 2013; Berger & Ensor, 2014). Second, more powerful community members can undermine the involvement of their more vulnerable counterparts (Ashley et al., 2015); Buggy and McNamara (2016) found that elite capture hampered community participation. A third, and arguably the most significant possible concern, is that

the failure of unifying efforts made as part of a CBA approach may in fact increase division, dissension, and the inability to work together (Buggy & McNamara, 2016).

A number of studies have documented cases in which CBA has failed in practice or encountered severe barriers. In some cases, donor countries have proven unwilling to hand over their resources to poor communities on a ‘no strings attached’ basis: they have, instead, fixed the parameters for the CBA projects before funding the international NGOs who implement them. The international NGOs who channel this funding have, in turn pre-empted or constrained the activities of the local NGOs and communities who act on the ground (Masud-All-Kamal & Nursey-Bray, 2021). Thus, many CBA projects, while they reportedly include ‘consultation’, have actually involved little more than discussions with local communities after critical decisions have already been made. This ‘consultation’, which has been referred to by researchers as “tokenistic” participation, has typically failed to truly engage the local participants (Arora-Jonsson, 2011; Dodman & Mitlin, 2013, p. 644). Monitoring and evaluation of CBA are further argued to primarily serve ‘donor-wishes’ and prioritise the donor’s needs over those of locals (Masud-All-Kamal & Nursey-Bray, 2021, p. 1096; Rarai et al., 2022). Moreover, research has shown that most CBA projects are, in fact, developed by outsiders, CBA activities are largely controlled by NGOs, and the success of these projects is externally assessed (Faulkner et al., 2015; Masud-All-Kamal & Nursey-Bray, 2021). As evidenced by numerous reports, this control by donor nations and NGOs of CBA initiatives has not changed (Masud-All-Kamal & Nursey-Bray, 2021).

Researchers have found that it can be particularly onerous to work towards the empowerment of vulnerable people in the context of an unequal power structure in which they lack resources and influence. Socio-political structures that exist in formal and informal institutions and on political and social levels (Barnett, 2001) shape people’s access to resources such as finance and technology, health, and education (Ribot, 2014). Given that the efficacy of a CBA project is significantly affected by the power and politics that exist within a community (Sultana, 2009; Buggy & McNamara, 2016), it is not surprising that CBA activities have also been shown to have been hampered by the personal interest(s) of certain groups (Dumar, 2010; McNamara & Buggy, 2017). In a number of cases, local people have not been well represented, either because they do not themselves care enough to get involved or because local power brokers present themselves as voices of the community (Ashley et al., 2015; Buggy & McNamara, 2016). Making sure every relevant stakeholder is involved in consultations at each level, it is

said, makes CBA decision-making slow and difficult. As Dumaru (2010) contends, when structural factors impede the ability of vulnerable groups to develop resilience to climate change, alternative livelihoods, safer communities, or any other improvement of their circumstances, these factors need to be addressed to advance any community-based adaptation action.

The literature has further demonstrated that, in developing countries, so-called ‘planned’ CBA projects, as described in section 2.2.3, face specific problems. Many CBA scholars say that poor coordination among participating stakeholders, especially between community members and policy-setters and between the non-government organisations who are often the project implementers and the relevant local and national government bodies, is a critical weakness (Ahammad, 2011; Khan et al., 2012; Spires et al., 2014; Ashley et al., 2015; Masud-All-Kamal et al., 2021). Others have identified that a lack of institutional knowledge about local needs, a lack of awareness of climate change among the local participants (which results in inappropriate actions being taken with respect to adaptation), and discursive, physical, and communication problems are all significant challenges for planned CBA (Forsyth, 2013; Spires et al., 2014; McNamara et al., 2020). Meenawat and Sovacool (2011) and Roncoli et al. (2011) reflect that the capacity of locals to access relevant climate-related information and to understand the technical terms of that information must be enhanced by the organisers of planned CBA projects. Spires et al. (2014) concur that climate-related knowledge needs to be appropriately communicated among the stakeholders involved in planned CBA.

The literature finally demonstrates that the outcomes of CBA projects are not always sustainable for reasons that include a lack of local institutional support, capacity constraints in terms of staff and technical expertise, a lack of adequate financial support, and a low level of awareness among community members. Other barriers to sustainability include elite capture, power, and governance issues (Reed et al., 2014; Nambi et al., 2015; Buggy & McNamara, 2016; Westoby et al., 2020).

2.3.4 Differentiating CBA from Other Development Projects

In many cases, it can be challenging to differentiate climate change adaptation components from development components of a project that aims to build community resilience to the impacts of climate change (Ayers & Dodman, 2010; Ensor et al. 2018; Masud-All-Kamal et al., 2021). Activities associated with CBA projects have been known to meet general local development needs above and beyond those associated with climate related risks, such as floods and droughts (Ayers & Forsyth, 2009; Forsyth, 2013). Because it has the capacity to address wider local vulnerabilities and to link its activities with socio-economic outcomes, CBA has been considered to be a development-centred approach (Deubelli & Mechler, 2021), such that adaptation activities are perceived as synonymous with development activities (Ayers & Dodman, 2010; Betzold & Weiler, 2018). In fact, the literature indicates that it can be difficult to get CBA funded since donors want to support climate-focused projects, and most CBA projects are indistinguishable from community development projects that target economic enhancement (Dodman et al., 2010; Forsyth, 2013; Reed et al., 2014).

Although a CBA project looks similar to other community development projects designed to lift the quality of life of a target population, scholars have identified a key difference, not in the intervention activities themselves but in the inputs that precede the intervention. The focus of a CBA project is not on the actions the community takes; instead, it is on the knowledge with which, and the ways in which, they undertake their activities (Ensor & Berger, 2009). What sets CBA apart is the fact that, as part of the design of activities associated with a CBA project, locals participate in training to build their awareness of climate change and future climatic risks (Dumar, 2010). Rojas Blanco (2006) asserts that, by integrating the awareness of future climate hazards into project design, CBA projects help local people adapt and create pathways for improving their livelihoods. Huq and Reid (2007) also claim that this process itself, apart from the activities that are created and implemented, assists the community to become more climate resilient.

To reduce the confusion associated with CBA projects resembling development-as-usual projects, because the additional adaptation component is difficult to identify (Reid et al., 2009), some CBA scholars have sought to differentiate CBA projects from traditional development projects (Ensor & Berger, 2009; Forsyth, 2013; Reid & Schipper, 2014). For example, Forsyth

(2013) identifies projects that address pre-existing practices of society which allow people to live with climate change as “not-CBA” and counts proactive responses to anthropogenic climate change as “CBA” (p. 441).

2.3.5 Issues for CBA as a Multi-stakeholder and Multi-scale Approach

A significant amount of CBA literature has emphasised that, to be effective, CBA projects need to be supported at various levels through a network of stakeholders which includes representatives of both local- and national-level institutions, as well as by national-level policy settings (Adger, 2003; Ayers, 2011; Stott & Huq, 2014; Reid, 2015). Moreover, many researchers suggest that CBA policy should be formulated in a coordinated way such that stakeholders from government, non-government, and non-profit organisations will work collaboratively with business leaders, civil society representatives, and community leaders. This policy should also be flexible enough to suit the individual community and to make the activities of a project locally accountable (Drolet, 2012; Regmi & Star, 2014; Ashley et al., 2015). Stott and Huq (2014) state that it is vital to link local knowledge with existing national policy to inform the resulting CBA policy. It is notable that researchers have also highlighted the importance of clear top-down communication in the policy development process; the information generated by the science of climate change is as essential to a CBA project as knowledge that comes from within the community (Barnett, 2001; David et al., 2013). Studies have shown that good governance, transparency and accountability – as well as the establishment of linkages and networking between actors and institutions – play a vital role in supporting the success of CBA projects (Dodman et al., 2010; Stott & Huq, 2014; Archer et al., 2014; Fischer, 2021). Other scholars have suggested that strong local-level institutions and enhanced social capital could help to increase participation (Dodman et al., 2010; Adhikari and Taylor, 2012; Kirkby et al., 2018).

Unsurprisingly, funding has been identified in the literature as a key issue in the management of multi-scale CBA projects that involve both local and national institutions. Scholars have noted that, to achieve lasting multi-stakeholder engagement, some funding should be raised locally, because donor and external agency funding for CBA projects is usually short-term in

nature; this could perhaps be from local government organisations, in particular, to create a sense of ownership among the local people for the project as well as to support activities after the completion of the project (Allen, 2006; David et al., 2013; McNamara et al., 2022). In addition to that, various types of longer-term global funding may be sought (Fenton et al., 2014). With the help of bilateral and multilateral climate finance, non-governmental organisations can implement climate change adaptation interventions for local communities to build their various capacities and resilience (Masud-All-Kamal et al., 2021).

The CBA-ECA project used as a case study for this thesis aimed to build community resilience as a key element of participatory wetland management. To further set the context for research undertaken for this thesis, the various definitions of resilience and community resilience and the critical drivers that can influence the building of community resilience are discussed in the following sections.

2.4 Resilience and Building Community Resilience

The following sections describe various concepts of resilience, adaptive capacity, community resilience, the measurement of community resilience using various drivers, and the role of community-based adaptation projects in the building of community resilience.

2.4.1 Resilience

The concept of resilience has been defined differently across the fields included in this literature review; it is a subject of debate (Freshwater, 2015; Cinderby et al., 2016; Adedeji et al., 2018; Kativhu et al., 2018). It has been said that the term ‘resilience’ was initially used in the field of ecology then in socio-ecology (Holling, 1973; Walker & Salt, 2006). The literature on ecological systems defined resilience as an ecosystem’s capacity to absorb and recover from external shocks (Holling, 1973). For many years after this, much of the literature focused on examining resilience within the context of specific case studies, rather than on developing a

theoretical perspective on the subject (Fan & Lyu, 2021). In the late 1990s, ecological researchers shifted to a more holistic socio-ecological approach that took human populations into account (Turner et al., 2003). At that time, resilience theory was well developed at the ecosystem level but not so much so at the local and community level (Berkes, 2007; Berkes & Ross, 2013), where human action takes place, and natural science concepts of resilience had to be rethought when applied to human communities and the discussion of human relationships (Métais et al., 2020). According to Brown & Westaway (2011), it is important to understand how individuals and the society as a whole respond to environmental change. They further emphasised the need to facilitate the capacity building of the community.

Over the last couple of decades, consideration of resilience as an essential concept both in the social and natural sciences (Fan & Lyu, 2021) has grown across disciplines including health and development psychology (Luthar et al., 2000; Luthar, 2006; Berkes & Ross, 2013), mental health (Kirmayer et al., 2009), management (Lengnick-Hall et al., 2011), and environmental research (Walton et al., 2013). Resilience theory also spread into numerous branches of the social sciences (Finkbeiner et al., 2017): economics (Perrings, 2006), psychology (Masten & Obradovic, 2008), political ecology (Peterson, 2000), and development studies (Brown, 2014). As generally perceived by social scientists, resilience is the ability for social entities to absorb, cope with, and adapt to various forms of adversity (Keck & Sakdapolrak, 2013). This definition reveals how ecological and physiological principles can be used to understand sociological and psychological mechanisms. When it comes to psychology and mental health, for example, resilience is characteristic of individuals who can face adversity and achieve positive development (Kirmayer et al., 2009). This is illustrated by the findings of Wu et al. (2020) in their recent study, which suggests that resilience and positive mental health have a reciprocally enhancing relationship over the short term.

The concept of resilience as it could apply to the social sciences has developed over time. In defining resilience, some scholars have focused on how this characteristic enables people to ‘bounce back’ to the pre-disaster position, while others have considered the degree to which resilient people can ‘bounce forward’ by enhancing their capacities, adapting, and learning from the trajectory (Norris et al., 2008; Lowe et al., 2015; Davies & Davies, 2018). The ability to bounce back was more common in the first generation of the definition, whilst bouncing forward represents the second generation (Asadzadeh, 2017; Rus et al., 2018; Saja et al., 2018).

Fan and Lyu (2021) contend that resilience has separate meanings across disciplines; the literature suggests that the form of adversity experienced in a particular field helps shape the way 'resilience' is defined. Adger (2000) defines 'social resilience' as "the ability of groups or communities to cope with external stresses and disturbances as a result of social, political and environmental change" (p. 347). Zolnikov (2019) defines resilience to climate change to be demonstrated "when people, communities, businesses, and various sectors independently or dependently come together to successfully cope with the effects of climate change" (p. 7). The Intergovernmental Panel on Climate Change (IPCC) defines resilience as "the capacity of social, economic, and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganising in ways that maintain their essential function, identity, and structure, while also maintaining the capacity for adaptation, learning, and transformation" (IPCC, 2014, p.23). These latter two definitions are useful to consider when examining what is being done to improve community resilience in the context of climate change. The common theme across these definitions is that resilience involves the ability to move beyond or recover from a negative event.

Most of these and other concepts of resilience in the literature focus on an interrelationship between human and nature which is built upon the human's intention to become able to absorb unexpected natural shocks by developing the skills of adaptation. For example, Norris (2008) conceives resilience as a process that links the human's adaptive capacities with functioning and adaptation within a changing environment. Socio-ecological literature describes resilience as a product of the coupling, co-evolution, and interdependence of social and natural systems (Folke, 2006); further, it is defined as a learning process involving coordination between national policy makers and local communities (Sendzimir et al., 2011). Environment-behaviour studies defines community resilience as emerging from people thinking about physical environments, understanding the behaviour within them, and identifying ways to modify the environment to meet community aspirations (Ross & Berkes, 2014). To build resilience, Folke et al., (2010) as well as Berkes and Ross (2013) encouraged the adoption of an integrative system that could link social and ecological systems. Furthermore, Folke et al. (2016) argued that a better understanding of and the well-managed governance of the complex socio-ecological systems involved are fundamental in building resilience.

Bahadur et al. (2013) identified ten key characteristics of resilience as used in the intersection between climate, development, and disaster management: “high diversity; effective governance and institutions; the ability to work with uncertainty and change; community involvement and the inclusion of local knowledge; preparedness and planning for disturbances; high social and economic equity; strong social values and structures; acknowledging non-equilibrium dynamics; continual and effective learning; and the adoption of a cross-scalar perspective” (p. 55).

It is worth noting that most of the literature on social-ecological systems is concerned with how resilience is expressed at the regional level (Brown & Westway, 2011), and the literature on psychological and mental health resilience examines this characteristic at the individual level (Kirmayer et al., 2009; Buikstra et al., 2010; Brown & Westway, 2011). Ross and Berkes (2014) pointed out that, at the time of their review, little research had been done into community resilience. However, in the last decade, sociological disciplines have conducted studies on resilience at the community level that emphasised the livelihood capacity of this social unit (Cutter, 2016). Tanner et al. (2014) proposed the concept of livelihood resilience, arguing that those who seek to strengthen community resilience should pay adequate attention to human needs, human rights, and their empowerment. Informed by the definitions and perspectives above, this research assumes that the adoption of a livelihood perspective into the examination of community resilience – which involves a close consideration of the ‘capitals’ that drive such resilience (as described in 2.4.5 and 3.6) – can help us to understand how interventions implemented through CBA projects can help communities respond positively in the face of external adversity.

2.4.2 Adaptive Capacity

The capacity for resilience as an individual or community characteristic, on its own, is not sufficient for people to make sustainable changes to address the effects of climate change: resilience must be complemented by adaptive capacity. ‘Adaptive capacity’ is the ability to anticipate or respond to environmental changes through the use and mobilisation of resources (e.g., social, physical, economic) when required (Nelson et al., 2007; Engle, 2011). The way

actors respond when any external disturbance occurs reveals their adaptive capacity (Chapin et al., 2006). Adaptive capacity can be developed to enhance individual and community resilience to change, by equipping actors with the skills to function when ecological and social systems reconfigure themselves.

Given that adaptive capacity refers to the ability of individuals, communities, organisations, and governments to make the decision(s) and take the action(s) needed to deal with external change (Engle, 2011; Hill & Engle, 2013), it is thus an essential pre-condition to social adaptation. The higher its adaptive capacity, the more likely a society is to adapt successfully (Engle, 2011). Thus, adaptive capacity is considered to be a critical property of a system for reducing its vulnerability (Engle, 2011).

Gupta et al. (2010) looked into the institutional dimensions of adaptive capacity and defined it as encompassing “the inherent characteristics of institutions that empower social actors to respond to short and long-term impacts, either through planned measures or through allowing and encouraging creative responses from society both *ex ante* and *ex post*” (p. 461). These authors argued that humankind must build adaptive institutions (i.e., systems of rules and social norms) capable of responding to unprecedented social and environmental change. They also acknowledge that, as a result of the relationship between institutions and the contextual factors operated within, adaptive capacity is characterised by complexity; they recommend that those who seek to develop the adaptive capacity of an institution consider the adaptability of the institution itself as well as the social, cultural, and political contexts in which it is embedded.

Fidelman (2021) emphasise that adaptive capacity is a matter of governance: how institutions and those who manage them deal with change, not merely how individuals do or how society as a whole does. Therefore, it is crucial for institutions to consider adaptive capacity when making decisions and setting out policies (Engle, 2011). Because institutions can facilitate and/or constrain adaptation (Engle & Lemos, 2010; Eakin et al., 2014), institutional dimensions of adaptive capacity have been an area of interest in the literature (Hill & Engle, 2013; Chandra & Uniyal, 2022). Many researchers have concluded that society cannot develop adaptive capacity if its institutions have not done so (Lebel et al., 2006; Agrawal, 2008; Engle & Lemos, 2010).

The terms ‘adaptive capacity’ and ‘adaptation’ are often used together. ‘Adaptation’ refers to “the decision-making process and the set of actions undertaken to maintain the capacity to deal with current or future predicted change” (Nelson et al., 2007, p. 396). Adaptive capacity has also often been referred to as ‘adaptability’ in the literature of resilience and, as noted above, has been seen to be necessary for social and institutional leaders to effectively influence and manage the resilience that is considered a function of adaptive capacity (Gallopín, 2006). Gallopín (2006), Nelson et al. (2007), Engle (2011), as well as Hill and Engle (2013) have all suggested a positive correlation between adaptive capacity and social resilience.

In the context of climate change, adaptive capacity is found within the essential social, physical, and economic resources that can be mobilised by individuals and institutions to learn from and adapt to new conditions (Brown & Westaway, 2011; Freduah et al., 2018). There has been some disagreement over the critical factors needed to develop adaptive capacity. Some focus on the socio-political side and suggest that kinship, social networks, and political activities build adaptive capacity (Smit & Wandel, 2006). Others argue that livelihood assets and access to natural, financial, and human resources (skills) are key (Brown & Westaway, 2011). While Saroar and Routray (2015) reported that the literature on ways to build resilient societies was increasing, they noted that few studies had quantified the extent to which the aforementioned factors affect people’s adaptive capacity. In their study of communities in a coastal rural setting in Bangladesh, these researchers found that demographic factors (such as gender, education, occupation) and social capital (membership status in social institutions) influenced differential adaptive capacity the most. They also identified past adaptive behavioural factors and knowledge or access to information as significant influencers of adaptive capacity. The authors recommended that the identified factors be considered as part of any program to enhance the adaptive capacity of individuals and communities against climatic disasters. Nelson et al. (2007) came to a similar conclusion, stating that, as adaptive capacity represents the ability of actors to build resilience, it is essential to ensure that actors have access to social, physical, and economic resources, as well as to further ensure actors may be able to use them in enabling adaptation.

In conclusion, adaptive capacity is entwined with resilience and may indeed be a precondition for it. In the context of climate change, adaptive capacity is fundamentally about the ability of a society to deal with the consequences of changes to their environment. Of the many factors influencing the development of adaptive capacity suggested in the literature, some are

contested. However, it is clear that developing adaptive capacity is not just a matter of improving individual capacity, or even social capacity, but about advancing and reforming social institutions so they can change and manage that change, as a governance issue. It is also possible to conclude that organisations and networks – which work as platforms for knowledge-gathering and sharing – can provide key resources and training in how to use them. These organisations and networks can also enable problem-solving flexibility between interest groups, thereby contributing to the development of adaptive capacity.

2.4.3 Community Resilience

The literature has identified that economic development, community competence, social capital (building relationships, trust, organisational linkages, social support), as well as information and communication – all factors that support adaptive capacity – can contribute to building community resilience (Norris et al., 2008; Cavaye & Ross, 2019).

Before undertaking a discussion about ‘community resilience’, it is necessary to address the term ‘community’. In the literature, there is no universally accepted definition of ‘community’ (Mulligan et al., 2016). However, a commonly used concept describes a community as a diverse group of individuals who are connected by socio-economic interactions, who share beliefs and values, who are engaged in collective action, and/or who live within the same geographic location (Frankenberger et al., 2013; Alshehri et al., 2015; Barrett, 2015; Kenter et al., 2015; Miles, 2015).

Over the past two decades, the concept of resilience has broadened: once an individual characteristic, it can now be used to describe communities, cities, and the environment. Patel et al. (2017) show, in a systematic literature review of 80 disaster-related articles, that there is no standard and agreed definition of community resilience. However, they observed that many scholars view the concept of ‘community resilience’ as a positive quality that is found among groups that demonstrate, for example, local capacity (Dawes et al., 2004; Kennedy et al., 2013), social support (Rodriguez-Llanes et al., 2013; Aldrich & Meyer, 2015), resources (Coles & Buckle, 2004; Pfefferbaum et al., 2010), reduced risks (Rego & Mehta, 2005; Twigg, 2007;

Turnbull et al., 2013), and increased communication (Chandra et al., 2011, 2013; Moore et al., 2013). In fact, social scientists in a wide range of fields including psychology (Bonanno, 2004), sociology (Mileti, 1999), socio-ecological systems (Adger et al., 2005; Folke, 2006, Nelson et al., 2007), and disaster research (Bruneau et al., 2003; Manyena, 2006; Norris et al., 2008; Aldrich & Meyer, 2015) have all contributed to the development of the community resilience concept.

Typically, resilient communities are also characterised by having access to various resources, social support, community participation, attachment to place, combined effort, a sense of community, and cooperative decision-making.

Magis (2010) suggests that community resilience is “the existence, development, and engagement of community resources by community members to thrive in an environment characterized by change, uncertainty, unpredictability, and surprise” (p. 401). She explains that ‘community resilience’ is not the same as ‘community capacity’ and argues that it is only when communities engage their capacities to thrive that they can build their community resilience. From this perspective, the development of community capacity is a process, and community resilience is the desired output of that process. Magis found that community resilience is developed through the identification, development, as well as engagement of community resources, active agents, collective action, strategic action, equity, and impact. She contends that resilient communities learn to cope with, adapt to, and shape change. Although she developed a community resilience self-assessment checklist, she was not able to test it in the field.

Fischer and McKee (2017) noted that other researchers, like Magis, considered the resilience and empowerment of a community to be functions of the capacities and capital of that community. However, in their study of a rural community in Scotland, they found that the poor interpersonal relationships and low level of trust amongst the individuals in the community made it impossible for them to collectively use their positive assets to improve their adaptive capacity. Their study thus demonstrates the importance of relationships and the need to manage conflicts within the community so that resources can be better utilised to develop adaptive capacity and community resilience.

Community resilience, as it has been used in multidisciplinary social science, is an increasingly integrated concept. Berkes and Ross (2013) developed an “integrated approach” (p. 5) to the development of community resilience, using the common ground between socio-ecological systems theory and developmental and mental health psychology. Their integrated approach, which seeks to develop community resilience by developing adaptive capacity and agency, uses community development techniques employed by community members or outsiders to identify social strengths and interconnections, then activate them through agency and self-organisation.

In a later study, Berkes and Ross (2016) took their integrated approach a step further by introducing the use of a panarchy to express community resilience theory. They argue that because each community is a part of a nested network of relationships that go ‘up’ to the State level and ‘down’ to the individual level, a community affects and is affected by each relationship. Thus, an examination of the community itself overlooks large chunks of what is happening within and around it and why the community is – or is not – sufficiently resilient.

Socio-ecological systems theory considers resilience to be a product of adaptive relationships across networks, and psychology sees resilience as a result of agency and self-organisation to develop community strengths (Berkes & Ross, 2013). To enhance community resilience, different scholars have recommended a number of specific interventions (Ross & Berkes, 2014): typical examples include community participation, skills development for community members, and the supplying of various assets to the people in the community (Pfefferbaum et al., 2015). Some scholars have considered community resilience building to be a social process that could be achieved through collaborative learning to increase the adaptive capacity of community participants and decision-makers (O’Donnell et al., 2018).

Pfefferbaum et al. (2015) recommend the tailoring of community resilience development initiatives to the needs of communities. Revell and Dinnie (2020) similarly encourage the participation of community people in the planning of training to be delivered with the aim of community capacity building. They also argue that regulatory and political support is necessary to provide opportunities for community members to use local resources. According to Schneider et al. (2020), in the case of climate adaptation – which is very much a context-specific process – the identification of the community’s own and contextual barriers to becoming resilient is an important pre-condition for the success of community resilience

development. They note that locally appropriate, nationally aligned responses, long-term planning, and community engagement are all essential parts of the community resilience development process. Cutter (2020) reported that the conditions for building a climate-resilient community include transformational (innovative and intergenerational) thinking, as well as a participatory approach that engages all community members and increases social connectivity. While these findings demonstrate that extensive research has been conducted around the conceptual aspects of community resilience, less focus has been given to exploring the practice of building community resilience (Chandler, 2014; Fazey et al., 2018).

A recent meta-synthesis by Carmen et al. (2022) shows the importance of social capital to the building of resilience across social levels, including communities. Based on a review of 187 studies, these researchers identified implications for community resilience and climate change practices based on conceptual and empirical understandings of social capital. They suggest that to achieve a more comprehensive understanding of how social capital is used to build community resilience within the context of climate change, interested parties should pay more attention to how outcomes emerge, identify how the factors involved interact, and observe the approaches of formal actors.

In their systematic review, Fan and Lyu (2021) examine how community resilience has evolved over the past 20 years. They examined community resilience in two different time periods. In the first phase (2001 to 2015), the themes were identified as: “Framework, disaster, change, and model” (p. 1643). In contrast, in the second stage (from 2016 to 2020), the themes of “social capital, capacity, and framework” were more prominent (Fan & Lyu, 2021, p. 1643). In addition, the study found that key issues differed across countries: for example, social support dynamics were important in the US, disaster resilience was most critical in Australia, and flooding resilience was the focus in the UK. Based on their findings, these researchers recommend that future studies of community resilience consider obstacles within daily life, resilience from an organisational perspective, and cultural context.

In terms of actually achieving community resilience, the International Federation of Red Cross and Red Crescent Societies (2012) pointed out that building community resilience is a long-term process. Other researchers suggest it might not be possible for the government of a country alone to ensure resilience is built, because many governments, especially in developing countries, have limited resources as well as endemic financial, human, and bureaucratic

resource management problems, which can be difficult to resolve (Scolobig et al., 2015; Lydon, 2017).

On the basis of the above discussion, I can conclude that – while the concept of community resilience can be generally considered as the ability of a community to adapt to various environmental, social, and economic changes, as well as promote better community functioning (Fazey et al., 2018) – ideas about, and approaches to, this subject are still evolving at a rapid pace. In my research, I am especially interested in community resilience because I aim to measure how community-based climate adaptation and wetlands management can make communities more resilient to climate change.

2.4.4 Measuring Community Resilience Using Community Resilience Assessments

The need to conduct community resilience assessments has developed in recent years as a requirement for development projects to obtain funds from donor agencies and to identify ways to reduce risk (Tyler et al., 2014; Schipper & Langston, 2015; Cutter, 2016). Conducting such assessments offers an additional benefit: identifying the characteristics of community resilience to be measured makes it easier for stakeholders, decision-makers, as well as other end-users to make appropriate and effective plans (Burton, 2012; Cutter et al., 2016; Asadzadeh et al., 2017).

Because the impact of climate change varies from community to community, any approach to measuring community resilience must take into consideration the fact that people of different communities face unique problems in their lives and livelihoods (Rahman et al., 2018a; Doherty et al., 2019; Doloisio & Vanderlinden, 2020; Haverkamp, 2021). Although many conceptual frameworks for measuring community resilience exist, there has been considerable debate on the characteristics that contribute to such resilience (Schipper & Langstone, 2015).

As one method for measuring community resilience, Cartagena (2019) put forward the Community Resilience Capitals Framework. The goals of the framework were to demonstrate the complex nature of asset interactions in practice in a place- and context-sensitive manner

and, it was hoped, to promote more equitable and participative community resilience building in the future. Cartagena's framework links community resilience, capitals, and power relations, showing how they are not discrete; rather, in practice, it is integrated into complex interactions by actors inside or outside the target community. Cartagena's framework emerged out of his examination of the rebuilding of communities in New Zealand after the 2010 earthquake, in which he found that government reliance on the insurance industry to lead and finance recovery disempowered the local communities. Taking advantage of their financial resources and strategic positioning, insurance-related stakeholders controlled the priorities for earthquake recovery and co-opted the process. Thus, those with the greatest capital made decisions, creating issues of power imbalance and lack of equity in decision-making. Cartagena (2019) concludes that prevailing emergency management and planning practices did not adequately consider the complexities of capitals, and the fact that capitals were concentrated in the hands of a few stakeholders, who co-opted the process. Because he demonstrated the way in which those who assembled the broadest range of capitals attained power, he advised mobilising communities and their own capitals. His Community Resilience Capitals Framework creates a structured way to identify the extent to which a community holds the necessary capitals, such as resources and assets, to be considered resilient.

In another study, Sharifi (2016) critically reviewed 36 selected community resilience assessment tools and developed comparison metrics that categorised their outputs into five dimensions for measuring resilience: social, environmental, economic, infrastructure (built environment), and institutional. In his review of assessment tools, Sharifi describes how various resilience dimensions and sub-dimensions are considered in selected community resilience assessments. As an example, the environmental and institutional dimensions can be viewed as being primarily about planning/preparation. The social and economic dimensions are primarily related to how quickly a community can recover. The infrastructure and physical dimensions consider robustness and redundancy, efficiency, ICT, transport, land use, and urban design. This analysis can clarify the nuts and bolts of how to design and use such assessments to develop more effective community resilience development plans.

Cutter (2016) also examined resilience assessment tools, using four different parameters to analyse 27 such tools. She identified a number of concepts commonly used to measure resilience: economic capabilities, social capabilities, community indicators (including

capacities, physical assets, or infrastructure), environmental indicators, and institutional or governance indicators. In order to examine overlaps in the concepts measured, Cutter examined 14 empirical case studies and concluded that the concepts can be classified as either attributes/assets (economic, social, environmental, infrastructure) or capacities (social capital, community functions, connectivity, and planning). She contends that new ways of collecting data are needed to measure many of the dimensions of community disaster resilience.

One might expect that if those developing a community resilience plan design it with a wide range of factors in mind for future assessment, it is more likely that the plan will produce the desired output and that factors impeding community resilience and/or the engagement of stakeholders will be more easily identified. The above findings and recommendations indicate that most studies to date have measured community resilience against 4 to 5 capitals. I argue this approach provides an incomplete result and that it is necessary to measure resilience from a wider perspective. Thus, I have add ‘governance ‘as an additional criteria within the framework for community resilience assessment, which I used in this thesis to measure all of the aspects referred to in this study as ‘drivers’. These are described in detail in the next section.

2.4.5 Using Drivers to Develop Community Resilience

As an alternative approach to preparing community resilience development plans against assessment frameworks, community resilience can be mapped against different capitals: social, human, financial, natural, and physical. These five types of capital act as drivers in the community to build resilience. For example, social capital in the form of a shared feeling of responsibility to address the need for the community to adapt can be, as a ‘driver’, channelled into action to make the community resilient (Dugarova, 2013; Fraser, 2021). A number of studies have shown a positive relationship between these drivers and community resilience (Cutter, 2016; Cafer et al 2019; Esteban, 2020). Chelleri et al. (2016) argue that drivers can be supported, enhanced, and leveraged to contribute to reducing poverty and increasing community resilience.

Communities that are climate-resilient are expected to be equipped with sufficient assets and resources to cope with long-term changes. As part of a proposed collective engagement urban

resilience framework, Esteban (2020) considers human, social, institutional, economic, and environmental capitals as drivers of urban resilience, and argues that these five drivers of resilience (p. 8) impact the way(s) in which an urban resilience strategy is developed. She further suggests that interventions designed as part of an effective community resilience development plan should aim to achieve a balance among these capitals. In addition to these five drivers, Villagra (2019, p. 8) inserted governance in her framework during measuring community resilience.

In Bangladesh, it is important to identify how different drivers contribute to community resilience. To do so, I have conceptualised the whole process as a simple framework that shows the relationship between hazards and resources, as well as the ability of specific drivers to influence the state of the resources and, with the assistance of project managers taking a participatory approach, enable communities to be able to cope better with changes in their environment and show increased resilience (Figure 2).

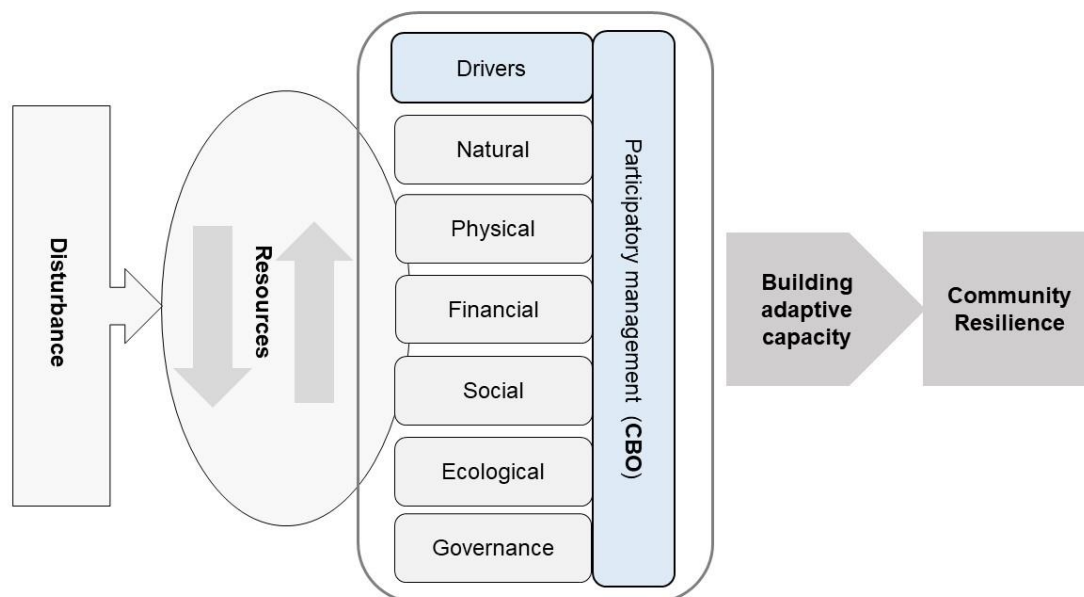


Figure 2: A framework to assess the resilience of a local wetland community that has gone through a development intervention.

(Author’s construction based on the merging of frameworks proposed by Cutter, 2016; Cafer et al 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020).

The purpose of this thesis is to assess the resilience of the community of the Hakaluki *haor* against drivers of resilience in the context of climate-stressed wetland management under the CBA-ECA project, and the extent to which the management approach influenced its development. A summary of the drivers of resilience to be used – based on findings in the literature review – is presented in Table 4. It is important to note that the ‘drivers of community resilience’ came from the literature review. They were adopted because existing frameworks only measure resilience against 4 to 5 Capitals. Adding governance as a 6th driver helped me to evaluate and explain more explicitly. Figure-2 indicates that when disturbance occurred in the society, it needs various resources to overcome the disturbance. In participatory management, these resources (natural, financial, physical, social, ecological, and governance) work as drivers which help to build the resilience of the community by increasing adaptive capacity of the community members.

Table 4: Drivers of community resilience as identified and defined in the literature

Driver	Description	References
Human	An individual’s innate and acquired personal attributes, such as work skills, education, knowledge, and health, which contribute to that person’s ability to earn a living and strengthen the community.	Cutter, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020; Fraser, 2020.
Social	The extent of social networks, social structure, social institutes, social support, social networks, social relationships, trust, equity.	Cutter, 2016; Sharifi, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019;

		Villagra, 2019; Esteban, 2020; Fraser, 2020.
Natural	The availability and sustainable use of natural resources for human consumption, and the availability of natural resources, such as water, land, biodiversity, fish, and natural resources (wetland protection).	Cutter, 2016; Sharifi, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020; Fraser, 2020.
Physical	The physical infrastructure of a community, including machinery, homes, factories, water, roads, transport, shelter, and energy.	Cutter, 2016; Sharifi, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020; Fraser, 2020.
Financial	Material property, wealth, and other financial resources available to be invested for business development or civic and social enterprises; includes economic structure (income, employment scope) and economic security (community grants or other common funds, savings).	Cutter, 2016; Sharifi, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020; Fraser, 2020.
Governance	Policies, laws, and other mechanisms put in place by government/funder/other managing bodies to ensure community participation/stakeholder engagement in planning and decision-making, and to ensure transparency and accountability.	Villagra, 2019

2.4.6 The Role of Community-based Adaptation (CBA) Projects in Building Community

Resilience

Community-based adaptation (CBA) is frequently cited as an approach to increasing community resilience. Ayers and Forsyth (2009) contend that CBA not only helps to address local social vulnerability and to achieve place-based resilience building, but it also contributes to understanding how to build the resilience of the most vulnerable people in the community. According to Dodman et al. (2009), CBA processes reduce vulnerability and build resilience to climate stresses. Pérez et al. (2010) would attribute to the way that CBA projects increase the capacity of communities to face challenges associated with climate change. Heltberg et al. (2012) observed that CBA addressed various consequences of climate change by offering approaches to develop greater resilience to current climate variability. Forsyth (2013) indicates that CBA activities may contribute to building resilient climate infrastructure through direct adaptation intervention. Reid et al. (2009) and Ensor et al. (2018) suggest that CBA increases the resilience of community members by providing technological support, empowering community members to make necessary changes themselves, and building adaptive capacity.

Various funding mechanisms for adapting to climate change have been generated in developing countries, and NGOs operate a wide range of community-based projects to implement such adaptation (Sperling et al., 2008). However, there is not much literature that focuses specifically on the management of climate-stressed wetlands, which examines whether community-based adaptation actually builds the resilience of community people in wetland areas, or that suggests ways to measure it (Reid & Huq, 2007; Heltberg et al., 2009). While some studies have focused on illuminating the adaptation process, others have concentrated on examining the resilience-building process.

One example of a study of the resilience-building process is the analysis conducted by Guleria and Edward (2012) of ‘elements of resilience’ in three coastal districts of the Indian state of Tamil Nadu. They argued that the coastal people of this south Indian state are threatened both by various types of natural hazards, which hamper health and ecosystems, as well as by human activities. These include shoreline development, land reclamation, overfishing, and destructive fishing practices, which are also responsible for change in the structure of the marine ecosystem. As a result of these, the coastal communities they studied faced problems of food

security, livelihood, and overall economic development. Guliera and Edward argued that the people living in these overpopulated coastal areas are unable to make proper plans to respond to these hazards. To reduce the long-term impacts of these hazards and the people's vulnerability to disaster, the researchers advocated that action be taken to develop 'community resilience'. To do this, they identified eight elements to be addressed: governance, land use and structural design, coastal resource management, risk knowledge, society and economy, warning and evacuation, emergency response, and disaster recovery. The researchers selected three districts within the state of Tamil Nadu, all of which had suffered in the effects of the 2004 tsunami, to examine the eight resilience elements. They collected both primary and secondary data and conducted semi-structured interviews, which included focus group discussions, group interviews, and key informant interviews. Based on the results and analysis of the data, the researchers recommended that the following be done to enhance community resilience: build institutions for the people; implement a poverty alleviation programme; operate a self-help group; plant mangrove trees; develop village knowledge centres; train government officials; and conduct awareness building. Although the researchers focused on community resilience in their research and provided some useful recommendations, their research did not examine the adaptation process of the community, which is the focus of my research.

Closer to the study area for my thesis, and touching on the drivers I use, Hossain et al. (2013), identified physical, human, financial, social, and natural assets to determine the resilience of a fishing community in Nijhum Dwip in Noakhali, a coastal area of Bangladesh. In their article, the researchers used the sustainable livelihood approach (SLA), an approach that aims to help outsiders comprehend the livelihoods of people in poverty by identifying and presenting the relationships between the factors that limit or expand their livelihood opportunities and use this understanding to measure the resilience of this community. Both qualitative and quantitative methods were used in their research. Qualitative methods included head-of-household interviews, participatory field observation, key informant interviews, and satellite imagery. The researchers also used secondary data and research papers to assess the resilience of the fishers in their study. Applying the sustainable livelihood approach (SLA), researchers identified various livelihood aspects which bolstered and undermined the resilience of the fishers. The researchers identified that it is necessary to preserve the existing mangrove forests and to extend them through tree planting in order to increase the availability of natural barriers that can protect communities against the full impact of extreme climate events. According to 48%

of the respondents in their study, natural resources were considered the most important factor that determined their ability to be resilient. Human, financial, and social aspects were identified as the next-most important by 18%, 15%, and 13% of respondents, respectively, while physical assets were deemed to be the least important contributing factor (5%).

In 2018, Ensor et al. published an article on their research of coastal communities in Timor-Leste and the Solomon Islands, entitled *Can community-based adaptation increase resilience?* In their study, community resilience was assessed against a framework these researchers had developed. Their study was based on projected future changes. Such a projection can be proven correct or incorrect. Therefore, this is not really a measure of community resilience.

It is worth mentioning that in 2019, Hossain and Rabby published an article entitled: “Institutional constraints to fishers’ resilience: Community-based fishery management in Bangladesh”; further, they also conducted a study in a wetland area in northeastern Bangladesh, in a district (Sunamgonj) near my study area. Based on key informant interviews, their study identified a number of barriers fishers faced that hampered resilience building: poor coordination among stakeholders, limited participation of CBO members, and conflict between fishery users. While their study examines the resilience of fishers, it does not fully address the adaptation process of local fishers, and, as such, it left a gap that this study can fill.

Stresses and shocks such as droughts, early floods, flash floods, destroyed fish habitat, declines in fish production, the reduced water-retaining capacity of the *beels*, as well as decreased crop production affect the livelihoods of low-income fishers and farmers in Hakaluki *haor* areas, where the case study for this research was carried out. The CBA-ECA project conducted interventions for capacity building through training, alternative income generation, crop diversification, and social connectivity – all of which were intended to increase the skills of the community residents to adapt to climate disturbances and to ensure the continuity of their livelihoods. To facilitate community participation in the CBA-ECA activities, the project formed Village Conservation Groups (VCGs) as community-based organisations that involved their members in the wetland management process. The details and analysis of these interventions follow in Chapters 4 through 7.

2.5 Conclusion

In this review, I have talked about wetland management, community-based adaptation, resilience, and community resilience, because these topics represent the focus of my work as I aimed to investigate the extent to which community-based adaptation (CBA) contributed to building the resilience of the people living in Hakaluki *haor* areas. My research also sought to identify the roles of parties involved in this participatory wetland management system. After extensive review of the literature, I found that a gap exists in examinations of what the link is between project-based community-based adaptation and community resilience. Therefore, in my dissertation, I sought to fill this gap- and explore whether CBA projects can enhance community resilience, and if so, why, and in what ways, and if not, why not. The following methodology section will set out in detail how this was done.

Chapter 3: Research Methodology

3.1 Introduction

This chapter focuses on the approaches, methodologies, and research instruments used to answer the research questions set for this study. It starts by describing the overall research design, then presents the research methods, providing justification for the mixed methods approach, and outlines the specific techniques that were used to collect and analyse data for my dissertation. This chapter also covers the validity and reliability of the research, ethical issues, and the research timeline. The aim of the research was to undertake a case study of the CBA-ECA project in the Hakaluki region of northeastern Bangladesh to discover whether community-based adaptation was successfully employed and was effective in increasing community resilience.

It is worth noting that the CBA-ECA project has already been reported on; in 2015, the Department of Environment of Bangladesh, with the help of the International Union for Conservation of Nature (IUCN), published a report at the winding up of the CBA-ECA project. This report, prepared by those who implemented the project, shares the results of the qualitative study that they had conducted while the project was running and served more as a description than an assessment; it essentially highlighted the various components of the CBA-ECA project and focused on the implications of the project for the management of ecologically critical areas. It did not specifically measure the impact of its community-based adaptation approach (DoE, 2015).

In 2019, the Department of Environment published another report entitled, “Good Practices and Innovations in Implementing Rio Convention in Bangladesh”; this report identified 14 examples of good practice under the three broad categories of biological diversity, climate change, and combatting desertification. The CBA-ECA project was identified as an exemplar of good climate change practices and innovations; it is described, like the other projects included in this report, in terms of its background, key features, major interventions and accomplishments, alignment to the UN Framework Convention on Climate Change

obligations, and limitations (DoE, 2019). This report also does not examine the effectiveness of the approach taken on the building of community resilience.

My research, conducted in 2019, at the time of publication of the aforementioned report and four years after the completion of the project, sought to gather and analyse data from interviews and surveys in order to identify the extent to which the community-based adaptation approach taken by the CBA-ECA project had contributed to increasing the resilience of the community.

3.2 Research Design: Case Study Approach

A research design, which should be finalised at the beginning of the research process, provides the framework for the collection and analysis of data (Bryman, 2012). In my research, I used a case study approach to examine the impact of community-based adaptation (CBA) interventions on the building of community resilience in the climate-stressed wetland area in the northeast of Bangladesh.

A case study approach is a type of empirical inquiry that investigates a contemporary phenomenon or issue in a real-life context and setting (Yin, 2011; Yin, 2018). A case study helps to understand the causal relationship between a phenomenon and its context (Teddlie & Tashakkori, 2009). Since the success of CBA relies on contextual variables (such as local values and institutions), a case study is the most appropriate approach to take to identify the causal relationship between specific CBA interventions and the resilience-building process of local communities. The case study approach was also selected for my research because such an approach has the capacity to answer not only ‘why’ and ‘how’ questions (Yin, 2018), but also ‘what works’ questions, for example: “What works, for whom, in what contexts, and how does it work?” (Johnson, 2008, p. 205). Specifically, the case study approach sought to reveal answers to questions such as, “Did CBA work as an approach to the participatory management of inland wetlands, for whom, in what contexts, and how?” and “Did CBA work to develop community resilience, for whom, in what contexts, and how?”

A common criticism of case study research design is that it has limited use for generalising findings to other cases in other contexts (Diefenbach, 2009). However, some researchers argue that appropriate case study design can, to a great extent, overcome this problem (Gerring, 2004; Flyvbjerg, 2006). For my research, within the case study design, a mixed methods strategy incorporating qualitative and quantitative techniques was used to generate more systematic observations and analysis of the empirical phenomena, and thus to increase the internal validity and reliability of the research method (Feilzer, 2010; Bergman, 2011; Crowe et al., 2011). Details of the techniques used to gather qualitative and quantitative data are presented in sections 3.4 and 3.5 of this chapter, respectively.

3.3 Research Philosophy, Methodology, and Methods

Philosophically, my research falls under the paradigm of ‘pragmatism’, which is based on the proposition that researchers should use the philosophical and/or methodological approach that best addresses the specific research problem under investigation (Tashakkori & Teddlie, 1998). As a research paradigm, pragmatism is often associated with the use of mixed methods or multiple methods of data collection (Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2009; Creswell & Clark, 2011) as methodologies best suited to answer the research questions (Kaushik & Walsh, 2019).

My decision to adopt a mixed methods approach to the case study – using both qualitative and quantitative methods to answer the research questions (Creswell, 2014; Zohrabi, 2013) – was a pragmatic one: a mixed methods approach has become common in academic research, as the two methods have been demonstrated to complement one another to achieve a comprehensive understanding of the study object (Creswell, 2014). Neuman (2006) concisely explains the difference between the two methods as follows:

Quantitative research design focuses on the issues of integrity and objectivity, involving precise statements, standard techniques, numerical measures, statistics, and replication; whereas qualitative research design relies on background knowledge of the research setting, avoiding the distance from the

elements of study setting, and striving to achieve trustworthiness in an objective manner (p. 152).

A mixed methods approach involves using two or more types of data collection and analysis techniques within the same project (Greene et al., 2005). Purists who employ either quantitative or qualitative methods have criticised this type of approach.

Quantitative purists would argue that enquiries in the social sciences should follow the same approach that physical scientists use to study physical phenomena. The quantitative school argues that the use of quantitative methods improves the reliability and validity of data collected by social scientists, because researchers who use them remain emotionally detached, uninvolved with the objects of study, and thus able to test their findings through objective rules and processes (Nagel, 1989). These purists tend to be most concerned that researchers, albeit subconsciously, might skew the analysis of the data to match their own preconceptions, ideologies, or opinions; they believe that the use of quantitative methods prevents this, owing to the idea that the rules of mathematics and logic drive objective analysis.

On the other hand, qualitative purists would assert that reality is multidimensional, so a time- and context-free generalisation of a given reality that could be achieved through quantitative measurement is neither desirable nor achievable. Qualitative purists usually dislike the detached and passive style of writing used by mathematicians and scientists to describe human social reality. They prefer detailed, rich, descriptive, direct, and informal writing that presents the whole human condition within its social context (Johnson & Onwuegbuzie, 2004).

In contrast to the purists, Robson (1993) argues that there is no rule that only one method must be used in social science research. Moreover, he argues that it is better to use more than one method in a single study. Neuman and Kreuger (2003) note that using mixed methods in a single project not only ensures complementarity of methods, but also increases the reliability of the analysis, as it will be based on a wider range of data.

Mixed methods research has become an established paradigm of social science research, seen to combine the strengths of both quantitative and qualitative approaches (Bryman, 2012; Warner & Afifi, 2013; Warner et al., 2013). Literature has confirmed that the use of both methods in a single study helps the researcher to explore the research questions from multiple

perspectives; further, it also confirmed that each method is better suited to answering different research questions (Bryman, 2004; Lorenzoni et al., 2007).

Both qualitative and quantitative methods were used to answer each of the three research questions presented in Section 1.3. Generally speaking, qualitative methods were deemed best for the in-depth exploration of the impacts of wetlands management and climate change-related policies and of the implementation process of the community-based adaptation project, both of which were tied to the specific context in which they operated (Neuman & Robson, 2012). Because my study was exploratory in nature, quantitative methods (descriptive statistics) were used to test the authenticity of the stories that respondents told and to delve into the diverse issues surrounding the facts (Neuman, 2006), as a form of ‘triangulation’.

Qualitative data collection was performed through literature and document reviews, semi-structured in-depth interviews, focus group discussions, and field observations. Quantitative data was collected through a survey as well as a review of secondary data from project offices and from the Ministry of Environment, Forest and Climate Change in Bangladesh. The case study data collection started in July 2019 and finished in November 2019 during an extended field visit to Bangladesh. Details of the techniques used to collect and analyse the data follow.

3.4 Qualitative Data Collection

In qualitative research, researchers use an interactive style of data collection (Creswell, 1994) that allows them to base their own interpretation of a phenomenon on the valuable and relevant perceptions of others (Neuman, 2006). Conducting a qualitative case study facilitates the exploration of a complex phenomenon within the research context through the use of multiple sources of data to improve the credibility of the results (Creswell, 2014). The qualitative techniques used in my research are described in the following subsections.

3.4.1 Document, Literature, and Archive Record Review

Documents play an important role in the gathering of empirical knowledge through qualitative data. Atkinson and Coffey (2011) consider documents as ‘social facts’, which not only record social events but also share and use our information about them in a socially organised way. The literature and documents used in the research were gathered from electronic databases including Scopus, Google Scholar, ProQuest, Web of Science, Science Direct, and the Adelaide University Library. Moreover, grey literature from international organisations, national and international governments, and fund providers were reviewed. Keywords used in search engine criteria included ‘community-based adaptation’, ‘wetland management’, ‘resilience’, ‘adaptation funding’, ‘climate change’, ‘climate public expenditure’, and ‘financing in wetland areas’. Additional sources included peer-reviewed and published primary research studies globally and related to Bangladesh. Finally, climate change adaptation, climate-finance-related government policies, laws, reports, and records, as well as BBS statistics, were collected from relevant ministries, directorates, NGOs, and project and programme offices of Bangladesh.

For my research, documents were analysed on the basis of credibility, representativeness, and authenticity. This allowed for a critical selection of the documents to be used (Scott, 1990), given the large volume of documents on the CBA-ECA project.

During the data collection phase of my research, 28 policy documents (published between 1992 to 2021) were thoroughly reviewed, including various project documents, minutes of meetings, government reports, leaflets for awareness building, and newspaper articles, as well as analyses of policies related to national climate change adaptation, policies related to bilateral and multilateral agencies, a climate change risk management approach, and a wetland management approach.

As a qualitative research method, document analysis is used as a supplementary data collection tool that helps to triangulate and assess the accuracy of data collected in interviews, focus group discussions, and observations. This method provided background information about planned adaptation activities in Bangladesh in general, as well as background information about CBA-related approaches, more specifically (Bowen, 2009). This additional material contributed to my understanding of the CBA project implementation process in the climate-stressed wetland

areas in Bangladesh and of the influence of CBA in building the resilience of local households and communities.

3.4.2 Semi-structured Interviews

In social science research, interviews are considered the most effective and widely used data collection method, as the participants can freely express their thoughts, feelings, opinions, and experience regarding the research issue (Patton, 2002). Conducting semi-structured interviews provides the researcher with opportunities to ask informants predetermined, though open-ended, questions. This method is increasingly common in the published literature of the social sciences; it has been well established in qualitative research arenas (Grenier, 1998). Usually, the researcher prepares a written interview guideline prior to starting the interview process. This guideline tends to be very specific, and the questions in it are developed very carefully. A list of topics may also be generated during this process, which can be added to by interviewers as new topics emerge from the interviews (Fylan, 2005; Dunn, 2016).

When conducting such interviews, the researcher should be careful not to incorporate leading questions that may impose their own biases and lead the respondent to follow them, and therefore leave out contrary information. Furthermore, the researcher should also be very mindful of cultural factors that could influence responses. In remote Asian villages, such as those from which participants in my research live and work, the researcher can be culturally perceived as being of high status and the respondent of low status; cultural expectations of this situation will tend to induce the respondents to follow the lead of, and try to please, the researcher. Furthermore, respondents may avoid sharing information that might be inconsistent with the researcher's own biases and thus disappoint or cause anger. In my case study, to increase the likelihood that respondents would provide genuine, specific, and detailed answers, semi-structured interviews with selected participants from the stakeholder groups were conducted using quite open questions in an informal and conversational manner.

To achieve the purpose of and address the research questions set for my study, 52 semi-structured interviews were conducted with a diverse range of respondents involved in the CBA-ECA project. Out of these, 28 interviews were carried out with the primary beneficiaries of the

CBA-ECA projects: members of the Village Conservation Groups (VCGs). Other participants included community leaders – who were not the primary beneficiaries but had an influence on the project – as well as key stakeholders selected from organisations involved in implementing the projects, central and local administrators, and NGO officials and experts. These respondents were selected based on their expertise in this field and/or their involvement in the planning and implementation of the CBA-ECA project. Table 5 identifies the participants by type and number, and the following subsections will provide further information on each group.

Table 5: Type and number of in-depth interview participants

Participants	Ministry Level	Local Level (Districts and Subdistricts/ <i>Upazilas</i>)	Total
Primary Beneficiaries (Village Conservation Group members)		28	28
Government Officials	3	9	12
Political Leaders and Public Representatives			4
NGO Officials			4
Academics and Experts			4
Grand Total			52

Source: Author’s construct (2019).

Interview guides were prepared based on the relevant literature, research questions, and objectives set for my dissertation. The content of these interview guides (found in Appendix 1, attachment 5) helped me conduct the interviews in a systematic manner within the scope of the research (Patton, 2002). Although the interview guides contained a set of questions regarding intervention selection, the implementation process, and the impact of the CBA-ECA project on the target population (at both individual and community levels), the discussions were not confined to the question list (Bryman, 2016). In semi-structured interviews, participants are encouraged to express themselves in their own ways, which helps them to provide sensitive information without interruption (Matthews & Ross, 2010); it also prevents the researcher from unknowingly excluding data based on the limits of their questions.

As previously noted, fieldwork began in July 2019 and finished in November of the same year. I prepared open-ended question guides in English, then translated these into Bengali. Being a civil servant in Bangladesh, I had easy access to key officials of different ministries. Initially, officials of the Ministry of Environment, Forest and Climate Change and the Ministry of Finance were interviewed, as these officials were able to identify other relevant officials and stakeholders at central and field level for interview. I also obtained the cooperation of the Center for Natural Resource Studies (CNRS), the NGO that had implemented the project. When collecting data, I assured the stakeholders and participants that their names and identities would not be disclosed to anyone.

Interviews were conducted in Bengali. The length of each interview varied between 30 minutes and one hour. Although the interviews were time-consuming, rich data was collected. Based on the circumstance and the choice of the participants, I took detailed notes and/or recorded the interviews. I later transcribed and translated the interview recordings into English. As part of the translation process, while I made some changes to the structure of the participants' words to read more colloquially in English, I also made every effort to maintain the meaning of their expression.

3.4.2.1 Interviews with Local Beneficiaries

The main beneficiaries of the CBA-ECA activities in Hakaluki *haor* include fishers, farmers, animal herders, and fuel wood and fodder collectors – who are members of Village Conservation Groups (VCGs) – of which there are 28 located throughout the area. Each VCG has its own leadership: a president and a secretary. These leaders helped me to select participants by arranging informal discussion meetings with other beneficiaries and inviting me to their VCG meetings when possible. Interviews with the beneficiaries were conducted after they had completed written surveys.

One beneficiary from each of the 28 VCGs was interviewed (28 interviewees in total), based on responses to the written surveys: interviews were offered to those who had provided relevant information about the ways their community earned their livelihood, as well as the changes that had occurred in their society over the previous couple of years. Participation was voluntary. A number of the original interviewees changed their minds about participating due to their engagement in household work or other activities and were not interviewed. In such cases, previously prepared lists of alternative candidates were used. Interviews were conducted in public places, such as a VCG office, where respondents were likely to feel free to express themselves.

The purpose of these interviews with beneficiaries was to discover the extent to which community-based adaptation strategies had been employed and been effective by finding out what role the interviewee had played in the planning and implementation of a given activity, as well as the extent to which they felt they had benefitted from the implemented activity. More specifically, I sought to identify whether or not the overall operation of, and the specific components of, the CBA-ECA project contributed to the building of the community resilience of its beneficiaries by influencing human, social, physical, natural, financial, and governance drivers. The interviews opened with some basic questions on familiar topics to put the subject at ease. A number of questions used during the body of the interview had been prepared beforehand, but many questions emerged during the process to follow up information given by the subjects.

3.4.2.2 Interviews with Administrative Officials and Local Representatives

In addition to the beneficiaries, one civil servant was interviewed from the Ministry of Environment, Forest, and Climate Change, the Ministry of Finance, and the Department of Environment (total three interviewees). Nine district and subdistrict-level unelected civil servants were also interviewed. At subdistrict level, the *Upazila* (sub-district) *Nirbahi* Officer, a CEO who coordinates the departments, reports to the government, and is responsible for monitoring any development activities was interviewed. The *Upazila Nirbahi* Officers then

assisted me with the selection of prospective interviewees who had been involved with the monitoring or implementation of the CBA-ECA project and/or had been working for an extended period in the Hakaluki *haor*. These other officers at sub-district (*Upazila*) level included the Fisheries Officer, Agriculture Officer, Project Implementation Officer (Disaster and Relief Officer), Cooperative Officer, and the Forest Officer assigned to oversee the management of wetlands. Moreover, four elected local representatives, one *Upazila Parishad* (council) Chairman and three Union (representing a number of villages) *Parishad* chairmen were interviewed. (In Bangladesh, ‘Chairman’ is the official designation, regardless of gender.) In total, 12 government officials and four political leaders/public representatives were interviewed. The purpose of the interviews with different government officials and local representatives was to understand the coordination among the groups at local level, as well as determining the extent to which community involvement in policy development was valued at the central level.

3.4.2.3 Interviews with NGO Officials

Because the employees of NGOs – including the Centre for Natural Resource Studies (CNRS) and the International Union for Conservation of Nature (IUCN) – have a wealth of expertise in the subject under study, their local officers were also interviewed. During the period in which interviews were conducted, no IUCN officers were found in the study area. Four officers from the Center for Natural Resource Studies (CNRS) were selected to participate in the semi-structured interviews. A number of employees from the CNRS head office had been involved in the CBA-ECA project and were able to help identify appropriate additional people, such as local representatives, who had been involved in the project administration when it had been ongoing and who could still be found in the area or nearby. A total of four NGO officials from the CNRS were interviewed. The purpose of these interviews was to explore the implementation process of the CBA-ECA project and identify any barriers the organisers faced during the implementation period.

3.4.2.4 Interviews with Experts

Researchers and university professors with a long record of conducting published research regarding the Hakaluki *haor* were also interviewed as independent experts, because they hold the latest knowledge on global climate change and on the impacts of climate change in wetland areas in general and in the study area in particular. I refer to these individuals as ‘independent experts’ because they had no personal or financial stake in the CBA-ECA project. Four such experts were interviewed.

3.4.2.5 Focus Group Discussion

Holding a focus group discussion is another useful and interactive way to informally gather qualitative information about people’s views, attitudes, experiences, and beliefs in a group setting (Burton, 2000; Gill et al., 2008; McKenzie et al., 2013; Krueger, 2014). These discussions help the researcher to develop an in-depth understanding of the community and the society on a broader scale, as six to eight selected participants share their knowledge related to the research objectives. The researcher plays the role of moderator and tries to maximise the contributions of those involved. Focus group discussion allows respondents to interact among themselves to build consensus or raise points of conflict around various perceptions for the researcher to note and assess. This method is used when a researcher seeks to delve more deeply into the ‘why’ and ‘how’ of the phenomenon under study. Focus groups offer the key unique advantage of facilitating the collection of rich, in-depth data from a large number of participants within a relatively short period of time (Burton, 2000; Hennink, 2014).

According to Patton (2002), focus group discussion is particularly helpful to gather data about the process and impacts of a programme. In fact, such discussion proved very appropriate for this dissertation, as the genesis, process, and impacts of the interventions of the CBA-ECA project in the Hakaluki were most clearly revealed through the focus groups.

It is important to note, however, that focus group discussion can be influenced by the exercise of factors including power relations, selection and composition of groups, and psychological

dynamics, all of which can inhibit or skew participation in discussions. For example, in Asian countries like Bangladesh, it may be unwise to invite community leaders and community residents to the same single focus group, because the residents are likely to be careful not to say anything that might displease the listening leaders, partly because this is culturally impolite, but also because they may fear retribution. Similarly, economic, social, ecological, and cultural factors may influence the decision-making process undertaken in such discussions (Grenier, 1998). Another problem is that discussions can be dominated by one or two vocal individuals (Smithson, 2000). In any case, the moderator needs to actively encourage the participation of all members.

With these factors taken into consideration and the discussion proactively and constructively managed, a substantial amount of relevant and insightful information can be gathered from a focus group discussion. Arguably, this information could be considered comparatively more accurate and less biased, since the discussion is held in a group: special interests are diluted and, in such a setting, people can challenge opinions that are self-interested or not representative.

The norms, meanings, and processes of community-based organisations like the Village Conservation Groups can be illuminated through the process of conducting a focus group discussion (Bloor et al., 2001). Because this study sought to examine the extent to which CBA interventions contributed to building the resilience of people within local communities, focus group discussions were arranged with the direct beneficiaries of the CBA-ECA projects (as previously noted: fishers, farmers, animal herders, and fuel wood and fodder collectors) to reveal the local views of the community-based adaptation activities and of the barriers that the project faced in managing the climate-stressed wetlands. Detailed notes were taken throughout all of these focus group discussions, because participants did not want to be recorded. Table 6 reveals the groupings for each set of discussions.

Table 6: Actors in focus group discussions and number of focus groups for each category of participants

Actors	Number of Focus Groups per Category
Participants of Village Conservation Groups in high-income areas: <ul style="list-style-type: none"> - 1 focus group with VCG executive committee members - 1 focus group with VCG general members 	2
Participants of Village Conservation Groups in low-income areas: <ul style="list-style-type: none"> - 1 focus group with VCG executive committee members - 1 focus group with VCG general members 	2
Exclusively female members (both executive and general members of the VCGs)	1
1 Non-VCG members (fisherfolk)	1
Total number of focus groups	6

Source: Author's construct (2019).

The focus groups were conducted not only to gather shared perspectives, but also to triangulate and validate information collected from interviews and surveys related to participants' involvement in project activities, the production of crops and fish in their areas, and changes experienced in livelihoods. Discussion topics also included questions about whether participants felt they had enhanced their capacity to cope with the changing environment and had diversified their livelihoods. Six focus group discussions were conducted for my research, five with VCG members and one with non-VCG members. The non-VCG members were all fisherfolk selected from communities identified in discussion with the *Upazila* Fisheries Officers. When I was conducting surveys and interviews, I spoke with members of the fishing communities, built up a rapport with them where I could, then offered a number of them the chance to participate in the focus group discussion.

VCG member participants were selected by income level. Before starting the fieldwork or conducting surveys and interviews, I gained an overview about the VCGs from the NGO officials, which helped identify high- and low-income areas. Two focus groups were conducted in high-income areas, with one being conducted with the executive committee members of the VCG and the other with general members to avoid any influence on the discussion from power differentials. Two more focus groups were conducted in comparatively low-income areas. Both males and females were invited to join these four focus group discussions to understand how female members express themselves in front of male members. The fifth focus group was conducted exclusively with female participants, with both EC and general members joining, in order to minimise any gender influence over the discussion, to observe how women participants express their opinions amongst themselves, and to be able to compare the findings arising from the mixed and all-female groups. Non-VCG members (fisherfolk) were interviewed to get unbiased responses regarding the effectiveness of the CBA-ECA project.

3.4.2.6 Field Observation

Participant observation and other related activities also took place as part of the field observation conducted for this research. In the tradition of qualitative social science research, field observation is conducted to uncover vital research information, which may be impossible to gather from participant responses due to cultural or other social factors (Bryman, 2016). Observation is a method of gathering qualitative data that requires the researcher in the field to pay attention, watch, listen, and use all the senses carefully (Neuman, 2011). Observation challenges a researcher to identify and interpret non-verbal expressions, grasp *intra-* and *inter-*group communication, and accurately record respondent activities (Schmuck, 2006). Observation also enables the inclusion of data about events and details that informants are not willing to share during other data collection processes (Marshall & Rossman, 2014). According to Kearns (2016), participant observation is a vital technique for understanding a phenomenon attached to a specific time and place. The various typologies and dimensions of observation have made the technique popular in social science research (Flick, 2014; Kearns, 2016).

According to Schensul et al. (1999), participant observation offers opportunities for researchers to learn how to interact with respondents. A careful observer can build awareness of the community and the cultural parameters of the interactions being witnessed (Gray, 2014), which can inform the development of appropriate questions. Kawulich (2005) argues that participant observation is a way to increase the validity of a study because observations help a researcher to comprehend the context of the phenomenon under study. A key advantage of participant observation over other qualitative methods is that the observer can examine the normal activities of the participants without interrupting them (Denscombe, 2014).

In the field, I interacted with local people very closely, keenly observing the operation and effect of CBA-ECA project activities, as well as the practices of the people the project aimed to support. All of this helped me fully understand project outcomes. By attending VCG meetings, I was able to witness the participants' development of communication skills and social networking skills. By mixing with participants for a period of time and visiting some households when invited (see Figure 3), I was able to recognise changes to their living standards. In the late afternoons, after finishing fieldwork, I would visit fish markets and note the availability of fish species (see Figure 4). Moreover, I had the opportunity to meet VCG members at village conservation centres (see Figure 5) and observe their activities.

Observation also helped me to understand how the interventions of the CBA-ECA project were implemented within the communities. Although I am also from Bangladesh (originally from a village), I was an outsider to the Hakaluki *haor*; as a researcher who holds a prestigious position in the eyes of my society, I needed to gain the confidence of the local people in order for them to feel comfortable enough with me to share their life experiences. During the four months I spent in the research communities, I was able to observe and gain insights that were new to me: for example, learning how males related to females, as well as how community leaders and VCG leaders behaved with community people both in the formal meetings and in their daily lives. These observations helped me to identify the power structure of the community, as well as other factors which affected the implementation of interventions.



Figure 3: AIGA project beneficiaries with their sewing machine and mat-making materials received from the project (Author's taken during field work, 2019)

Field observation yielded in-depth knowledge of the physical infrastructure associated with the CBA-ECA project, such as the submersible embankments and village conservation centres (VCCs) built for the local community members. I was able to observe the present condition of physical interventions that had been implemented years earlier as part of the CBA-ECA project and determine how and whether these interventions continued to contribute to building the resilience of local communities.



Figure 4: Fish at local market (Author's taken during field work, 2019)



Figure 5: Exterior of village conservation centre (VCC) (Author' taken during field work, 2019)

3.5 Quantitative Data Collection

Quantitative research concentrates on the collection and analysis of data in the form of numbers or values that describe specific variables or characteristics (Bryman, 2012). It is essential for a researcher to undertake quantitative research when they are interested in gathering data to answer research questions relating to ‘how much?’, ‘how many?’, ‘how long?’, ‘how heavy?’, ‘what size?’, or ‘what values?’.

John and Onwuegbuzie (2004) note that the research questions should determine the choice of research method. The objectives of my research are to measure the extent to which the CBA-ECA project was effective in increasing the resilience of the beneficiaries of the Hakaluki and evaluate how much improvement had occurred through the implementation of the projects. Therefore, as these answers require that ‘how much?’ questions be answered, a quantitative method was indicated.

A quantitative survey collects factual information and data that describe the context of a phenomenon. In my research, a quantitative questionnaire survey was conducted among beneficiaries of the CBA-ECA project, the results of which were analysed in comparison with the outcome of interviews and focus group discussions for cross-checking, triangulation, and better validation of the collected data.

In my project, I used a survey to collect quantitative information in the *haor* area. The Hakaluki *haor* area covers two districts, five subdistricts (*Upazilas*), and 11 Unions. There are 28 Village Conservation Groups (VCGs) in the study area. With the help of its president and members of the Executive Committee of each VCG, I selected ten to 16 participants from each VCG. This number varied according to the size of the VCGs and the willingness of the participants. A structured survey questionnaire was used to collect data from these participants and evaluate the relevant components of the CBA-ECA project implemented between 2010 and 2019 (this includes ongoing components still active four years following the official end of the CBA-ECA project in 2015). Specifically, the survey was designed to capture information about the six drivers of resilience used to measure the extent to which the CBA-ECA project had built community resilience. In total, 346 beneficiaries completed the survey.

Survey questions about ‘human drivers’ asked to what extent the CBA-ECA project had helped to increase the capacity of the respondents to deal with uncertainty, produce diversified crops, share knowledge, and manage wetland resources. Survey questions about ‘social drivers’ asked how much the project had contributed to the mobilisation of different community members in the *haor* area. Of particular interest was the role participants thought their local networks played in reducing the impacts of the natural disasters. Survey questions about ‘physical drivers’ aimed to measure the extent to which the project-built community infrastructure – such as submersible embankments and roads – were effective against climate events. Survey questions about ‘natural drivers’ were intended to reveal the degree to which participants thought that the excavation and re-excavation of *beels* increased fish diversity and fish production, as well as the possibility that the swamp forest restoration programme increased tree diversity. Survey questions about ‘financial drivers’ measured the impact of the project on the livelihood incomes of the beneficiaries. Finally, survey questions about ‘governance’ asked to what extent the community participation/stakeholder engagement in planning and decision-making was ensured, as well as overall transparency and accountability were maintained.

3.6 Data Analysis

The Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project sought to manage the climate-stressed wetlands of the Hakaluki *haor* using community-based adaptation (CBA) principles to enhance the community resilience of the marginalised communities of that area. The purpose of my thesis is to assess the extent to which the CBA approach influenced the development of community resilience and to identify the factors that impeded the building of such resilience by mapping key components of the project against the key drivers of resilience. The “Resilience Driver Framework” (RDF) developed for this study is based on an extensive review of the literature, and I have included governance as a sixth driver in my research. The data I collected was mapped against these drivers to assemble themes in the case study evaluation. Collection and analysis of data from a wider perspective, under RDF ensured better coherence and present the rigor of the study. Table 7 presents the definitions of the Resilience Driver Framework.

Table 7: Key drivers for building community resilience and associated definitions

Driver	Definition
Human	The personal attributes of a person, such as work skills, education, knowledge, and health, which contribute to that person's ability to earn a living and strengthen the community.
Social	The extent of social networks, social structure, social institutes, social support, social relationships, trust, and equity.
Natural	The availability and sustainable use of natural resources for human consumption, and the availability of natural resources, such as water, land, biodiversity, fish, and natural resources (wetland protection).
Physical	The physical infrastructure of a community, such as machinery, homes, factories, water, roads, transport, shelter, and energy.
Financial	The material property, wealth, and other financial sources available to be invested for business development or civic and social enterprises; includes economic structure (income, employment scope) and economic security (community grants or other common funds, savings).
Governance	The policies, laws, and other mechanisms in place to ensures community participation/stakeholder involvement in planning and decision-making, ensuring transparency and accountability.

Source: Cutter, 2016; Sharifi, 2016; Cai et al., 2018; Khazai et al., 2018; Baxter, 2019; Cafer et al., 2019; Cartagena, 2019; Villagra, 2019; Esteban, 2020; Fraser, 2020.

To assess whether or not community resilience was enhanced, I mapped the components to the above mentioned drivers, which were introduced in Section 2.4.5 and presented in the assessment framework depicted in Figure 2.

The designers of the CBA-ECA project created and facilitated the selection of activities that would activate drivers of change and development. The purpose of my thesis is to assess the resilience of the community of the Hakaluki *haor* against the drivers of resilience (identified

above) in the context of climate-stressed wetland management under the CBA-ECA project, and the extent to which the management approach influenced the development of community resilience.

3.6.1 Analysis of Qualitative Data

As previously noted, qualitative research seeks to illuminate a phenomenon from various perspectives; it typically involves the collection of a large volume of data through methods that include interviews and focus group discussions which subsequently needs to be analysed properly. According to Bloor et al. (2001), analysis of qualitative data should be systematic and rigorous and reflect the views of all interviewees.

The qualitative data in this study was collected in two different ways: semi-structured interviews and focus group discussions (FGDs). To conduct a systematic analysis of the data, I mapped this data against six key drivers to identify their influence in building resilience in the community and potential barriers associated with them.

Interviews, focus group discussions, documents, and field notes altogether generated a huge volume of data. To identify and categorise common characteristics, data were grouped, then regrouped. Data gathered from multiple sources were analysed manually and using NVivo 11 software, which was employed to organise data and to make various nodes for themes and subthemes. Field notes and documents were analysed manually (Bazeley & Jackson, 2013; Frohlich et al., 2018). Findings were reviewed critically to determine what respondents thought about the emergent themes, then reported using suitable verbatim quotes, translated so that the English version expressed the true content of the Bengali version, rather than simply offering a word-for-word translation, which, can be confusing and lose the meaning of the original statement.

3.6.2 Quantitative Data Analysis

The analysis of quantitative data from the survey involved conducting descriptive statistical analysis to collect information about frequencies, percentages, means, and standard deviations. The results found in this analysis were compared with the results of the qualitative methods to triangulate them. Data from secondary sources and information from stakeholder surveys were coded and entered into the Statistical Package for the Social Sciences (SPSS) for analysis.

3.7 Research Rigour and Ethical Considerations

Various measures were taken to increase validity and reliability, including triangulation, conducting fieldwork for a period of four months, clarification of researcher bias, and transcript reading and rereading (Creswell, 2014; Yin, 2017). The key steps are described in the following sections.

3.7.1 Ensuring Data Validity and Reliability

Validity focuses on truthfulness: whether the real conditions of the idea of the research are illustrated or not (Neuman & Robson, 2012). Reliability refers to the extent to which the process and findings are consistent over time and the diversity of the population is represented.

To ensure validity, reliability, trustworthiness, and rigour, I cross-checked information gathered from various sources using different methodologies. Survey and interview questions were created, pretested to ensure clarity, consistency, and usefulness, and managed electronically for recording and transcription. Data gathered from surveys were cross-checked with those from collected interviews and focus group discussions and vice versa. Cross-checking helped to enhance the consistency and validity of conclusions drawn; results and conclusions from the data collection and analysis were checked with the sources and compared with the secondary sources to ensure the rigour of the study. Finally, detailed transcriptions

and notes on field observations were provided as appendices to the dissertation to help readers to evaluate the research.

3.7.2 Triangulation

Every data-gathering approach has its own strengths and limitations, and triangulation (using multiple approaches at one time) can make the most of the advantages and overcome the disadvantages of taking a single approach (Patton, 2002). Triangulation helps to improve the validity of research by reducing bias and increasing the consistency of results (Creswell, 2014) and can make the results more generalisable by restricting personal methodological biases (Decrop, 1999). To answer the research questions posed for my dissertation, it was essential to gather data from a wide range of actors involved with the interventions undertaken by the CBA-ECA project. As previously explained, I collected data from multiple sites, using multiple research methods, to obtain credible answers to the research questions posed (Flick, 2014).

3.7.3 Ethical Considerations

It is essential to address ethical considerations when conducting any research to clearly establish the relationship between the researcher and the researched and keep all parties safe. To maintain the ethical standards of this social research, this study was conducted in accordance with the guidelines of the Human Research Ethics Committee (HREC) of the University of Adelaide (Ethics Approval Number: H-2019-071).

There are two important and related ethical considerations that must be met when conducting social science research, particularly when conducting surveys and interviews: confidentiality and ensuring anonymity (Piper & Simon, 2005). During data collection, to protect both the scientific quality of research and the rights of the respondents, personal records were kept confidential (Flick, 2014). In my research, no names of participants were disclosed and the gender-neutral ‘they/them’ pronouns were used. In addition to that, a large sample size was

used, which makes it more difficult for anyone to match transcribed or reported dialogue with individual speakers. In the dissertation, quotations from participants were housed in a rubric like “one fisher said in a focus group discussion that . . .” and – as the analysis presents aggregated data – individual responses cannot be easily traced.

Fully informed consent of all participants was sought and obtained through the provision of an informed consent form, which participants signed before being included in the data collection. This form was translated orally into the local dialect to ensure that each prospective participant understood what they were agreeing to by signing. Photos were taken and audio recordings were made only where those who were being photographed or recorded had given their specific consent.

No participant received any remuneration in cash or in kind except for the food and drink that is culturally expected at a group meeting in Bangladesh. Some VCGs also arranged for refreshments themselves while focus group discussions were being conducted.

3.8 Limitation of the Study

In any research, qualitative methods of enquiry require the researcher to have appropriate background and skills. For this dissertation, my being a government officer in Bangladesh (with around 16 years of work experience at the field level) contributed a great deal to my capacity to mix with people of the communities involved with the CBA-ECA project. With this personal background, I have solid interpersonal skills and an extensive understanding of the field. However, there is also a chance that my preconceived knowledge influenced my interpretation of the results, despite my best conscious efforts to exclude any bias.

To minimise bias, I used self-reflection and reflection in the process of analysis. Similar strategies were also incorporated in the research design. As an example of a self-reflection design strategy, I discussed planned activities with colleagues, mentors, and supervisors (Crowe et al., 2011). Reflection on the analysis process came through my supervisory panel at the University of Adelaide; findings and interpretations were discussed with colleagues both formally, including at one postgraduate conference, and informally.

3.9 Conclusion

This chapter presented the study design and the research methodology in detail. In my research, I used a case study approach in which multiple methods, both qualitative and quantitative, were applied to collect data about the CBA projects from various actors. A substantial amount of rich data was collected. Before the results are described in Chapter 5, a description of the case study region in Chapter 4 sets the context.

Chapter 4: Climate Change-Related Policies in Bangladesh and Case Study Project Details

4.1 Introduction

This chapter describes the climate change and wetland management policies of the Government of Bangladesh, as well as their implementation. It also provides a background context of the study area. The chapter then discusses key components of the Community Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project associated with the drivers outlined in the methodology section that formed the basis of my research.

4.2 Bangladesh Policies on Climate Change

Bangladesh has been involved with climate policy for a long time: in 1992, Bangladesh, as a party to the agreement, attended the Rio Earth Summit and signed the United Nations Framework Convention on 9 June, which was ratified on 15 April 1994.

Bangladesh was the first among the least developed nations to identify priority issues, as well as urgent and immediate needs regarding climate change adaptation, by adopting a National Adaptation Programme of Action (NAPA) in 2005 (Sovacool et al., 2012). In addition, in 2009, Bangladesh was the first country in the world to prepare a Climate Change Strategy and Action Plan, which included six thematic areas and identified 44 priority programmes (MoEFCC, 2009). Also in 2009, the Bangladesh government proposed the creation of the Bangladesh Climate Change Trust Fund in the national budget of that year; this was later enacted by Parliament in the Bangladesh Climate Change Trust Fund Act 2010. The Bangladesh Climate

Change Resilience Fund Act 2010 then established a scheme to manage funds from international donors. In 2014, the Ministry of Finance developed a Climate Fiscal Framework to integrate climate change policy implementation into the national budget and other fiscal policy decisions (Ministry of Finance, 2014). Climate change adaptation was included in the Seventh Five-Year Plan (2016–2021) (Ahmed et al., 2015). Another five-year framework, the Bangladesh Country Investment Plan for Environment Forestry and Climate Change 2016–2021, was launched in 2017.

In addition to these plans, funds, frameworks, and policies, in its approach to addressing climate change and building community resilience, the Government of Bangladesh has become actively engaged in wetland management, established key ecologically critical areas for protection, and placed its Ministry of Environment, Forestry, and Climate Change and its Climate Change Unit into key positions to help formulate and implement activities. Climate Change and Wetland Management related major policies, programmes, laws, and acts are presented in the following table 8.

Table 8: Climate Change and Wetland Management Related Major Policies in Bangladesh

Serial Number	Related laws, rules, acts and their year of Publications
1.	National Environmental Policy (1992)
2.	National Forest Policy (1994)
3.	National Environmental Management Action Plan (1995)
4.	Environment Conservation Act (1995)
5.	Environment Conservation Rule (1997)
6.	The National Water Policy (1999)
7.	National Adaptation Programme of Action (NAPA, 2005)
8.	Bangladesh Climate Change Strategy and Action Plan (2009)

9.	National Adaptation Program of Action (2009)
10.	<i>Jalmahal</i> Management Policy (2009)
11.	Bangladesh Climate Change Trust Act (BCCT Act 2010)
12.	Master Plan of Haor Areas (2012)
13.	Climate Change and Gender Action Plan (2013)
14.	Bangladesh Water Act (2013)
15.	Intended Nationally Determined Contributions (2015)
16.	Seventh Five Year Plan (2015)
17.	Bangladesh Disaster Management Programme (2015)
18.	Revised National Forestry Policy (2016)
19.	National Biodiversity Strategy and Action Plan of Bangladesh (2016)
20.	Bangladesh Country Investment Plan for Environment, Forest and Climate Change (2017)
21.	The National Plan for Disaster Management (2017)
22.	Bangladesh Biodiversity Act (2017)
23.	Revised National Environment Policy (2018)
24.	Bangladesh Delta Plan 2100 (2018)
25.	Perspective Plan 2021 – 2041 (2020)
26.	Eighth Five Year Plan (2020)
27.	Nationally Determined Contributions (2020)
28.	Mujib Climate Prosperity Decade 2030 draft plan

Source: Author construct based on Policy and document analysis.

These noteworthy attempts are described in further detail below.

4.2.1 National Adaptation Programmes of Action (NAPA)

In its formulation in 2005 of a National Adaptation Programme of Action (NAPA), which aligned with international policy requirements, Bangladesh was a climate adaptation pioneer among the least developed countries (Rai et al., 2014; Ayers et al., 2014). In the participatory process that was engaged to prepare the NAPA, the Ministry of Environment and Forests and Climate Change took the lead role, with the United Nations Development Programme as the implementing agency. The process also involved the key stakeholders: policymakers, local representatives, academicians, researchers, research institutions, doctors, lawyers, media persons, NGO representatives, and indigenous people (AKP, 2010).

The final NAPA document was based on background papers prepared by six sectoral working groups: Agriculture, Fisheries, and Livestock; Forestry, Biodiversity, and Land Use; Water, Coastal Zone, Natural Disasters, and Health; Livelihood, Gender, Local Governance, and Food Security; Industry and Infrastructure; and Policies and Institutes.

The NAPA identified 15 priority activities, which focused on capacity building, general awareness raising, and the implementation of projects in vulnerable areas. Particular focus was given to agriculture and water resources. The NAPA was revised in 2009 and identified 45 adaptation measures, including 18 for the immediate and medium-term (MoEFCC, 2009).

The NAPA concluded that the coastal people in Bangladesh were highly vulnerable to the impacts of climate change due, in particular, to salinity intrusion, inundation of coastal lands due to the rising sea level, and exposure to more frequent extreme climatic events. This conclusion was, in part, informed by the expectation of the Ministry of Environment, Forestry, and Climate Change that – as Bangladesh consists of low-lying deltaic floodplains – 17.5% of the country's land may go underwater due to the rising sea level by 2030. By 2050, six to ten million people could be displaced as a result, a figure that may well rise to 20 million by 2100 (MoEFCC, 2005). As an area of such great need, where information can inform future policies and strategies, the wetlands of Bangladesh and their climate management present a vital subject of study.

4.2.2 Bangladesh Climate Change Strategy and Action Plan (BCCSAP)

In 2008, in response to the NAPA, the Bangladesh government prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP); this plan was then modified in the following year (MoEFCC, 2009). There are six thematic areas in the BCCSAP: comprehensive disaster management; food security, social protection, and health; development of infrastructure; research and knowledge management; mitigation and low-carbon development; and building up human capacity and strengthening institutions.

The aim of the BCCSAP is to promote adaptation measures, both medium- and long-term; the plan originally envisioned the implementation of 120 projects. Legal instruments (Bangladesh Climate Change Trust Act 2010) and an institutional system (the Bangladesh Climate Change Trust) that allowed resource allocation in the form of the Bangladesh Climate Change Trust Fund were put in place to ensure proper execution of the BCCSAP (Irfanullah, 2016).

The wide range of early policies and frameworks associated with the BCCSAP were enacted and implemented using top-down management strategies. Government bureaucrats, political parties, community experts, and bilateral and multilateral donors made the decisions; there was no direct involvement of the most vulnerable people affected by climate change (Hossain, 2009; Raihan et al., 2010; Alam et al., 2011). While policy makers have argued that selected NGOs did represent local communities in their policy formulation processes, in reality, local NGOs were absent in the formulation and the implementation of the BCCSAP thematic strategies, which ultimately did not offer any scope for the capacity building of local communities and community-based organisations (Parvin et al., 2014).

Budget reports of funding allocation between 2016 and 2021 demonstrate that the Government of Bangladesh is committed to building the country's climate resilience through the BCCSAP: funding allocation has increased across nearly all the climate-related sectors (Finance Division, 2021). Table 9 presents the amount spent on the six BCCSAP thematic areas from the 2016–2017 financial year (actual) to the 2020–2021 financial year (budget).

Table 9: Budgeted funding across BCCSAP thematic areas

BCCSAP Thematic Areas	Climate Relevant Allocation/Expenditure (amount in crore taka)			
	FY 2020-21	FY 2019-20	FY 2018-19	FY 2016-17
	(Budget)	(Revised Budget)	(Actual)	(Actual)
Food security, social protection and health	9,992.70	8,614.60	7,596.80	4,623.60
Comprehensive disaster management	1,810.70	1,765.30	1,448.70	794.00
Infrastructure	6,303.90	7,226.80	5,454.10	2,851.20
Research and knowledge management	848.60	754.40	853.90	724.00
Mitigation and low carbon development	4,003.40	3,435.90	4,002.10	1,426.60
Capacity building and institutional strengthening	1,266.30	996.80	781.40	1,059.90
Total	24,225.60	22,793.90	20,136.90	11,479.20
% of total budget	7.5	7.6	7.8	6.5

Source: Finance Division (2021).

Note that while line-item spending generally increased over the term, the percentage of the total budget represented by this allocation remained fairly steady. Spending was consistently highest over the period for food security, social protection, and health along with infrastructure development, and lowest for research and knowledge management. Figure 6 illustrates how the funds were shared out across the six thematic areas in the financial year 2020–2021.

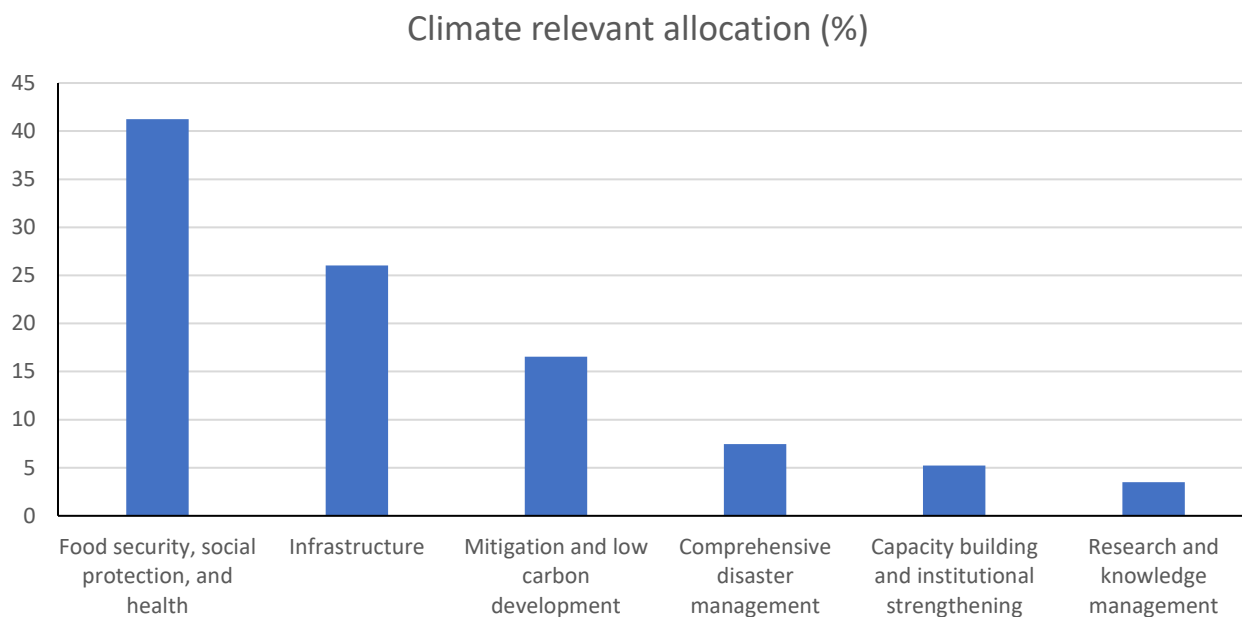


Figure 6: Climate-relevant allocation (%) across BCCSAP thematic areas in financial year 2020–2021

Source: Finance Division, Ministry of Finance (2021, p. 30).

4.2.3 Bangladesh Climate Change Trust Fund (BCCTF)

The Bangladesh Climate Change Trust Fund (BCCTF) was created by the Bangladesh government from its own revenue budget under the Bangladesh Climate Change Trust Act 2010 to address the inequalities and uncertainties of international funding for climate change (Yasmin, 2018). Because the BCCTF contributed about 50% of the funding that supported the CBA-ECA project – as such, it carried some monitoring responsibility; it is relevant to briefly describe the objectives, structure, operations, and funding priorities of the Trust here.

Bangladesh is one of the frontrunners among countries establishing their own national climate fund from their own resources (Hedger, 2011). The prime objective of the BCCTF is to manage climate-related funding efficiently and effectively (Yasmin, 2018). As per Section 15(3) of the Climate Change Trust Act, 66% of the funds in this Trust are to be spent on implementation of projects and programmes prioritised in the BCCSAP, and the rest (34%) are to be kept as a

‘fixed deposit’ for emergencies (BCCT Act 2010, 2016). Interest accrued on this 34% fixed deposit can also be allocated to BCCTF projects (Khan et al., 2012).

An independent trustee board, chaired by the Minister of MoEFCC, is the highest decision-making body, as per Section 9 of the Act. Out of the 17 members of this board, ten are either ministers or state ministers, five are secretaries, and the rest are climate change experts from NGO/CSOs who are appointed by the Government of Bangladesh (Khan et al., 2012).

As per Section 12 of the Climate Change Trust Act 2010, there is a technical committee headed by the Secretary of the MoEFCC. The technical committee supports the trustee board by, for example, reviewing proposals, providing technical input, and ensuring implementation of the funded activities. The role of this technical committee is vital. Although section 13(h) of the Climate Change Trust Act 2010 creates the opportunity for this committee to seek assistance from competent experts, doing so is not mandatory (BCCT Act 2010, 2016). Khan et al. (2012) reported that the technical committee – which can create sub-committees with the prior permission of the trustee board to review the technical feasibility of submitted proposals – formed sub-technical committees to address each of the six BCCSAP thematic areas.

There is a provision for engaging local administration and local political representatives in the monitoring phase. In addition to that, district-level coordination meetings are expected to ensure the proper implementation of local-level projects. The Climate Change Trust Act 2010 requires the BCCTF to be audited by the Comptroller and Auditor General (C&AG), the supreme audit authority of the country (BCCT Act 2010, 2016). Given the significant investments being made in climate projects in Bangladesh, it is necessary to understand the extent to which these mechanisms are working at a practical level.

After formation in 2009 from its own revenue fund, the BCCTF received a total allocation of TK 3,800 crore (one crore is equivalent to ten million) up to Financial Year 2019–2020 (equivalent to USD 4.418 million; at current conversion rate (February 2022), 1 USD=TK 86). Following receipt of this funding, the BCCTF approved 788 projects to be implemented up to May 2019. The majority of these projects (727) were to be implemented by the government ministries/divisions and 61 projects were to be implemented by various national NGOs.

The Local Government Division received the most funding (TK 1,312.96 crore) for the greatest number of projects (441). The MoEFCC also received a significant allocation (TK 415.15 crore) for 68 projects. Relevant to my research, it is interesting to note that the Ministry of Fisheries and Livestock only received TK 2.00 crore for one project.

In light of all this investment directed to local projects, it is worth asking: to what extent can the involvement of the locals themselves in determining the use of the funds influence the success and sustainability of such funded projects?

4.2.4 Bangladesh Climate Change Resilience Fund (BCCRF)

Another funding source was activated in Bangladesh in 2010 that provided an additional stream of capital to climate change-related projects: the Bangladesh Climate Change Resilience Fund (BCCRF), which operated between 2010 and 2016 (Pervin et al., 2019). The process for establishing this ‘financial mechanism’ started in April 2008 at the UK-Bangladesh Climate Conference, where the development partners showed their interest in creating a fund to address the impact of climate change (Ministry of Finance, 2014). Later, in September 2008, another Climate Change Conference was organised jointly by Bangladesh and the UK, where it was decided to start a multi-donor trust fund (BCCRF, 2012). In May 2010, the then-called ‘Multi-Donor Trust Fund’ was converted into what is now known as the Bangladesh Climate Change Resilience Fund (BCCRF) (Anderson et al., 2017).

There were four main donors when the fund was established in 2010: the UK, with a contribution at the time of USD 94.6 million; Sweden, with a contribution of USD 13.6 million; the EU, with a contribution of USD 11.7 million; and Denmark, with a contribution of USD 1.8 million. Switzerland subsequently contributed USD 3.8 million (Khan et al. 2012).

Between its creation in May 2010 and the end of 2016, the BCCRF disbursed USD 71.23 million (the Fund closed its operation on 30 June 2017). Table 10 provides a summary of the projects and the funding allocated.

Table 10: BCCRF investment projects disbursements as of December 31, 2016

Serial Number	Description of Projects	Amount (In million USD)
1	Climate-resilient participatory afforestation and reforestation project (CRPARP)	29.89
2	Emergency 2007 cyclone recovery and restoration project	23.06
3	Community climate change project	12.98
4	Rural electrification and renewable energy development project II (REDD II), solar irrigation project	5.00
5	Secretariat for BCCRF	0.30
Total disbursement		71.23

Source: BCCRF Annual Report 2016 (Finance Division, 2021, p. 72).

From the data reported, it is clear that the BCCRF prioritised projects most likely to mediate the biodiversity loss and extreme weather events associated with climate change, by focusing the great majority of its funding on forestation and cyclone recovery. Although this funding has been suspended, learning from the experience gained through the operation of the BCCRF will help to strengthen the coordination involved in the governance of future projects.

4.2.5 Intended Nationally Determined Contribution (INDC)

In 2015, COP 21 – the Conference of the Parties of the United Nations Framework Convention of Climate Change (UNFCCC) – was held in Paris. At that conference, global leaders pledged to take the initiative to limit global warming to within 1.5 to 2 degrees Celsius above the pre-

industrial level (Buxton, 2016; Morgan, 2016; Vogt-Schilb et al., 2017). Prior to COP 21, each nation was asked to make its own goals and plans, known as ‘intended nationally determined contributions’ (INDC), for the reduction of emission of greenhouse gases (Rajamani, 2015). Bangladesh highlighted three sectors (power, industry, and transport) in its INDC and submitted it to the UNFCCC on 25 September 2015. Later, in 2018, Bangladesh prepared an INDC implementation roadmap and action plan (MoEFCC, 2021).

According to its INDC, by 2030, Bangladesh aims to reduce greenhouse gas emissions associated with the power, industry, and transport sectors by 5-15% below ‘business-as-usual’; this is dependent on sufficient support being received from developed countries. Because the Government of Bangladesh has focused its work in this area on adaptation activities, an adaptation component is included in the INDC (Finance Division, 2021).

4.2.6 Bangladesh Delta Plan 2100

Of particular significance to the target area of my research, on 4 September 2018, the Government of Bangladesh approved the Bangladesh Delta Plan 2100 (BDP 2100) (General Economic Division, 2018; Finance Division, 2021). The subtitle of this plan calls it: “the best gift for the future generation by the present generation” (General Economic Division, 2018). The BDP 2100 aims for the sustainable management of water, ecology, the environment, and land resources and for the management of and control over longer-term challenges (Finance Division, 2021). By undertaking robust and integrated planning, the BDP 2100 seeks to ensure that the delta regions of Bangladesh are climate resilient and prosperous (General Economic Division, 2018). One of the specific goals of this plan is to conserve wetland areas and their ecosystems. The six hotspots highlighted in the plan encompass 16,574 square kilometres of *haor* and flash flood-prone areas (Finance Division, 2021). This plan demonstrates how serious the Government of Bangladesh is about taking care of the country’s wetland areas.

4.2.7 Wetland Management Policies in Bangladesh

In Bangladesh, early natural resource management policies were developed to support agriculture (Nishat, 2003). The policies that apply to wetland areas are controlled by the National Water Policy, 1999, which does not address the management of specific bodies of water separately (Byomkesh, 2009). This policy and the Environmental Policy (1992), the Master Plan of *Haor* Areas (2012), as well as the *Jalmahal* Management Policy (2009), are all relevant to current wetland management in Bangladesh. These policies are briefly described below:

Environmental Policy, 1992. This policy was introduced in an attempt to protect the environment from the impact of human activities. This policy encompasses all natural environments including the wetlands and prohibits any plan or program from being implemented which has the potential to endanger nature. The policy stipulates that every development must be environmentally sound and preserve the environment. All those whose business affects the land, forest, biodiversity, wildlife, water bodies, fisheries, livestock, and other aspects of the environment must strictly follow the rules set out by this policy by conducting regular Environmental Impact Assessments.

The National Water Policy, 1999. The policy sets guidelines for water usage to ensure economic development, poverty alleviation, food security, public health and safety, a decent standard of living for the people, and protection of the natural environment. As for biodiversity, it is mentioned in the policy that measurements will be taken to identify the fisheries and wildlife that are most affected by human impact. Preservation of *haors*, *baors*, and *beels* is also included in this policy, which explicitly mentions that the preservation of *haor* areas is of high priority, although I have yet to observe this in practice.

Master Plan of Haor Areas, 2012. This master plan was developed by the Bangladesh *Haor* and Wetland Development Board (BHWDB) in collaboration with the Central Environmental and Geographic Information Service (CEGIS) and the Ministry of Water Resource (MoWR). This plan identified problems and provided policy analysis to review past and ongoing development initiatives, assess the present status and environmental setting of such initiatives, and formulate plans and develop strategies for future development. It also

considered natural disaster management in these ecologically significant areas. The master plan made promises to preserve, restore, and protect the ecosystem as well as to promote ways for the people in the area to earn a living.

Jalmahal Management Policy, 2009. *Jalmahal* refers to all bodies of water used in the Bangladesh fisheries sector, including lakes, *beels*, *haors*, ponds, *deeghis*, canals, rivers, the sea, swamps, or *baors*. *Jalmahal* can have water in them all year or be dry and then appear at a certain time of the year; they can be both open (without boundaries) and closed (with defined boundaries). *Jalmahal* are managed as fishery estates by the *Jalmahal Management Policy, 2009*, through which the State leases the fishing estates to those who are legally eligible (members of fishers' associations) for one to three years (Shafi & Payne, 2007). Usually, those fishers' associations that are registered with the District Cooperative Department receive leases (Rahman et al., 2015). Leases are also auctioned, a process which favours financially well-endowed organisations and local elites (Mamun, 2010; Rahman et al., 2012). Individual fishers cannot lease fishing estates. The short-term nature of the leases and the high cost of the auctioned rentals push lessees to fish in ways that generate high profits quickly. Such a system does not incentivise conservation and good management of the resource and arguably imperils biodiversity. In this case, the ecosystem and related livelihood are endangered by the very resource management system that should be protecting them (Khan & Haque, 2010; Rahman et al., 2012).

As illustrated in Figure 7, wetlands in Bangladesh are managed by wetland management committees according to their size: wetlands above 20 acres are managed at district level; wetlands of between three and 20 acres are managed at *Upazila* (subdistrict) level; and wetlands below three acres in area are the responsibility of Union *Parishads* (local councils) (Khan & Haque, 2010).

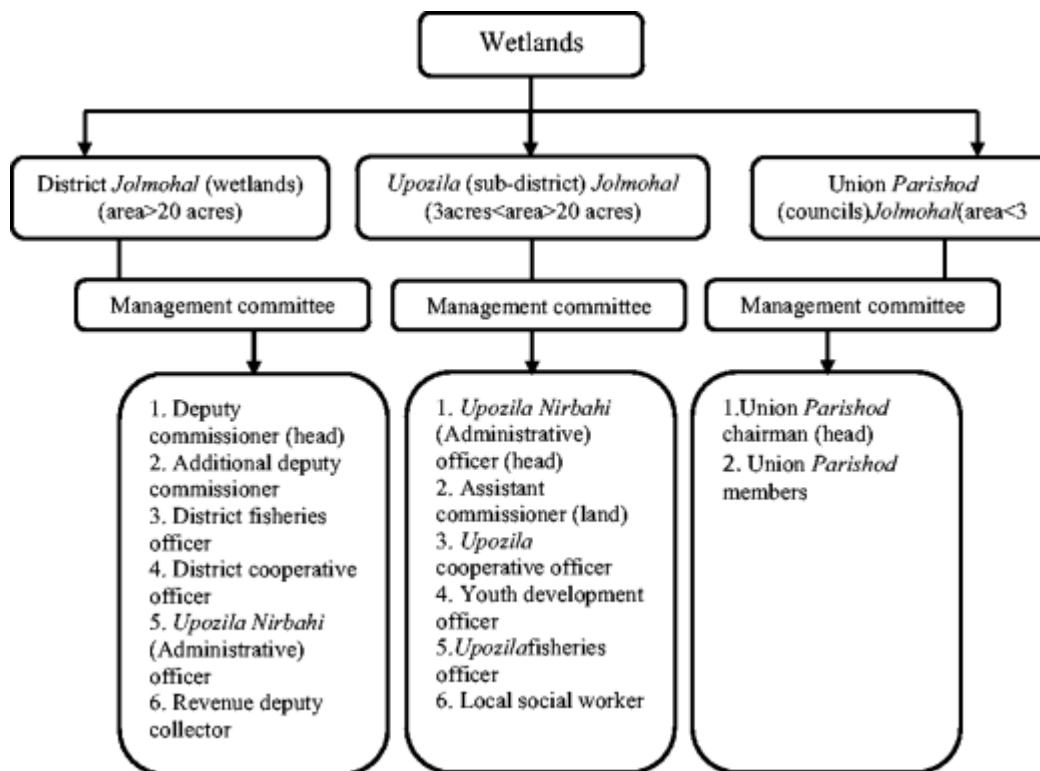


Figure 7: Bangladesh wetlands management structures by area

Source: Rahman et al. (2015, p. 488), with permission.

The wetland management policy of Bangladesh is vertical and top down, and the involvement of multiple departments in wetland management delays decision-making due to gaps in coordination (Supria, 2015). The short-term leasing system encourages the leaseholders to exploit the resource by catching more fish within a short period and restricting the ‘floating fishers’ (ultra-poor fishers who are neither members of fishing associations nor leaseholders) from catching fish from the leased *beels* (Khan & Haque, 2010). It can be argued that the whole system empowers the exploiters of the wetland resources, rather than the people in the local communities; it could be, in fact, not environmentally sustainable. The wetland management policy has also been blamed for a lack of community preparedness for natural and health hazards, for the marginalisation of the village-based fisherfolk, and for the degradation of the natural resources and environment of the wetlands (Supria, 2015).

To conserve the *haor* ecosystem, the Government of Bangladesh formulated and implemented the above wetland management plans and policies. Overall, these have failed to address the social, ecological, and political dimensions of resource distribution within which poor communities living in the wetland areas have long been known to suffer from exclusion, deprivation, injustice, and inequality (Bennett et al., 2001). Community participation is severely limited, and their rights to their share of the resources are not protected. Because management strategies are mostly influenced by short-term economic goals that undermine the sustainability of wetland resources, the scope for the long-term contribution of renewable wetland resources to society is limited (Bennet et al., 2001). Figure 8 illustrates both the outside factors that adversely affect the existing wetland management policies as well as the shortcomings of these policies.

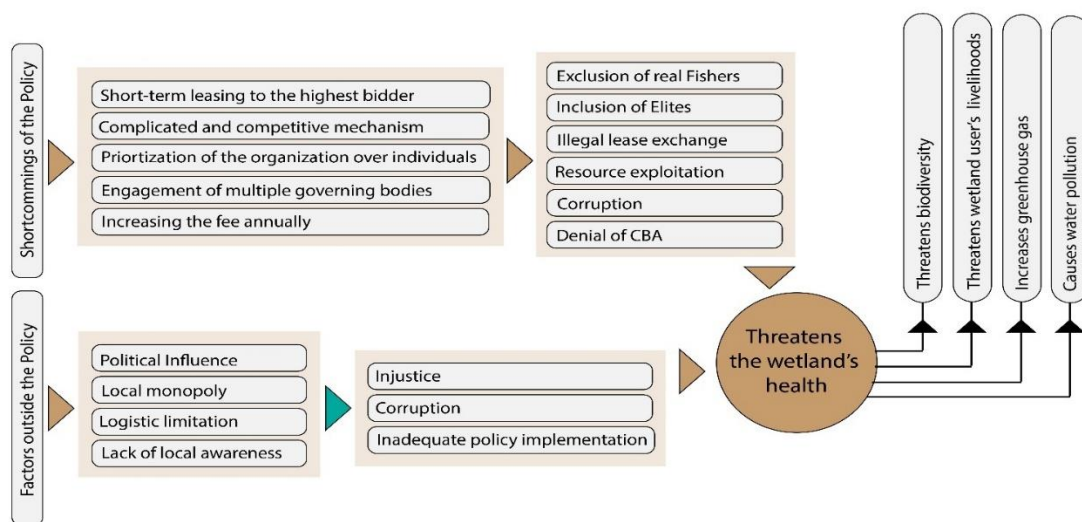


Figure 8: Impacts of existing wetland management policy

Source: Developed by the researcher based on the literature review and qualitative and quantitative data collected during this study (2021).

From the above figure, it is clear that present fishery management (wetland management) systems favor wealthy fishers and enables them to get leases which puts the livelihoods of poor

fishers and other wetland users at risk. This short-term leasing system encourages over exploitation for the generation of maximum profit in a short period. Over exploitation is also responsible for the degradation of wetland biodiversity, water pollution, and greenhouse gas emissions.

Over the past few decades, human activity has posed a number of threats to the wetlands in Bangladesh (IUCN, 2015), and biodiversity conservation remains a major challenge for densely populated wetland areas. The lack of an effective governance system in natural resource management is thought to be one of the key reasons behind the problems faced by the wetland environment in Bangladesh, as well as the people who depend upon it for their livelihoods (IUCN, 2015). I seek to determine in my research whether the participation or lack thereof of local people in the activities intended to resolve such problems is another key reason.

4.3. The role of the Ministry of Environment, Forest, and Climate Change (MoEFCC) and the Climate Change Unit (CCU)

The Ministry of Environment, Forest, and Climate Change (MoEFCC) and its Climate Change Unit (CCU) play vital roles in the formulation and implementation of the above plans, policies, and funds. One major task of the MoEFCC and the CCU is to coordinate among organisations from various sectors that are taking climate change action at the national level. The MoEFCC also addresses climate change-related matters in global fora such as the UNFCCC and the Global Environment Facility, on behalf of the Government of Bangladesh.

The MoEFCC formulates its own adaptation programmes, negotiates at international level, and facilitates the mainstreaming of climate change at sectoral level, among other activities. In its capacity, the MoEFCC has participated in preparing many policies and institutional instruments like the NAPA, BCCSAP, as well as the Climate Trust Fund – which were all established to reduce the negative effects of climate change (Huq & Rabbani, 2011).

In June 2010, the Government of Bangladesh launched the Climate Change Unit (CCU) in the MoEFCC. The overall responsibility of the Unit was to manage the climate-related funds of the state. Along with nine senior officials and 33 general staff of the MoEFCC, a number of experts in climate change act as advisors to strengthen the decision-making capacity of the CCU (Huq & Rabbani, 2011).

In Bangladesh, various other state institutions are involved in dealing with climate change-related activities. For example, 37 ministries, along with their departments and autonomous bodies, more than ten donors on a multilateral and bilateral basis, and an indeterminate number of NGOs operating at the national level are all working on such activities. This creates coordination challenges. Although the MoEFCC is primarily responsible for the proper implementation of climate change-related projects and programmes, it needs support from other institutions involved with this process (Chowdhury, 2012; O'Donnell et al., 2013; Haque et al., 2013).

Article 8 of the guidelines published by the MoEFCC for government projects provides the monitoring and evaluation authority to the concerned ministry where projects were implemented by the ministry itself or by any other subordinate department (Guideline, 2012). These guidelines also give the CCU the authority to monitor and evaluate the implemented projects. However, they do not mention the projects implemented by NGOs and CSOs. According to Chowdhury (2012), the monitoring system of the Government of Bangladesh is weak. Although public procurement regulations were introduced in 2008, Global Witness (2012) declared that community people played no role in the monitoring teams for climate finance projects. There is little evidence to suggest that either of these circumstances has changed in the ten years since these observations have been made. Therefore, the present situation was observed at ground level during field work.

4.4 Project-related Information

4.4.1 Project Site

The Hakaluki *haor* – situated in the northeastern part of the country, lying between latitudes 24°35' N to 24°45' N and longitudes 92°00' E to 92°08' E – is the largest freshwater wetland ecosystem in Bangladesh and one of the biggest in South Asia (Islam et al., 2011; Rahman et al., 2018a). It falls under two administrative districts (Sylhet and Moulvibazar), five *Upazilas* (subdistricts: Baralekha, Juri, Kulaura, Fenchugonj, and Golapgonj), and 11 Unions (the smallest administrative units of rural local government) (CNRS, 2002).

The estimated area of the *haor* is 18,386 hectares during the rainy season and about 4,400 hectares in the dry season (Hossain, 2019). It is connected with nine rivers (Kushiara, Mora Sonai, Sonai, Kantinala, Juri, Pabijuri, Kuiachara, Dhamai, and Fanai) and 136 canals. This connectivity makes the Hakaluki *haor* the largest wetland ecosystem of Bangladesh (Khan & Haque, 2010). Within the *haor*, there are more than 238 *beels* (depressions and lakes that hold water permanently or seasonally) of different sizes. Of the interconnected *beels* that make up the complex ecosystem of the Hakaluki area, Chatla, Pinlarkona, DuIla, Sakua, Barajalla, Balijhuri, Lamba, Tekonia, Haorkhal, Tural, Baghalkuri, and Chinaura are the most important (IUCN, 2015). Hills, forests, and tea gardens surround the *haor* (Khan & Haque, 2010; Islam et al., 2011).

The Hakaluki *haor* provides direct and indirect livelihood benefits to around 190,000 people (Hossain, 2019). On 19 April 1999, the Hakaluki *haor* was designated as an Ecologically Critical Area (ECA) (Sajal, 2018).

4.4.2 Ecological Description

This *haor* was selected as the site for a study of the impact of climate change adaptation projects because of:

- its significance to the world – as the winter home for many migratory bird species, its destruction or disappearance would have negative biodiversity impacts on other countries and on other continents;
- its significance to Bangladesh – as a repository of so much of the country’s surface water, which feeds so many rivers, and as a home for so many species of native plant life, its destruction or disappearance would have significant adverse consequences for the water supply and biodiversity of other parts of the country;
- its significance to the local residents – the rural people of northeastern Bangladesh are heavily dependent on the *haor* for the essentials of life, including water, food, and livelihood (irrigation of farms, small wild animals, fish), as well as firewood and building materials (forests), such that its destruction or disappearance would, at best, drive living standards down to a primitive bare minimum, and, at worst, make the area uninhabitable.

The Hakaluki *haor* supports the existence of a wide range of natural resources. According to Ahmed et al. (2008), over 100 species of fish are present in the Hakaluki *haor*, of which a third are considered endangered. Choudhury and Faisal (2005) also reported that this *haor*, at the time of their study, supported a minimum of 73 types of wetland vegetation, about 50% of the national total (158). This *haor* also provides shelter for various mammals and reptiles, such as frogs, snakes, turtles, tortoises, toads, squirrels, and gangetic dolphins (Rana et al., 2010). Many migratory ducks come to the *haor* and spend the winter here (CWBMP, 2004). Islam et al. (2021, p. 1) found a total of 57 fish species, which belong to 42 genera, 23 families and 7 taxonomic orders. According to them, 15.79%, 26.32%, and 26.4% of the fish species are commonly, moderately, and less available species, respectively. Of the remaining species, 21.05% are rarely available and 22.80% are threatened.

4.4.3 Projects Implemented in Hakaluki Haor

In the policy and governance management context described above, a number of projects have been implemented in the case study wetland. Table 11 presents a list of programmes and projects implemented in this area under the auspices of overall national plans like the BCCSAP; Table 12 details the funding provided (total amount and sources of funding) to the Hakaluki *haor* area under the CBA-ECA project, which was used as the case study for my thesis.

Table 11: Examples of completed projects in Hakaluki *haor*

Duration	Name of the Project	Funding Bodies
1998–2005	Sustainable Environment Management Programme (SEMP)	UNDP
2001–2007	Community-Based Fisheries Management (CBFM- II) Project	USAID
2003–2008	The Nishorgo Supported Project	USAID
2003–2011	The Coastal and Wetland Biodiversity Management Project (CWBMP)	Department of Environment
2009–2012	Integrated Protected Co-management Project (IPAC)	USAID
2010–2015	Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project*	BCCTF, UNDP, EKN
2013–2018	Climate-Resilient Ecosystems and Livelihood (CREL) Project	USAID

Source: DoE (2015, pp. 7–14).

* The Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project was the focus of the research for this dissertation.

The following table (12) presents the way that the costs of the CBA-ECA project were shared by the funders. It shows that the Bangladesh Climate Change Trust Fund (BCCTF) invested about 50% of the total funding; it therefore has the both the scope and the responsibility to monitor the project.

Table 12: Estimated funding contributed to the CBA-ECA project by funding source, in lakh taka*

Source of Fund	Original Cost of the Project	1st Revision	2nd Revision	3rd Revision
BCCTF	1,500.00	1,500.00	1,957.87	1,957.87
UNDP Bangladesh	483.00	483.00	147.38	147.38
UNDP Bangladesh and EKN	0.00	0.00	1,749.78	1,749.78
Total	1,983.00	1,983.00	3,855.03	3,855.03

Source: DoE during the field study.

*3,855.03 lakh Bangladeshi taka is equivalent to USD 4,477,926 at current conversion rate (1 USD=86.09 BDT, March 2022)

4.5 Key Components of the CBA-ECA Project

As noted in Chapter 3, the CBA-ECA project, through a number of components set out to engage the participation of locals in a range of formats, developed and implemented a number of activities to activate key drivers of change and development in its pursuit of community resilience. I sought to determine, by mapping the components and activities of the project to the drivers described in chapters 2 and 3, to what extent the project contributed to the building of community resilience among the VCG members and the wider community. This section describes the key components and activities observed, studied, and analysed in my research in greater detail.

4.5.1 Village Conservation Groups (VCGs) and Ecologically Critical Area (ECA)

Management Committees

As a fundamental part of the community-based adaptation approach of the CBA-ECA project, local village conservation groups (VCGs) were established in order for community members to be fully engaged in and have responsibility for the development, maintenance, and overall management of the activities designed and implemented under the project. Ecologically critical area (ECA) management committees were also developed to support the work of the VCGs, liaise with relevant stakeholders, resolve conflict, monitor activities, coordinate with the appropriate ministries, and make policies.

Ultimately, the management of all activities undertaken by the CBA-ECA project – including both project initiation and implementation – was carried out by the VCGs and ECAs. Over the course of the CBA-ECA project, 28 VCGs were formed with membership that included the resource users of Hakaluki *haor*. Each VCG consisted of 20 to 35 members led by an executive council of nine members, as outlined in Table 13. This executive council was elected by the general members of the VCG.

Table 13: VCG Executive Council Officers

Category	Numbers
President	1
Vice President	1
Secretary	1
Assistant Secretary	1
Cashier	1
Executive Members	4
Total	9

Source: DoE (2015).

VCGs were considered to be important organisations and, as such, were registered with the Local Government and Cooperatives Ministry. During the operation of the CBA-ECA project, it was intended that members of the VCGs be engaged in the design and implementation of activities – to look after the sanctuaries and plantations in their jurisdictions, to protect them from illegal activities, and to be involved in preparing their local annual natural resource management plans.

As mentioned above, ecologically critical area (ECA) management committees were formed at each level of government to support the CBA-ECA project and to ensure the participation of community people and other stakeholders. The structure and functions of each level of ECA committee is summarised in Table 14.

Table 14: ECA management committees

Committee	Formation	Function
Union ECA Management Committee	The concerned Union <i>Parishad</i> Chairman is the president of the Committee, and the DoE site office representative works as a member secretary. Other members are the Union Land Assistant Officer (ULAO), the Union Assistant Agriculture Officer, the Ansar/Village Defence Party (VDP) Officer, and representatives of the Brick Field Owners Association, the Fishery Cooperative/Society, the VCGs, and the project-implementing NGO.	Provide support to the VCGs, take the initiative to resolve conflict at the local level, maintain regular communication with the <i>Upazila</i> ECA Committee.

<p><i>Upazila</i> ECA Management Committee</p>	<p>The <i>Upazila</i> Nirbahi Officer (Chief executive civil servant of <i>Upazila</i>) is the president and the Ecologically Critical Area Management Officer is the member Secretary, along with the Assistant Commissioner (Land), the <i>Upazila</i> Fishery Officer, the <i>Upazila</i> Agriculture Extension Officer, the <i>Upazila</i> Livestock Officer, the Officer-in-Charge of the local police station, the <i>Upazila</i> Cooperative Officer, the Forest Range Officer, the Ansar/VDP Officer, the Union <i>Parishad</i> Chairman, and representatives of rubber plantations and tea gardens, the project-implementing NGO, the Fishery Cooperative/Society, and the VCGs.</p>	<p>Coordinate with all <i>Upazila</i>-level stakeholders for the proper implementation of development activities in the Hakaluki <i>haor</i> ECA. Take jurisdiction when the Union ECA committee fails to resolve a conflict.</p>
<p>District ECA Management Committee</p>	<p>The Deputy Commissioner (DC) is the president, and the ECAMO (Ecologically Critical Area Management Officer) is the member secretary. Other members are the Police Superintendent, the Additional Deputy Commissioner (Revenue), the Deputy Director of the Department of Agriculture Extension, the District Fishery Officer, the District Livestock Officer, the Deputy Director of the Department of Environment, the Divisional Forest Officer, the Deputy Director of the Department of Social Welfare, the concerned <i>Upazila</i> Nirbahi Officer, the District Ansar and VDP Officer, and the Chair of the District Lawyers Association.</p>	<p>Coordinate among district-level GOs and NGOs and monitor the activities of <i>Upazila</i> ECA committees.</p>

Ministerial ECA Management Committee	The Secretary of the Ministry of Environment, Forest, and Climate Change (MoEFCC). Other members are the representatives of the Ministry of Land, the Ministry of Fisheries and Animal Resources, the Ministry of Agriculture, the Ministry of Water Resources, the Ministry of Local Government, Rural Development and Cooperatives, the Ministry of Civil Aviation and Tourism, natural resource experts, academics, the Director General of the Department of Environment, and representatives of NGOs.	Coordinate among the ministries and make overall policy about ECA management.
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Source: DoE (2015).

Ecologically critical area management committees were formed at every level, from the top (ministry) to the bottom or grassroots level (union); the responsibilities of the committees were specified. The effectiveness with which these VCGs and committees functioned – and are still functioning – needs to be understood in order to determine how well supported the VCGs were/are to implement the activities of the CBA-ECA project, both during its operation as well as afterwards and into the future.

4.5.2 Village Conservation Centres (VCCs)

Once the membership of a Village Conservation Group (VCG) was established, the project initially hired an office building, usually far from the members’ village, or used a private house among their members – neither of which were suitable for making meetings accessible. To plan the initiatives of the CBA-ECA project and draft the climate change adaptation-related plan,

local permanent office structures were considered necessary. Thus, ten buildings were constructed with discussion rooms and training classrooms for shared multi-purpose use as meeting places. These buildings – generally intended to be shared by two VCGs in the local area – were called ‘Village Conservation Centres’ (VCCs).

Rich members of the VCGs provided the land for the construction of these VCCs, which occupied, in most cases, 900 square feet (84 square metres) of floor space. The building of the VCCs created jobs for the target groups, provided meeting and training spaces for VCG members and community residents, and established information centres for the young generation and the wider community. Since the opening of the VCCs, which remain active even after the winding up of the CBA-ECA project, one day each week has been set aside for the use of the women members of the VCGs. This has given the women a chance to share their views and make decisions without interference and has empowered the female participants. The VCCs were intended to remain after the project ended to ensure the sustainability of the current efforts and support for designing future efforts. The degree to which the VCCs served their purpose is worth examining as part of the evaluation of the participatory approach of the CBA-ECA project to determine the degree to which this infrastructure contributed to community resilience.

4.5.3 Building Awareness and Capacity

In Bangladesh, community-based adaptation projects typically undertake initiatives to strengthen the capacity of the members of the target community (in the case of the CBA-ECA project, the village conservation group members) by, for example, arranging various types of training and offering cash and other material support (Masud-All-Kamal & Nursey-Bray, 2021). Accordingly, the CBA-ECA project also organised different types of awareness- and capacity-building programmes for the village conservation group members to help them adapt in response to the changing environment, as well as manage their local wetland areas efficiently. Descriptions of such programmes are as follows:

Awareness building. To build awareness among the local people of the effects of climate change, such as reduced rainfall, flash floods, and droughts, on their area and their livelihoods, the CBA-ECA project, through the VCG leaders and NGO officials, arranged regular discussions in meetings, training sessions, and project-led focus group discussions. In addition, workshops were conducted, and folk dramas were performed. Art camps were organised in schools on days of national and international importance, such as World Environment Days, in various places within the Hakaluki *haor* area.

Capacity building. In building the capacity of the VCG members to enhance their own climate resilience, the CBA-ECA project staff prepared, arranged, and facilitated a number of training activities for the members of the VCGs. Of these activities, leadership and management training, adaptation training, crop diversification training, as well as diversification of livelihood training, all were deemed most important to increasing the adaptation knowledge of the VCG members and enhance their ability to manage their wetland effectively. A brief summary of each training is given below.

Leadership Training. A primary goal of the CBA-ECA project was to develop the capacity of locals to run the community groups that were to help create, develop, and implement project activities through the VCGs. Strong leadership would be necessary to run the VCGs efficiently; in fact, the performance of each VCG varied according to the quality of their leadership. To develop the leadership skills of its members, the CBA-ECA project arranged training in VCG management, micro capital grant management, management of infrastructure, natural resource management, wildlife conservation, sanctuary management, and agricultural activities. Every VCG member received components of leadership training at least once.

Crop Diversification Training. Farmers in this area had traditionally produced rice, the cultivation of which requires a vast water supply. As global climate change has driven weather shifts that have interrupted the water supply, many farmers in the Hakaluki *haor* have become unable to rely upon their rice crops for their livelihood. Under the CBA-ECA project, 170 farmers received crop diversification training, which influenced many farmers to produce alternative crops that require less water, such as nuts, sunflowers, and beans.

Diversification of Livelihood Training. As another approach to building the climate resilience of the locals, the CBA-ECA project trained around 500 VCG members (both men and women) in alternative income generation activities. The major areas of training were paramedical, sewing, tailoring, handicrafts, the operation of small businesses, the rearing of ducks and poultry, and the raising of livestock. After completion, about 230 individuals received material support in order to reduce their dependency on the resources of the ecologically critical area of the *haor*. The overall aim of this training course was not only to address capacity development but also to contribute to the financial capital of the participants by providing income-generating assets. Training in trades was also provided to create opportunities to earn money through employment. This was intended to build resilience against the possibility that climate change could make agriculture and fishing no longer viable in the Hakaluki and the villagers would have to relocate to cities.

Adaptation Training. With goals similar to those of the diversification of livelihood training, adaptation training was offered to VCG members to introduce them to ways to adapt in response to climate demands. 110 VCG members (both men and women) attended 1-day or 2-day adaptation training sessions in agriculture (training on stress-tolerant varieties and climate-adaptive agriculture), solar irrigation (training in the use of such a system and plant management), and wetland management.

This research aimed to determine how valued these trainings were by the VCG members who participated in them, and whether/in what ways what they learned increased their community resilience.

4.5.4 Submersible Embankment Construction and Tree Planting

At the beginning of the rainy season, water flows to the Hakaluki *haor* from the upstream rivers. In the rainy season, the whole area becomes flooded; further, wind creates heavy waves that hit the local houses and other establishments. Locally, these forceful waves are called ‘*afal*’. To protect the villages, the CBA-ECA project placed submersible embankments totalling 17.85 kilometres in length as per the choice of the local beneficiaries in ten areas of

the Hakaluki *haor*. To protect the submersible embankments, *hijol* (*Barringtonia acutangula*) and *koroch* (*Pongamia pinnata*) trees were planted on both sides to reduce soil erosion and create places of shelter for fish in the rainy season, when the embankment goes under water.

As per the project document, the building of the submersible embankments and the complementary tree planting had multiple purposes. The embankments were established to protect the village houses and local infrastructure by reducing the impact of the *afal*. The trees planted on the embankments were expected to supply food for fish when they were submerged in the rainy season and to provide nesting sites for both local and migrating birds. Local people could collect the branches from mature trees on the embankments to use as firewood to meet their energy needs. An additional benefit of the embankments is that they can be used in the dry season as alternative roads – by local farmers to carry their crops from the wetlands and by children to go to school more easily.

Because the development, construction, and maintenance of these embankments involved a number of parties, it was particularly useful to explore how these parties functioned and coordinated between levels, as well as the extent to which their cooperation helped to increase community resilience.

4.5.5 Excavation and Re-excavation of Beels and Fish Sanctuary Management

Like other wetlands in Bangladesh, the Hakaluki *haor* faces various natural and human-made challenges, which are destroying the safe shelter places of aquatic species. These challenges reduce both biodiversity and overall fish production. Siltation, the overharvesting of natural resources, poor wetland resource management and coordination problems, as well as the adverse impacts of climate change, are the primary causes of these problems.

Most of the *beels* in Hakaluki *haor* – which, as previously noted, provide an essential habitat for fish and wildlife – are vulnerable to siltation during rainy seasons; silt flows from upstream, becoming stored in the wetland (*haor*). As a result, many permanent *beels* have become seasonal *beels* reclaimed for use as agricultural land. The end result is the steadily worsening

deterioration of the water supply essential for both fish production and crop production in the area, as well as the drying up of areas within the wetland.

To overcome these problems of the *haor* ecosystem – and as another part of its on-ground climate adaptation action – the CBA-ECA project worked through the VCGs to create and manage fish sanctuaries, which involved the excavation and re-excavation of *beels*. Ultimately, 12 fish sanctuaries were managed by the VCGs and, of these 12, the ten identified in table 15 involved the re-excavation of *beels*.

Table 15: Fish sanctuaries in Hakaluki *haor* area

Serial Number	Name of Sanctuary	Location			Area (Acres)
		Union	<i>Upazila</i>	District	
1	Tekoni <i>Beel</i> -1	Talimpur	Barlekha	Moulvibazar	80.38
2	Tekoni <i>Beel</i> -2	Talimpur	Barlekha	Moulvibazar	21.65
3	Moiajuri <i>Beel</i>	Talimpur	Barlekha	Moulvibazar	28.20
4	Ronchi <i>Beel</i>	Talimpur	Barlekha	Moulvibazar	224.00
5	Maislerdak <i>Beel</i>	Jaifarnagar	Juri	Moulvibazar	63.45
6	Agder <i>Beel</i>	Jaifarnagar	Juri	Moulvibazar	22.20
7	Koiarkona <i>Beel</i>	Jaifarnagar	Juri	Moulvibazar	14.45
8	Khorua <i>Beel</i>	Shorifganj	Golapganj	Sylhet	14.75
9	Birali Khal	Ghilasara	Fenchuganj	Sylhet	12.45
10	Continalar Kor Khal	Jaifarnagar	Juri	Moulvibazar	4.40
Total					485.93

Source: DoE (2015, p. 49).

As per the guidelines prepared by the CBA-ECA project, the local VCGs became responsible for the proper care of the sanctuaries in their area, both during and after the project. The VCG committees responsible for the sanctuaries were guided by two advisors – one from the DoE (an assistant director); another from the *Upazila* fishery office (usually the head of the office). As the president of the Union ECA committee, the concerned Union *Parishad* chair played a role as a patron. For the duration of the CBA-ECA project – in an arrangement similar to that established for the submersible embankment component – these committees selected and

appointed security guards, provided a salary and other benefits to the guards, monitored the activities of security guards, and managed the fund.

Along with the VCGs, the Union ECA committee and the *Upazila* ECA committee were also engaged with the management of the fish sanctuaries; the Directorate of Environment (Office of the Ministry of Environment at Sylhet division) played a vital role in coordinating these groups. As with the submersible embankment component, the (re)excavation of the *beels* as well as the creation and protection of fish sanctuaries involved a complex network of stakeholders. The examination of this, alongside an investigation into outcomes, is particularly relevant for the study of how such a project builds community resilience.

4.5.6 Wetland Swamp Forest Protection/Conservation

Another adaptation component that was enacted as part of the CBA-ECA project was that of wetland swamp forest conservation. The forested area of the Hakaluki *haor* is socio-ecologically valuable to the planet, the ecosystem, the wildlife inhabitants, and the local people. The wetland forest acts as a carbon storage sink that contributes significantly to the mitigation of atmospheric carbon, benefitting the planet. The forest also prevents soil degradation in the *haor* area; it exerts effective resistance against both siltation and water pollution. Fish and other water animals can use this forest, which also attracts local and migrating birds, as a natural sanctuary for their safe living and breeding and as a vital source of food. The people benefit from the abundant animal wildlife resources and from the forest plants, which provide sources of herbal medicine, firewood, and building materials. Raw materials for local handicraft industries can also be gathered from the wetland forest. Furthermore, the forest serves as a natural embankment to protect the local inhabitants from dislocation caused by flooding.

In light of these benefits provided by swamp forests, the CBA-ECA project sought to implement community-based adaptation activities that would protect the *haor* forests while increasing fish production: 500 hectares of swamp forests were selected for protection. In addition to conserving existing swamp forests, the CBA-ECA project took initiatives to plant new swamp forests. In total, 7.68 hectares were selected across six locations for new swamp

forest planting. The extent to which these plantings both benefitted the local environment and raised the awareness of the local community of their inherent value, was considered as another way to evaluate how well the CBA-ECA project contributed to community resilience.

4.5.7 Micro Capital Grants (MCGs)

Microfinance is gaining popularity in many south Asian countries, especially in climate-stressed areas where community members need money urgently to face various risks including floods (Shammin et al., 2022). In the Hakaluki *haor* area, the CBA-ECA project created a fund that provided micro capital grants (MCGs) to qualifying VCG members. The primary objective of the MCG was to increase the financial capacity of the VCG members and reduce their dependency on Hakaluki *haor* resources. To achieve this, the project had multiple aims: to serve as a vehicle to provide credit to members, based on need and compliance; to support the development of income-generating activities, which would augment household income and increase resilience among those who may have to change occupation due to adverse impacts of climate change; and to generate social capital as recipients communicated, met, received training, and shared knowledge.

The salient feature of this fund is that the donor agency provided the money for this programme to the VCGs as a grant that did not need to be repaid. Each VCG received an initial contribution in 2008 of BDT 100,000.00 (USD 1,250.00) to establish their MCG funds from the Coastal and Wetland Biodiversity Management Project (CWBMP). In 2010, a number of VCGs (not all) received BDT 100,000.00 from the CWBMP project as a performance bonus for meeting its standards. At the end of 2015, each VCG received an additional BDT 100,000.00 from the CBA-ECA project. Therefore, the total funding received by the VCGs totalled between BDT 200,000.00 and BDT 300,000.00.

Micro capital grant loans were made to support innovative agriculture, cattle breeding, fish farming, cottage industry, small-scale furniture manufacture, tourism, and

entrepreneurship/livelihood. Recipients received between BDT 5,000.00 and 15,000.00 and were expected to pay a service charge of 10% as well as interest or default and delay penalties as determined by the VCG. MCG provides the opportunity to practice democratic systems of loan disbursement where VCG members decide loan approvals or rejections in the VCG meetings based on the need of the applicants. Low interest rates, quick disbursement and offering loans without collateral security made the MCG unique to the community people.

Credit recovery for the project involved a number of strategies. The small-scale entrepreneurs who were given MCG loans – especially the poor and poorly educated ones – proved vulnerable to income shocks arising from their natural or socio-economic context or from their own inefficiency. These unforeseen events were taken into account in the recovery process, and the repayment schedule was generally adjusted accordingly. Sometimes, in the case of inability to repay, the borrowers were able to provide voluntary labour to the activities and programs of the VCG projects, instead of cash. For borrowers with good repayment records, there were systems of reward and recognition to encourage others, such as reductions in the interest amount charged. The research considered the benefits and drawbacks of this programme, as well as the impact it had on the long-term financial security and resilience of those who accessed the MCG loans in particular.

4.5.8 Endowment Fund

The CBA-ECA endowment fund was created to maintain the sustainability of achievements of the project, as well as maintain the climate resilience of the local communities after it closed. Kept in a state commercial bank as a fixed deposit under the custody of the *Upazila Nirbahi* Officer, the endowment fund is permanent. Some activities, like the dredging of canals and the assistance with crop diversification, were expected to require this funding source in order to carry on for the long term. The various adaptation techniques VCG members learned during the project period – for which they had received support from the project to implement – were also believed to still require support after completion of the project. The endowment fund was designed to provide such assistance.

One important aspect of this fund is that it is not to be directed towards an individual person, but to be used for common purposes, for example, supporting initiatives that serve all the VCGs of one sub-district. Funding can also support the introduction of pilot projects, for example, to encourage local farmers to reduce agricultural water consumption by cultivating new crops such as sunflowers, which produce marketable, healthy cooking oil without irrigation.

When the fund was established from the previous CWBMP project, each *Upazila* received BDT 1,000,000.00 (equivalent to USD 12,500.00 in 2019). The Department of Environment provided the authority to the CBA-ECA project to operate this fund. Interest earned from the fixed deposit kept in the bank can be spent, as per guidelines prepared by the department of environment, for administrative purposes, for the conservation of the *haor* ecosystem, and to support climate resilience through, for example, law enforcement and biodiversity conservation work (e.g., re-excavation or dredging of canals). Because the *Upazila Nirbahi* officers serve as the custodians of the funds – and since VCGs who seek to use the fund must gain the approval of the *Upazila* ECA committees in which the presidents of the Union ECA committees are members – the endowment fund connects these parties. It was essential to the objective of this research to understand both how the endowment fund was accessed and used as well as how this connectivity between the custodians and the users of the fund worked.

4.6 Conclusion

This chapter outlined the governance and policy framework that regulates wetland and climate management in Bangladesh. It then described the institutional arrangements at local level that were established to oversee the implementation of adaptation programs in the Hakaluki *haor*. The chapter went on to introduce the various components of the CBA-ECA project and the specific adaptation activities that have been established in the area and which are mapped in later chapters against the selected drivers of resilience. The next chapters present the results of field work conducted and the analysis undertaken to determine whether or not the project, through its community-based adaptation approach, built community resilience in the Hakaluki wetland.

Chapter 5: Components Positively Influencing the Building of Community Resilience Through the Management of Climate-stressed Wetlands Under the CBA-ECA Project

5.1 Introduction

This results chapter focuses on identifying the ways in which specific components of the CBA-ECA project supported the building of community resilience by influencing the state of local community resources. This has been done by mapping the data from the interviews, surveys, focus group discussions, and observations conducted with respect to these components against five key community drivers (human, social, natural, physical, and financial) discussed in Chapter 3. The sixth community driver of ‘governance’ referred to in 3.6, Table 7, is discussed separately in Chapter 7.

Key findings of this chapter:

- Awareness building and teamwork helped to reduce the impact of natural disasters on the Hakaluki *haor*.
- Participatory wetland management activities that involved implementing the excavation and re-excavation of *beels*, as well as the planting of swamp forests increased biodiversity.
- Building submerged embankments and adding/attracting biodiversity in *haor* areas brought manifold benefits to the local community.
- Women involved in wetland management were empowered and provided with various resources, including training, material support, credit facilities (micro capital grants), and village conservation centres (VCCs) reserved for their exclusive use once a week. Access to these resources helped to increase household resilience.

- Successful Village Conservation Groups (VCGs) set examples for the other VCGs that performed poorly.

5.2 Components Enhancing the Human Drivers

The effective management of natural resources can build the resilience of the communities that depend on them (Simane & Zaitchik, 2014); the success of the natural resource management of a given area depends on the ability of the people involved with this process to engage with and participate in it effectively (Frey & Berkes, 2014). It is often the case that locals have neither the expertise nor the capacity to involve themselves and contribute to ecosystem management (Westcott, 2002; Mamun et al., 2016). The CBA-ECA project sought to address this lack of expertise and capacity, recognising that capacity building and empowerment, like robust resource management, also contribute to the enhancement of community resilience (Klein et al., 2019). The CBA-ECA project took a community-based adaptation approach to address the human driver of ‘capacity’ among its target population through training that would help them to be constructively involved with this participatory wetland management process.

Various types of training were arranged to build the capacity of the Village Conservation Group (VCG) members. According to the data collected, training that increased their general awareness, developed leadership, management, and knowledge-sharing skills, and outlined the benefits of the diversification of crops and livelihood were considered by the villagers to be very beneficial. The training opportunities described in this section, as CBA-ECA project components supporting human drivers of resilience, helped to build the awareness and skills of the VCG members, which they then shared with the whole community.

5.2.1 Awareness Building

Awareness can motivate human beings to seek ways to improve their livelihood and to conserve natural resources (Guerry et al., 2015): studies have demonstrated that improvement in climate change awareness and knowledge has contributed to changes in the norms and behaviour of community members (McNamara et al., 2020). These adjustments can be expected to increase the resilience of community members. So that the livelihood options and the resilience of its beneficiaries are increased, the CBA-ECA project engaged in a number of initiatives to increase community awareness of the local effects of climate change.

My findings indicate that these awareness-building initiatives were very successful: almost 100% (344 out of 346) of survey participants agreed that their level of awareness regarding the impact of climate change on the *haor* ecosystem had been increased by the CBA-ECA project. In terms of the extent of the increase, 223 participants reported that their level of understanding had increased at least partially or more.

Many fishers in the area are now more aware of the value of conserving swamp forests as they have learned that these natural habitats can, directly and indirectly, increase the productivity of the wider ecosystem. This awareness was demonstrated in interviews, exemplified by this statement of a participant from Alinagar VCG:

Swamp forests work as a breeding ground for mother fish. They help to increase fish production. When we get more fish, our level of income increases, and we can spend more on our families. Therefore, many of us protect the swamp forests.

Another interview participant (Halla VCG) mentioned how their awareness of the *haor* ecosystem had helped to prevent environmental degradation:

A few years back, we used to collect firewood from the Hakaluki haor by cutting trees. We did not know it was harmful to the environment. Our level of awareness has been increased by our involvement with the project. Now,

beneficiaries of our VCG do not cut trees. Moreover, they prevent others from doing so.

Some participants reported that – because of their participation in a number of training programmes – they had gathered knowledge which had not only helped them to improve their standard of living, but also enabled them to share what they had learned among those who had not had the chance to participate in the same programmes. One interviewee (Rakhal Shah VCG) said that such knowledge-sharing had helped to protect the swamp forest. Moreover, VCG members had shared what they had learned in informal discussions with people from the wider community, in tea stalls and in other community gathering places. A Belagaon-Sonapur VCG interviewee noted that VCG members had been empowered to motivate non-VCG members to protect birds from hunters. During focus group discussions, a majority of the participants noted that most of the members of their VCGs can now explain the impact of climate change on their local areas, and they discuss climate matters amongst themselves in their regular VCG meetings.

The attitude of the participants in the focus group discussions revealed that internal changes had occurred among the VCG members, through their engagement in various training activities arranged by the CBA-ECA project. Their observations of the positive impact that the project had on their awareness, their altered practices, and their influence on others have had on the *haor* show promise for the long-term viability of these adjustments, which can ultimately contribute to improving their standard of living and increase community resilience.

5.2.2 Management Skills Training

During the interviews, many participants (17 out of 28) stated that, although the level to which members had developed their management skills varied from VCG to VCG, the overall standard of these skills had increased over the course of the project. An interviewee from Surjomukhi VCG, for example, reported that, while the members of their group shared a good understanding among themselves which helped them to organise their work, the leadership and project management skills of the members in the group particularly increased, as a result of their participation in management training programmes. With project management skills that

could be used to manage people and to promote business development, participants could turn ideas that their existing good relationships made possible into workable options within the context of a community development project.

One interviewee (Padma VCG) explained how his communication skills, in particular, had increased through his involvement with his VCG.

Basically, I was a shy person. Involved with VCG, I had the opportunity to join in some management training programmes and to mix with other people for a long time in a formal situation. Initially, I mixed with our VCG members, talked to them on various issues. Day by day, my level of confidence and communication skills increased. Now I can talk to many people and do not feel shy. I visit government offices and talk to the officers. Many of my neighbours take me with them when they visit government offices. I talk to the officers for them.

The CBA-ECA project has had other positive influences on the management skills of the local people of the communities it served, both when it was operational and following its closure. 66% survey participants were partially satisfied with this training. One key benefit has been the building of financial management skills that could be put to use by people of limited resources during difficult periods or when starting a new venture. For example, during interviews, I noted that the basic bookkeeping knowledge gained from one of the training courses was particularly very helpful for someone running a small business or simply managing domestic accounts. 15 out of 28 interviewees mentioned that they had received basic training from the CBA-ECA project to run small businesses. While a few of the project interventions to support alternative income generation, such as short-term vegetable production, had not worked well for some beneficiaries, thanks to improvements in their financial management skills, participants were better equipped to consider, develop, and manage opportunities that arose. One interview participant (Akota VCG) described how they had strengthened their business after learning some techniques from the project training for keeping accounts:

I was operating a small business but could not keep accounts myself properly. I had to depend on another person and pay him. Therefore, my business was not

profitable. After learning an account-keeping system from the training, I was able to do it myself and saved money for my business.

In an interview, a female participant from Salia-Kazirband VCG, who had also benefited from the financial management training provided through the project, said:

I got training from the CBA-ECA project on how to run a small business, maintain its accounts, and how to behave with the customers. After completion of the training, I started a small shop in my area. The knowledge I had gathered helped me to run the business smoothly and reduce my dependency on others.

It is clear from the survey and interviews that the management training offered as part of the project empowered participants in ways that directly improved lives and indirectly enhanced community resilience.

5.2.3 Crop Diversification Skills Training

Technological innovation resulting in crop varieties that are resilient to the effects of climate change can be of great benefit to the local farmers in the *haor*. Introducing farmers to a new variety of a certain species can present them with a viable alternative crop to grow that can withstand adverse environmental conditions (Raza et al., 2019). In this case, the CBA-ECA project successfully facilitated the introduction of modified species, particularly rice varieties, to farmers in order to help them diversify. This is evident from a statement of Nischintapur VCG during their interview:

I used to cultivate traditional rice, which consumed too much water. However, there has been a crisis in water supply since the nearby beel silted up and went shallow. One of our VCG members, my neighbour, after getting training from the CBA-ECA project, had started cultivation of a new crop that needs less water. From his inspiration, I followed him and selected the same variety.

Interviews and observations revealed that farmers within the communities in the Hakaluki *haor* included in the CBA-ECA project have, thanks to this capacity-building component, taken steps to increase their resilience to the effects of climate change on their livelihoods. In fact, one of the most significant and measurable achievements of the CBA-ECA project was the increase in crop diversification practiced among the VCG participants, following training and demonstration. This crop diversification helped the communities to shift to producing shorter-duration crops, most of which could be harvested before the annual floods begin.

The survey results also revealed that more than 60% of the participants had increased their knowledge of crop diversification options to some degree. While 30% reported little or no improvement in their knowledge, all the participants confirmed that they understand the *meaning* of crop diversification now, and 80% asserted that crop diversification was useful.

During a key-informant interview, a *Upazila* Agriculture Extension Officer observed:

Some VCG members cultivate short-duration crops as well as some species which consume less water now, after training. Moreover, they inspire and work with their neighbours to follow them. Many of them communicate with us and seek our support. Our field officials visit their fields and cooperate with them.

Under the CBA-ECA project, 170 farmers received direct crop diversification training (details in Chapter 4). Analysis of the data revealed that the knowledge VCG participants gained of ways to diversify their crops to grow varieties that either require less water or have a shorter growing season has enabled them as well as members of their wider communities to be more resilient to altered weather patterns and events associated with climate change. These changes to farming practices also help to enhance both the food security as well as the earnings of these farmers, two things that have a significant and lasting impact on community resilience.

5.2.4 Disaster Preparedness Training

The results of interviews and focus group discussions indicate that the disaster preparedness training programmes implemented by the CBA-ECA project during its operation helped empower the community by developing their capacity to predict and plan for the consequences of climate-induced threats.

In their household interview, a respondent from Rakhalsah VCG described the extent to which the community's forecasting and disaster preparation skills had increased:

In the past, whenever the water level rose, we became flooded. We were not prepared. When the water level started to go up, we just understood that we were going to be flooded soon. However, from the VCG, our knowledge as well as our level of awareness have increased. Now, we understand the warnings. We listen to the radio for warnings and get more accurate information from more reliable sources. Then we call urgent meetings with the executive committee of our VCG. We determine our action plan, then inform the other VCG members and our local community. We try to save our people and our property. We look for alternative shelter.

Another interviewee (Belagaon-Sonapur VCG member) reported:

Since our knowledge regarding disaster preparedness has increased, we understand the pattern of disasters better. For example, observing continuous rainfall, we can predict when a flood may occur. Accordingly, we can make plans. We get early warnings from Sylhet as well as from our Upazila. After getting early warnings, we stock food, make plans where to take shelter, and decide where to keep our cattle.

Focus group discussion participants confirmed that their level of understanding of disaster preparedness had increased. They can now recognise weather patterns to make predictions and better prepare for any uncertain situation with greater awareness than they had before participating in the CBA-ECA project. Focus group participants from low-income earning

groups reported that they now seek and receive early warning information from their VCG leaders while those from comparatively high-income earning groups said that they tended to be more attentive to forecasts and announcements broadcast on the television and the radio and to discuss signs of danger among themselves. Both groups indicated that they are more conscious of climate hazards now. Clearly, this ability to predict and prepare for the likely consequences of a climate-related event, both individually and collectively, indicates that CBA-ECA beneficiaries who had received this training had developed a fundamental aspect of community and climate resilience.

5.2.5 Leadership Skills Training

Effective wetland resource management depends on appropriate local leadership and a smooth two-way flow of information that links community groups and government institutions (Rahman et al., 2015). Bolton (1991) stated that leadership should not be seen as an innate characteristic but instead as a skill individuals can develop through formal and informal training. Incompetent leaders cannot guide their community members properly to adapt to threats and challenges they (communities) face from climate change (Mamun et al., 2016). To achieve its aims of wetland conservation and community resilience, the CBA-ECA project explicitly sought to build leadership skills among the VCG participants.

According to Hannum et al. (2007), the most common benefits of community leadership training are increased involvement within the community and improved networking among members and/or community groups. As Figure 9 illustrates, with respect to the leadership training provided by the CBA-ECA project, more than half of the participants in the household survey felt that leadership training had either somewhat or very much increased their level of motivation to engage in community action to conserve the *haor* ecosystem. However, out of 346 respondents, only 3 disagreed.

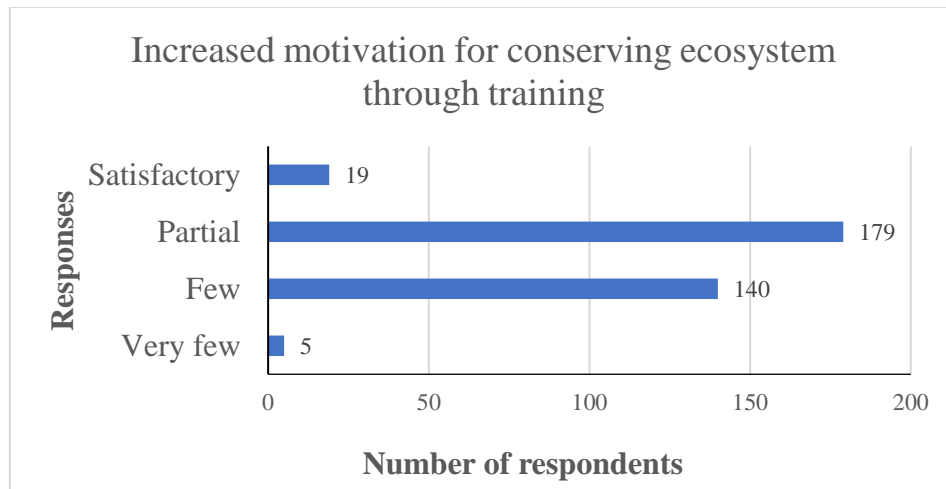


Figure 9: Extent to which leadership training increased motivation for conservation?

One interview participant from Judhistipur VCG explained how their capacity to lead had grown due to the training under the CBA-ECA project and described the way they are applying leadership skills in practice:

Through training, my leadership capacity has increased. I have learnt how to talk to others, how to interact with others, and how to motivate others. I am more acceptable not only to our VCG members but also to other community members. We have, in the meantime, taken many initiatives. For example, we identified those who are using unhealthy toilets in our area. Then we categorised people in the community into groups of those who have money and those who are poor. After that, we motivated those who have the money to buy healthy sanitary toilets by themselves and sent a list of the poor to the Union Parishad as well as to the Upazila Public Health Department to seek government support. Many poor people got sanitary toilets from government agencies. Now people value our leadership and initiatives. The overall environmental condition of our locality has improved.

Another interviewee (Shapla VCG) reported that leadership training had helped to develop them as a person:

In leadership training, I have learnt how to give value to others' opinions. This thing made me a leader. Earlier, I thought leadership meant only that the leader will talk, and others will listen. Now, I listen to others, try to learn something from them, and give them value. Therefore, my acceptability has been increased. This change of attitude works positively not only at the community level but also in my personal life.

An interviewee from Gobindapur VCG expressed how the people in their group can now work beyond the traditional norms, due to the dynamic leadership skills they have developed. They also outlined the resulting benefit to society:

Training helped us to think differently. We can take responsibility for our group members as well as others. For example, as per the guidelines, we provided MCG loans to our VCG members. However, we have already changed this practice and are thinking outside the box. For example, some young people of our area, non-members of our VCG, approached us to request loans from our VCG. They shared with us their vision to buy a 'rickshaw van' to carry children to school. They have raised money, but not enough to buy the van. We considered their objectives and their background. We discussed the matter among our executive members and decided to provide loans. One of our VCG members became the guarantor for them, and we granted a loan of BDT 80,000 (Taka 10,000 each for 8 people), which is equivalent to about USD 1,000. This was possible due to the change in our attitudes and our increased leadership capacity. They are repaying the loan regularly. The number of children going to school has increased. They are carrying our children as well. Therefore, we also benefit from their project.

This analysis highlights the importance of human drivers to overall resilience. In addition to increases in individual human capacity gained through awareness building and training in management, crop diversification, disaster preparedness, and leadership, the impact of this training had a wider reach: well-informed community members and dynamic leaders were now able to guide many other members of their community and take innovative decisions to increase community resilience.

5.3 Components Enhancing the Social Drivers

Social organisations can develop networks that can contribute to increases in community resources (Berkes & Ross, 2013). The mobilisation of social drivers – such as internal/external networks, social networks, and social cohesion – is essential for the success of CBA approaches (Reed et al., 2014). On the other hand, competent leaders can help the people in their communities in various ways. One relevant example is that when individuals in a community do not have sufficient linking social capital, they rely on their community leaders to get credit from external sources (Khan & Haque, 2010). Social drivers – evident in the relationships between stakeholders – can help to rally different community members to a cause and increase the incidence of internal and external interactions to make joint decisions; this, in turn, helps communities to face natural disasters cooperatively. This section presents the ways in which the CBA-ECA project contributed to the development and activation of social drivers for community resilience, including factors such as cohesion among community members, trust, and reciprocity. Analysis of the data revealed that many participants perceived that community relations had improved through the project, as well as the fact that the project had revealed commonalities between the interests of community members. As constructive relationships and shared goals are key characteristics of a resilient community, these outcomes of the community-based adaptation approach taken by this project are noteworthy.

5.3.1 Village Conservation Groups (VCGs) – Internal Relationships

61% of survey respondents agreed that the CBA-ECA project had promoted unity among the VCG members. Moreover, two-thirds of the participants interviewed acknowledged that their involvement with the CBA-ECA project had created opportunities to share common interests with other members of their community. They shared their opinion that the VCGs served as platforms to strengthen ties among community members through project activities that engaged the participants in collective action. One interview participant (Volerkandi VCG) described the way the project had strengthened their relationships:

Being members of the VCG, we often met to discuss various issues related to our association, our community, and our environment. We completed many trainings together and cooperatively monitored some projects implemented in our wetlands. Doing this helped us to share both personal and community issues, which strengthened our bonds.

According to the interviewees, through the project – over the course of many meetings or within as little as an hour – VCG members united as communities more strongly than they had ever before. This created a mind shift through which they began to consider an individual problem as also a community problem. People began to help each other to face challenges. This was a direct outcome of the strengthened relationships and bonding achieved by the VCGs that operated under quality leadership.

One interview participant from Shosherkandi VCG explained how their social values had developed and strengthened through the relationships that were formed over the period of the CBA-ECA project:

It is true that, like in many other places, social norms, culture, and values had deteriorated in our area. When we acted as individuals before, we could recognise the deterioration but were not capable of stopping it. However, as members of the Village Conservation Group, we saw ourselves in a different way. We tried to give value to one another. Our children, observing this, changed their social values too, over time. All of this was possible with improved community relations.

A majority of the focus group discussion respondents expressed their gratitude to the CBA-ECA project for providing them an opportunity to change their ways of thinking as well as their behaviour patterns and to work collectively to develop a sense of community.

5.3.2 Village Conservation Groups (VCGs) – External Relationships

The VCGs also offered members the chance to develop their relationships with other stakeholders in and outside the community. Analysis of the interviews revealed that about 50% of the household respondents saw the VCG as a communication hub or information centre and, in some instances, as a two-way communication system. For example, some VCG members became quite proactive in asking for help from the local agriculture officials about different aspects of farming, which had not been common practice before the implementation of the CBA-ECA project. One interviewee from Borudol VCG explained:

Our relationships with the officials of various government and non-government organisations have improved. We often visit different offices, such as the Upazila Administrative Office, and the Agriculture, Fishery, Land and Local Government [Union Parishad] Offices. We discuss many things with our VCG members at our VCG office. Moreover, we use our VCG as an information hub. The information we collect from relevant offices, we share through our VCG office, not only to our members but also to other people in the community. This information varies from crop cultivation to disaster management.

Another interviewee (Salia-Kazirbandh VCG) reported that their local VCG works for the whole community, not just for the VCG members:

During the irrigation season, when agriculture officers visit our area, we arrange a conversation session with local people, including both VCG members and non-members, at our VCG office. This process helps to improve our relationship with government officials as well as with community people outside our VCG membership.

These statements are supported by interview comments from an agriculture officer (Juri Upazila), who said: “Some VCG members keep regular communication with us and seek our advice. We appreciate it.”

By acting as a base in the community that provides strong social capital, some VCGs provided benefits that worked both ways between the government and the local communities. In fact, data revealed that government officials sometimes actively sought out the cooperation of VCG members. In one example case, when a flood affected a particular area for an extended period, government officials – especially those from the Disaster Management Department – had to prepare a list of the most vulnerable persons, so they could offer them support. According to an interviewee from Surjomukhi VCG, the official responsible for this would typically ask for the help of their VCG to make a list. One of the project implementation officers working in the Department of Disaster Management in Barlekha *Upazila* confirmed this in an interview, saying: “Some VCGs of this Upazila are performing well. They provide us valuable information during natural disasters.”

With VCGs serving as two-way communication platforms, many VCG members are now more capable of talking to the government officials, and the government officials are more likely to trust the VCG members as non-political individuals who have the correct information and will tell the truth, rather than try to peddle influence or build their networks at public expense. These active channels of communication serve as a strong social driver of community resilience.

5.3.3 Village Conservation Groups (VCGs) – Social Networks and Social Cohesion

In addition to acting as communication hubs, the VCGs also created social networks among their members: those who have cell phones connecting quickly and passing information to others, the latter of whom might not have access to phones. As is evident in Figure 10, 82% of the survey respondents felt that the social networks developed through the VCGs had reduced the impact of disasters at least partially. In addition to that 10.1% respondents reported that the role of social networks was satisfactory in reducing the impacts of natural disasters.

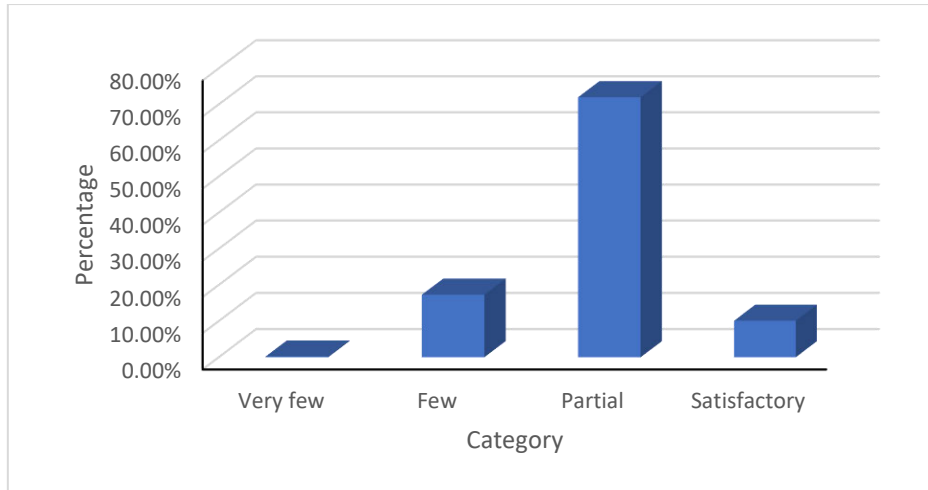


Figure 10: The Role of Social Networks in Reducing the Impact of Natural Disasters

During their interview, one respondent (Salia-Kajirbond VCG) mentioned the importance of social networking:

Floods occur almost every year. We cannot stop them. However, what we can do, nowadays, is to reduce the impact of floods by using our social networks. Following any incident, we can meet at our VCG office at short notice and discuss the matter and take immediate action jointly to make the mitigation of flood damage successful. Before becoming VCG members, we were not that united. We faced each challenge individually. We could not motivate others.

Another interview participant (Nischintapur VCG) said:

Through our involvement with the VCG, our social networking capacity has increased. Now, we can consult among ourselves. We pass information to others easily. We can take decisions jointly and decide what to do next. We are lucky that we have some members who love social networking and working with others. This has given us the wherewithal to face disasters like floods collectively.

An interview respondent from Shantirbazar VCG reported that the community now works as a team, and this helps to reduce the impact of disasters:

Since our knowledge regarding disaster management has increased, we do not feel nervous facing the challenge of any disasters now. We can tackle them in a better manner than we did before. We prepare in a group. We are not individual persons; we are a group. During the recent floods [in 2017], we took shelter at a nearby school. Since our communication skills had increased, we were able to meet with government officials. We explained our condition, and we managed to get relief for poor people, not only for the VCG members, but for the community as a whole. Many of us collected dried-food and preserved it beforehand as emergency stock. We disbursed MCG loans quickly among those who were vulnerable.

Another interviewee from Surjomukhi VCG explained how their VCG brought members together – getting them to work cooperatively in helping their community to increase their resilience – so they are able to fight “for the last moment” to reduce the impact of climate change-related disasters:

Before, we did not have any plan for facing disasters. However, since forming a VCG and getting training from the CBA-ECA project, our level of awareness has increased. We discuss how to face disasters regularly in our monthly meetings. We get weather updates and disaster warnings. Our way of thinking has changed. We think positively, and this helps us fight through the disaster. We want to try for the last moment. For example, previously, the flood meant to us ‘sell all the cattle’ because we were busy finding accommodation and food for ourselves. Now, we try to find a place to keep cattle with us, and if we fail, then we send the cattle to a relative’s house.

When disaster starts, we take shelter in the highlands or in any structures nearby, like school buildings. Since our level of awareness and knowledge regarding disaster management has increased, we feel we can handle any disaster efficiently. The flood in 2017 could be the best example. We managed it nicely compared to earlier disasters, although the floodwaters affected us

longer. As soon as the level of water increased, we arranged a special meeting with 11 members from our VCG, took some quick decisions, and disseminated the plan among the other members. I must give credit to the contribution of submersible embankments, which protected us from the waves of the haor and saved our houses.

After joining the VCG, we changed our attitude. We have become more responsible. We work for the betterment of society as a whole. For example, in one rainy season, a portion of one road became damaged. It needed a quick repair. As soon as we noticed it, we took the initiative to repair it ourselves. It did not involve a considerable amount of money from us, and a quick response was necessary. Earlier, we had thought it was the responsibility of the government officials or the concerned Union Parishad to fix flood-damaged roads. Now we understand we are really responsible, and we can apply our accumulated knowledge.

Along with awareness building, the cooperation among the VCG members helped us to handle this situation effectively. We have very good understanding among the members, which helps us to take any decision jointly. I think our social connections and the relationships between the members are very helpful tools for facing the challenge of disasters as a team.

These summaries indicate that, for many respondents, active participation in VCGs resulted in the development of internal and external relationships, as well as social networks that proved very useful in times of need. What is more, the success of these networks in responding to disasters clearly developed a feeling of cohesion, confidence, and mutual trust within these groups, social drivers which certainly bolstered community resilience.

5.4 Components Enhancing the Natural Drivers

Efforts to enhance natural drivers and thus create ecosystem benefits for local communities have long been undertaken worldwide in attempts to develop communities that are sustainable, resilient, and capable of confronting the impacts of climate change. An example of this is the swamp reforestation programme implemented by the CBA-ECA project in order to increase tree diversity and create shelter for fish and birds, which would have follow-on advantages for the people.

5.4.1 Swamp Forest Restoration Programme

Swamp forests are not only helpful for protecting the environment but also for increasing diversity and productivity of biota (Smith et al., 2021). Global climate change reduces fish production by reducing rainfall and drying out or otherwise changing the temperature of fish habitats – or by increasing rainfall such that fish are flooded out and their safe places are destroyed; this makes the people who depend on fish for their diets and livelihoods vulnerable (Gitz et al., 2016). In the inland areas of Bangladesh, where the number of free-ranging animals is near zero due to over-settlement – and where the keeping of livestock requires a large capital investment that the poor cannot afford – fish are the main source of protein (Belton et al., 2014). Fishing also generates additional income through the sale of surplus catch (Belton et al., 2014; DoF, 2020).

The protection of existing swamp forests and the creation of new ones create safe zones in wetland areas for fish, as these forests provide them shelter from predators, defences from flooding, and protection from excessive fishing (Alam et al., 2015; Smith et al., 2021). The existence of such safe zones can ultimately improve fish stocks. The fishers who can depend on resources from actively managed and protected wetlands become more climate resilient, because they can obtain a stable livelihood near their places of residence from sustainable sources, even under the effects of climate change (Rahman & Begum, 2011; Kibria & Haroon, 2017; Smith et al., 2021).

Data analysis of the expert interviews confirms this is also the case in the Hakaluki *haor*. As one of the experts (an academician) explained: “Fish shelter in swamp forests and eat the leaves of submerged trees, and this assists their breeding.”

Experts have illuminated many other benefits of swamp forests in the literature on wetland restoration and management. For example, they have described how the swamp forests they observe provide shelter for birds and increase biodiversity generally by providing habitat for a range of plants, animals, and insects (Alam et al., 2012; Islam et al., 2021). To achieve the CBA-ECA project goal of increasing biodiversity in the Hakaluki *haor*: 500 hectares of swamp forest were selected to be protected; 7.68 hectares were selected for the creation of new swamp forests.

In interviews, VCG members disclosed that they had had some involvement in the swamp forest protection programme. Some respondents had been a party to the selection of the location of the forests for protection or creation; others had participated in project implementation. A representative of Udayan VCG confirmed in their interview that the vulnerable group of fishers and poor farmers in their area had also joined in on the selection of the project location.

Of the survey respondents, 99% (343 out of 346) indicated their belief that the swamp forest restoration programme protected birds and fish species. More than 60% reported that swamp forest restoration had increased tree diversity in the *haor* area. According to 330 survey respondents (out of 346), the deforestation of swamp forests stopped to some degree after the implementation of the CBA-ECA project. Among these respondents, about 50% perceived that deforestation had partially stopped. Most of the respondents expressed the opinion that the swamp forest project was most successful in areas in which it had been supported by effective awareness programmes and community action. Further, many noted an additional benefit of the new tree plantings: they now helped to break the high waves in the *haor* which often sank fishing boats.

A key informant for the Rakhil Shah VCG explained during their interview that, through the project, the VCG had forged relationships with other groups like leaseholders, NGOs, and fishers and that this social driver of cooperation between these key stakeholders had also supported an increase in fish stocks and other animal life. One interview respondent

(Judhistipur VCG) explained how effective leaders and motivated members had contributed to creating and looking after the new forest. They said:

We had planted 2,500 and 2,350 saplings in two steps on the bank [Kanda] of Tekuna Beel. Although some of the trees had been damaged by buffalos, most of them survived. This successful planting was possible because of the dynamic leadership and active participation of our members.

This respondent went on to describe some of the benefits associated with the new forest:

When the branches go underwater, fish can eat their leaves. This helps to increase fish production. Another mentionable benefit we are getting is protection from storm-induced waves in the haor. Earlier, due to heavy waves, which we call 'afal' in our language, many boats had sunk while in use or been damaged while tied up during storms. Afal also injured many fishers and even caused some of them to go missing. Now, fishers can take shelter in the new forest when waves start. They can save themselves because the swamp forest gives them a safe place, just as it does for the fish.

The benefits of tree planting were confirmed by a number of VCG members in interviews. One from the Ali Nagar VCG noted that the cutting down of trees has been controlled in their area thanks to the influence of the CBA-ECA swamp forest restoration programme. Another (Borudol VCG) reported that they have a number of active VCG members who regularly take part in this programme and discuss the benefits of trees both within and outside the VCG. Yet another (Hakaluki VCG) noted that prior to the implementation of the CBA-ECA project, many people could be seen carrying a small-sized whole tree or the branches of a tree in the evenings as they returned from the *haor*. At present, that scenario is very rare: this, that participant believed, was a direct result of the awareness-building component of the swamp forest restoration programme.

Another (Shapla VCG) spoke about the alternative fuel now used to replace the burning of trees from the swamp forest, thanks to what they had learned from the reforestation programme. They stated:

We had arranged a lot of awareness-building programmes. These were very effective. People in our area are much more conscious about these issues in deciding what to use to cook or to heat their homes. Those who have the money buy LP gas from a nearby market. Poor people, on the other hand, cultivate jute and dhoincha [sesbania bispinosa] to serve as fuel for their fires.

Clearly, this component of the CBA-ECA project offered numerous tangible benefits to the people who lived in or near the swamp forests and served as a significant natural driver that could be leveraged to enhance community resilience.

5.4.2 Other Factors Enhancing Natural Drivers

While the above section made clear that the beneficiaries saw the swamp reforestation programme as a successful example of a natural driver that offered significant benefits for both biodiversity and community resilience (with benefits that reduced household vulnerability), a number of other factors were also perceived to have been of benefit to natural drivers. As highlighted in Table 16, data analysis against the drivers of resilience shows that, in addition to the swamp reforestation programme, participants identified several outcomes associated with physical drivers/infrastructure development (described in Section 5.5) that contributed to increased fish production and biodiversity of the Hakaluki *haor*.

Table 16: Survey Participants’ Perceptions of Resources Influenced by Natural Drivers Associated with Components of the CBA-ECA Project (N=346)

Resource Target Outcome	Yes (%)	No (%)
Biodiversity in the <i>haor</i> area has improved	99.71	0.29
Excavation and re-excavation have increased fish production	80.92	19.08
Illegal fishing is controlled	80.92	19.08
Sanctuaries conserve fish diversity	83.53	16.47
Fish are harvested sustainably	88.73	11.27
Birds and wildlife are protected from illegal hunting	97.40	2.60

More than 80% of the survey respondents agreed that the steps taken by the CBA-ECA project to augment natural drivers were effective. It is worth noting that almost all participants shared the opinion that biodiversity of the *haor* area had improved, and that birds and wildlife were better protected from the hunters.

Results demonstrate that improvement of natural drivers (fish and aquatic resources, birds and wildlife, and swamp forests) was tied to advancements of other drivers: human (awareness building), physical (excavation of *beels*), and financial (fish production). Particularly, the link between human and natural drivers, recently emerged a key topic of discussion by researchers. The choice to excavate the *beels*, a type of infrastructure project, reflected an awareness of the natural, human, and financial benefits that would result; it would not only create better habitats for the fish but also enhance the public's awareness of such practices through increased fish production for the fishers and improved irrigation options for farmers cultivating the nearby land (Hussain et al 2005; Alam & Islam, 2018).

5.5 Components Enhancing the Physical Drivers

Community-based adaptation, as an approach, focuses on the building of climate-resilient infrastructure (Forsyth, 2013). Physical drivers, defined in 3.6. as the physical infrastructure of a community, are considered very important to the building of community resilience. The physical driver components of the CBA-ECA project that project beneficiaries felt contributed to the development of community resilience are the submersible embankments and *beel* excavation, which enhanced the biodiversity of the wetland ecosystems and provided additional benefits; similarly, the Village Conservation Centres developed community resilience as they served as spaces to sustain active community engagement. Details of these components are given below.

5.5.1 Submersible Embankments

When participants were asked about the effects the CBA-ECA project had on the development and availability/accessibility of various forms of community infrastructure, they most frequently mentioned the benefits associated with the creation of submersible embankments, which were designed to conserve water during certain times of the year, protect crops from flash floods, and save the *beels* from siltation flowing from the hills upstream. Farmers can also use embankments as roads to carry their crops along during the dry season. Under the CBA-ECA project, a total of 17.87 kilometres of submersible embankments were constructed in ten different areas of the *haor*.

While only about 26% of the survey respondents indicated that they had directly benefited from the construction of the submersible embankments, the majority of the community (VCG) members interviewed considered this intervention to be a particularly successful component of the CBA-ECA project, due to the multi-dimensional contribution it makes to wetland management. For example, one participant from Rakhil Shah VCG, who is a fisher, reported in their interview:

We were involved in the selection of locations and the monitoring of embankments during their construction. The quality of the work was satisfactory. We are now getting many benefits. The embankment saves our beel from siltation. The water-retaining capacity of the beel remained unchanged, which helped to increase fish production.

Data analysis show that creating a sense of ownership and engagement with the project work among local beneficiaries was a key factor that helped to ensure that the submersible embankments were implemented efficiently and cost-effectively. As per the project guidelines, manual labourers were employed to build the embankments. Some participants reported that they had been anxious about whether the work could be finished before the rainy season, since there was a shortage of professional labourers in that area. During the rainy season, all work can stop for months, with roads becoming impassable and machinery stuck in the mud. Incomplete work could be damaged or destroyed by floodwaters. One interviewee, a member

of the Halla VCG, explained that group members had worked voluntarily with the professional workers to finish the work in time:

We considered this project as our own project. If we could not complete the task in time, all our effort would be in vain, because floods would wash out our half-done work. Then, we would need to start from zero in the next year. Since we had a shortage of professional labourers, we managed to recruit some volunteers from our community to support the professional labourers, which helped to finish our job in time.

According to interview participants, the introduction of submersible embankments by the CBA-ECA project fulfilled a long-cherished desire for many people living around the *haors* and helped many people to save their crops and homes from being washed away by flash floods and waves. One interviewee from Shusherkandi VCG described the benefits:

Submersible embankments saved our houses from the waves in the rainy season. In winter, we can carry our crops from the haor to our homes using the embankments as roads, so we can keep earning income and not waste our harvest.

One interview participant from Belagaon-Sonapur VCG reported that, since this project provides important ongoing benefits, the VCG have remained involved with post-project monitoring:

We are getting direct and instant benefit from this project. Therefore, we are very concerned about this project. We were not only involved with the implementation phase, but also, we look after the results with post-project activities, such as repair and maintenance. Although, as per the project design, we can seek help from the local Union Parishad for maintenance work, in most of the cases we do it ourselves.

Key longer-term benefits are that the villagers' experiences of floods are not as bad as they once were, and their houses do not get flooded so often; the majority of focus group participants see these benefits as a direct result of the submersible embankments. Interview comments from

the *Upazila* Disaster Management Officer – locally known as the Project Implementation Officer (PIO), an engineer who often visited the Hakaluki *haor* during floods and other disasters – attest to these benefits. This officer highlighted the positive impact of the submersible embankments, noting that the floods had been a significant danger to the lives and livelihoods of the villagers, destroying crops, farm animals, and homes. According to him, flood intensity has reduced significantly in those parts of Hakaluki *haor* where submersible embankments were built.

As previously noted, the embankments can also be used as winter roads. This additional benefit requires no additional work: in winter, when the water level goes down, the embankments become visible, dry out, and can carry the villagers and their light vehicles. Villagers in focus group discussions confirmed that they use the embankments as roads so that they can use vehicles bring their produce from the *haor* to their homes. Some interviewees involved in these discussions reported that – before construction of the embankments – they had carried crops themselves, on foot, which was physically demanding, time-consuming, and costly. Now, they can use tractors or rickshaw vans, rickshaws with extended bases that can transport goods as well as people, to bring their products home or to market, saving money and reducing wastage. Now, instead of throwing hay into the *haor*, which they previously did to clear it away because it was not worth the effort to keep, they carry it home for their cattle to eat. Also, children are less frequently absent from school in the winter because they can walk there on the embankments. In all these ways, the embankments, as pieces of infrastructure that serve as physical drivers for community resilience, have had a number of socio-economic as well as environmental benefits and, as such, also serve as financial and natural drivers supporting this resilience. The analysis of the research data shows that villagers certainly believe that the embankments will keep them more climate change resilient in all seasons than they had been before they were built.

5.5.2 Excavation and Re-excavation of Beels

Excavation and re-excavation can be done to make *beels* (the depressions in wetlands that hold water), deep enough to retain their water year-round. This development of what could be

considered underwater infrastructure can greatly improve the ecological condition of wetlands, as, during the dry season, fish can find shelter and food in such excavated *beels*; further, the presence of interconnected *beels* can sustain the free movement of fish and other aquatic species.

Most excavation of the wetlands of Bangladesh is undertaken to create fish sanctuaries, in part because building and managing a fish sanctuary that can ensure safe breeding is essential for the protection of indigenous fish from extinction (Islam et al., 2018). It is also due in part to the fact that the establishment of fish sanctuaries under participatory management has contributed to increasing both the social and ecological resilience of local beneficiaries, as Mozumder et al. (2018) reported, in their study of a coastal area in southern Bangladesh. The primary purpose of fish sanctuary management under the CBA-ECA project was to create new wetland infrastructure that would provide a safe environment for the fish that would allow them to thrive and their numbers to increase. Brood fish take shelter in the fish sanctuaries, from which the catching of fish and other aquatic resources is prohibited; their survival contributes to a growth in fish population in the subsequent year. Under the CBA-ECA project, a total of 12 *beels* were preserved as fish sanctuaries and, of these, ten were kept excavated between the project period (2010-2015). During interviews, respondents informed me that, after the establishment of these 12 sanctuaries, both the number of fish species and the quantity of fish had increased.

This physical intervention – also intended to reverse the decline of food security in the *haor* – was identified by beneficiaries as one of the most important participatory wetland management strategies of the CBA-ECA project. 80% of survey respondents indicated that sanctuaries were conserving fish diversity and that excavation and re-excavation was contributing to increased fish production. 41% of respondents observed that the number of fish caught had risen significantly. 36% reported that catches had improved a little. Responses also highlighted that some endangered fish species, such as the olive barb, pabo catfish, and long-whiskered catfish, had returned, contributing to improved biodiversity in the *haor*. In their interview, one Hakaluki Jagoroni VCG member said that some fish varieties, especially the olive barb (*puntius sarana*), had returned after a long absence.

There was a fish sanctuary in our area which contributed to increased fish production. Olive barbs had become rare between 2000 and 2010. However,

after the establishment of the sanctuary, olive barbs have now become available again. Both fishermen and the local people are happy with this result.

Another interview participant (Gobindapur VCG) reported that excavation had created connectivity between the *haor* and the river, which had a number of follow-on benefits:

In our area, a canal was excavated. It established a link between Hakaluki haor and the river. Fish can now migrate from the river to the haor and from the haor to the river. Therefore, fish species, especially Sperataaor, returned. At the same time, overall fish production has also increased, which has contributed to increasing the earnings of the fisherfolk in this area. Beside the canal, we built a road using the excavated mud, so we also have better land transport.

Interviewees consistently highlighted the increased fish numbers, the return of some species, and the improved biodiversity, evident in this comment from one participant (Belagaon-Sonapur): “Our VCG established one fish sanctuary. Many fish species were not available a few years back, now these species have reappeared. Their return not only contributed to increased biodiversity but also increased overall fish production.”

Another interviewee (Surjomukhi) described how the local VCG members cared for the sanctuary and the benefits they gained from this:

A fish sanctuary was established at Maislardak Beel in our area. We (VCG members) monitored it jointly. This was possible due to our teamwork. Before, people used to take water from this beel for irrigation. After establishing the sanctuary, we protected it and prohibited people from catching fish. We set out an adequate number of bamboo sticks, and enough tree branches, which helped to create an environment safe for fish taking shelter. Brood fish were safe and comfortable here during the breeding season. Therefore, we increased the number of fish species and overall fish production. We found huge production of Chapila fish [Indian river shad] in our area.

Since the excavation of *beels* and the management of fish sanctuaries contribute to increasing both fish diversity and overall fish production, fishers and local consumers benefit a great deal from the surplus production generated by these physical drivers: fishers can increase their

income selling extra fish and consumers can enjoy food security and affordability. This further demonstrates the effect that a boost from one driver can have on others (natural, financial, human).

5.5.3 Village Conservation Centres (VCCs)

To ensure community participation in wetland management, the CBA-ECA project led the formation of community-based organisations, in the form of Village Conservation Groups, and facilitated the training of their members. With the goal of sustaining this participation following its completion, the CBA-ECA project created permanent offices for the VCGs: ten buildings, called Village Conservation Centres (VCCs) were constructed to accommodate multiple VCGs. These VCCs are considered in this study as important physical drivers, as they provided community infrastructure in the form of built space to accommodate meetings, discussions, and training.

Interviewees explained that the Village Conservation Centres (VCCs) were essential spaces for the members of Village Conservation Groups (VCGs), where they could sit down, discuss, and plan for the management of the wetlands. Most of the participants from those VCGs which received these facilities were satisfied with them, and other VCGs wanted ones of their own.

An expert interviewee from the Department of Environment described how VCCs were typically developed in partnership with the local community:

Construction of the VCC was completed efficiently with beneficiary participation. Land for the VCC, in most cases, was donated by wealthy VCG members, which helped to reduce the project cost and created ownership for them. The VCG members do not need to pay office rent any longer, since they can use the Village Conservation Centre as their office.

In their interview, a VCG member from Belagaon-Sunapur reported an additional benefit of the creation of the VCCs:

A critical aspect of the Village Conservation Centre was to encourage the participation of the women members. One day of the week was reserved exclusively for women participants. They could speak more freely without men present.

In focus group discussions arranged exclusively for female members, participants confirmed this statement and showed their satisfaction with this policy of having a weekly women-only day set aside at the VCC. According to them, the most positive steps in the empowerment of the local women were taken in the VCCs. On the women-only days, the women were reportedly able to have open group discussions with each other and speak frankly, without the intimidating presence of men. They were able to make plans and receive training in a suitable environment that boosted their participation.

Field observations provided further confirmation that the development and implementation of the VCCs had a positive impact on the community and that these physical meeting places represent the most sustainable aspect of the project, as VCG members, meeting in VCCs, have continued to act as community organisations following the end of the project. The submersible embankments and excavated *beels* also continue to provide lasting benefit. All these physical drivers can be seen to be having a positive influence on community resilience.

5.6 Components Enhancing Financial Drivers

Financial support that is adequate to diversify income against climate uncertainties is another core driver for building community resilience (Ayers & Forsyth, 2009). During its operation, the CBA-ECA initiated financial support mechanisms that channelled funding to community members through micro capital grants (MCGs), alternative income-generation activities, and endowment funding. The project also provided other means of improving member income. Analysis of the impact of these initiatives is presented below.

5.6.1 *Micro Capital Grants (MCGs)*

Poor fishers and farmers in Bangladesh have no access to the formal banking system because they cannot provide collateral security against their loans. Therefore, they often lack much-needed cash (Alam et al., 2021) and must rely more heavily on the natural resources available to them. This can drive them to overuse or otherwise put too much pressure on these resources; this leaves them particularly vulnerable to the effects of climate change on ecosystems. As one way to reduce the dependency of local people on wetland resources, the CBA-ECA project offered micro capital grants (MCGs) to help support the diversification of livelihood among the target population. The MCG programme, which is still available at time of writing through a number of VCGs, aims to increase the financial capital of the VCG members by providing funds they can use to operate small businesses and manage short-term financial crises. The primary objective of the MCG was to increase the financial capacity of the VCG members and reduce their dependency on Hakaluki *haor* resources.

As noted in 4.5.7, VCGs received donations to set up MCG funds in each area; neither the VCGs nor the individual recipients are required to repay the donors. Instead, a VCG can lend money to its members and use the repayments and interest to establish a revolving source of revenue for making subsequent loans.

In the survey conducted as part of this research, more than 80% of the participants indicated that they had received a loan from the MCG programme at least once. Among them, just above 50% of the respondents reported that using the MCG loan had partially helped to increase their income. Ten percent of the participants reported that this loan had had a significant positive impact on their financial status. 20% reported that it had made some contribution to their livelihood.

According to the interview participants, the MCG achieved its aim of serving as a means for members to access credit. Many interview participants considered the MCG loan to be more accessible than a traditional bank loan. Another advantage of this credit facility is the fact that money is typically disbursed quickly to the applicant to meet immediate needs, for example, to buy various inputs and fertilizer to start cultivation.

One interviewee (Noagaon VCG) described the barriers associated with other types of loans, including the requirement for collateral security and the lengthy processing time involved:

We are poor people. If we go to the traditional banks, they ask for a lot of documents, collateral security, and guarantors, which are difficult to manage for many poor people like me. Although some of us were able to manage these things, it took time. The important thing is time: trying to get the loan took so much time that, by the time we got it, it was too late to start the crop season. MCG fixes this problem. We can receive loans from MCG without offering any collateral security. Moreover, it takes a minimum amount of time to provide the loan. Therefore, we can use the funds for crop production.

The interviewees also noted that loans from the MCG programme are cost-effective. A comment from one participant from the Padma VCG provides a clear example:

I took a loan from our MCG. The rate of interest is very reasonable, only 10%. Before that, I paid about 20% for loans from other sources. I utilised the MCG loan for crop production. It was very beneficial for me.

During their interviews, some VCG members indicated that the MCG programme had also succeeded in supporting the diversification of livelihood and described ways they were able to use their MCG loans as capital to upgrade their living standards and increase their earnings by starting new small businesses. One participant from Hakaluki Jagoroni VCG used an MCG loan to become a self-employed driver of a rickshaw van. They explained:

My level of income has increased a lot, being a member of the VCG. Before, I drove a rented rickshaw van and therefore I had to pay a share of my earnings to the owner. As a VCG member, I received a loan from the MCG and bought a rickshaw van. I repaid the loan from my daily savings on rickshaw rent. Now, I do not need to pay rent to the owner, because I have become the owner. It has not only increased my income but also raised my status.

It is clear that the sustainability of the funding stream for the VCG, the accessibility of the loans to the community members, as well as the creative use of the funding to support the

development of additional income streams, made the MCGs very valuable to the local communities able to access them. These characteristics also set the MCG programme apart as a key financial driver for community resilience.

5.6.2 Alternative Income Generation Activities (AIGA)

Another way the CBA-ECA project worked to support the financial drivers of the local people and decrease their dependency on the wetlands for their livelihoods was through alternative income generation activities (AIGAs). After receiving appropriate training, project participants from each VCG were selected, based on their performance in the training and on their financial need, to receive non-financial assets. These assets included cows, ducks, sewing machines, and other materials supplied by the CBA-ECA project.

About 25% of survey participants agreed that they had received some form of alternative income generation support. In the interviews, almost 100% of the participants who reported having received AIGA support confirmed that their financial circumstances had improved as a result. One participant (Udayan VCG) described the impact the training and AIGA support they had received had on their financial circumstances:

I got cattle rearing training from the project. After I completed the training, they provided me with a cow as AIGA support. After I had raised it a few months, that cow gave me a calf and started supplying milk. I was able to sell the surplus milk after our family consumption. It helped to save some money. After one year, I was able to buy another cow from my savings and sell the calf. Applying knowledge gathered from the training, I was able to take care of my cows. I am earning more money selling milk from both cows. My overall living standard has already increased.

An interviewee from Judhistipur VCG reported that, because their financial circumstances were above the threshold, they did not qualify to receive AIGA support. However, they were able to play a role in ensuring the equitable distribution of this support. They also added that

those who had received AIGA in their VCG utilised this support properly and that their financial circumstances had benefitted.

The following extended quote highlights how important the AIGA support had been for an interviewee from Belagaon-Sonapur:

I received training in duck rearing. After that, in 2014, I got 100 ducks as AIGA support. At that moment, the market value of 100 ducks was about 30,000Tk [equivalent to USD 375 in 2019]. After rearing ducks for a few months, I started earning money by selling eggs. I did not misuse my savings, and I started buying more ducks from my savings. Now, I have about 300 ducks with a market value between 105,000Tk and 120,000Tk (equivalent to USD 1,500).

My earnings have increased tremendously. Earlier, my average monthly income was about 8,000Tk. Now, I can make about 30,000Tk per month. I bought a cow for 62,000Tk last year selling duck eggs.

In the past, my earnings depended only on catching fish. If I was able to catch fish, I could manage to buy rice for my family. Frankly speaking, some days we were starving. When the project started, I became a VCG member and got the responsibility to act as a guard for the VCG. I performed my duties sincerely. Later on, I received training for duck rearing and got AIGA support. At the same time, I worked as a security guard and reared my ducks nearby. Since the tenure of the project expired, I haven't been able to earn by guarding the sanctuary. However, the money I earn from duck and cow rearing is good enough to support my family. My dependency on the haor has been reduced.

Another related finding was that training and non-financial assets provided through the AIGA programme had enhanced the living conditions of women. Earlier, women of this area had only been involved with household activities; they were not able to contribute financially to their families. However, having participated in AIGA activities, a significant number of women are now engaged in duck rearing, cattle rearing, and sewing. Their monthly incomes and living standards have increased significantly. An interviewee (woman) from Jogri VCG said: “While training increased my level of confidence and efficiency, AIGA support, helped to increase my earnings. There are some other women in our VCG and nearby VCGs who could also change

their financial conditions.” During one focus group discussion arranged for exclusively female participants, there was an agreement among those involved that their financial contribution has not only increased their value to the family but also helped to reduce the dependency of their male family members on the wetlands. This has contributed to the community resilience of the families of the Hakaluki.

Participants in the other focus group discussions confirmed the above findings and consistently praised the AIGA support and expressed their confidence in it. According to them, AIGAs have been the best financial driver for reducing the dependency of the local people on the wetlands.

5.6.3 Other Factors Enhancing Financial Drivers

Most of the VCG members interviewed mentioned that they had benefitted from various initiatives offered by the CBA-ECA project which had improved their standard of living. Survey data show that the household incomes of 55% of respondents had “partially increased.” According to interview respondents, the most common sectors through which the VCG members increased their incomes were crop diversification, tailoring, fish farming, horticulture, running small shops, duck rearing, and cattle rearing. The additional income generated made the community more resilient: if climate change were to make the Hakaluki *haor* less productive, they felt they could survive thanks to the improvements they had made to their livelihoods.

A number of VCG members extended what they were able to access from the CBA-ECA project and improved their incomes in innovative ways. One interviewee from Volekandi VCG explained how they had taken their business in a different direction than others who had received the same training:

Many of us took part in duck-rearing training. I collected good quality ducks from Netrokuna, about 6 hours' drive from our Upazila. After rearing them for a few months, I got huge eggs. I was earning good money selling the eggs. The

demand for this duck was increasing in our area. I started to supply ducks collected from Netrokuna and earned a good profit. My level of earnings increased tremendously when I set up a hatchery for raising ducklings. Now I make money not only from selling eggs, but also from selling ducklings.

Reported improvements to their living standards included improved nutrition and increased calorie intake. Interviewees said that they were now able to eat eggs, fish, milk, and vegetables; before, they might have only eaten rice and fish or rice and vegetables. Those who have managed to start producing agricultural products for food themselves, or have set up a profitable agricultural business now, have the money in their pockets that they rarely had before; thus, they are able to buy a wider variety of foods.

The CBA-ECA project has also reportedly had an impact on the health practices of the people involved. As one specific example, the use of sanitary latrines has become the norm rather than the exception among many participants, due to CBA-ECA training which has also resulted in participants looking after their families with more knowledge and a greater sense of concern, including regarding the education of their children. Many respondents (16 out of 28) interviewed said that they now approach family health with a focus on prevention and know better when to seek medical care. Interviewees credited the efforts made via the CBA-ECA project to raise community consciousness about health for this change in attitude, which, in some cases, led to participants spending more money to assure family health.

As one interviewee (Judhistipur VCG) explained:

My living standard has increased with the increase in my income – I can spend more money. I concentrate on food intake, medical care, and sanitation. I use a mobile phone now, which helps to get weather updates. Being a member of the VCG has given me the opportunity to mix with the broader community and work for the people. Now, more people respect me than they did before.

A Borogaon resident outlined other benefits:

My living standard has increased. I not only get better food but also drink tube-well water rather than pond water, which carries dirt and disease. I installed a tube well [a pipe driven down into the ground to reach a water source from which water is pumped up] outside of my residence. My neighbours can also use this. There is plenty of clean water underground for all. When my earnings increased, I also put my house on supports that now keep it above the floodwaters.

A resident of Noagaon described other changes to their lifestyle:

Since my income has increased, I can spend more. I can eat better food like fish, meat, and milk. With the enlightenment given to me by CBA-ECA training and awareness building, I want to spend more time with my family now, giving attention to the education of my children. Earlier, I thought it was the duty of my wife only to do these things. Now she gets my help in doing so. The project staff opened my eyes to many things that I had never thought of before.

Overall, the analysis of the data demonstrates that a number of financial drivers, in the form of accessible, affordable loans, non-financial assets, as well as training that created opportunities to improve livelihoods and lifestyles, contributed to a reported increase in income levels (55% of the VCG members, survey respondent). The failure of the CBA-ECA endowment fund to contribute in the same way to positive changes will be addressed in Chapter 6. The benefits of financial stability are understood to build upon each other: as earnings increase, the standard of living also rises, as does the resilience of not only those whose lives have improved but also their communities.

5.7 Conclusion

In this chapter, the results of the data analysis have been mapped against the drivers of community resilience to assess whether or not the project contributed to the building of such resilience. The results show that community involvement in components of the CBA-ECA project has resulted in a wide range of benefits within and across the drivers that influence household and community resilience. The specific activities described above enhanced a wide range of personal skills, increased feelings of connection and cohesion, generated a sense of environmental custodianship, had observable positive effects on the ecosystem, built key infrastructure, and improved financial well-being.

The CBA-ECA project increased participants' level of awareness of a variety of aspects of life and inspired them to adjust their priorities, to improve their livelihoods, and to conserve natural resources. The project also boosted participants' confidence and enhanced their ability to speak out in group meetings. The development of such social drivers enabled people in the community to mobilise others and to interact better with others. In addition, improvements in natural and physical drivers through multiple CBA-ECA activities, such as the planting of trees, the excavation and re-excavation of *beels*, and the creation of fish sanctuaries, significantly enhanced local natural resources. This, in turn, improved overall community livelihood. In all, household income has risen significantly. With better integration among the people in the community, continued building of trust, greater awareness, as well as a fair distribution of resources, these advantages could be spread more widely.

In short, the CBA-ECA project, as an example of a participatory wetland management strategy, brought significant positive changes to the livelihoods of the people in the communities they served and built community resilience. These changes can be sustained and extended if the community can continue to act together under the established VCGs and maintain their motivation to share a better future.

Chapter 6: Factors Impeding the Building of Community Resilience Through the Management of Climate-Stressed Wetlands Under the CBA-ECA Project

6.1 Introduction

By mapping and assessing data associated with each component against social, human, natural, physical, and financial drivers, I have demonstrated the ways and extent to which components of the CBA-ECA project contributed to the building of community resilience in the Hakaluki *haor*. This chapter presents an analysis of the factors associated with each driver that were reported to have impeded the building of community resilience. It is important to identify impeding factors so that lessons learned can be used to help make future participatory community-based wetland management schemes more successful in contributing to community resilience, particularly in the context of community-based adaptation projects. Analysis of the results in this chapter are also mapped against the drivers for community resilience (as with the previous chapter) to gauge the overall barriers.

Key findings of this chapter:

- There was a lack of training opportunities that the community wanted for jobs available in the local market, which limited the contribution of training to community resilience.
- Extreme and persistent poverty, in many cases, meant that increased awareness of conservation methods among community members had to be pushed aside in the pursuit of income. This, in turn, contributed to failures in putting the recommended methods into practice. Thus, poverty elimination must be a major goal of all conservation interventions, as it is a precondition for community implementation of conservation measures.

- Participatory wetland management increased fish diversity, but elite capture and the actions of so-called “power people” undermined the benefits of the interventions.
- Poor market linkages reversed the initial positive results of crop diversification training.
- Because of their social and political status as well as their economic need, VCG members failed to raise a collective voice against illegal fishing, despite their awareness of its long-term harms.
- To some extent, the CBA-ECA project failed to achieve some of its objectives because it was a short-term project trying to solve a long-term problem of climate change without having made any changes to obstacles of social and political inequality, individual and collective poverty and greed, and the social and physical isolation of the community, all of which had prevented adaptation before the project. Thus, progress after the end of the project was short-lived: resources dried up, project activities ceased, and the VCGs were not able to maintain the level of success that they had reached during the project, after the staff and financial support associated with the project had gone.

6.2 Factors Impeding Human Drivers

As community resilience is deemed to reflect and be reflected in a community’s capacity to adapt to extreme situations, it is important to take action to build that capacity (Alexander, 2013). Yet, building capacity is not an easy task, as it requires a well-structured, well-planned, and community-driven approach that produces basic, systemic change within the target community. Change is never easy; it is exponentially more difficult for those involved in community-based management to make radical and lasting adjustments in under-resourced communities through short-term projects. Even though the CBA-ECA project made capacity building one of its core initiatives (to be achieved through awareness raising, leadership development, management training, knowledge-sharing, crop diversification, and income generation), the findings of this study show that the project was least successful in capacity building. Overall, improvements in capacity were temporary and did not survive beyond the project, because members of the target community depended too much on the staff and systems of the project itself. Real capacity building results in a community that can continue to achieve

project goals after the project ceases to exist. The obstacles that impeded the human drivers associated with capacity building are described below.

6.2.1 Social Inequality

The CBA-ECA project failed to achieve all its goals in the long term, in part, because it was unable to address pre-existing inequalities among community residents that restricted their ability to take up, take advantage of, and make lasting changes from training opportunities. Analysis indicates that the CBA-ECA awareness building programme did not alter the behaviour of the ultra-poor or of the powerful. Poor people learned lessons from the training, but many (14 out of 28 interview participants) of them said that they could not act on what they had learned due to their overwhelming need. They still catch fish during prohibited times because they have nothing else to eat. They still collect firewood from the swamp forest because they have nothing else to cook or stay warm with. They work for the fish looters at night, using illegal commercial nets, as they have no other way to increase their incomes and the looters pay well. The elite tended to respond to the training by deciding that the information did not apply to them, because they do not depend on the wetland environment for their livelihood.

Extreme and persistent poverty is a crucial factor working against the success of interventions among those affected by it; pressing financial need cannot merely be laid aside while ecologically related issues are dealt with. One interviewee (Akota VCG), a fisher, explained this in stark human terms:

My level of awareness has increased due to my participation in the CBA-ECA project. I understand that, if we do not catch small fish, we will get more large fish, which will contribute to improving our incomes in future. In spite of the knowledge, I am unable to keep my promise not to catch small fish. If I do not catch fish year-round, even if they are small, my family will starve, because we have nothing else to eat and no money to buy anything else.

If poverty is ignored, it will derail the project. As demonstrated in Chapter 5, in cases in which poverty was ameliorated, the CBA-ECA interventions worked; those participants who received material support from the project after completing training are now financially secure enough to turn their attention to addressing environmental issues.

As an example, a representative from Boromoydan VCG explained the difference between those who received AIGA support and those who did not:

We are poor, so we cannot take advantage of the know-how we can get from training. Let me explain this. We received training about how to make money with sewing machines. That was good. Participants who received sewing machines are sewing and doing better. But poor people who did not receive sewing machines cannot earn money by sewing, no matter how well-trained they are.

Poverty can also drive people to be unreliable and to break rules. Bangladeshi fishers are basically ethical and not likely to violate the law if they are able to feed their family while following the law. Hindu fishers consider their work as sacred. Poverty, however, often pushes people to perform unethical acts, such as illegal fishing, to survive.

As one interviewee (Dosghori VCG) explained, poverty influences poor fishers to get involved in illegal activities undertaken by “powerful people” whose “big nets” are known to bring in undersized or illegal catch:

Powerful people buy big nets, but fisherfolk operate them. It takes about 100 people to operate one net. A single fisher can only earn 400Tk in a day with his own gear or in a small group. Now, one can get 1,000Tk or more in pay working on the big nets of the powerful people. Since most of our fisherfolk are poor, they often do this for money to survive. We cannot survive on 400Tk per day for long, but we do well on 1,000Tk. That is ample. With non-VCG members some of our poor VCG members may also work on the big nets despite our efforts to motivate them through awareness-building. Motivation does not always work.

Another interviewee (Shantir Bazar VCG) claimed that raising awareness can be effective, to some extent, among the general people of the community, but not among the “powerful people.” According to this respondent:

Our efforts to raise awareness only reach the common people of the society, and only some of them listen to us and follow our recommendations. However, we can hardly reach powerful people. Occasionally, the powerful people may listen to what we say but not follow through or even care.

This statement, supported by other findings from this research, indicates that awareness-building programmes can generally work for those poor individuals who do not have to rely on wealthier people for their incomes. Majority of the focus group participants mentioned, bird hunters are especially poor people, but awareness-building proved effective at motivating them to work against excessive bird hunting as a means to protect the long-term viability of their trade; these people largely eliminated the practice. Yet, the poor fishers admitted taking salaries from the “powerful people,” who are able to buy nets and hire workers, continuing to loot the *haors* of fish – despite the awareness they had developed through the CBA-ECA project. Poverty diminished the ability of the project’s awareness-building activities to enhance the human driver of capacity and, in turn, enhance community resilience.

6.2.2 Inappropriate Training

CBA scholars attest that capacity-building and skill-enhancing training must be arranged and provided to make community-based adaptation projects effective (McClymont Peach and Myers, 2012; Remling and Veitayaki, 2016). The training offered through the CBA-ECA project was aimed at developing a number of skills among the target population that were deemed useful for the community. Analysis of the data revealed that the training offered through this project had been arranged to focus on trades without consideration of the needs and preferences of the trainees. This, plus a limited scope of trades to select from and communication as well as language problems with the trainers, reportedly made the training less effective. One of the representatives of Dosghori VCG reported in their interview:

Many people were interested in learning to drive. However, it was not on the training list. Driving skills – especially for driving CNG auto-rickshaws – are in high demand nowadays. By driving these vehicles, one can earn a satisfactory level of income. This could help to reduce our dependency on income from the wetlands.

Another interviewee (Kushiara VCG) noted that the training had been arranged to support a narrow range of trades, which limited future opportunities, saying:

Training had been arranged for some limited trades. Therefore, participants did not have many options. They participated in training because their friends were going. After completion of training, many of them could not earn anything from it because we don't need many tradespeople here.

An interview participant from Ideal VCG offered an additional reason for the poor results achieved from the training provided by the CBA-ECA project, explaining:

There were many participants in the tailoring course. However, some people were already working with sewing machines in this area. Unfortunately, the number of customers is rather limited in this poor area. Additionally, ready-made items are available at local markets for a significantly lower price. This makes people opt for ready-made clothes. These matters were not considered by the CBA-ECA project before selecting trades and supplying equipment. In my opinion, this is a major reason why some of the CBA-ECA project activities have not been effective.

The most frequent complaint (from 55% of survey respondents) about the training was that it was not long enough to make them proficient at the skills nor marketable for employment. Participants also reported that they faced communication problems with their trainers. Usually, people of the Hakaluki *haor* are shy among outsiders, who are usually higher-status people from the city, often State agents like police and teachers. Moreover, the Hakaluki people have their own dialect; the trainers were from outside areas. According to many respondents, while

they did not understand the official Bengali language used by the trainers, they felt it was not their place to embarrass their high-status teachers by telling anyone about this problem. As one representative from Udayan VCG said in their interview:

We did not understand much of what the trainers were trying to tell us. People were too shy to ask any questions. It would have been better if the training organisers had brought trainers from our region who could speak to us in our language as equals.

An NGO official supported this statement, but noted the difficulties in securing local trainers, saying:

As per the guidelines, we got trainers from various government departments who were, however, not local. It was difficult to arrange qualified trainers locally. We might have been able to get some of them from Sylhet city, if we'd had enough time.

There may have been many conditions under which beneficiaries had participated in training – either at the request of their peers, or just for show; either they had received training in a skill that was not marketable, or they had sat through training that they could not fully understand. But after completion of the training programmes offered by the CBA-ECA project, many participants were unable to derive any benefit.

Participatory resource management has been proven to be ineffective when the preferences of local people are ignored, the types and quantities of technological resources are incorrect, and the technologies are incompatible (Mamun et al., 2016). The development of individual resilience can be supported by appropriate human resource management strategies that focus on building capabilities first, then skills which are in high demand in the trainees' area of residence (Douglas, 2021). The CBA-ECA project arguably did not provide enough training relevant to the demand in the community. Training should always be a means to an end, but the CBA-ECA project provided training, in some cases, as an end to itself, not sufficiently linked with earning opportunities suitable for all participants; this weakness in their approach also undermined their effort to build community resilience through the human driver of capacity.

6.2.3 Lack of Market Access for Diversified Crops

Community access to and ability to use technology as well as the development of appropriate market linkages can strengthen multiple drivers, ensure long-term benefits, and result in community resilience. Aiming to enhance the resilience of communities to the pressures of climate change through training to support the human driver of capacity, the CBA-ECA project provided crop diversification training to local farmers in technologies used to facilitate improvements in vegetable cultivation. This training was reportedly popular with many farmers while the project was operational. However, as Simane and Zaitchik (2014) have argued, the long-term success of future resilience-building by CBA projects working to diversify the livelihoods of farmer beneficiaries will depend on whether such projects can establish appropriate market linkages between the target growing communities and the consumers meant to buy the products grown. My results confirm the importance of such linkages, indicating that, after the completion of the CBA-ECA project and the departure of project staff, farmers were unable to continue raising and selling the new crops without support.

Interview data showed that the produce grown by these beneficiaries were neither added to the existing value chains nor created as a new value chain, to ensure that farmers would be able to receive maximum value for their products. There was no linkage scheme between farmers and markets: the farmers were far from markets and the new products were unfamiliar to local people; therefore, farmers faced difficulties in selling their crops. Day by day, farmers lost interest in producing the alternative crops, because they earned nothing from doing so. The net long-term impact of the crop diversification training was, as a result, minimal. This experience was shared by many respondents in their interviews and focus group discussion, who reported that the sustainability of their achievement was hampered due to poor monitoring, lack of local demand, and a lack of buyers. Ultimately, these barriers were all associated with a lack of market linkage.

One respondent (Dosghori VCG) explained, during their interview, how poor market linkage damaged their business:

I have taken training in vegetable cultivation. I began cultivating vegetables after completing my training. Unfortunately, I did not get a good price for the

vegetables I produced. Before starting training, I learned that many people had benefited from gardening. This inspired me. People who live near a city or large market can sell vegetables at a good price. People in our area are poor. They eat just one curry a day. Typically, they prefer to buy either fish or eggs rather than vegetables. I would get a good price if I could sell to the city market. Taking just a small number of vegetables there would not be practical for me. My farm isn't very large. I would not be able to recoup my transport costs if I were to take a small number of goods to the city. I've realised that this training has not been my best career choice.

Another participant from Halla VCG reported that they produced sunflowers (for oil) after the CBA-ECA project had introduced this alternative crop, and that they were happy with the production; as a crop, sunflowers consume less water. However, they were frustrated after the harvest, for several reasons, and lost interest in continuing this business. As they explained:

Once we cultivated sunflowers as an alternative crop in our area using the endowment fund. The purpose was to generate sunflower oil and encourage the local people to develop this industry. Although the production of the crop was satisfactory, we did not get the benefit of it because there was no oil-making machine in our area. Therefore, we could not make oil from this crop, and no one wants to buy the raw sunflowers. Then we became demotivated from further cultivation. It is easy to produce sunflowers, since they consume less water compared to rice, and we have a water crisis. However, there is no demand for sunflowers in our area.

In the focus group discussions, participants expressed the opinion that the decision to not establish market linkages for the produce of local farmers had been a critical failure of the CBA-ECA project. As an example of a successful market linkage, a group of ten to 20 farmers producing the same crops might gather their product in one area and send it to the city market. This could either be arranged by someone from outside the producer groups or by someone from the beneficiary groups. Had the CBA-ECA project taken this approach, a sustainable business model could have been established. This process could have been used to connect to any existing value chain or to create a new value chain, but it required the development and

implementation of a well-designed plan to unite the farmers and connect them to market traders, which the project did not provide. This failure significantly weakened the ability of the project to leverage the human driver of this training component to support community resilience.

6.3 Factors Impeding Social Drivers

Social drivers facilitate interaction among community members both internally and externally. Even when they aim to meet needs common to members of a community, many community-based initiatives can fail through a lack of social cohesion and collaborative relationships. It was evident from interviews that some (13 out of 28) community members believed that the trust and mutual assistance that grew out of their participation in the CBA-ECA project helped them to grow as people as well as to build their resilience, both individually and as a group, against external shocks. Yet, other (15 out of 28) participants in the VCGs also expressed their experience of poor relationships, conflict, and difficulties dealing with social issues within the group that undermined the efforts of the project.

6.3.1 Internal and External Conflicts

It is reasonable to expect that interpersonal conflicts occur because human beings have unique characteristics that make them stand out from others. Conflicts often occur within various social groups, including community-based organisations, in response to these differences. Community conflicts may occur on a micro-micro level, within the community (internal), and on micro-macro levels between community groups and outside government, private, or civil society organisations (external) (Grimble & Wellard, 1997). In the context of resource management, these conflicts can also be divided into two types, conflict that arises between those who are directly involved with resource management (internal) and conflict between those directly involved and those who are not directly involved (external) (Conroy et al., 1998).

Comments in interviews and focus group discussions indicated that those VCG members who had had little previous experience of working collaboratively towards a goal had not developed

strong conflict resolution skills. Unsurprisingly, both internal and external conflicts arose during the planning and implementation of CBA-ECA activities that had negative impacts on the harmonious operation of the VCGs.

One VCG member interviewed (Halla VCG) explained how internal conflict ruined the performance of their VCG and caused members to grow apart:

Conflicts emerge in VCGs for a variety of reasons. From our VCG, we were managing a fish sanctuary. It is prohibited to catch fish from the sanctuary. We are supposed to take care of it, ensuring a safe place for the brood fish to increase fish production in the next year. Some of our VCG members suspected that those members living near the fish sanctuary were secretly catching fish from it. When suspicion spread and the executive committee of our VCG failed to resolve the problem, our VCG was divided into two groups. Then, one group sought shelter from the political leaders, while another group went to the court. They spent a lot of money doing so. In the end, this made it harder for the VCG to continue its work, although, initially, we had very good relationships and our performance was better than that of other VCGs nearby.

The adverse impact of internal conflict on VCG performance was specifically evident from reports associated with the performance of the micro capital grant (MCG) scheme, as expressed by a member from Jogri VCG: “Internal conflict arose over the selection of clients for MCG loans. After that, the MCG activities had to stop. Therefore, we could not get loans and utilise the funds that had been donated to the VCG.”

A significant bottleneck restricting the functioning of the VCGs often proved to be the lack of skills among members to deal with conflicts effectively and come up with lasting solutions. One participant (Dosghori VCG) described in their interview how an internal conflict between the officers of their VCG affected the group’s economic activities:

We could not take loans from our MCG for a long time because there were conflicts among the president, secretary, and cashier of our VCG. Conflicts started when the president and secretary wanted to provide loans for their

favourite people, violating the rules of the MCG. Then the loan activity was suspended and, therefore, our economic activities were seriously hampered.

In general, while some respondents in their interviews said that they had very good relations with members of neighbouring VCGs, external conflicts between VCGs were also reported. The most common cause of such conflict was over the selection of project locations, such as the citing of submersible embankments and Village Conservation Centres (VCCs). Sometimes conflict started when people had to decide where to build a VCC that would be shared between two neighbouring VCGs. Most VCG members demanded that the proposed VCC be built close to their villages. Conflicts between VCGs not only hampered the personal harmony among the members of the groups but also reduced the prospects for wider local development.

Focus group participants elaborated on this matter. They explained that the CBA-ECA project had established endowment funds which were designed to be spent by agreement across several VCGs. To access this funding, two or more VCGs from a sub-district were and still are required to prepare a project proposal and submit it to the custodian (the *Upazila Nirbahi Officer*) for funding. The fact that no endowment funds have been used in some *Upazilas* (described further in Section 6.6.2) demonstrates the reluctance of some VCG members to work jointly across areas, due to external conflicts.

Focus group participants recognised that, to stop illegal fishing, it was crucial that conflict become reduced and cooperation increased among the VCGs as well as between the VCG members and the illegal fishers in their areas. Respondents reported that, when the VCG members tried to stop illegal fishing, they faced a conflict of interest. One participant from Alinagar VCG explained during their interview how this destroyed their motivation on the matter:

In most cases, illegal fishing starts at night and ends before dawn. One morning, I, along with some of my VCG members, stopped some illegal fishers returning from the haor with a catch of undersized fish. I then contacted the police. The illegal fishers convinced the police that I had demanded a bribe after seizing their fish. The police believed the illegal fishers and charged me with extortion. I lost all my motivation to try to stop illegal fishing after that. And this is not the

end. This matter created conflicting situation among ourselves, the illegal catchers, my community, and the police, and it continued for a long time.

Conflicts between the two groups can arise in several other forms. As noted previously, disputes emerged during the project period between the two types of guards engaged in protecting wetland areas: those appointed by the *beel* lessees to protect their specific *beels* from illegal fishing, and those appointed by the VCG during the project implementation to prevent illegal fishing in the protected fish sanctuaries and illegal hunting anywhere in the *haor* area. When any illegal activities occurred in the *haor* during the project period, one group pointed the finger at the other. One NGO official (NGO Official-3) reported in the key-informant interview:

Conflict starts when one group blames the other for excessive fishing and hunting of birds. The organisationally strong VCGs can solve this issue locally. Issues that are not solved end up in conflicts that continue escalating with increasing hostility and intensity. In the worst cases, someone ends up in court.

According to participants in interviews and focus group discussions, conflicts arise both within the VCGs, among the VCGs, as well as between the VCG members and the outsiders for numerous reasons. VCG members lack the ability or the established social channels to resolve this conflict. Although the CBA-ECA project had a conflict resolution process in place, as described in the next section, it clearly did not succeed across all 28 VCGs in supporting the social drivers needed to facilitate cooperation and conflict resolution.

6.3.2 Ineffective Conflict Resolution Processes

Village Conservation Groups have a formal conflict resolution process in place that was set out by CBA-ECA project guidelines and was supplied to every VCG. As described in Section 4.5.1 and presented in Table 14, ECA management committees at each level of government provided the structure whereby conflict could be escalated, when needed. The first step of the formal conflict resolution process is for the VCGs to resolve the conflict amongst themselves. If this

fails, the matter needs to be placed before the *Union* ECA committee. If the *Union* ECA committee fails to resolve the conflict, it goes to the *Upazila* ECA committee. Referring to this process, one participant (Hakaluki VCG) during their interview said that whenever VCG leaders were unable to solve any conflict, they referred it directly to the local *Union Parishad*. Most of the cases were then decided politically rather than on the basis of the argument. This participant added that, as a result, the conflict resolution process did not function and characterised it as a formality.

During an interview, one respondent from Noyagram VCG offered their perspective on the matter:

When conflict arises within the VCG [internal conflict], there is no one to solve it because we do not have that much capacity. Then we feel that we need someone from outside who can help us. The Union ECA committee is supposed to resolve the problem. The reality is that most of the Union Parishad Chairmen (presidents of the Union ECA committees ex officio) are newly elected. They do not have enough knowledge of the VCG and ECA committee. Another thing is that, since they are political persons, they sometimes try to consider problems from a political point of view. Therefore, we are not that much interested in taking their advice.

In fact, 85% of survey participants noted that they did not have access to conflict resolution processes; they are unable to resolve any conflicts which arise in their VCG. One participant (Ideal VCG) during interview said that their VCG failed to resolve conflicts due to a lack of unity among the VCG members. However, several other participants in their interviews reported that they had resolved a number of problems with the help of their VCG leaders. This indicates that the way that conflict is addressed varies from VCG to VCG and is dependent on the level of unity among the VCG members and on the capacity of the leadership of the VCG to deal with conflict. This indicates that social driver is also dependent on human driver.

While the findings reported in the previous chapter suggest that VCG members benefitted from leadership training, it is clear from the above comments that this leadership training lacked a

focus on the development of conflict resolution skills and therefore hindered the development of social drivers to build community resilience.

6.3.3 Lack of Collective Voice

In the rainy season, most of the villages in the Hakaluki *haor* area turn into small islands and people's movements become restricted. This makes the *haor* very calm and quiet, particularly at night, when the general public usually do not move through the area. Under the cover of darkness, this isolated place becomes a safe haven for the illegal fishers. Defending the *haor* from these illegal activities at night requires collective action from all corners of the area.

The CBA-ECA project organisers hoped that, after having received appropriate training, the members of the VCGs would join together to protest any illegal activities. However, in practice, this did not work as expected. According to interviewees and focus group discussion participants, in most cases, the VCG members were unable to raise their voices collectively due to a lack of unity across the VCGs. In fact, the performance of such combined effort also varies from VCG to VCG, as one interview participant (Judhistipur VCG) explained:

We have good leaders, and we are well organised. We work collectively within our VCG. Our presence and activities to protest illegal fishing are very visible in the area. However, only a limited number of VCGs are working actively. Hakaluki is a huge area. To get better results, all the VCGs should work collectively and raise their voices against any illegal activities, including illegal fishing. But the reality is that we cannot reach that level. Some VCGs struggle with internal conflicts and some VCGs fight with each other.

Another interviewee (Noagaon VCG) echoed: "We cannot raise our voices against illegal activities because we lack unity as a team." Respondents noted that they need external support in order to collaborate effectively. A participant from Shapla VCG during interview said: "While the project was in operation, we did well. The NGOs encouraged us to work together. Later, when the project period was over, there was no pressure from anyone nor was there

encouragement, so working together was impossible.” While many VCG members wanted to work collaboratively against activities that would damage the wetlands, they clearly needed ongoing support to do so.

Most of the participants reported that illegal fishing decreased when the CBA-ECA project was running and increased thereafter; one interviewee (Salia-Kazirbondh VCG) explained why:

When the project was ongoing, we had many security guards throughout the haor. When people tried to catch fish illegally, security guards tried to stop them first. If they failed, they informed us. We went ahead and, at the same time, we informed the project officials over the mobile phone. The project officials lived in the town, just near the police station. They used to go to the police station physically and visit the spot with the police. This way we worked was very effective. Currently, we do not receive any information from the field level, the security guards. At present, we are alone in the middle of the process. Before, we had an upper level occupied by the NGO/project officials and a lower level with the security guards. Now, there is no one at the upper or lower levels of the process. The system no longer functions.

Interviews and focus group discussion data show that, vertical communication about illegal fishing was absent. Although CBA-ECA project staff had done so effectively, neither the community residents nor the VCGs had developed any social capital in relationships with the law enforcement personnel, including the fisheries officers and magistrates, who had the power to stamp out illegal fishing. Moreover, the parallel communication, such as that from VCG to VCG, was found to be ineffective. A majority of the participants in focus group discussions suggested that the amount of interaction among the VCGs needed to be increased to generate a sense of community between members. They also recommended arranging common programmes; for example, all the VCGs of a *Upazila* could observe International Environment Day together, or they could organise an “exchange views programme” to be held once or twice a year.

By shedding light on the social factors that impeded the building of community resilience through the CBA-ECA project, we confront the reality that ongoing problems like illegal fishing cannot be solved by short-term projects or without social cohesion. If a project does not

nurture and develop social drivers of social networks, structure, institutes, support, relationships, trust, and equity, project benefits can last only so long as the project does, and lasting community resilience becomes harder to achieve.

6.4 Factors Impeding Natural Drivers

Despite the fact that a number of measures were taken through the CBA-ECA project to protect swamp forests and properly manage fish sanctuaries – thus leveraging natural drivers of community resilience – analysis of the data revealed that the lack of consideration of local knowledge, the elite capture and the influence of social power structures were the most common impediments to the long-term success of such measures.

6.4.1 Ignorance of Local Knowledge and Values

Although the ecosystem, biodiversity, and disaster minimisation benefits of the swamp forest planting component of the CBA-ECA project were widely recognised by study participants, as described in Section 5.4.1, there were areas in which tree planting was less successful. A lack of knowledge among the project organisers of the local plants and conditions was a key factor that hampered the implementation of planting programmes in these areas. When asked to describe the causes for failures of the swamp forest plantings, participants discussed the size and source of the plants, the timing of plantings, as well as the lack of cooperation by powerful persons, all of which reflected the dismissal and/or ignoring of local knowledge. Examples of these factors follow.

The size of the seedling trees at time of planting had a significant impact on whether a planting would be successful. One interviewee (Belagaon-Sonapur VCG) who was involved in the tree planting described the process:

In total, we planted 3,850 trees. We were involved in the plantation process, but the plants were supplied by the NGO. Generally, the plants they gave us were about two feet long, though the standard length varied between three and five

feet. We did not want to accept the smaller plants. However, the NGO explained that they could not manage the delivery of large-sized plants, so they asked us to accept the provided plants. After planting, we observed that many plants had died due to their smaller size after being exposed to early flooding.

The size of the plants was not the only problem. 25% of the respondents working on swamp forest plantations said that the programme was inefficient and expensive because the plants were collected by NGO officials from another district, Sunamgonj, and brought to Hakaluki. Respondents said that this transportation added time and cost that would not have been required had plants been produced locally.

An interview respondent from the Ideal VCG noted how important the timing of the planting could be to the success of swamp reforestation:

Planting in the wetland is very sensitive. A seedling tree needs around 40 days to generate new roots. When new roots are growing, trees may go underwater. If their roots are established, going underwater will not affect their survival for the next year. In our case, we got the trees late. Our newly planted trees did not get enough time to generate new roots. When these trees went underwater, that destroyed most of the trees.

The implementation of forestation activities was also compromised by people who ignored the local values associated with this effort to protect the wetland ecosystem. A majority of the participants in the focus group discussions reported that – after the CBA-ECA project had come to an end – they observed that the number of trees, no longer protected by security guards, was declining day by day. They reported that it was not the local villagers who were cutting and carrying away trees from the swamp. Instead, respondents said that some of the security guards working for the leaseholders had been seen cutting the branches of the trees for their cooking, as well as cutting whole trees and throwing them to their *beels* to make fish shelters. These respondents proposed that a long-term project for tree planting was needed, with project security guards hired with a ten-year tenure.

Thus, the size of the plants, the timing of the planting, and the disregard for local knowledge and values all collectively contributed to failures over the longer-term of the swamp

reforestation programme initiated by the CBA-ECA project. Analysis demonstrates that the cause of all these issues can be traced back to one source: outsiders. Ultimately, the VCGs had to depend upon the NGO officials implementing the project for resources; when these outsiders left, the resources went away, as well. The outsiders also had a different opinion about what trees should be planted when; the locals were often unable to influence that opinion. Other outsiders, including powerful farmers and security guards, thought that they could use the *beel*, the funding, and the trees in ways that undermined the swamp reforestation project.

Local knowledge is also very crucial for resource management; ignoring this knowledge is bound to hamper the effectiveness of participatory projects (Klein et al., 2019) and the ability to enhance natural drivers to build community resilience. As an interview respondent from Judhistipur VCG explained, this failure to consider context and local knowledge undermined the success of the *beel* re-excavation component of the CBA-ECA project (which supported both natural and physical drivers, as described in Section 5.5.2), as well:

You cannot expect better results by just implementing some projects in the wetlands without identifying root causes and addressing the problems properly. There is a link between Hakaluki haor and the adjacent mountains. The mountains are losing trees gradually and generating a huge amount of siltation in the rainy season. Therefore, the re-excavation of beels is not providing the better results that were expected. Everything has gone back to the way it had been within a couple of years. People who approve projects from Dhaka neither know the root causes of the problems nor value our knowledge. They sanction projects as per their own formulae. They concentrate on one location and try to solve all problems within a short period. This is not effective and can only produce limited results.

A specific example of officials overlooking local knowledge came from another interviewee from Hakluki-Jagoroni VCG:

Siltation has been a serious problem in the river Shunai, locally called the 'Dead Shunai'. This river needs to be re-excavated, and we need to build a sluice gate to prevent siltation. We requested a project like this be started in this area, but we are yet to get any fruitful result.

It is clear from the above findings that lack of consideration of local context and knowledge hampered the long-term impact of the natural drivers that the CBA-ECA project sought to enhance.

6.4.2 Elite Capture and Adverse Impacts of Power Dynamics

In many cases, the operations of community organisations have been found to be dominated by local leaders and local elites (Krishna, 2003; Rahman et al., 2015). Lewis and Hossain (2008) found this to be the case in the open water fisheries in Bangladesh which, at the time of their study, were controlled by a small number of powerful elite people who maintain good connections with local government officials and thus obtain a disproportionate share of power; there is little to suggest that this has changed.

Although donor-funded participatory resource management programmes provide the scope for breaking power relationships by empowering women and engaging poor community members in development processes, Mamun et al. (2016) have argued that, because of the rigid social structures in the communities in which they operate, the initiatives developed by these programmes often fail to achieve their desired goals. Research has demonstrated the ways in which – through the established power dynamics within a community – powerful people have captured control of fisheries that are ostensibly being managed for the good of the community, which, in turn, hampers the resilience of the fishers who cannot fight these powerful elites for their right to their livelihoods (Khan et al. 2016; Hossain & Rabby, 2019).

As described in Chapter 5, one of the benefits of the CBA-ECA project was increased fish production. Analysis demonstrated that the re-excavation of *beels* and subsequent creation of fish sanctuaries, the protection of existing forests, and the planting and maintenance of newly created swamp forests not only helped to increase the number of fish species in the area but also contributed to rises in overall fish production. The poor fishers expected that – by catching and selling a greater variety and a larger number of fish – they would be able to increase their

financial resilience, but many were unable to achieve this. In many cases, so-called “powerful persons” of the society appropriated the benefits of the CBA-ECA interventions by circumventing the laws to catch fish (including brood fish and fishlings) at night. This was done on a large scale, using huge nets, and employing many poor fishers who, though ideologically opposed to such fishing, had little choice but to take the opportunity to earn money because of the financial pressures they faced. Findings from the data that revealed the extent to which this happened follow.

One natural resource of the wetlands the CBA-ECA project sought to protect was the brood fish because the protection of brood fish increases fish populations for subsequent years; the CBA-ECA project created fish sanctuaries and educated its VCG members to protect these fish. However, as one respondent (Kushiara VCG) during their interviews said, brood fish are regularly caught by “powerful” leaseholders who have access to the *beels* as part of the government’s resource management approach (refer to Jalmahal Act, described in Section 2.2.2). This Kushiara VCG member explained: “Brood fish are caught in winter when the water level goes down and water is only in the *beels*. The leaseholders catch these fish. They are powerful people, and do not care about us.”

Another interviewee (Noagaon VCG) suggested that the leaseholders, who are arguably involved in elite capture in this circumstance, do this out of greed:

We tried to motivate them, saying ‘if you do not catch brood fish, it will produce more fish in the fishing season’. Even though they do not want to listen to us, we keep telling them. The fact is that they know it, but they catch brood fish because of greed. They want to earn money instantly and cannot wait for next year.

One interview respondent (Nischintopur VCG) said their ability to protect fish was restricted to *beels* located near their VCG: “When leaseholders remove water from the *beels* to catch brood fish, we can try to protect them together, if the location of the *beel* is near our VCG. Otherwise, it is difficult for us to take fruitful measures.”

Another respondent (Borgaon VCG) described a harmful new technique that leaseholders were applying at the time of interview to catch more fish:

Leaseholders want to catch all the fish by removing water although it is illegal. Since we try to protect the beels when the leaseholders remove water, some corrupt leaseholders now apply harmful techniques for catching fish, including brood fish. They use a particular chemical that reduces the level of oxygen in the water so that the fish feel suffocated under the water and become exhausted, so they float. Then it becomes easier for the leaseholders to catch them. The interesting thing is that they are not removing water but catching almost all the fish. They are gaining for the short-term and creating problems for the society as a whole.

In interviews, 22 respondents out of 28 identified the forces behind illegal fishing as misuse of power, extreme poverty and greed, high levels of corruption, a tendency to resist cooperation, a lack of coordination, and the inability of the VCG members to raise their voices collectively. A majority of the participants in the focus group discussions echoed these insights.

The 22 respondents mentioned above specifically noted that attempts to reduce illegal fishing were hampered by the involvement of locally influential persons and outsiders who were either directly involved with politics or were politically connected. In the focus group discussions, there was an agreement among the participants that these powerful people had invested large sums of money to buy the most effective nets to catch undersized or brood fish, being actively involved in illegal fishing. They reported that the owners of these nets paid needy fishermen double their daily income to do this work at night and said that thousands of poor fishers were engaged in these illegal activities.

One participant (Padma VCG) offered their observation about this, saying:

From what I understand, there are two reasons to fish illegally. One is poverty, and the other is power. Let me explain: firstly, how will poor fishers survive if they don't catch fish all year round, including during the breeding season? They have no other means of income. Secondly, even though the poor fishers catch

fish, they only get a small portion of the income. The reason for this is that they are not the owners of the illegal gear that catches the most fish: the 'Kafri net', which not only catches small fish but also captures or destroys eggs floating on the water. Do you know who this gear belongs to? The owners are the powerful people in society. You hardly ever see them. Most people know their names but are afraid to tell others.

The use of such “illegal gear” by unnamed “powerful people,” both from inside and outside the community, creates unfair competition that stands in the way of protecting fish and fisheries by law. Respondents shared their concerns during interviews and focus group discussions that, through the illegal actions taken by powerful people, the fish resources will dissipate again, and numbers will be as they were before the project was implemented.

During interviews, respondents added that they no longer received assistance from law enforcement agencies for the fight against illegal fishing because the CBA-ECA project had finished, and NGO officials were no longer present. They suggested that the lack of enforcement of laws in place to protect the fish was, in part, due to corruption. One interviewee from Hakaluki VCG contended that “powerful people have some agents in this area. They pass secret information to them. These agents also help to preserve and carry materials, such as *Kafri* nets, for financial benefit.”

Complaints from respondents illuminated another problem that adversely affected the natural drivers that the CBA-ECA project aimed to boost through swamp reforestation: after the trees had been planted by the project, “powerful people” set their buffalo, under armed guard, out to the *haor* to graze, and the animals damaged the forest. Grazing buffalo in the *haor* is of great benefit for the owner, because the *haor* provides fresh, free, natural grass, the consumption of which increases the milk production of the buffalo. Further, it saves the significant cost associated with bringing in fodder for the whole dry season. One interview respondent (Akota VCG) described the situation:

Buffalos destroy trees, everyone knows that. During the winter, powerful people send a large number of buffalos to Hakaluki haor for rearing. 'Buffalo boys'

are used to protect the buffalo. These boys are ferocious and armed. We cannot stop them since they are too numerous. Even the security guards cannot intervene. The owners of the buffalos are powerful individuals in society, and they take advantage of their power.

The findings demonstrate that the CBA-ECA project was able to both establish systems to protect and enhance the natural environment of the Hakaluki *haor* and increase its participants' awareness of measures that can be taken to protect fish stocks and to increase their own resilience to the impacts of climate change, which, in turn, supported the natural drivers of community resilience. However, at the same time, these beneficiaries often found themselves, both during and after the project, unable to promote and maintain the strategies to protect the natural wetland resources so vital to their livelihoods from the greed and cunning of people with greater power. This power differential and the behaviour of the “powerful people” diminished the ability of the natural drivers to support desired outcomes.

6.5 Factor Impeding Physical Drivers: Lack of Consideration of Stakeholder

Opinions

While the data demonstrated the numerous benefits to the community of the physical drivers associated with infrastructure put in place by the CBA-ECA project – submersible embankments, (re)excavated *beels*/fish sanctuaries, and VCCs) – the inability of project organisers to facilitate agreement around the location and use of Village Conservation Centres (VCCs) proved to be a critical factor that undermined the ability of local VCGs to activate this physical driver.

The rationale for building VCCs and their operational purposes are described in detail in Sections 4.5.2 and 5.5.3. While the intent was to have permanent offices for each VCG that could accommodate discussion rooms, training classrooms, and multi-purpose spaces for meetings, the reality was that, ultimately, ten VCCs were built. Because there were 28 VCGs in total, some facilities had to be shared by two nearby VCGs until VCCs could be built for all VCGs.

In fact, it proved impossible to get the VCGs to share a VCC, for a number of reasons. According to the interview responses of four VCG members out of the ten whose VCGs received a VCC, the opinions of stakeholders were ignored in the initial selection of VCC locations. Although this figure does not reflect the majority view, I think it is important to highlight, because these respondents also informed me that, sometimes, the decisions to locate VCCs in certain places created conflict between the VCGs that broke down the possibility of developing positive, constructive relationships and thus of boosting valuable social drivers of community resilience. Indeed, some VCGs went so far as to seize their local VCC and refuse to share it with their partner VCGs. In other cases, the conflict between the two VCGs reached an impasse and the VCC they were meant to share was left unused by both. A statement by one interview respondent (Hakaluki Jagoroni) clearly reflected this second situation:

We selected a place near Kanongo Bazar for our proposed Village Conservation Centre. This place was near our VCG. However, the project officials decided to build the Village Conservation Centre near Halla Village and asked us to share the VCC with Halla VCG. This arrangement created conflict between the two VCGs and now none of the Village Conservation Groups is using this Village Conservation Centre.

In their interview, an NGO official confirmed how difficult it was to set up VCCs, which met the expectations and needs of all stakeholders, saying: “Due to resource constraints, some VCGs need to share the Village Conservation Centres and it is difficult to satisfy all the stakeholders when selecting a suitable place for constructing the VCC.”

During my field visits, I found one VCC completely idle due to conflict between two nearby VCGs, with neither intending to use it, and another VCC used by only one VCG instead of two. Thus, despite the best intentions of the project organisers, the goal of creating sustainable infrastructure to serve as physical drivers that would enhance community resilience was difficult to achieve in practice.

6.6 Factors Impeding Financial Drivers

As noted in Section 5.6, the CBA-ECA project achieved some degree of success in improving the incomes and livelihoods of its beneficiaries, enhancing financial drivers to support community resilience. However, findings also indicate that insufficient funding, a lack of capacity of the VCG leaders, problems of access, and the lack of social capital impeded the implementation and impact of both the micro capital grant (MCG) and the endowment fund programmes.

6.6.1 Insufficient Funding and Other Management Issues

In addition to being more accessible than loans offered by banks or other providers, the micro capital grants (MCGs) offered by the CBA-ECA project had the potential to ensure gender equality and maintain social equity during lending (details explained in Section 4.5.7), which made the MCGs arguably better than other available credit alternatives. However, the analysis of the results shows that the MCGs were unable to fulfil the expectations of the true target group, the majority of whom were farmers and fisherfolk who were not middle-class but poor. These people needed far more credit than the MCG could offer. When the MCG they received was insufficient to buy the fishing gear, tractors, fertiliser, or farm animals that they actually needed to improve their livelihoods, the target population typically used the loans to cover household expenses instead. A micro capital grant spent on ordinary expenses generated no income for repayment, kept farmers indebted, and made zero contribution to their climate change resilience. Most of the revolving funds collapsed when borrowers did not repay, and the MCGs ended.

Given that most local farmers and fishers in the study area are poor and the MCG loans are not large enough to help them build livelihoods independent of the *haor*, then the MCG, at best, can support the climate change adaptation of only the more financially stable recipients who can pay their loans back and therefore supplement the MCG fund.

An interviewee from Boromoydan VCG typified those who had failed to achieve their goal because the loan amount was too small:

I received a loan from MCG and bought a calf. Although the rate of interest of MCG is favourable, the amount I was given is not sufficient to start a business. Those who have some savings can do something with this MCG loan. If I could buy three to four calves, I could dedicate all my time to rearing them and get a good return on my investment.

Another interview respondent (Noyagram VCG) who is a fisher, explained that the MCG loan had proven useless to him and in fact became a burden:

I had a plan to buy fishing gear. Since the loan amount was very small, it was not possible to buy the gear I wanted. I tried to borrow some money from other sources but failed. Therefore, I spent this MCG money for other purposes which did not give me any return. In my opinion, I wasted the money, and am now facing difficulties repaying the loan amount.

After completion of the CBA-ECA project, some VCGs stopped their MCGs programmes due to excessive defaults on repayments. Analysis of the interviews shows that, in addition to insufficient loan amounts, internal conflicts, leadership crises, as well as coordination and monitoring problems, are perceived as other reasons behind the closure of the MCG programmes. Analysis also revealed that many VCG members did not like the idea of the VCG requiring interest to be paid on loans that had been funded with donations that the VCG itself did not have to repay.

A majority of the participants in the focus group discussions stated that the performance of the MCGs has varied from VCG to VCG due to the differing management skills of the VCG members and, in particular, of their leaders. During field visits and household interviews, I also observed that about half (13 out of 28) of the VCGs were suffering from various problems with handling the MCGs, such as internal conflicts between VCG members and non-cooperation from the MCG recipients as well as issues around refunds and repayments.

Despite the success stories of a few, the net long-term result from the micro capital grant scheme was often nil for many poor farmers and fisherfolk. Results show that after completion of the CBA-ECA project, some VCGs continued to supply small one-off loans to the middle class; this improved the cash position of the borrowers a little and lowered the interest expenses they would have had to pay had they borrowed from other sources. Ultimately, findings demonstrate that these grants were unable to serve as a financial driver of community resilience for the communities most in need.

6.6.2 Communication Problems: Information Gaps and Problems of Access

As described in Section 4.5.8, the endowment fund that the Department of Environment authorised the CBA-ECA project to operate was intended to be used cooperatively by the VCGs to maintain the sustainability of components such as diversified crop production, *beel* (re)excavation, and submergible embankments. On paper, putting the endowment fund into the bank accounts of the *Upazilas* seemed a good idea. The *Upazila* is the centre of local government in Bangladesh. Having the chief executive officers of the *Upazilas*, the *Upazila Nirbahi* Officers, as conservators of the funds was sensible. Nevertheless, results show that this initiative has failed to bring about the expected results and that, in fact, this fund has been poorly used due to problems associated with human and social drivers such as the capacity of the VCGs to handle this fund (human driver) and communication problems within each VCG (between VCG leaders and VCG member) between the VCGs (from one VCG to another), as well as between VCGs and the government officials (social drivers).

Interviews revealed that, even though I was able to confirm their existence in State bank accounts, the majority of the respondents (20 out of 28) were not even aware of the endowment funds. One respondent (Shantirbazar VCG) said that they did not have any idea of the endowment fund or how to use it. Another (Noyagram VCG) said that the first time they heard the name of the fund was when I asked them about it. One from Ratkhal VCG said that they knew nothing about it. Only a few respondents could explain the purpose of the endowment fund and describe how it was utilised in their areas. These statements illuminate a clear information gap between VCG members (general members and their leaders) and those operating the endowment funds (Upazila ECA committee).

Given how few of the interviewees knew about the existence and purpose of the endowment fund, it is not surprising that 90% of them expressed their opinion during their interviews that the fund was not being used properly. It was assumed by the CBA-ECA project planners that handling the endowments at the local level would ensure the availability of funds, reduce the time gap between asking for and receiving funding, and create opportunities for the local administrators (from the sub-districts), working with other (*Union* ECA and VCG) committee members, to build institutional capacity. However, the data shows that availability did not result in true accessibility: an information gap between the VCG members and the more recently appointed *Upazila Nirbahi* Officers limited the number of projects funded while the CBA-ECA project was running and brought that number down to nearly zero following the winding up of the CBA-ECA project.

It is worth noting that – while the CBA-ECA project was operational, and with help from project staff – some VCG members did manage to cooperatively access and utilise the endowment fund to cultivate mustard, repair barrages, and to distribute vegetable seeds. The most common complaint by those who had used the fund was it was difficult to access without assistance.

One respondent (Boradal VCG) explained how their VCG had relied upon “the project people” to receive endowment funds to cultivate mustard:

We cultivated mustard in favour of all the VCGs at our Upazila, using grants from the endowment fund. The purpose was to show local people that it is possible to cultivate alternative crops like mustard in this area. Local people became interested in cultivating mustard at that time. However, after the completion of the project, there was a communication gap between the local people and the Upazila Administration. We needed to go there and submit a project proposal for the fund since the custodian of the fund is the Upazila Nirbahi Officer. Before, the project people had completed this formality on behalf of us. We just used the fund. We did not know how to complete the forms, so we could not get the funds ourselves.

In this case, although the project funded by the endowment had been successful in its aim to attract farmer interest in growing a new crop, the VCG members had not been empowered by the CBA-ECA project with the skills they needed to build on this success. Instead, they remained dependent on external parties like NGOs, which suggests that the CBA-ECA project did not activate this specific human driver to build financial community resilience.

Notably, the majority of the interview respondents who had received funding from the endowment (three out of five) found getting money from this fund to be slow and difficult. In response to this criticism, one NGO official (NGO official 2) reported that complexity of access was intended as a means of ensuring transparency:

Although this fund has been kept at a National Bank under the custodianship of the Upazila Nirbahi Officer, any decision taken for the utilisation of the fund needs to be taken by the Upazila ECA committee. This process made use of the fund more transparent but surely also time-consuming and a bit lengthy.

Another problem with the operation of this endowment fund is that the *Upazila Nirbahi* Officers are regularly transferred; new officers do not receive training on its administration. Within several years of the 2015 closing of the CBA-ECA project, most *Upazila Nirbahi* Officers (those who were new to the role) did not even know about the endowment fund unless someone had made a claim against it. As one *Upazila Nirbahi* Officer (Golapgonj) said: “I have only been posted in this *Upazila* for a couple of months. Nobody has submitted any project proposal for consideration to release money from the endowment fund. No one has even informed me about the fund.”

As most villagers and new committee members (newly elected *Union Parishad* Chairman and newly joined *Upazila Nirbahi* Officers) knew nothing about the funds, they were not able to make use of this service to which they were entitled. My research strongly suggests that a lack of communication from the VCG leaders (president and secretary of the VCG) and the *Upazila Nirbahi* Officers about availability and access allowed the endowment funds to sleep in the banks. One NGO official with experience in this area (NGO official 3) countered this suggestion by contending that the endowment fund had been overlooked due to a lack of community-mindedness, saying:

VCG members are concerned about their individual matters or, at best, about their own VCG. Their first concern is whether the matter pertains to their own benefit or not. Since endowment funds benefit the society as a whole, VCG members are not that much concerned about the endowment fund. They are not interested in communicating with other VCGs and making a joint decision.

At the time this research was conducted, I found that the existence of the endowment fund was largely unknown to the people it is intended to serve. Whether this was due to poor communication or self-interest, it becomes clear that underdeveloped social drivers were – at least in part – to blame for the inability of the endowment funds to enhance the financial drivers of community resilience as they were intended.

6.7 Conclusion

While the CBA-ECA project is associated with numerous success stories for individuals that one might expect could coalesce and develop wider community resilience, it has also failed its target population in many ways – both during and after its operation. Working through the study participants' criticisms of the various components from the perspective of each driver for community resilience and identifying common themes in the data found the shortcomings of the CBA-ECA project as the following: a lack of integration among the community people, a lack of trust in local knowledge, a low level of awareness, and an unfair distribution of resources. All of these have hindered the attempts by the CBA-ECA projects and the members of its VCGs to build community resilience.

Security has proven to be a key issue for the sustainability of outcomes, as there was overall consensus of respondents that the dismissal of full-time project security guards following the termination of the project left no formal way to protect the community resources that directly or indirectly contribute to the livelihoods of those in the VCGs. This hampers prospects for a range of positive outcomes for the community resilience of members of the VCGs that would otherwise be possible from participatory wetlands management. Without the external support

of security guards or other officials, VCG members have proven to not be united enough to raise their voices collectively against illegal activities that undermine conservation and adaptation efforts. This matter was not addressed properly during the CBA-ECA project period, and, without the support of the project, is likely to be too difficult for the locals to resolve.

Chapter 7: Governance Factors Undermining the Participatory

Wetland Management System of the CBA-ECA Project

7.1 Introduction

Analysis of the data collected in this study indicates that community involvement at various stages of participatory wetland management, as it was engaged through the CBA-ECA project, had some effect on the building of resilience among the climate-vulnerable people of the Hakaluki, but not enough, especially over the long term. One driver that I have yet to address is that of ‘governance’, which, as explained in 2.4.5 Table 4 / 3.6 Table 7, reflects the extent to which community members and stakeholders participate in project planning and decision-making. Governance specifically encompasses the mechanisms that managing bodies put in place to ensure transparency and accountability through community/stakeholder participation. This chapter presents factors that negatively affected the governance drivers of community resilience, revealed through the way the project formed VCGs, involved the community in the planning, implementation, and management of project activities, coordinated with other relevant parties, and handled finances.

The findings of this study reveal that – while the CBA-ECA project managed to actively engage locals in the planning and implementation of its activities – it occasionally encountered barriers that arose because wetland governance in the Hakaluki was not always consistent across its multiple layers; furthermore, local and central government interacted in ways that were sometimes undermining.

The results in this chapter were derived against the governance driver set for this research, from the identification of key themes from the interviews and focus group discussions, and from quantitative results from the survey questions that addressed governance. This analysis helped me to comprehend the extent to which the approach of the CBA-ECA approach to wetland management, which incorporated community involvement and systems of governance, has influenced the resilience-building process of communities depending on the Hakaluki *haor*.

With this understanding, I can better evaluate community-based adaptation as a means of wetland governance wherever it is used.

Key findings of this chapter:

- VCGs were less effective to the extent that they failed to include representatives of stakeholder groups who have a real interest in the results of the project and are in a strategic position to make the project a success or a failure, like the *beel* leaseholders in the Hakaluki.
- Those who were recruited as VCG members were not equally committed to the cause as laid out in the objectives of the project: the inclusion of enemies did not turn them into friends.
- Selection of locations for project implementation did not consistently reflect the knowledge and preferences of local residents.
- Planning with local people without giving them effective roles in implementation resulted in activities that were well planned on paper but ineffectually carried out in practice. True community-based adaptation, which requires the involvement of beneficiaries and stakeholders throughout all stages of activities, did not occur consistently under the CBA-ECA project.
- The building or lack of close working relationships between project managers and community residents was key to the success or failure of project activities.
- A number of CBA-ECA project outcomes and processes faded out within two years after the project had concluded, due to the dependence of its beneficiaries on the skills and networks of project staff. This rendered the impact of the project on community resilience merely temporary.
- While the CBA-ECA project aimed to facilitate cooperation between VCGs, civil servants, and local governments, this was difficult to achieve and, in many cases, did not eventuate.

7.2 Problems with the Selection of Village Conservation Group (VCG) Members

The development of community resilience depends heavily on the establishment of institutions such as community-based organisations (CBOs) and the performance of the CBO members (Ellis & Abdi, 2017; Masud-All-Kamal & Nursey-Bray, 2021). As described in the literature review chapter, the sustainability of these institutions depends on capacity-building initiatives that support the members to develop democratic practices, establish fiscal discipline, and secure the participation of other local-level institutions. Community-based organisations get results for the environment particularly, by creating networks through which to disseminate information and respond to environmental issues efficiently and effectively (Khan et al., 2016). In the case of the CBA-ECA project, village conservation groups (VCGs) served as local-level CBOs.

As previously stated, the CBA-ECA project aimed to build the community resilience by increasing their capacities and involving them in participatory wetland management. The outcome of the project activities largely depended upon the performance of the VCG members involved, so it is critical to reflect on who was and was not recruited into the VCGs, and on the causes of membership-related problems.

7.2.1 Nepotism

When a certain group of people in the society use their power and influence during the formation of a community group to select members who will follow their lead, they can maintain the homogeneity of the group and prevent the benefits associated with community action from reaching those most in need (Rahman et al., 2015). Several community resident interview respondents said that financially and politically influential members of their area initially used their power to include their followers while forming the VCGs; these respondents believed, subsequently, such followers interfered in the group decision-making process in many ways. For example, in a VCG meeting, members typically openly discuss any issue and take decisions on the basis of opinions expressed by the majority of the members; interview

participants reported cases in which influential members instructed their fellow participants what to say at the meetings. An interview respondent from Hakaluki-Jagori VCG noted:

Some members speak in the meetings as they have been instructed by others, or they are representing someone else without considering the interest of the community as a whole. Yet some other members, with broader concerns, remain silent. Therefore, the decisions are, in effect, determined by the influential members who can instruct their followers.

This observation was confirmed by an NGO official (NGO Official 1), who said in their key-informant interview:

The main purpose of forming the conservation group was to reduce undue influence over decision making about the haor. However, we were forced by local politicians to include locally influential people as VCG members. Therefore, the views and interests of other members of the groups were neglected.

This imbalance in decision-making in VCGs has largely been driven by the pre-existing economic and social status of the silent majority of the local stakeholders, who are farmers and fishers and live in extreme poverty. Because of their social status, these general members rarely feel free to express their opinions in the presence of local vested groups. In practice, it is reportedly usually almost impossible to form any groups in the area without involving and gaining the permission of the “influential people.”

7.2.2 Project Opponents

Field data shows that the inclusion of individuals in the VCGs – who were hostile to the goals of the project – also limited the success of the projects. Many people who were directly involved with illegal fishing and illegal logging from the Hakaluki *haor* secured VCG membership. While there was criticism of decisions that resulted in these people becoming

members, there was a belief among the decision makers that these people would change their attitudes after having received proper training and through their interactions with the other members. However, results show that the majority of these non-cooperative people never changed their position of hostility toward the goals of the project; further, they made a point of not performing duties assigned to them.

An NGO official (NGO Official 4) explained:

During the formation of the VCGs, some people who were known to have engaged in various illegal activities related to the use of wetland resources were selected as members. The primary reason for selecting them as members was that they had incredibly good knowledge of the haor. It was assumed that, after getting training on the ethical and moral aspects of resource management, they would become an asset to the group and contribute to the conservation of the wetlands. However, while some of them did change their attitudes and helped us, others remained unchanged.

In some cases, people with hostile attitudes reportedly influenced other people in a kind of cascade effect that often hamstrung the VCGs. Ultimately, this cascading hostility created an atmosphere of non-compliance, which had a negative effect on the success of the project as a whole. During their interview, a respondent from Halla VCG described such “bad members”:

People with bad intentions do not change. There are some bad members in our VCG, and we are facing various problems because of them. For example, they never repay MCG loans. Additionally, they influence other members of the group to not repay the loans. They make comments in public places, saying that the cashier or Executive Committee can do nothing if they do not repay the loans. Therefore, the number of defaulters is increasing gradually in our VCG.

While the majority of the VCGs envisioned the MCG as a revolving fund, under which today’s borrowers created the funds for tomorrow’s loans, oppositional members took issue with the fact that the MCG funds themselves did not need to be paid back to the original funding source. They lead debtors’ strikes and assured other VCG debtors that the VCGs could not enforce

their obligations to repay what they referred to as the MCG ‘grants’. This undermined the positions of VCG cashiers and Executive Committee members, and the number of defaulters increased day by day. Where a significant number of debtors participated in these strikes, the MCG accounts simply emptied out and the VCGs who held those accounts had to abolish MCGs in their respective jurisdictions.

This sort of behaviour was commonly reported by key informants, who indicated that it was worsening. The problem lies at the root of VCG formation and operational processes: most often it is not possible to take enforcement action against cases of non-cooperation with or subversion of the project. In interview, a respondent from Hakaluki-Jagoroni VCG explained:

We cannot suspend any non-cooperating members from the VCG because it is a registered entity with the Ministry of Local Government and Cooperatives. We must follow the Ministry rules and regulations. Thus, the VCG must be elected, whether we like the elected members or not. So, bad people, who want to abuse the project, vote for people like themselves and unfortunately, they are the majority.

The opponents of the project were elected to the VCG because of their money and influence, which was there long before the VCG existed. The VCG is in no position to take it away. This scenario of [typical fraudulent use of the MCG system] identified and shared by the VCG members during their interviews. Falls vouchers [falls bills prepared without purchasing anything or charge additional than the real spending] are commonly used. This scenario, given by a Borgaon VCG member in their interview, paints a very clear picture:

Five people from the vested group make a false claim for BDT100 with fake vouchers. The money is then divided among them. In contrast, if the VCG had elected VCG officials with good moral character, such claims would simply be rejected, and no one would be able to defraud the system like that. Yet our VCG leaders approve such claims because the claimants are their supporters, and they may even take a share of the ill-gotten gains.

One of the respondents from Volerkandi VCG, during their interview, described similarly unethical behaviour, amongst VCG members involved in safeguarding biodiversity and resource management activities:

Sometimes, VCG members appointed as community guards for the fish sanctuaries do not perform their duties properly. Sometimes, they are even the ones catching the fish and committing other crimes. They pass confidential information to their friends. This is happening more and more often.

From the above examples, it becomes clear that the inclusion of inappropriate people who, in fact, opposed the aims and objectives of the CBA-ECA project, undermined its success. Attempts were made to solve this problem, according to focus group participants, who mentioned that attempts to restructure the old VCGs had been taken but proved unsuccessful. As they explained, restructuring required the development of complex administrative procedures and the expulsion of existing members. The VCGs that tried to restructure and expel members faced a political backlash from these expelled members and this weakened the status of the VCGs in the wider community.

7.2.3 Exclusion of Beel Leaseholders

As has already been explained, *beels* are particularly important natural resources in a *haor* ecosystem. Under the Jalmahal Act 2009 (see Section 2.2.2), the wealthier fishers in the community – through their professional associations – have been able to take leases for a certain period from the government that give them the responsibility for the overall management of and the opportunity to harvest resources from the *beel* that they have leased. There are VCGs in which these *beel* leaseholders are not included as members. According to the key informant interview statement, the reason for this is that – during the formation of the VCGs – the rich fishers, as lessees, showed little or no interest in participating. These rich fishers argued that if they participated, they would lose what they perceived as their right to use their leased areas as they saw fit.

Interviewees expressed their perception that the *beel* lessees who are not members of VCGs do not engage with VGC members and are reluctant to join in activities arranged by the VCGs, such as awareness-building meetings. A number of VCG members complained that *beel* lessees often do not obey the rules and regulations for catching fish: they catch brood fish during winter and, consequently, poor fishers do not get enough legal-sized fingerlings and adult fish in the successive years. Interviewees suspected that lessees feared that VCG members would restrict their freedom. Clearly, there is a conflict between *beel* lessees and the less-affluent members of the VCGs.

Researchers contend that representation of all segments of a local population needs to be ensured at every stage of a community-based adaptation (CBA) project (assessment, planning, implementation, and evaluation) for its effective and sustainable operation (Reid et al., 2009; Sherman & Ford, 2014). Failure to incorporate leaseholders as VCG members arguably makes these community-based organisations less participatory and less likely to achieve their aims. As a key informant (NGO Official-2) said: “*Beel* lessees are not generally involved with VCGs. Therefore, VCGs lose their diversity and strength. To me, for this reason, formation of VCGs remains incomplete.”

Findings indicate that a number of components of the CBA-ECA project [selection of locations of the *beel* excavation, training trades, and monitoring activities] suffered from a lack of genuine, open community input from a broad range of local stakeholders, resulting from failures of project organisers and VCG leaders to acknowledge and manage differences in income, status, occupation, and character.

7.3 Lack of Community Participation in the Design of Project Activities

As repeatedly noted, the success of community-based adaptation (CBA) projects relies on the active participation of community people at various stages of such projects. Since the people involved with CBA projects are accountable to the community, a CBA project is considered successful if the people in the target community are participating in it (McNamara & Buggy, 2017). The survey data reported in Table-17 indicate that just under 80% of those surveyed had

participated at least partially during the design stages of the project activities. However, during interviews it emerged that VCG members from the community expressed their opinions during the planning processes, but many of their ideas were not reflected in the final decisions. Details analysis presented below.

Table 17: Participation in selection of CBA-ECA project activities

Participation	Number of Respondents	Percent
Very little	74	21.4
Partial	195	56.4
Satisfactory	67	19.4
Full	10	2.9
Total	346	100.0

Source: Field Survey, 2019.

According to Table -17, community members did participate in selecting activities for the CBA-ECA projects. More than half (56.4%) of the respondents reported that they had at least partially joined in selecting the activities of the projects. Moreover, 19.4% participants described their participation as satisfactory: they were able to contribute their opinions at this level. While survey results were positive, findings from interviews, focus group discussions, and observations indicate that this participation did not always ensure that their choices of activities would be reflected at the next level, at which projects were approved.

The CBA-ECA project claimed to follow a bottom-up approach that took feedback from lower-level stakeholders into serious consideration. However, the results of the analysis of the data in this study show that, in many cases, the opinions of the local beneficiaries were overlooked. One of the interviewees from Noyagram VCG said:

When we were asked to take responsibility to manage a fish sanctuary, we proposed monitoring beels near our VCG. However, the local NGO responsible for project selection and implementation gave us Agder Beel, which was far from our VCG. Therefore, we faced various problems while trying to monitor the beel, because we lived so far away.

Another interviewee from Noagaon VCG was unhappy with the outcome of their discussion with the higher authority. The interviewee stated that “to select the location of the excavation projects, NGO officials discuss the matter with the local people. However, when they take final decisions, they listen only to themselves.” Likewise, a respondent from Hakaluki Jagoroni VCG said:

As per the instruction of project officials, we were searching for a suitable place for the construction of our VCG office. Later, they built an office building in a different place, which was used by two VCGs simultaneously. But our VCG members are not willing to use that office, since it is far from our area. Before selecting the place, they did not take our opinions. They sometimes take decisions like that, ignoring our opinions.

One of the interviewees from Borgaon VCG said: “Proper management of fish sanctuaries is helpful for increasing fish production. No fish sanctuaries have been established in our Kulaura Upazila, although we have raised the issue several times in different fora.”

The delineation and appropriate distribution of sanctuaries in a large *haor* is vital for resource productivity. This process by which sanctuaries are developed requires significant input from a technical point of view, as well as proper consideration of the views of the local community, since these decisions can directly affect the income and livelihoods of the locals. However, during a focus group discussion, a beneficiary in Fenchugonj stated:

The benefits of establishing fish sanctuaries depend not only the number but also the proper location. Sanctuaries should be scattered throughout the haor, not with many in one place and none in another place. We have raised this issue in discussions. Nevertheless, in reality, we observed that the project officials, both from the local NGO and the Department of Environment, are

concentrating on increasing the number of sanctuaries just anywhere, rather than selecting the most suitable places for them. The officials always express their pride at how many fish sanctuaries they have established. This is not wetlands management. This is political advertising.

One respondent (Volerkandi VCG) similarly shared their view that the project selection authorities tend to consider ‘showy’ projects more seriously, selecting interventions which are very visible to the wider community, instead of those which might best achieve the goals of the project. They gave this example:

For crop diversification, the project planners introduced the cultivation of sunflowers and nuts, which are good ideas because these crops consume less water than our usual crops do. But the problem is that there is no oil-producing machine in this area. These crops are used for making cooking oil. What would we do with these raw products? We need a complete solution. An oil-making machine could solve this problem. Then we could sell oil that has a market value in the markets. We informed the project planners of this need but got no answer. We therefore lost interest in growing these worthless raw crops. Therefore, the impact of the crop diversification scheme was temporary at best.

The development of a new, colourful crop brought attention to the project, but the crop ultimately offered little value to the farmers.

One participant from Shusherkandi VCG explained how the local fishers are losing significant earnings due to the project organisers ignoring their opinion, saying:

It takes a long time for fishers to catch fish, and it takes hours for them to reach the city market. The fish starts to decay in the vehicle travelling to reach the city market. If fishers sell the fish too close to where it was caught, they avoid this problem but do not get a good price, because rural people are poor and there is also more competition from other fishers catching the same fish in the same place. The city is where the money is. We raised this problem several times in project design meetings and requested that the project build an ice factory in this area. This would allow us to transport fish in ice, preventing it from rotting

on the way. Every time, project designers duly noted our proposal. They spoke approvingly about our proposal. But the project did nothing about the ice factory, so we lost that opportunity to improve our livelihood, become financially stable, and become more resilient against climate change.

These problems stand in stark contrast to examples I gathered, pertaining to what can be achieved by incorporating local people into management activities in true sense and give them value, such as this comment from a Rakhal Shah VCG member in their interview: “Locations of submersible embankments in our area were selected as we advised. Therefore, we are getting maximum benefits from them.” According to another interviewee from Halla VCG: “The *beel* called ‘Koier Kona’ has been preserved as a fish sanctuary, as per our proposal. It was easier for us to look after the sanctuary and monitor activities there, since it was close to our VCG office.”

Thus, the true picture seems to be that sometimes decisions, for example, about the location of projects, are bottom up; at other times, they are top down. However, analysis shows that, generally, the decisions that were taken from the bottom up seemed to cause fewer problems and to produce better results.

Top-down decision makers, however, were defensive when faced with the local criticism of their decisions. One NGO official (NGO Official, 3) stated in their interview:

In selecting the proper location of the projects, we initially discuss the matter with local people and get many proposals. Then we try to identify the best option and send that to headquarters for approval, although selecting the best option is always difficult. Moreover, we have some pressure from headquarters to expedite the matter due to time constraints.

Participants in focus group discussions in comparatively low-income areas disclosed that CBA-ECA project designers did arrange conversations with them and encouraged them to express their opinions. However, after the project interventions were approved, participants found that, in most cases, their suggestions had not been acted on. They considered that these conversations had been merely for show, to give the image of participation that was not the

reality. They now believe that interventions for the CBA-ECA project had, in fact, mostly been decided before their views were invited.

7.4 Lack of Community Participation in the Implementation of Project Activities

In their key-informant interview, one NGO official (NGO official 3) reported: “There is a project implementation committee [for the CBA-ECA project] which includes certain VCG members. This committee is supposed to join in the implementation phase of the project.” However, comments from participants in the interviews and survey for this study indicate that their involvement was not at all extensive.

Table 18: Participation in implementing CBA-ECA project activities

Participation	Number of Respondents	Percent
Not at all	5	1.4
Very little	121	35.0
Partial	163	47.1
Satisfactory	50	14.5
Full	7	2.0
Total	346	100.0

Source: Field Survey, 2019.

As revealed in Table-18, 83.5% of the survey respondents reported that they had partial, very little, or no participation at all in the implementation of the CBA-ECA projects. This was confirmed in a number of interviews; one participant in the Dosghori VCG said that no one

had asked the general members of their VCG anything during the implementation phase of *beel* excavation. This respondent also added that it was likely that the President of their VCG was engaged in some way with project implementation but did not report back about this to members. Another participant from Jogri VCG reported that, because they were illiterate, they did not understand project implementation, considering it too technical to participate in.

65% of the survey participants disclosed that they did not have good relationships with the team leaders and project managers, which is arguably a key reason why so few survey respondents had engaged in the implementation of activities. It is useful to consider the process by which these relationships were made while the CBA-ECA project was underway. When any new activity was undertaken in the CBA-ECA project, a project implementation committee was formed. Members from nearby VCGs – usually the president, secretary, or the cashier – were included. According to the respondents, this committee system restricted the involvement of wider groups of people in implementation and reduced opportunities for members to make key social connections through the project. In addition, while the project implementation committee was operating, representatives of each participating VCG were supposed to inform their members of the status of the ongoing project. Because this practice was not observed in all VCGs, the relationship between these committee members and the general VCG members varied from VCG to VCG.

One VCG member (Nischintapur VCG) said, in their interview, that the members of their VCG, including the president and secretary, had very good relationships with each other, in part, because those who were involved with the project implementation committee reported regularly to the general members. This member also added that sometimes they (a member of the project implementation committee) took other members with them while inspecting the project activities. Their project also involved an individual from DoE or from the concerned local NGO as a project manager or coordinator, and relationships between these officials and VCG members were reportedly constructive.

However, 16 out of the 28 VCG members interviewed reported that they did not contact their project managers directly for project updates and did not take part in the implementation process of project activities. One participant from Boromoydan VCG reported that their VCG leaders discouraged them from communicating directly with the project manager. This

indicates that, in many cases, a gap was intentionally created between the VCG leaders and the general members that hindered the development of productive relationships and reduced community participation in activities like excavations or tree planting; this ultimately slowed down the project implementation process.

7.5 Lack of Community Ownership of and Responsibility for the Management of the Project

A sense of community ownership, which can build and invigorate community resilience, develops when community members join various processes of a project and can influence decision-making processes (Lachapelle, 2008). As noted in the literature review in Chapter 2, community ownership – or at least the development of a sense of community ownership – is a prerequisite for the successful accomplishment of most community-based adaptation projects. The CBA-ECA project planners expected that the community participants would continue to be engaged beyond the end date of the project, after project staff had left (Masud-All-Kamal & Nursey-Bray, 2021). To support the takeover of the project by locals, those overseeing the CBA-ECA project made various attempts to build up the capacity of both individual members and the wider community to understand, appreciate, and own what the CBA-ECA project was doing. To strengthen individual capacity, the project offered a range of training courses (details of training programmes are offered in Section 4.5.3).

However, the data gathered as part of this research raised serious doubts that the efforts made by project managers had resulted in generating community ownership of the project. One interview respondent from Jogri VCG suggested that it was difficult for them to take on the CBA-ECA project themselves, because “most of us are illiterate, so we need guidance, continuous monitoring, and pushing from behind.”

This observation was supported by an NGO official (NGO Official 4), who said in their key-informant interview:

It is true that local people have become more aware of the issues due to their involvement with project activities. They can differentiate between right and wrong. They perform well when project people are with them. However, later

on, after the project was finished and no staff were around them, it seemed that they had forgotten the know-how they had acquired when the project was running. They seemed unable to take their own initiative to prevent damaging activities from continuing in the wetlands. So, the benefits of the project deteriorate day by day.

According to an interview respondent from Surjomukhi VCG, ownership did not develop because members participated at the request of others, rather than out of their own sense of purpose:

Many VCG members do not own the project because they do not own this concept of being involved in a CBO and working for the community. They do not own their VCG because they were not interested in becoming members of the VCG. However, they joined on the request of their friends or the local NGO officials.

Creating ownership of a project by the local people is vital for its overall success (McNamara 2013). According to Wright et al. (2014), it is important to accommodate the priorities of locals and ensure that they have ownership over resources. These researchers contend that, to have ownership of a project, people need: to feel it is doing something for them, to possess a stake in it, and to share in its success or suffer from its failure. The people I spoke with who felt ownership of the activities of the CBA-ECA project recognised that it was doing something for them; that is, they had a stake and would be affected by its success or failure. However, more often than not, when reflecting on the CBA-ECA project, participants shared their impression that they were actually getting nothing out of it, collectively or individually; as poor people, they had to focus on earning a living. As a Ratkhal VCG member stated: “I am a poor person. I need to work for the survival of my family. If I work for free for the community, how can I support my family in their daily needs?”

One NGO official (NGO Official 3) supported this perspective on the participation of locals following the end of the term of the project:

Awareness building is not working here because people are poor. They need direct financial benefits. When the CBA-ECA project was running, poor VCG members got some cash benefits for engaging in project activities like guarding the sanctuaries. Now they get nothing and feel they cannot spare the time.

The key problem was that the operation of the project was temporary (2010 to 2015), but the problems it was meant to solve were permanent; it could not achieve all its long-term aims through its temporary injection of resources into communities – not without seriously challenging the chronic conditions of basic poverty and inequality of power in those communities.

Yet it was not only the poor who felt they did not benefit personally and did not develop a sense of ownership of the project. One member of Alinagar VCG, a middle-class businessperson, said during their interview: “Why should I involve myself in protecting fish sanctuaries? I do not catch fish from the *haor*. If fish production increases, the fishermen will benefit. Therefore, they should protect it.”

Most of the VCG members, regardless of background, became interested in engaging with the CBA-ECA project activities from which they would get direct benefits. For example, people worked hard to build and maintain submersible embankments because these structures stopped floodwaters from washing into their houses and provided a hard road in the dry season for the transport of people and goods.

An NGO official (NGO Official 2) offered one other reason why the work initiated by the projects did not always continue after the project ended:

In voluntary work, job specification is necessary. Who will perform which job is important. Most people think other people will do everything: ‘If I do not join, no problem’. There are many members who fall into that group. Although, theoretically, all VCG members are supposed to contribute. However, who will do what task, and why? Usually, nobody wants to do voluntary work. For poor people, it is an even more critical decision, whether to join or not.

After providing what was intended to be long-term support through the establishment of micro capital grants, an endowment fund, and buildings constructed for multipurpose use (VCCs), the Department of Environment and CBA-ECA planners expected that the VCGs would survive as self-sufficient entities after completion of the project in 2015. However, results show that many components of the project have not carried on as expected, which indicates that the organisers had not successfully endowed the members with a feeling of ownership and the capacity to take over the management of these components.

Focus group participants perceptively noted that the existence of buildings could not ensure the sustainability of a project. They contended that the error of the civil service and NGO planners was to focus on the creation of permanent infrastructure rather than to craft permanent solutions to the problems faced by the community residents, starting with survival. They felt that the infrastructure approach could only work if it involved some transfer of resources to the participants as, for example, salaries for VCG members who continued the work of the project. Salary could be arranged to be covered by the interest on the endowment fund.

It was clear from interviews and focus group discussions that – when the local people felt that a given CBA-ECA activity was appropriate for them and that it offered them immediate benefits – this created ‘ownership’ feelings in them that inspired them to engage themselves in the activity from the start to the finish. A project which succeeded in making residents financially resilient for the long term would most likely be happily and gratefully owned and carried on by community residents, even as volunteers, as the inflow of resources from outside would no longer be necessary.

Key lessons from this study include the following: a focus on infrastructure did not work, and financial and social problems hindered the long-term prospects of the project. Participants in all phases of the study made clear that they would be more likely to have stronger feelings of ownership and voluntarily participate in the VCGs and their activities, both during and after the project, if their livelihood needs were met.

7.6 Lack of Synergy Between Government and Non-government Agencies

In CBA projects, usually, NGOs coordinate the different parties involved. However, it is common in many countries to observe a coordination gap between government and non-government organisations (Khan et al., 2012; Spires et al., 2014; Ashley et al., 2015). In the case of the CBA-ECA project, a coordination gap was also found between government organisations and NGOs at the sub-district level. One example of this emerged from descriptions of the day-long monthly coordination meetings between the *Upazila* Parishad members and the NGO officials that were presided over by the *Upazila Nirbahi* Officer. In short, results showed that these meetings were not fruitful.

During interviews, NGO officials reported that they did not get priority in the day-long monthly coordination meetings arranged by the *Upazila* Parishad, and that NGO-related information was usually placed at the end of the agenda, by which time most of the members had become tired. They were not interested in concentrating on nor discussing NGO issues; many of the members left the meeting place early. NGO officials also said that they lost interest in actively joining these meetings: they sat in for a time, just to go through the formalities, signed the attendance sheet, then left the meeting. On the other hand, *Upazila* administrators perceived the situation differently. During interviews, they expressed their belief that NGO officials were not interested in joining the meeting or having open discussions, especially about funding mechanisms. It became clear, talking to both parties, that there was not a productive relationship of openness between them. As one *Upazila* Fisheries Officer noted:

NGO-related coordination meetings are not fruitful. The NGOs do not want to share details about their projects, especially about financial matters. They just discuss the ongoing project. Involvement in the intervention selection process is more important. We could contribute our knowledge there. But they do not involve us in that process.

The lack of clarity around the roles of the different parties, as identified in interviews, likely contributed to these apparent misunderstandings and the overall lack of synergy between them.

As explained in detail in Section 4.5.1 (refer Table 14), in the CBA-ECA project, the *Union Parishad* Chairman was included as the Chair of the *Union* ECA committee and the *Upazila Nirbahi* Officer as the Chair of the *Upazila* ECA committee. It was expected that their involvement would increase interaction among the VCGs, NGOs, and the local government authorities. One *Union Parishad* Chairman (Barlekha Sub-district) offers some insight into the real impact of these ex-officio – the key point here is to emphasize that without exception, ex-officio members of boards and committees have exactly the same rights and privileges as do all other members, including the right to vote – Chairs, saying: “The NGOs invite us as a formality. They come to us when they face some problems while implementing the projects. But they do not listen to us.”

Offering the NGO point of view on this matter, one official (NGO Official 2) said:

If we ring local leaders – elected Union Parishad chairmen – they tell us to meet them at their offices. When we go to their offices, we find them busy with other meetings or absent at some other meeting. We have to try at another time. Before joining in any community activities, local leaders calculate whether people in that activity are politically important to them and whether they voted for them or their opponent. If yes, they agree to come. If not, they try to avoid the activity.

Clearly, each party saw the other as being driven by separate agendas rather than being on the same team.

While the two parties were meant to be working together, there was a chain of command in place. Theoretically, *Upazila Nirbahi* Officers (as chief executives of their *Upazilas*) have the power to hold the NGO officials accountable to the citizens, particularly with respect to suspected funding irregularities. In practice, however, key informant interviews disclosed that these officers face problems when they try to exercise this authority. One *Upazila Nirbahi* Officer said:

NGO officials are very clever. They come to us at the eleventh hour, when they need to collect an inspection report from us and submit it to their headquarters.

They ask us to visit their project when we are very busy with other activities. In that situation, we can just have a look but are not able to inspect in detail. When we want to take time to do a thorough inspection and then issue an inspection report, we get phone calls from our senior officials to cooperate with NGO officials and complete the task quickly.

This kind of call – urging the officer to “cooperate and complete the task quickly” – indicates a measure of political influence the NGO officials have on the senior officials in Bangladesh. From interviews, it became clear that the NGOs have some sort of power they can leverage against the civil service. Failure to give an NGO what it wants, in such circumstances, can reportedly lead to a negative annual evaluation by the senior official of the targeted civil servant. Such an evaluation, in turn, can have adverse effects on the promotion, transfer, or salary rises that may be pending for that individual.

Typically, poor coordination indicates that local linking networks (among the local government, NGOs, and other CBOs) are comparatively weak (Islam & Walkerden, 2017). Poor coordination was observed and reported by those involved in the CBA-ECA project, and the resulting weaknesses affected the success of its activities especially protecting illegal fishing and even in using endowment fund.

On the other hand, proper coordination can play a vital role in the successful completion of any task (Ahmed et al., 2017). During interviews, participants highlighted the importance of good coordination and noted instances in which visible coordination did exist among the various parties involved with the CBA-ECA project at the local level, where activities were implemented. Data analysis highlights a common view among interview participants that, while the project was active, project workers and VGCs had in fact coordinated with law enforcement authorities from local fisheries to chase out illegal fishing operations, but that this depended upon the project staff. According to participants, now that the project is no longer fully operational and staffed, no one is doing the effective coordinating nor chasing, locally or across the districts and divisions.

An *Upazila* Fishery Officer with extensive experience observing and working in the area raised concerns about the sustainability of the project's work in the Hakaluki because, in his opinion, the VCG members were overly dependent on professional coordinators to facilitate the activities and were therefore unable to take on those roles themselves:

I have been working in this region for a long time. I observed the activities of the CBA-ECA project. However, many officers are new here. They do not know much about the project activities. During the project period, project officials always came and asked us to operate a mobile court or to take other measures against illegal fishing. They worked as coordinators between the project and us. However, since the project has finished, no project people are working here. Nobody is working as a coordinator, so no one is doing anything about the work done during the project.

Another *Upazila Nirbahi* Officer shed further light on this issue of post-project inaction:

I can coordinate the officials within my Upazila and operate mobile courts against illegal fishing. Yet, when we do that in our Upazila, illegal fishing moves to other Upazilas. Those who want to fish illegally can go anywhere. However, we cannot chase them out of our jurisdiction into other Upazilas where our mobile courts have no jurisdiction to try or punish anyone. Nor do I have any authority to order other UNOs [Upazila Nirbahi Officers], who are equal to me, in other Upazilas, to try people who run away from us. Therefore, there is a need for inter-district and inter-division coordination that the project used to provide, by informing other UNOs of illegal operations in their Upazilas, but that no one does now.

These statements demonstrate that, during project period, project staff coordinated, often quite successfully, among the parties involved in its activities. However, after completion of the project, no one has stepped up to fill this gap; the lack of any high-level coordinator, as well as ongoing problems between *Upazila* and NGO officials, diminish the long-term prospects of the CBA-ECA project.

7.7 Inadequate Governance of Climate Finance

While financing is crucial for any project aiming to support climate change adaptation, mitigation, and resilience, the proper governance of any funding received is equally important (Rahman et al., 2020). To face the challenges associated with the adverse effects of climate change, the Government of Bangladesh established, out of its own resources, a funding source known as the Bangladesh Climate Change Trust Fund (BCCTF) (ERD, 2018). Bangladesh also receives funds from various multilateral and bilateral funds (Islam et al., 2015; Rahman et al., 2020; Kabir et al., 2021); more funding from these sources in the future can be expected to be received (Sarker et al., 2021). It is reasonable to expect that the international providers of grants that support the climate-related projects in Bangladesh would want to see evidence of proper governance that addresses the accountability, transparency, and monitoring of the use of this funding (Tashmin, 2016). Due to fair distribution of funds, effective project planning, appropriateness of sites for intervention, and selection of project beneficiaries are best influenced by the stakeholders, it is additionally essential that this finance governance involve the meaningful participation of related group members (Sarker et al., 2021).

Since the funding of the CBA-ECA project was arranged by co-funding sources, whereby the Bangladesh Climate Change Trust Fund (BCCTF) provided more than 50% of the funding, the BCCTF had a significant role to play with respect to coordination, monitoring, and other governance issues. However, funding oversight in the context of the CBA-ECA project is quite complex. The BCCTF provided its share of funding for the CBA-ECA project from the top down; it had overall expectations about how that money was to be used, though was not always concerned with and did not monitor each individual intervention. According to the interview respondents, funding was not given directly from the BCCTF to the CBA-ECA organisers. Instead, the BCCTF gave funds to the Department of Environment, then the Department of Environment engaged a local NGO to administer the CBA-ECA project at field level. When it came to individual interventions, like the micro capital grants, other NGOs donated funds directly to the VCGs, and the VCGs then allocated the funds as micro grants to individual locals. The MCG programme exemplifies the bottom-up approach taken by the CBA-ECA project, which involved the beneficiaries (VCG members) in the selection of applicants to receive loans. Because the project involved a combination of top-down and bottom-up funding

mechanisms, it required a sophisticated level of governance, which, as the results from interviews and focus group discussions indicate, the project did not have.

According to Alam et al. (2013), inadequate accountability and transparency, due to weak governance structures, were, in the past, major barriers to the successful implementation of previous climate projects. Chowdhury (2012) identified the major finance governance challenges for climate adaptation in Bangladesh as the failure to ensure accountability due to poor institutional capacity on multiple levels, problems of coordination and cooperation, monitoring issues, corruption and misuse of funds, and failure to control abuse of power. Khan et al. (2022) argues that Bangladesh has been suffering from not only governance problems associated with climate projects, but also corruption and resource leakage. Sarker et al. (2021) suggest that – although the mechanisms associated with climate finance in Bangladesh have improved – implementation systems are still problematic and do not ensure participatory governance, especially at the local level. My research found issues of accountability and transparency, limited institutional capacity, problems of coordination between the administering parties, and monitoring issues to have all contributed to the problems the CBA-ECA project encountered with respect to funding.

7.7.1 Lack of Accountability and Transparency

The issue of accountability is rarely raised in the governance of climate change adaptation finance, despite the fact that accountability has been found to be critical to the success of climate adaptation projects (Mees & Driessen, 2019). Researchers have argued that using a bottom-up approach, involving community people in project implementation, can not only increase the resilience of the local people, but also improve accountability with respect to the use of funds, as such use is viewed by more people and therefore more likely to be transparent (Grasso, 2010; E3G Research Team, 2011; Klijn & Koppenjan, 2014). However, problems that grassroots organisations often have with social networking, poor coordination of various organisations, and poor flow of information (Islam, 2021; Wang et al., 2021), political

favoritism (Uddin et al., 2020), as well as corrupt practices (Sarker et al., 2021), have been found to hinder accountability and transparency.

It became clear from the interviews I conducted and my observations that proper accountability was not ensured as part of the CBA-ECA project. Information gaps and a tendency of the leaders to avoid being transparent with the general members about their activities were identified as major problems. As noted in 6.6.2, the majority of interviewees were unaware of the existence of the endowment fund; one interview respondent (Boromoydan VCG), when asked about the endowment fund in his VCG, replied that this was the first time they had heard the name of the fund. Notably, they added: “Our president and secretary may be aware of this fund, but they did not discuss the matter with us.” If a source of money is only known to some members of a group, this raises questions about its management.

The findings of this research indicate that the lack of transparency around funding hampered the overall effectiveness of the CBA-ECA project. The project did not disclose its financial transactions to the community, especially regarding the two main instruments the project used for wetland management: (re)excavation and swamp forest planting. This withholding of financial information was confirmed by statements made during interviews and focus group discussions. Here, a majority of the participants concurred that, while the president and secretary of a VCG might be aware of spending details, the general members of the VCGs knew nothing about them. In that context, the funding mechanisms of the project at the grassroots level were not transparent.

7.7.2 Poor Institutional Capacity

To develop climate change resilience among marginal peoples, it is essential that climate funding (both national and international) to support community/climate development projects be used effectively (UNDP, 2016). To ensure funds are used well in the design, implementation, as well as monitoring of activities, it is also crucial to build the capacity of the people involved to participate in and contribute to the processes involved (Fatemi et al., 2020).

However, Bangladesh suffers from a lack of capacity at various levels, despite the fact that the government has tried to address this as part of its responses to address climate change and build community resilience (refer Section 4.2). The nation's five-year National Adaptation Programme of Action (2005) emphasised training; the Bangladesh Climate Change Strategy and Action Plan (2009) included capacity building as one of its six areas in which both short- and long-term action should be taken. In 2012, Chowdhury found that donors identified a lack of capacity as a major challenge to the effectiveness of programmes in the area; they reported that donors saw no long-term plan for capacity development. As recently as 2021, Kabir et al. emphasised the need to build the management capacity of stakeholders arranging training. Results from this study reveal that the Bangladesh Climate Change Trust Fund (BCCTF) is not investing sufficient money in capacity building. One respondent from the Ministry of Finance attributed this to 'optics' in their key-informant interview: "One of the reasons for not investing enough money in capacity building may be that it does not provide instant benefits and is not visible to all, like infrastructure projects are."

This underinvestment by the BCCTF is typical of other development organisations as well, as a representative of the Ministry of Environment, Forest, and Climate Change explained:

The Climate Change Unit was established within the Ministry of Environment, Forest, and Climate Change. However, the Climate Change Unit did not take the proper initiative to train its own staff and those dealing with climate change-related activities in other ministries. No long-term training was arranged by the Ministry of Environment, Forest, and Climate Change. They just arranged short-term training, which is not sufficient to build capacity in the field of climate change.

The same representative further suggested that it is difficult to implement effective training in an environment in which staff changes are frequent:

Climate change focal points [officers assigned to deal with climate change-related matters in different ministries] were trained. However, because they are frequently transferred, many of them cannot utilise their accumulated knowledge properly. Newly appointed officers need to be trained again. It is a waste of time and funds.

Capacity problems exist at the local level as well. The insufficient capacity of local bodies to plan and implement climate change programmes is a well-known problem (Global Witness, 2012; Sarker et al., 2021). Working in collaboration with other local organisations, local government, as the lowest tier of governance, could play a vital role in climate change adaptation work. However, they often cannot fulfil such expectations because they have neither the proper planning skills nor a sufficient workforce (IIED, 2014; Fatemi et al., 2020). During interviews at sub-district level, one local government official (*Upazila Parishad* Chairman, Barlekha) described their staffing problems:

We have shortages of officers in many departments at Upazila level. For example, regarding the Hakaluki haor, the Upazila Fisheries Officer and Upazila Agriculture Officer are very much concerned about the problems there. However, due to staff shortages, both of them are working for two Upazilas at a time. Therefore, they are over-engaged.

Clearly, organisations at all levels that were expected to support the CBA-ECA project suffered from a lack of stable, well-trained staff.

7.7.3 Coordination Challenges at Central Level

In Bangladesh, numerous institutions are involved in dealing with climate-change-related activities. It is well understood that trying to get these organisations to work together creates coordination challenges (GED, 2012; Hossen et al., 2022). Although the MoEFCC is primarily responsible for the proper implementation of climate-change-related projects and programmes, it needs support from other institutions involved with this process. Therefore, it is essential that the Bangladesh Climate Change Trust Fund (BCCTF), the Bangladesh Climate Change Resilience Fund (BCCRF), the World Bank, the Climate Change Unit, as well as the MoEFCC cooperate and collaborate effectively to take proper decisions and reduce duplication of climate finance activities (Chowdhury, 2012; O'Donnell et al., 2013).

Complex bureaucratic systems in Bangladesh exacerbate coordination problems. For example, at the national level, the Economic Relations Division of the Ministry of Finance (MoF) is the National Designated Authority for the Green Climate Fund. The Executive Committee of the National Economic Council of the Planning Commission of the Ministry of Planning approves all the development projects under the Annual Development Programme. Projects that gain approval are implemented, monitored, and evaluated by another division: the Implementation, Monitoring, and Evaluation Division of the same ministry. The role of the Finance Division (MoF, Bangladesh) is to disburse funds for all projects according to the budget allocation. While the MoEFCC governed both the (operational) Bangladesh Climate Change Trust Fund (BCCTF) and the (now-closed) Bangladesh Climate Change Resilience Fund (BCCRF), the World Bank served as the trustee of the BCCRF (Haque et al., 2013; BCCRF, 2016). In addition to that, non-government organisations are also involved with this process and therefore collaboration is required between government and non-government organisations; Sarker et al. (2021) argue that improvements are needed in this area. Coordination among the various agencies in government, non-government, and private sectors involved with this process is both vertical and horizontal (Hossen et al., 2022).

The data I collected from interviews showed that the coordination problems exist among these organisations, not only inter-ministry but also within the MoEFCC and between the BCCTF and the BCCRF, before the activities of the BCCRF were suspended. In fact, Transparency International Bangladesh (TIB) alleged that BCCTF had approved some projects which the BCCRF had previously rejected. This evidently happened due to insufficient project documentation and political interference in the project approval process (Kabir et al., 2021). One interview respondent from the Ministry of Finance explained: “Although the BCCTF and the BCCRF operated under the same governance structure, under the MoEFCC, there was a huge coordination gap between the two funds which facilitated duplication.”

Although the BCCRF was shut down in 2017, learning from this experience of non-cooperation may be helpful for future dealings with other funds. Currently, better cooperation is needed between the BCCTF and other international funds like the Green Climate Fund (World Bank 2016).

7.7.4 Ineffective Monitoring Systems

Article 8 of the guidelines published by the Ministry of Environment, Forest, and Climate Change (MoEFCC) for the Government of Bangladesh projects offers specific instructions regarding project management, such as how to formulate projects and how to approve, implement, and provide funding for projects. These guidelines, which do not address NGO/CSO-implemented projects, are for government, semi-government, and autonomous bodies and provide the monitoring and evaluation authority to the concerned ministry whereby projects are implemented by the ministry itself or any other subordinate department (Guideline, 2012). These guidelines also give the authority to the Climate Change Unit to monitor and evaluate the implemented projects. However, the effectiveness of these guidelines can be undermined by the lack of honesty and inadequate monitoring, shown to exist in climate finance projects in Bangladesh (Kabir et al., 2021).

Donors have criticised the monitoring system in Bangladesh and recommended that it be strengthened in order for the country to receive additional climate finance (Chowdhury, 2012). Despite this criticism, poor monitoring in Bangladesh of the impacts of climate actions and inadequate coordination of local and national government agencies continue to undermine climate finance projects (Rashid et al., 2021). In Bangladesh, public procurement regulations were introduced in 2008; these offered no role for community people in the monitoring teams for climate finance projects (Global Witness, 2012). By leaving them out, the creators of these regulations missed the opportunity to strengthen the monitoring system through community involvement, which would arguably have offered additional benefits of increased transparency and accountability (Rahman et al., 2020) as well as reduced corruption (Khan et al., 2022).

Following the introduction of the Bangladesh Climate Change Trust Fund (BCCTF) Act, 2010, the MoEFCC prepared a rule for ‘NGO/CSO selection for the BCCTF and project implementation’ (Rule 3). This rule required NGOs to have experience in dealing with climate change in order to be eligible for funding from the BCCTF (BCCTF 2010, section 22). However, in practice, NGOs without such prior experience have received funding, as well. During interviews for this study at ministry level, it was suggested that such grants might have been given due to poor monitoring, due at least in part to a shortage of staff.

The Bangladesh Climate Change Trust Fund (BCCTF) has its own internal monitoring department, which performs regular field visits of the projects it has funded and reports to the managing director of the trust. However, according to one ministry-level interview respondent (MoEFCC), internal monitoring is not effective. They explained:

This monitoring is not fruitful for two reasons. One is the lack of sufficient officers. They cannot cover all the projects. Another is that the team members cannot take action against the poor performers due to the inter-ministerial relationship.

At the field level, where the CBA-ECA project was implemented, participants often blamed the poor performance of activities on poor monitoring and corruption. In their interview, a participant from the Udayan VCG describes an example of an activity that proved ineffective in their area:

In our area, Moiyajuri Beel had been selected as a fish sanctuary. It helped to increase fish production. However, the proposed beel was not excavated properly. The contractor just made a barrage surrounding the beel. They did not make any attempt to increase the depth in the middle of the beel, which was very necessary if it was to be a sanctuary for fish. Therefore, the level of water goes down during winter, which hampers getting improved results in fish numbers the next year.

This participant said that this poor excavation was the product of defective project design and poor monitoring of the work. They also noted that the local people were expected to oversee them, since it was neither possible for the city-dwelling NGO officials nor the officials from the Department of Environment to monitor activities properly. However, although local VCG members were included in the monitoring team, they were reportedly not interested in doing the monitoring and did not give enough time to it, as it was a voluntary task.

To address this problem, which proved to be common to a number of VCGs, a representative from Judhistipur VCG in interviews, offered advice based on their experience that, as they say, was not heeded:

The beel needs to be excavated properly. Some soil may be used for boundary work, however, the rest of the soil must be removed from the haor so that it cannot re-fill the excavation. Soil can be supplied to the brickfield nearby or can be used in road works. I am sure it will cost a lot, but development will be sustainable. Those VCG members who are involved in monitoring teams should get some salary or other form of benefit. We have shared this advice several times, but nobody listens to us. They just repeat the earlier mistakes. They follow the same model in the next project and do not want to learn from others' mistakes.

It is clear from this and other statements in this section that CBA-ECA project activities were not adequately monitored either by community residents or by those who had the responsibility for doing so, and this lack of monitoring was seen to diminish the success of specific activities.

7.8 Conclusion

Organisations are driven by human beings. The success of community-based adaptation projects largely depends on the involvement of local people and, specifically, the intended beneficiaries. Further, the success depends on the various aspects and steps of the projects (including the selection of suitable locations): the design of interventions, as well as the implementation of the projects, including oversight of the funding associated with them.

To sum up, the above findings demonstrate that specific governance drivers were not well established to support the project, as well as the inadequate or inappropriate involvement of community people in the planning and implementation of the activities, combined with the relatively little interaction between the general VCG members and the project managers, as well as the influence of the “powerful people” significantly hindered the overall effectiveness of the CBA-ECA project.

Chapter 8: Discussion

8.1 Introduction

In this study, using a resilience driver framework, I investigated the extent to which CBA approaches contributed to building community resilience through the management of climate-stressed wetlands in Bangladesh. Specifically, I explored whether the CBA-ECA project enhanced community resilience by using a CBA approach: if so, why, and in what ways; and if not, why not. In doing so, I mapped the data from interviews, focus group discussions, survey responses, and my own observations against key drivers of community resilience, which derived from an extensive literature review.

This study identified the best practices in CBA and uncovered the limitations of CBA approaches, in order for these to be maximised and minimised, respectively, to support the building of community resilience in developing countries. Table-19 presents a brief assessment of the contributions of CBA-ECA project interventions with respect to their short- and/or long-term success and an indication of the overall change in community resilience.

Table 19: Summary of the contribution of the CBA-ECA project interventions for building resilience

Activities	Drivers	Short-term outcome for the majority of the interventions	Long- term outcome for the majority of the interventions	Reasons/mechanisms	Change in resilience
Excavation of <i>Beels</i> and Management of Fish Sanctuaries	Physical	Yes	No	No net long-term increase in villagers’ resilience or in their financial or natural capital.	↔
Submersible Embankments	Physical	Yes	Yes	Villagers maintain embankments with their own labour and cash after project ended – increased security of homes from monsoon floods – improved human, physical, financial capital.	↑
Village Conservation Centres (VCCs)	Physical	Yes	Partly	The majority of the Village Conversation Centres (VCCs) were used, however, some were found idle due to internal and external conflicts.	↔
Swamp Forest Conservation and Expansion	Natural	Yes	No	Little expansion of forest, not sustained after project ended – buffalos under armed guard now knock down trees. Project partially contributed to natural capital; no increase in physical, financial, human, or social capital.	↔
Alternative Livelihood Training	Human	No	No	Crop diversification failed, entrepreneurial training only benefitted a minority who received cash grants to support establishment of start-up businesses, employment	↔

				training failed (job-training mismatch, no jobs) – for majority, no increase in capital.	
Environmental Awareness Training	Human	Yes	Yes	Trainees ‘passed through’ training to wider community – bird hunting stopped – little increase in human capital and natural capital but potential for increases in future (speculative) – small benefits proportional to a small investment in training.	↑
Micro-capital grants (MCGs)	Financial	No	No	Many revolving funds collapsed – grants too small for most to invest in building resilience, money used for current expenses, no increase in financial resilience for most of community – financial capital did not generate physical, natural, social, or human capital for the community as a whole.	↔
Endowment Fund	Financial	No	No	Zero impact, fund not employed, no increase in any capital for the beneficiaries.	↔

This chapter presents a discussion of the lessons learnt from the impact of the above interventions and of the project as a whole on the people of the wetlands. This analysis based on the experiences of participants involved with the CBA-ECA project in the Hakaluki wetlands has given me a clear understanding of CBA in practice and of the biological and sociological interaction occurred in wetlands management. It is expected that my findings about the CBA-ECA's experience in the Hakaluki wetlands will help the managers, designers, and funders of such projects in the future in using community-based adaptation more effectively as part of wetlands management in developing countries. Moreover, this work will help to contribute to the literature on CBA-based wetlands management in developing countries.

Indeed, there were many interesting findings which indicate that CBA – or ‘participatory wetlands management’ – is a different model in western and non-western societies, because the assumptions and ideology of CBA are so western and so democratic. Where CBA makes these assumptions and assumes that its ideology is being followed in a society which is neither western nor democratic in its political culture, unexpected results appear.

8.2 Important Components that Contribute to Building Community Resilience

The study found that the overall impact of the Community-Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project was positive, at least in the short-term, while the project was being implemented. Long-term positive impact has been noted for some of the interventions. At the time of my study, the VCGs, VCCs, submersible embankments, and biodiversity-related interventions were still benefitting the local communities in some ways which described below.

In this context, the Village Conservation Groups (VCGs) created to facilitate the interventions of the project gave the people of the Hakaluki – both men and women – the opportunity to become active members in wetland management. They were able, for example, to participate (to an extent) in project planning and implementation, to express themselves, and to unite for common purposes. The Village Conservation Centres (VCCs) built to serve as offices for the

VCGs are now considered by residents as one of the most important benefits of the participatory wetland management project, since local people can meet there and express their opinions for the betterment of their wetlands. This finding is similar to the Reed et al. (2014). The VCCs act as information hubs about wetlands management for their respective villages, which had never existed before the project. According to interview participants, in traditional wetlands management, nobody had told nor asked the villagers anything about joining in wetland management.

Particularly, participation in the VCGs and in the training opportunities provided through these community hubs increased the environmental and climate change awareness of the VCG members. Therefore, local people can now explain the impacts of climate change in their communities. They know more about the threats and adverse impacts of natural disasters. This knowledge helped them to respond to floods, cyclones, and periods of drought with greater confidence and in a more united way than they could before the project. These findings are supported by Dumaru (2010) and Forsyth (2013). In addition, the micro-capital grants and alternative income generation training with capital support were found beneficial as per field results. Both were provided locally through individual VCGs. These interventions were found to have empowered women, reduced borrowing costs for some farmers, and some could start new businesses who received capital grants.

One of the most successful impacts of the CBA-ECA project was on gender equity. Women reported being treated equally in most of the village conservation groups, the meeting spaces of the VCCs have been reserved for one day of the week for the exclusive use of women members. On these women-only meeting days, they can talk among themselves, receive training, as well as make future plans. Women said that they felt more capable than they had before joining the project, and I also observed this change in many of them. They are now more likely to work alongside men, earn money, and contribute financially to their families. If climate change interrupts the earnings of their husbands, these women can now support their families. The confidence women showed in interviews and in the focus group discussion arranged for them indicated that the female participants in the CBA-ECA project are more independent, self-confident, and self-reliant now than most typical rural Bangladeshi women. It indicates that these facilities make them more climate change resilient, which indirectly

contributes to increasing the resilience of the communities around them. This successful outcome of the project seemed to be the result of a combination of the training the women received and the encouragement they received from their male family members.

The submersible embankments built under the CBA-ECA project have also contributed lasting benefits to the people of the local communities in which they were constructed. Although this represents only around one-fourth of the Village Conservation Group (VCG) members, those members are very happy with the multi-dimensional benefits provided by the embankments. These benefits include protecting their houses from damage by seasonal flood waves and serve as alternative roads in the dry season. Since the concerned VCG members have looking after the matter, even after the closing of the CBA-ECA project to maintain their submersible embankments personally, with their own labour, it is expected that this intervention will continue for a long time and contribute to building resilience of these wetland communities.

Participatory wetland management also helped to increase biodiversity. After the protection of and planting of swamp forests, and excavation of fish sanctuaries under the community-based adaptation project, biodiversity improved and fish diversity and overall fish production increased, due to providing safe shelter for fish.

So, it would be wrong to say that “the CBA-ECA project was a failure and accomplished nothing.” The examples given above are real successes.

There is a question however about, whether we should set the bar so low as to say that indirect social benefits of a project, like improved gender equity, infrastructure development (embankments and village conservation centres), better general information gathered by the community people about environmental problems, and improvements in numbers of fish species, are good enough to justify the huge amount of money spent on the project by national and international sources. These successes were not the main targets of the project. However, in relation to the main benefit the project sought to make – such as enhancing the general long-term biodiversity of fish, birds, and other living things, non-fishing livelihoods, as well as

improved livelihoods, conserving the *beels* and the swamp forests – the project came up almost empty, especially in the long-term.

8.3 Nil Impacts/ Key Factors Impeding the Building Resilience

As noted in the Introduction in Table-19, many interventions developed and implemented by the CBA-ECA project had arguably nil impact. For example, the endowment fund, although it is, in theory, permanent, is effectively pointless, as almost none of the money available to communities has been or is being used, since key actors are unaware of the fund. Several activities of the CBA-ECA project, like the creation and supervision of fish sanctuaries and the conservation of existing and planting of new swamp forests, had short-term benefits that did not continue long after the end of the project as per results.

Failure to ensure genuine – as opposed to apparent – democracy in the design and implementation of the CBA-ECA project underlies much of the unsustainability of project benefits. Researchers argued that in CBA, it is necessary to ensure active participation of community members in both planning and implementation stages (Ayers, 2011; Lasage et al., 2015). A *de facto* top-down approach failed to produce basic changes in the power relationships and levels of income among community residents that would have been needed to allow those who had been convinced to support the protection of the ecosystem in the Hakaluki to continue the project interventions, both during the operation of the project and after it had ended, over the objections of those elites who simply wanted to exploit the natural resources for profit. While those locals who wanted to continue to protect the ecosystem may have been the majority in the Hakaluki on the day the project ended (since the project had failed to empower them politically, economically, or socially), these people were left too powerless and too socially isolated. They could not impose their will on the minority nor raise their voices so that they could seek help from outside their communities. They were still, in effect, too dependent upon the project staff and resources to protect the environment. With the project, its staff, as well as its resources gone, there was little to prevent the elites from going back to buying off the poor locals with high wages to engage them in the looting of natural resources or from scaring them off with armed guards if they attempted to protect the forests or the fish sanctuaries.

In addition to the lack of true community control and empowerment by the project, western assumptions contributed to the unsustainability of outcomes. From the comments made by key informants, it is safe to suggest that outsiders held expectations that *Upazila Nirbahi* Officers would share information: for example, about the endowment fund, because there was a dedicated bank account for that purpose. Information could also have come from the bank itself to the stakeholders. It is not uncommon in Bangladesh for accounts with otherwise useful funding to ‘sleep’ for years because those responsible for overseeing them are not well informed about or too busy to their main administrative job at the same main beneficiaries are not properly aware of their facilities.

Key problems associated with participation/representation and cultural misunderstanding, as well as specific solutions are addressed in the following subsections.

8.3.1 Problems of Participation and Representation

The main strength of the CBA concept, in theory, is its participatory approach (Reid, 2015; Rembling & Veitayaki, 2016). Under this approach, the community-based organisations are supposed to play a vital role in engaging the active and effective participation of stakeholders and beneficiaries. In the case of the CBA-ECA project, the Village Conservation Groups (VCGs) were supposed to play a vital role serving as a hub. However, they could not properly train nor empower locals to join in the planning and implementation of project activities.

The CBA-ECA project organisers did not create the VCGs as community-based platforms but instead co-opted the ‘Village Conservation Groups’ which had been left behind following an earlier project. It has been suggested that it can be quite effective to develop and run projects with and through pre-existing community groups (Masud-All-Kamal et al., 2021). The CBA-ECA project organisers took this approach by re-activating old VCGs, but the findings from the data in this research demonstrate that this did not work in this context. Reportedly, attempts to restructure the old VCGs proved unsuccessful: project organisers explained that

restructuring required the development of complex administrative procedures and the expulsion of existing members. The VCGs that successfully restructured faced a political backlash from these expelled members and this weakened the status of the VCGs among community members. One could argue, from a point of principle, that bonding with a pre-existing group raises the possibility of being co-opted by the pre-existing power structure upon which the new project would become totally dependent.

Results identified two key membership-related problems above and beyond those issues created from taken over the VCGs from the previous project. One issue was that the members who were recruited to participate in the CBA-ECA project, for the most part, did not include the leaseholders of the *beels*. Inclusion of this experienced group could help to long-term protection of the fish resource. They (the leaseholders) could have increased the strength of the VCGs and made them more sustainable, as they had higher social status and enough money to buy leases from the State. Studies note, the involvement of diverse groups of the community in such projects is essential to support effective and democratic decision-making (Ensor et al., 2018). There is also a need to include representatives of local beneficiaries in all stages of the CBA projects (Reid et al., 2009; Sherman & Ford, 2014). Adding the voices of *beel* leaseholders could ultimately how helped the project organisers to make better decisions, particularly with respect to the selection of interventions of the project. Studies of donor-based programmes have shown that the selection of appropriate beneficiaries with the necessary training, local knowledge, representativeness, and mindset is essential to ensure the effectiveness of the fund being invested (Barrett 2013; Fenton et al., 2014). The results of this study indicate that the failure of the CBA-ECA project were, in part, since the membership of the VCGs was not adequately representative. In addition to that the capacity of the members was not adequately developed to participate in various activities, more specifically in implementing and monitoring.

While the leaseholders who could have strengthened the VCGs were largely left out of these groups, local political and economic elites, who were largely responsible for the declining level of resources in the Hakaluki because their wealth and power were based on exploiting those resources, were actively brought into the VCGs. The inclusion of these elites was intended to influence them to change their behaviour, but this was not successful. Local elite members of

the VCGs, who opposed everything the project stood for due to their personal conflicts of interest with it, subverted the VCGs and used them to extort gains for themselves and those in their personal networks. One of the worst examples was the extortion of microcredit loans for supporters of elites, who then led debtors' strikes against repayment of such loans, exhausting the microcredit capital, thereby making the microcredit scheme unsustainable.

It is difficult to criticise the project for its attempt to select the so-called 'powerful people' of the community, given the patron-client nature of local politics in Bangladesh. Excluding local leaders from the membership of the VCGs or prosecuting or punishing such leaders for subverting the project could have made the VCGs as less-powerful community organisations. For these local elites, who are close with the ruling party of government do not care for the poor security guard instead try to manage them either offering bribe or threatened to harass.

The reality is that participatory management may be inappropriate and impossible in the contexts in which local political institutions are not truly democratic. Community-based adaptation has proven to be quite popular and successful in western countries but, CBA may not be the right choice in non-western countries where the same political assumptions that underlie CBA as an approach do not hold true. If democratic practices are not used in resource management at local level in a given area, one can expect at best is "show democracy" or pretend to be democratic. In such an environment, a top-down approach may be needed to overwhelm local power. But those making the decisions should have the expertise in the relevant field. They need to listen to local knowledge and had better understanding of the local politics and should have control over the people who have connections with the local elites.

8.3.2 Problems of Cultural Disconnect

A common critique in the literature is that CBA practitioners often fail to understand the social norms, culture, and power structure of the areas in which they were operating, which makes the goals of the CBA projects unachievable (Dumar, 2010; Reid and Schipper, 2014; McNamara & Buggy, 2017; Ensor et al., 2018; Patnaik, 2021). The exclusion and inclusion of

inappropriate members described above are clear examples of ‘the blind leading the sighted’ in the CBA-ECA project. Yet there are many more things for CBA project planners to take into consideration beyond culture and power structure in an isolated rural society like the one in which the CBA-ECA project operated in Bangladesh.

The most important consideration is to truly understand the needs of project beneficiaries. For example, in the CBA-ECA study area, the beneficiaries are divided into two major groups: farmers and fishers. According to my findings, in many cases, the project design seemed to miss the point that the needs of these two groups are different. Farmers require small amounts of short-term credit during cultivation time to buy inputs like seed and fertiliser that can be paid back from selling their harvest. On the other hand, fishers need larger amounts of longer-term credit to buy fishing gear that can only be repaid in small amounts out of their daily catch. Microcredit grants, therefore, were unsuitable for most residents since they were not particularly thoughtfully designed to serve the real needs of the intended beneficiaries. In addition to that the training preferences of farmers and fishers are also different. The CBA-ECA project trained locals for jobs that mostly did not exist and failed to train for jobs that many community residents had a good chance of getting, given appropriate training. The crops chosen to help farmers diversify their production were selected without understanding the local demand for them and without establishing a market linkage for selling the products.

8.4 Proposed Solutions and Improvements:

The findings of my study revealed the failures of the CBA-ECA project to achieve many of its goals and to promote lasting community resilience. On the contrary, it identified a number of ways to increase the potential for success, including: empowering local stakeholders and beneficiaries to lead from the bottom-up, planning for the long-term, respecting and incorporating local knowledge, improving coordination of key players, and addressing power imbalances. The following sections present them in greater detail.

8.4.1 Replace Top-down Decision-Making with Democratic Devolution

The shortcomings of the CBA-ECA project with respect to management and empowerment may be summarised under the rubric of ‘Who decides?’ in the planning and implementation of CBA projects. In theory, CBA is a community-led process in which community members are actively involved in adaptation planning and implementation (Reid et al., 2009; Ensor & Berger, 2009). However, the findings of my research, which demonstrate that the CBA-ECA project was implemented following a top-down approach, also indicate that CBA projects are typically operated in this way in Bangladesh. Although initiatives had been taken by CBA-ECA project organisers to include local beneficiaries in planning and implementation processes, to some extent, this participation was just ‘for show’ because the community people were ‘heard’ but their input was not followed in the decision-making process. This indicates a clear gap between theory and practice; and restates my earlier analysis about the tension between Western expectations in Bangladeshi cultural contexts.

A significant amount of literature has showed that wetland management in Bangladesh failed to ensure the conservation of environmentally critical areas and the fisheries resources of the country due to its revenue driven and top-down nature (Thompson et al., 2003; Byomkesh et al., 2009; Barkat et al., 2019; Sunny et al., 2020; Aziz et al., 2021; Islam et al., 2021). It argues that community driven natural resource management approaches may work as remedies solving this problem since this approach priorities stakeholders in decision-making process and arguably offer better protection of the ecosystem (Carwardine et al., 2009; Enqvist et al., 2020; Danielsen et al., 2021; Callesen et al., 2022). However, findings of my study demonstrate that CBA did not automatically provide better results as it failed to ensure community participation in a true sense.

Adaptation scholars and practitioners have recognised that so-called ‘planned’ CBA initiatives facilitated by external organisations, still need to be ‘bottom-up’ and community-led (Ensor et al., 2018; McNamara et al., 2020). However, they are often, in practice, operated in a ‘top-down’ manner (Masud-All-Kamal & Nursey-Bray, 2022) in which the influences of outsiders (NGO management) (Bebbington, 2005; Banks et al., 2015) and donors (Mir & Bala, 2015),

as well as time pressures (Mosberg et al., 2017; Nightingale, 2017), diminish local participation. These influences and pressures also affected the CBA-ECA project in this study.

The results also in my research show clearly that successes in making the target community more resilient were directly proportional to the extent to which the views of the community were followed by decision-makers. When the views of the community were rejected and actions were taken that did not follow their advice, the community were usually proven right, and the outsiders were usually proven wrong.

There are many criticisms of CBA in the published literature to the effect that, although it was meant to empower vulnerable communities, the CBA model has, in practice, empowered NGOs. Ireland (2012), Dewan (2020), Masud-All-Kamal and Nursey-Bray (2021), and others have argued, for at least ten years, that NGO empowerment does not create community resilience or successful wetland management. Real community empowerment is possible when decision-making power is democratically devolved to the community-based organisations created to run CBA projects. To accomplish this goal and return CBA to its true purpose, a clear guiding statement must be made that the VCG is the decision-making authority for the project. In so doing, the VCG acts with the advice and assistance of NGOs as well as other outside experts; all resources for the project are to be delivered to the VCG for VCG leaders and members to manage. Only in cases in which community groups are dominated by local elites – who are, in fact, opposed to the purposes and aims of the project – should a conscious decision be taken to reject CBA and use a top-down management scheme.

To be sure, some issues will arise in any attempt to implement a true democratic process in wetlands management in areas in which ‘true democracy’ does not exist. Vulnerable communities often have little experience in managing anything or in democracy. VCG members will have to be selected carefully and given a great deal of training to be effective. For getting better result, there should have a true partnership among the VCG members, NGOs and outside experts. This partnership and mutual respects to each other will help to take better decisions. Corruption is endemic in most developing countries and therefore, it is not surprising that the VCG members will tend to be corrupted. It may occur either out of greed or out of poverty. This corrupt practice must be reduced through the selection of VCG members who are personally committed to the protection of the environment.

To increase the likelihood that this devolution of power into the hands of the VCG members will contribute to improve community resilience. For ensuring this devolution of power, community representatives should be professionally selected according to their relevant experience and personal commitment to the goals of the project. Local administration and local representatives can help to select people and a decent honorarium can be arranged for the poorer members to empower the poor to participate. As partners in such projects, NGOs should devote their attention and skills to community organising and social capital development to create strong and united communities which are committed to the project and capable of playing the central role in project implementation.

It is important to note, as mentioned above, the unavoidable influence of ‘powerful people’, especially because elite capture is a predictable pitfall of the devolution of power to an inexperienced VCG consisting of poor and vulnerable members: in cases in which the power imbalance threatens the project, community participation in management may not be the right choice. To better manage the contributions of ‘powerful people’ as insiders to the project, organisers should set very clear expectations and boundaries and be willing to prosecute members, with the help of local civil servants and law enforcement, for engaging in illegal activities. Organisers should also find legitimate ways to reward constructive behaviour, both among the members and among those enforcing the rules set by the group.

8.4.2 Priorities in Project Design

The data from my research shows that the most effective activities of the CBA-ECA project were those that resulted in the building of physical infrastructure: the submersible embankments and the village conservation centres. This infrastructure was most successful in the cases in which it met urgent community needs (e.g., flood relief) and did not depend on community cooperation for its use. The second-most effective activity was that which trained members about the ecosystem and the residents’ interrelationships with it. Training tended to be most effective when given to the ‘great middle’ of the community: the rich did not need it

and the poor did not have enough control over their situation to change in response to new information. Where training was given to poor people, e.g., livelihood/entrepreneurial training, it only was effective when linked with the cash grants and social networking needed for the trainees to be able to use what they had learned.

The least-successful interventions involved the provision of grants of money that were given without training or the provision of loans to poor people who had no means to repay. Interventions that required permanent changes in the local power structure or the habits of the local people, like fish sanctuaries and forest conservation efforts, were not successful. Where the intervention challenged the local power structure, by, for example, policing the behaviour of powerful local people to stop overharvesting fish in the *haor* or running buffalo in the swamp forest, it failed: the powerful people simply ‘waited out’ the project then went back to their old ways after it closed.

The five-year project model, of which the CBA-ECA project is an example, is suitable for building disaster preparation and management skills for and developing community resilience to one-off extreme events like cyclones and tsunamis. Damage suddenly caused can be repaired, and future disruptions can be prepared for in the short term. However, climate change and wetlands management are long-term issues. They cannot be solved through a series of uncoordinated short-term projects. Especially in poor and vulnerable communities, where there is an imbalance of political and economic power, short-term projects produce short-term benefits. Elites quickly lead the community back to ‘normal’ at the end of the project term, undoing most of the benefits. Communities which are weak in social capital cannot simply be settled after a short time: this is what happened in the Hakaluki. Climate change and wetlands management projects should be planned for the long-term and remain in place until the community are truly resilient and are managing the wetlands effectively without external resources.

Take crop diversification as an example. For the CBA-ECA project to achieve its long-term aim of supporting the livelihood and climate resilience of farmers through training in crop diversification, the project organisers needed to supply the community with physical assets (vehicles or buffalo-drawn carts) that they would be able to use to take the new products (not wanted or needed in the local community) to market in the towns. Looking even more long-term, the project organisers could have liaised with the local authorities to secure trade licences

for Hakaluki farmers to operate in market towns and created a principal-agent relationship between farmers in the Hakaluki and sellers in the towns. This would have given the Hakaluki growers access to the town markets through social networks. VCG members should also have developed social networks in towns that could assist in the marketing of community products.

Another long-term solution might have been to cooperate the marketing of the new crops by having all Hakaluki growers sell to the town sellers, on a wholesale basis, rather than try to compete with them by selling directly to town consumers. Farmers' marketing cooperatives are well-established in Bangladeshi law and practice. It would have been quite straightforward, in that context, to develop a Hakaluki growers' cooperative that would buy all the farmers' produce and sell it to sellers' cooperatives or to sellers individually in the town markets. Instead, the issue was not addressed, and the net result of the crop diversification activity was almost nil. It is important to note that the community residents had raised these expected problems associated with taking new crops to market with the project administrators: the administrators listened to, heard, then ultimately ignored them. Again, a more democratic form of participation, in which the decision-making power was devolved to the community groups and NGO administrators served as advisors as well as facilitators of the decisions, would have solved such problems and enabled the development of long-term projects for long-term benefits.

8.4.3 Develop Community Drivers for Successful CBA Projects

Data in this research indicates that the successes of the CBA-ECA project depended on human drivers, but the sustainability of the project benefits, which was not achieved in most activities undertaken by the project, depended on social drivers. Leadership stands out as a human driver that was strongly correlated with the success or failure of a given project activity. VCGs that were poorly led tended to fail. VCGs which had at least one strong and effective leader tended to get through most of the challenges they faced. When a strong leader was replaced by a weak one, everything tended to fall apart. Besides leadership, overall capacity building for the community members is important for resilience building which is supported by the resilience literature. For example, to enhance community resilience, Revell and Dinnie (2020), emphasised for building capacity of them through arranging various training and ensuring participation of community people in the planning of those training. Pfefferbaum et al. (2015)

recommended for supplying various assets to the people in the community after developing proper skills.

Unity was a similarly influential social driver: united communities tend to resolve problems, but divided communities tended toward conflict and inertia. The impact of the endowment fund was nil because it was rarely used because the social drivers of information sharing and organisation to administer the fund were not operational enough to make the financial driver (the fund) useful. Thus, this fund, as an initiative of the CBA-ECA project, was a failure. Resilience literature emphasises the need to increase social connectivity to the building of community resilience (Berkes & Ross, 2013, 2016; Cutter, 2020; Carmen et al., 2022). Fischer and McKee (2017) noted that during their study of a rural community in Scotland, community members failed to increase their adaptive capacity as well as community resilience due to poor interpersonal relationships and low level of trust amongst the individuals in the community. Therefore, they highlighted the importance of building relationships among the communities and the need to manage conflicts within the community so that resources can be better utilised to develop adaptive capacity and community resilience.

Similarly, the performance of the micro capital grants (MCG) programme also depended on the strength of human drivers. This fund was given by the donor agency to the grassroots level with the goal of improving the climate resilience of the beneficiaries by lending them money to establish and develop alternative income generation activities. Local beneficiaries who served as members of their local VCGs had the opportunity, by handling this fund, to increase their leadership and management skills. However, the performance of each VCG in terms of their operation of this programme was not the same, in part due to variations in the quality of leadership (human driver) of the VCGs, especially the leadership skills of the president, secretary, and cashier. A few VCGs with strong leadership in their executive committees were able to almost double their MCG funds because their leadership ensured equity in the disbursement of MCG loans and they collected instalments regularly, actions which helped to increase their revolving funds and extend their lending capacity. On the other hand, about half of the VCGs had to stop their MCG activities due to a lack of proper guidance from their leaders (lack of human drivers).

A lack of social drivers was also found to be responsible for the poor performance of both the endowment fund and the MCGs. This finding is quite similar to that of Rahman et al. (2015), who, in their study of a fishing community in the northeastern part of Bangladesh stated that: ‘social capital in the form of networks, trust and reciprocity become essential to access financial resources’. My data demonstrated that VCGs with strong bonds in the community (social drivers) were better able to collect MCG loan instalments, and conflict between sub-groups in many VCGs encouraged default cultures. For the VCGs that suffered from a lack of social cohesion and trust, the revolving funds collapsed and the scope for further micro credit ended. Therefore, the net long-term result of the MCG programme across the area originally served by the CBA-ECA project was almost zero.

In CBA projects, community leaders are expected to bridge the gap between community members and external agents, using the linking and bridging social drivers that they have developed over time, which help facilitate collective decision-making (Rahman et al., 2015). In the case of the CBA-ECA project, while bonding and bridging social drivers were in place within the membership of a number of local VCGs, which were able to help the VCG members to decide what to do with the endowment fund money, the linking social drivers necessary to communicate vertically with the local administrator (the UNO), the trustee of the fund, to gain approval for funding. Literature has also indicated the importance of vertical communication, and both the NAPA and BCCSAP have highlighted communication as key to increasing awareness and improving communication between different agencies working on adaptation in regional and national knowledge networks. However, in reality, problems exist in the chain of communication from the line-ministry level to the departments and between autonomous bodies and local government (Abedin & Shaw, 2013; Islam et al., 2013; Stott & Huq, 2014).

Therefore, the success of CBA projects has been again shown to depend in many ways on human and social drivers. Before providing funds to a community, it is important to build capacity and increase social networks within that community. Funding should be provided only after a community is able to show that they have developed the necessary human and social drivers to use it effectively.

In general, the more that a project can develop within a community the human, physical, financial, social, natural, and governance drivers that can support that community, by developing capacity of the community members, improving the sustainability of the resources,

ensuring transparency and accountability, facilitating organisation of the community members. Thus, the drivers help building community resilience that increases the likelihood that the project is to succeed. Attending to all the drivers is important, because there is a strong inter-correlation among them. For example, physical drivers of infrastructure are only as good as the uses to which it can be put, based upon the human drivers that determine how the infrastructure will be used. Therefore, planning infrastructure requires more than consideration of the architecture. The existence of financial drivers is only as useful as what the money can buy and depends on the human and social drivers that influence how available resources will be used. Any weakness in the development of some drivers can be counterbalanced by the strong development of others, but there are limits: in my study, communities with strong human drivers were able to secure results from the activities of the CBA-ECA project, but, if the social drivers in these communities were weak, the results tended to be short-lived.

Wilson (2012) mentioned that a community's resilience depends on the proper use of three drivers – economic, social, and environmental (natural). According to him, a community can be considered to be 'strongly resilient' when these three drivers are well-developed and 'weakly resilient' when only one or no driver is developed. A community with two developed drivers is labelled 'moderately resilient'. Based on this and my findings, I would argue that a climate change adaptation project that aims to build community resilience is successful to the extent that it significantly develops all community drivers that support the well-being of the target population.

8.4.4 Implement Projects with an Understanding of Local Culture

Community-based adaptation (CBA) theory highlights how important it is to genuinely incorporate the local cultural knowledge, practices, and values into to adaptation plans and activities (Ayers & Forsyth, 2009; McNamara & Buggy, 2017). Proper understanding of local culture and the identification of its norms are essential to maximising local participation (McNamara, 2013) and, arguably, to ensuring the relevance and sustainability of actions taken. Thus, understanding the local context and the ability to address it play a key role in building community resilience. However, CBA practitioners often fail to understand the local culture.

Two groups that came into conflict over the course of the CBA-ECA project were the Hakaluki people and outsiders. The barriers that separate these groups are both language and culture. Hakaluki people have their own dialect and are very shy about talking to outsiders. Results show that trainers employed by the CBA-ECA project were invited from outside the area; their language was different from that of the trainees, and this created a communication gap. In addition, the non-Hakaluki people who work in the Hakaluki have traditionally been people of higher status: civil servants, teachers, magistrates, and police. Because the Hakaluki people are poor, they have developed a stance of discomfort and reticence when faced with outsiders. Despite their best efforts, outsider trainers experienced a social distance between themselves and the villagers, as the local Hakaluki trainees did not dare to ask questions or participate in training comfortably in the presence of outsiders. Trainers should have been recruited from the Hakaluki: if none were available, at least initially, one Hakaluki interpreter or assistant could have facilitated communication between trainers and trainees. A Hakaluki person may not dare to speak directly to an outside trainer, but they could speak freely with a trained Hakaluki assistant, who could then speak to the outsider. Thus, community-based wetland management projects should include provisions to incorporate local translators and train local people as trainers.

Local residents of any wetland arguably have knowledge about their ecosystem and the impacts upon it caused by climate change, knowledge that is based on generations of observation and shared experience. Despite the warnings of Hakaluki residents that particular trees would never grow in the places chosen for a given project, at the time chosen by the project, project managers of the CBA-ECA insisted on planting trees that were too small, at the wrong time of year, in bad weather. The residents were proven right when tree plantings failed and valuable opportunities to increase carbon sequestration and oxygen production in the area and create sanctuary spaces for birds and fish were lost. The failure of a number of the reforestation projects observed in this research is convincing support for the argument that local knowledge must be sought out, given due respect, and acted upon by those organising CBA projects. If this dissertation's proposal to truly devolve decision-making power to the community-based organisations were to be followed, local knowledge would be assured of its proper place in project planning.

This overlooking or ignoring of local knowledge is not new to CBA projects and weakens the effort to build community resilience. For example, Klein et al. (2019) found that, in Nepal, disaster-related decisions for rural areas were taken by the city dwellers, who ignored local ecological knowledge. These researchers' analysis of this programme in Nepal revealed that it was integrated and community-based in principle, but actually city-based in practice; they further found that it proved to be limited in its effectiveness. Scholars have argued that CBA ensures community participation and recognises local knowledge; these conceptions of CBA help to present it as a people-centred approach (Desai, 2008; Forsyth, 2013). However, this study found the opposite, observing that, on many occasions, CBA practitioners diminished community participation by not recognising cultural barriers and by not incorporating local knowledge in the planning and implementation of activities.

8.4.5 Improve Coordination

Some studies have argued that CBA is an effective tool for the management of natural resources (Rawlani & Sovacool, 2011; UNDP, 2015; McNamara et al., 2020). However, the findings of my study show that coordination gaps between the policy makers and the implementers hampered the building of community resilience through the management of climate stressed wetlands under a participatory system based on CBA ideology and methods.

My analysis indicates that the formation of appropriate policies alone does not foster community resilience. To establish and embed such policies requires balanced coordination among stakeholders, including those implementing the project at the field level. This finding aligns with those of other studies that have found limitations in the coordination among the implementing agencies involved in CBA projects (Spire et al., 2014; Olding, 2017; Amerasinghe et al. 2017; Lundsgaarde et al., 2018; Clar et al., 2019; Macdonald et al., 2021; Phong et al., 2022).

It is not surprising that coordination is difficult in Bangladesh; the Climate Public Expenditure and Institutional Review (CPEIR) identified more than 37 ministries, along with their departments and autonomous bodies, and at least ten donors (bilateral and multilateral) were involved with climate change-related affairs in Bangladesh (Ministry of Finance, 2014). This

was still the case at the time of my study. Such complex bureaucracy – especially in a context in which civil servants are regularly transferred into new positions – makes effective coordination a challenge. Published literature has demonstrated that coordination and collaboration problems between implementing agencies associated with adaptation projects in Bangladesh are common; they have also reduced project effectiveness (Rawlani & Sovacool, 2011). Chowdhury (2012) mentioned that, in the field of climate change, coordination problems among various departments of the government of Bangladesh arose between international development partners, local and national ministries, and agencies. Chowdhury identified the comparatively poor capacity of some ministries to deal with climate change programmes as a key contributor to these problems which, my findings and those others indicate, still exist.

Rahman et al. (2020), in their study of the Koyra and Shyamnagar *Upazilas* of Khulna and Satkhira districts (coastal region, southern part of Bangladesh), stated that – although the government officials are supposed to inspect NGO-related projects and provide progress reports to the central government – these officials were in fact just invited to join the inaugural and closing sessions of the NGO-related projects. Therefore, it can be said that no inspection was conducted. According to these researchers, this was a product of weak coordination between the government and the NGO at the grassroots level. Mustafa (2019) recommended that coordination needs to be increased between the Fisheries Department and the Land Ministry in Bangladesh. Hossain and Rabby (2019) – in their study area at Langalkata *Ozur Beel* in Sunamganj district, northeast Bangladesh – found poor coordination among the *beel* user group (fishers), *beel* management committee, and the government officials. They argued that self-interest of some of the stakeholders who took advantage of poor coordination to fish illegally at the cost of poor fishers, who lost both income and resilience.

My research revealed that the CBA-ECA project suffered from such coordination gaps on multiple levels. For example, in the central government, different ministries dealing with the project duplicated, contradicted, and delayed one another. Similar problems existed at the district and local levels of government. My study also found that, due to poor coordination under the CBA-ECA project, illegal fishing was only reduced while the project was operating, not over the long-term. Results also identified visible coordination gaps among the VCGs. Due

to conflicts between two nearby VCGs, one village conservation centre is still abandoned, and another is used by only one VCG instead of two. Endowment funds are not being used due to the inability of the VCGs to collaborate.

To ensure the effectiveness of climate change adaptation projects in building community resilience, it is essential for the various parties involved in the project to coordinate and collaborate well at all stages, from initiation through to implementation. The results of this research revealed that coordination between stakeholders was a major challenge, due to the complex bureaucratic structure in Bangladesh, personal/professional conflict between VCG members, and time pressures. Many people who were meant to cooperate held equivalent senior positions in different ministries, and all were busy with their respective ministries, leaving little time for extra-ministerial joint efforts. My findings suggest that it would be of great value to create an upper-level coordinator position similar to that of the post of sustainable development goals (SDG) Coordinator, who coordinates all development projects in Bangladesh. The institution of a new position of ‘Climate Finance Coordinator’ would go a long way toward resolving the coordination problem, but more thought and research should be undertaken to find additional ways to address this issue.

8.4.6 Understand the Local Power Structure

While CBA scholars have tended to assume that communities in a specific region are homogenous groups (Dodman & Mitlin, 2013; Berger & Ensor, 2014), this study illuminated the ways in which the distinct values of the ‘powerful people’ or elite groups in the Hakaluki, who are known to exploit the local resources, came into conflict with those of the middle-class and poor. Scholars have argued that impacts of CBA projects are often unsustainable due to the non-engagement of those in the local power structure (Dodman & Mitlin, 2013; Galvin, 2019). However, findings of my study show that the engagement of local powerful people impeded the decision-making process in various ways. These arguments and findings support the conclusion set out in this chapter that CBA as a tool to build community resilience is not appropriate in contexts in which the local political culture is not democratic and participatory and should not be used in such contexts.

Some recent studies have also similarly found that inherent power relations discouraged marginalised community members from participating in the selection of interventions (Nagoda & Nightingale, 2017; Khatri 2018; McNamara et al., 2020; Omukuti, 2020). Sultana et al. (2021) argued that fishers in Bangladesh cannot raise their voices since they have limited access to formal institutions. Choudhury and Haque (2016) found that local wetland communities are highly vulnerable to natural disasters and will feel helpless due to entrenched inequalities within existing social power structure. Mangubhai et al. (2021) reported that power and social inequity made Indo-Fijian fishing communities economically vulnerable and stressed. Other literature also revealed that CBA activities have failed to reckon with various important aspects of local communities, such as traditional power dynamics, the personal interests of particular groups, and power imbalances (Dumar, 2010; McNamara & Buggy, 2017; Ensor et al., 2018). Prior and Erikson (2013), as well as Dodman and Mitlin (2013), argued that a collective approach can increase the capacity of community members to face challenges posed by underlying political structures. Choudhury et al. (2019) focused on good governance. According to them, the success of resilience building initiatives is difficult to achieve without following good governance criteria. However, this study found that – even when the community members were connected with social institutions like VCGs – they could not raise their voices against corruption and illegal fishing, because they were in such great economic need and felt intimidated by those who, in their context, were the ‘powerful people’.

My study found that the direct and indirect involvement of local ‘powerful people’ (both acting as VCG members and as non-members) captured the benefits (output) generated by the various interventions associated with community-based climate-stressed wetland management. Over the period when the CBA-ECA project was operational and after its closure, it was observed – by interview, focus group participants, and by me – that a few wealthy people became wealthier while the villagers became, over the longer-term, poorer, or their livelihood status was relatively unchanged, and that the benefit to the environment was minimal at best. The elites used their connections with local politicians gaining undue benefits and exploiting the wetlands, bribed the poor fishers with high wages to acquire their loyalty, and created division among the poor fishers who either supported or condemned what these ‘powerful people’ were doing. Some poor fishers – involved with this gang of wealthy and powerful environment-wreckers – improved their standard of living for a short time, at the long-term cost of the whole

fishing community. Had the fishers not felt the need to participate in this looting behaviour of the 'powerful people', nor feared informing fisheries officers where illegal fishing was occurring, the adverse impacts of illegal fishing in their local areas would not have been as extensive.

The conclusion drawn from the findings in my study is that using CBA in places where power imbalances exist tends only to enhance the climate and livelihood resilience of the powerful, not the resilience of the community as a whole. No donor funds should be wasted on such exercises. Instead, available funding should support projects that have developed well-structured ways to ensure and be responsive to the involvement of all sorts of people within the society and to deal constructively with local power structure to enhance the community resilience.

Within the context of hierarchical society, any attempt to develop community resilience should take the local power structure into consideration. More attention is required to improve capacity of the community members by providing appropriate training and strengthening the community coherence.

8.5 Conclusion

Of the many observations I have gleaned from my analysis of the information given by the Hakaluki residents – as well as from my critical evaluation of the impediments and challenges associated with trying to build community resilience through community-based adaptation in a developing country – first and foremost, I have realised that concepts such as CBA, which developed within a western political culture, do not mean the same thing in a non-western developing country as they do in western countries.

For example, westerners generally believe that the provision of open meetings, typical in participatory democracies and in the CBA approach, creates spaces for community members to speak freely, share their local knowledge and ideas, and join in collective decision-making. Yet many developing countries are not participatory democracies. In Bangladesh, for example, the political culture is based on patron-client relations between community leaders and

followers in the community. Community residents are trained to follow orders and to limit any input to that which will please the local 'big men'. People who stand in opposition tend to be driven out of the community, harass politically or lose their livelihood. Therefore, what looks to the western observer like a participatory meeting for community-based adaptation, in a rural community in Bangladesh, is really a stage play in which community residents find ways to demonstrate their loyalty to the local leaders. In such a context, there can be no real community participation, only the appearance of it. The only time that I observed community residents transcend these limitations was when VCG members, particularly older ones, spoke to present their local knowledge. As, for example, when one said: "The saplings that the NGO are bringing to plant in the swamp forest are too small. They will never survive and grow." It was disappointing to note that the NGO did not take on board the information shared in that rare moment of active community participation.

This research has studied some of the poorest people in one of the world's poorest places, in a wetland, to identify the extent to which participatory wetland management contributed to making vulnerable communities more resilient under a 'typical' CBA project. This chapter has discussed the findings of my study. Moreover, I have presented the implications of the findings and highlighted possible solutions based on lessons learnt from this study for building of community resilience in climate stressed wetlands in developing as well as climate vulnerable countries.

This fundamentally top-down nature of project management by the NGO was largely responsible for the CBA-ECA project looking good in the short-term but failing in the longer term, after the end of the project. The community were not really empowered, their capacity was not really built up, and resources were not distributed to the majority: in brief, not significant improvement was found after four years of the ending of the project. The community had remained fundamentally dependent on the NGO to continue project interventions.

From above mentioned discussions, what I realised is that the notion of 'participatory wetlands management' must be more pragmatic. If the community are not empowered by giving resources and providing appropriate training to carry on the project after end of its duration,

one cannot expect for the resilience of the community, as well as the long-term success of the project.

It is hoped that the findings and recommendations from this case study of CBA/participatory wetlands management in Bangladesh may be useful to emphasise local context where similar approaches for building community resilience in the Global South are attempted.

Chapter 9: Conclusion

9.1 Introduction

In this research, I sought to understand the impacts of community-based adaptation projects for the management of climate-stressed wetlands in Bangladesh for community resilience of residents. The method of the research was a case study of a five-year wetlands management project called the Community Based Adaptation in Ecologically Critical Areas through Biodiversity Conservation and Social Protection (CBA-ECA) Project. This project was jointly financed by international donors and the Government of Bangladesh through the Bangladesh Climate Change Trust Fund, was implemented in Bangladesh's largest wetlands area, the Hakaluki *haor*, between 2010 and 2015. The CBA-ECA project used the common CBA structure for such projects: NGO management, assisted by residents (represented by Village Conservation Groups). The previous chapter has presented a discussion of the results in relation to the overarching research question. This chapter summarises the major findings on the basis of the following research questions prepared for this study (Table 20 presents the key findings):

Table 20: Research Questions and Key Findings

Research Questions	Key Findings
1) Was the implementation of the project, with its community-based adaptation approach, effective in realising its goals of achieving better community adaptation and resilience to climate impacts? If not, what factors impeded effectiveness?	Awareness building and teamwork helped to reduce the impact of natural disaster in the Hakaluki. Re-excavation of <i>beels</i> , and management of fish sanctuaries significantly increased fish production during the project. Trainees who got capital and asset grants to start new businesses were more successful than the majority who got only training with no financial assistance. All these efforts contributed to

	<p>improve the livelihood of the community members and made the community more resilient while the project continued.</p> <p>Although various CBA-ECA project interventions generated benefits for different individuals, especially VCG members, the goal of long-term resilience for the majority of the community's residents, especially the most vulnerable, was not achieved.</p> <p>There are many factors which impeded the achievement of this goal. Too often, achievements ended with the end of the project and the community, or the environment, reverted to the earlier position. Other factors hampering the success of the project in achievement of widespread community resilience included a lack of integration among community residents; lack of trust of NGO project managers in local knowledge; and failure to identify local needs. Poor market linkage undermined the positive initiative of crop diversification training. Undue influence of powerful people allowed them to capture the benefits of increased fish production and tree diversity. Then the project's interventions, which had produced these benefits, were not continued after the project's end. So, the project's achievements were as temporary as the project.</p>
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<p>2) In what ways did the project include community participation and with what outcomes?</p>	<p>The CBA-ECA project, in the VCGs and VCCs, provided a forum through which local people could participate in wetland management interventions. The village conservation groups, and village conservation centers helped the community people become more united and express their opinions.</p> <p>However, this participation was not effective since, in many cases, the choices of the local people were not reflected in final decision taken by the project organisers, which hampered the outcome of the project. The community had lots of input but little impact.</p>
<p>3) What lessons can be learnt for the building of community resilience in climate stressed wetlands in developing and climate vulnerable countries?</p>	<p>The most important lesson learnt from this study is that communities need to be empowered with resources and decision-making authority to become more resilient. Decisions in such projects need to be taken at community level with wider participation of the local people. NGOs and other outside experts should only advise and assist the community in implementing their decisions. Appropriate training is essential to build capacity of community people to carry on the project after its termination.</p>

9.2 Summary of Findings

This section relates to the research question regarding both factors influence and impeding the building of community resilience. Based on interviews, focus group discussions, survey

responses, as well as my observations of various initiatives of the CBA-ECA project, the overall impact in building community resilience was not consistent. While some components of the project contributed to improving some aspects of community resilience, most of the benefits were short-lived and did not survive the end of the project. This has been presented in the summary of finding in the table below.

Table 21: Summary of Findings

Factors positively influencing the building of community resilience:

- Awareness building helped to protect birds from hunters. It inspired the local community to adjust their priorities and to conserve their wetlands.
- VCGs and VCCs played a role in the development of social drivers, which helped to connect and mobilise communities.
- Physical drivers (re-excavation of *beels*, submersible embankments), natural drivers (plantation and protection of swamp forest), and management of fish sanctuaries increased fish production during the currency of the project. Such interventions contributed to increase the earnings of the fishers as well as ensuring food security of the community.
- Financial drivers, such as MCG, offered low interest credit, which helped to address short-term crises for middle-class farmers.
- Participatory wetland management contributed to increase community resilience, in the short term, through positive changes in its various drivers, where NGO project managers followed the advice and local knowledge of community residents.

Factors impeding the building of community resilience:

- Most of the benefits generated by the CBA-ECA project terminated at the end of the project. Almost no changes had been made in the pre-existing social and economic realities of the community to allow benefits to persist.

- Livelihood and employment training were not successful. Most entrepreneurs had no start-up capital or markets to build new businesses and most employment trainees could not find employment in the trades in which they had been trained.
- The CBA-ECA project did not establish market linkage for its diversified crops training. Farmers could not sell the new crops they had produced.
- Failure to understand the socio-political realities in the community allowed powerful local people to co-opt the CBA-ECA project and prevent needed social and economic changes to make resilience improvements significant, widespread or permanent.
- After the project staff had left, VCG members could not stop the undoing of project advancements for the economic benefit of powerful local people.
- Community members tried to participate in decision-making for the CBA-ECA project's implementation, but NGO project managers ignored community local knowledge, policy preferences and substantive advice, leading to failures of this project in most of its interventions.

Some of the findings are described in further detail below.

One of the strongest arguments for community-based adaptation and participatory wetlands management – that it is the most sustainable method of increasing community resilience because it empowers the community – was not proven by most of the data collected in this research.

The most important aspect was that the participatory wetland management approach had given an opportunity to the community members to organise themselves and involved them with the project. Village Conservation Groups (VCGs) and Village Conservation Centers (VCCs) improved community unity, increased connectivity, as well as cohesion within the community; it helped to provide a model of women's equality and empowerment which did continue after the project ended. Residents were more environmentally conscious, which sometimes was reflected in concrete action, like a community taboo on the common practices of bird hunting and gathering of firewood in the swamp forest, which practices were not resumed after the

project's end. Residents completely understood the causes and consequences of global warming and how it affected them, with greater self-confidence in discussing and acting on these issues. Residents feel that, in the event of climate-related disaster like flood or fire, they can work together to do what is needed to survive, repair damage, and rebound; this is an important element of resilience. Submersible embankments, which residents continued to repair and maintain at their own expense, continued to protect homes from flood damage in rainy season and provide needed paved roads during winter. Village Conservation Centres stood as monuments to environmental resilience and provided meeting places. They were information hubs and potential coordination centres in the event of climate disaster, even though one out of ten was abandoned in disputes between villages since the project did not have enough money to build a centre for each village conservation group. Some villagers – the lucky few whom the project gave capital grants, after training – were able to start new businesses like sewing with the machines they were given and milk-and-meat sale with the cows they were given, which helps make them less dependent on the resources of climate-stressed wetlands.

Yet for most of the big projects that could have made the community more-generally resilient, the end of the project meant 'back to normalcy'; the benefits were squandered. Dredging of *beels* to improve fish shelter (and thus catches) stopped. There was no money for it; no one was responsible. Illegal commercial trawling in the *haors*, mostly stopped by the project, resumed in large-scale – with excellent short-term income for residents that destroyed the resource. Training produced a few jobs since it did not reflect the choices of the local people and was arranged only on traditional trades. Farmers were induced to diversify crops with no means of selling the new crops in the markets. The NGO management brought trees for plantation from far away, at the wrong time, in the wrong place and at the wrong size: only a few grew. Swamp forests protected by the project were knocked down by buffalo set to graze there by the powerful people and no security guard are working there, after end of the project. The loan amount offered from the micro capital grants (for individual use) was so small with that the fishers cannot buy their fishing gears. Grants for community use (endowment fund) slept in the State banks as a custodian of the fund: newly joined local civil servants did not know, or continue not to know, anything about the fund; the general members of the VCGs were not aware, or are not aware, about their benefits due to communication gap. Many local loan funds went bankrupt as poor farmers and fishers would not or could not repay the loans

since they could not generate revenue from this small fund rather used for family expenditure. This is not a picture of building resilience.

To understand the governance system of the CBA-ECA project, I also asked the beneficiaries in what ways did the project include community participation and with what outcome.

The study found that there is a positive relationship between the community involvement under this participatory wetland management and building the resilience of climate vulnerable people living around Hakaluki areas. However, the results of my study also confirmed that the level of community participation in various stages of the project was not satisfactory. Although project organisers attempted to make project participatory, data analysis revealed that this participation was not effective. Reportedly, most of the cases preferences of local beneficiaries were ignored. The CBA-ECA project failed to ensure its democracy, in terms of community participation. It happened in a number of components of the CBA-ECA project. For example, in selection (selection of location of *beel* excavation, training trades), implementation, and monitoring of project activities. Failure to ensuring real, open community input from a wide range of stakeholders hampered to achieving project goals: community resilience.

Study findings also indicate that due to poor coordination among VCG members, civil servants, and local government officials impeded the success of project activities – especially in using endowment fund and protecting illegal fishing. Results demonstrate that adequate accountability was not ensured in CBA-ECA project. Moreover, VCG leaders did not show proper transparency to their general members in relation to the funding activities, more specifically, two major components of the project used for wetland management. One was re-excavation, and another was swamp forest planting. Lack of transparency and accountability created confusion among the general members of the VCGs which hampered proper monitoring of the project. Clearly, the governance system of the CBA-ECA project was weak in many ways and which hampered building community resilience in the wetland area.

9.3 Contributions to Knowledge

My study has made a clear contribution to conceptual as well as empirical knowledge related to natural resource management. My thesis contributes a ‘Resilience Drivers Framework’ (RDF) that could be used to measure both the resilience of a community and its ability to build adaptive capacity. The ‘drivers’ in this framework are the human, social, financial, natural, physical, and governance capitals that act as ‘drivers’ in a community to build resilience. Governance was included as a driver in the RDF in order to facilitate the examination of the linkages between resilience and governance structures and related factors. This initiative, informed by the work of Villagra (2019), led to my conceptualisation of the RDF via its integration of capacity building, physical infrastructure construction, and participatory governance and management for the purpose of assessing the processes associated with building community resilience.

This is an interdisciplinary concept that integrates development studies, environmental studies, geography, and ecology and has the potential to inform interdisciplinary research. In addition to this, the identification of both the links between different drivers and the processes of community resilience building and the role of governing institutions in these processes is a significant contribution. The results of my thesis have the potential to support the use of a highly valuable conceptual framework for addressing community resilience building in other comparable parts of the world.

I have also offered insights into the ways that participatory processes and the application of democratic principles are mediated by culture and as such should not be automatically assumed to be ‘good’ and other approaches ‘bad’. I argue that approaches to CBA need to be based on understanding of the cultural context in which they operate.

9.4 Policy Implications and Recommendations

In light of the findings and lessons learnt from my research, I propose the following policy implications and recommendations be considered by all involved in future attempts to facilitate the community-based management of natural resources and to increase community resilience in developing and climate vulnerable countries:

1. The overall aim of the project should be to permanently empower the powerless by providing them with sufficient and ecologically sustainable sources of income, as well as by training them in ways to meet the ongoing needs of the ecosystem from which they earn their living.
2. The approach to the design, implementation, and evaluation of project activities should be determined by the degree to which the existing community operates democratically. If the local political culture and reality are sufficiently democratic to support CBA, decision-making power should be devolved into the hands of carefully selected community-based organisations, with NGOs and other outside experts acting in the role of advisers. If the local political institutions are not democratic or do not conform to the western assumptions that underpin CBA, a top-down approach focused on overwhelming local power structures and enhancing the community resilience of majority and marginalised groups should be chosen. To achieve this, it is most likely better to start fresh than try to co-opt or bond with pre-existing entities. Preference should be given to select relevant stakeholders who have non-conflicting interests, like *beel* leaseholders. But local elites could not be ignored.
3. If decision-making is democratically devolved to community-based organisations, the capacity and livelihoods of local people should be proactively built through appropriate training and cash investment, with trainers from the same region and social class of the trainees preferred.
4. Projects should prioritise taking actions that will empower communities by strengthening their social linkages with individuals and groups in their area, region and, where possible, at the national level. Social isolation leaves communities vulnerable to climate change.
5. Projects dealing with long-term/permanent challenges such as those associated with climate change and natural resource management should be equally long-

term/permanent. The duration of the project should be determined based on the needs of the target population and/or the nature of the components of the project. For example, it takes around ten years for a newly planted swamp forest to mature. Therefore, a swamp reforestation project needs to be planned to operate for at least ten years.

6. To ensure transparency and maintain communication with local participants and beneficiaries, project details, including fund-related information, need to be published and hung on a billboard in the given project area, so that the information will reach the majority and especially the marginalised people in the community.
7. To control corruption, an independent monitoring commission needs to be formed by the host government. In the case of projects in Bangladesh, this commission could operate with the help of the Bangladesh Climate Change Trust Fund (BCCTF) and include representatives from donor agencies.
8. Coordination of stakeholders in a given CBA process at national, regional, and local levels should be strengthened. In the Bangladesh context: the Ministry of Environment, Forests and Climate Change (MoEFCC), at the national level; the Department of Environment (DoE), at the regional level need to play vital roles.

9.5 Limitations of the Research and Future Research Directions

While the findings of this research indicate quite strongly that the goals of the CBA-ECA project to achieve better community adaptation and resilience to climate impacts were not met in a way that could be sustained over the long-term, it is difficult to confirm this against a clear measurement of the broader context of the research area. Because my research began four years after the project had been terminated, I was not able to undertake a baseline survey before the start of the CBA-ECA project to assess the economic and resilience status of the community people at that time; the project itself did not do such an assessment. Thus, there was no way to say definitively by how much the community resilience to climate change within the target population had progressed (or not) from ‘before’ to ‘after’ the project. The conclusions drawn from this research are inferences from current data and participants’ memories of what had happened in the past.

Another limitation is the lack of clarity around the extent to which conclusions drawn from this case study – albeit a comprehensive one of one project in one developing country – are representative of experiences in Bangladesh, let alone of those in the developed world or in the world as a whole. More such studies are needed to arrive at such conclusions. It is hoped that the findings, analysis, and recommendations of this study can serve as hypotheses or foci for future data collection and discussion by other researchers.

A few additional questions have emerged from this study which merit further research. These include:

- how do drivers of resilience correlate with one another?
- how does the impact of more-democratic CBA projects compare with those that are less democratic?
- how does the impact of longer-term approaches to CBA wetlands and climate adaptation projects compare with short-term approaches (with longitudinal studies to determine how long-term the impacts of ‘successful’ short-term projects are)?
- how can coordination gaps among central and local governments over projects be redressed?
- what approaches have been/can be taken to control and/or manage corruption in the use of climate change and wetland management funds? and
- what projects have been most successful in securing efficiencies in the expenditure of climate change adaptation funds?

It would also be interesting to compare the issues arising in CBA projects undertaken in developed and less developed countries.

9.6 Concluding Statement

Using drivers as a methodology of this study ensures a better coherence of the analysis and literature. It thus presents the rigour of the study. Further, it helped to understand how building community resilience is different in a developing country from a developed country. Then,

relating the drivers to factors contributing to or obstructing community resilience helped in understanding how community resilience can be built.

The CBA-ECA project shows us some of the best and worst of community-based adaptation and participatory wetlands management projects. It shows us how such an intervention can make a marginalised community more cohesive, more committed to the environment, better informed, and more progressive in terms of how they treat their women, as well as how they look after their migratory bird guests. It shows us that, as with submersible embankments and village community centres, sometimes a little infrastructure can go a long way – producing benefits that were never expected. But this also reminds us that good infrastructure planning is not just about cash and bricks; instead, it is as much about training and motivating people who are going to use it to get the best out of it. Yet it also shows us that ‘participation’ does not create democracy when the society is fundamentally undemocratic, that short-term projects bring short-term results, that trying to co-opt local elites can empower them to co-opt the project, and that livelihood projects are not just about opening alternatives to poor people but also need to be thought through – to the point that those poor people have enough working capital to get started in viable businesses. Further, it shows that they have well-defined markets which they know how to access, that they have the social networks which every small business needs everywhere to be successful, and many other lessons that are too manifold to list exhaustively here.

Community-based adaptation literature focuses on building the capacity of local people vulnerable to climate change to cope with that change. However, CBA researchers have yet to concentrate on the extent to which CBA approaches contribute to building community resilience through the management of climate-stressed inland wetlands. My study closes this gap by identifying the best practices and exploring the challenges CBA approaches face during the implementation of wetland management project in practice. This study found that a low level of awareness, a lack of trust in local knowledge, short duration of project taken, an unfair distribution of resources, social and political inequality, failure to understand community needs, a lack of appropriate training opportunities, coordination gaps among key players and failure to ensure real community participation in project design and implementation were the major impediments for building community resilience. Understanding the factors which

positively influence, and the constraints, of the participatory wetland management system of the CBA-ECA project in Bangladesh will help the following: the future CBA initiatives to address these challenges in building community resilience, as well as better results – which can be expected to be achieved.

One of the major problems in building community resilience in the CBA-ECA – shown clearly by the data in this research – was the ability of the wealthy and powerful of the local population to dominate the community representatives; this was for their own economic benefit, at the expense of the environment and community resilience. This research also gave us many insights into the following: how to do better, how to give vulnerable communities the power to determine their own futures, as well as the drivers (the human, social, natural, physical, financial, and governance drivers) that are needed to do so. Rather than directing the people in these communities, we need to help them. The focus should be on the impact: to enable the project to support the community to be more resilient over the long term by facilitating sustainable change. Efforts should be made to make the projects permanent, as well as having commitment from the developed world to work in partnership with the developing world towards climate change adaptation and management of the climate-stressed wetlands. If we take these lessons from this research on board, our participatory wetland management projects in Bangladesh will be more effective in the future. This will be able to influence people, aiming to assist communities in building their resilience, as well as assist developing countries to follow our lead, fostering adaptation.

References:

- Abedin, M., & Shaw, R. (2013). Agriculture adaptation in coastal zone of Bangladesh. In R. Shaw, F. Mallick & A. Islam (Eds.), *Climate Change Adaptation Actions In Bangladesh* (pp. 207-225). Tokyo, Springer.
- Adaptation Knowledge Platform (AKP). (2010). *Scoping Assessment on Climate Change Adaptation in Bangladesh*. Bangkok: Thailand Regional Climate Change Adaptation Knowledge Platform for Asia. Retrieved June 13, 2020, from <https://www.yumpu.com/en/document/view/30764822/scoping-assessment-on-climate-change-adaptation-in-bangladesh>
- Adedeji, T. J., Proverbs, D. G., Xiao, H., & Oladokun, V. O. (2018). Towards a conceptual framework for property level flood resilience. *International Journal of Safety and Security Engineering*, 8(4), 493-504.
- Adeli, S., Salehi, B., Mahdianpari, M., Quackenbush, L. J., Brisco, B., Tamiminia, H., & Shaw, S. (2020). Wetland monitoring using SAR data: A meta-analysis and comprehensive review. *Remote Sensing*, 12(14), 2190.
- Adger, W. N. (2000). Social and ecological resilience: are they related?. *Progress In Human Geography*, 24(3), 347-364.
- Adger, W. N. (2003). Social capital, collective action, and adaptation to climate change. *Economic Geography*, 79(4), 387-404.
- Adger, W. N., Hughes, T. P., Folke, C., Carpenter, S. R., & Rockstrom, J. (2005). Social-ecological resilience to coastal disasters. *Science*, 309(5737), 1036-1039.
- Adhikari, B., & Taylor, K. (2012). Vulnerability and adaptation to climate change: A review of local actions and national policy response. *Climate and Development*, 4(1), 54-65.
- Adhya, T., Bagaria, P., Dey, P., Muñoz, V. H., Ratnayaka, A. A. W., Thudugala, A., Aravind, N.A., & Sanderson, J. G. (2022). On the Edge: Identifying priority areas for conservation of Fishing Cat, a threatened wetland felid, amidst rapidly altering freshwater landscapes. *Preprint Article*. <https://doi.org/10.1101/2022.01.16.476498>
- Agrawal, A., & Gibson, C. C. (1999). Enchantment and disenchantment: the role of community in natural resource conservation. *World Development*, 27(4), 629-649.
- Agarwal, B. (2001). Participatory exclusions, community forestry, and gender: An analysis for South Asia and a conceptual framework. *World Development*, 29(10), 1623-1648.
- Agrawal, A., McSweeney, C., & Perrin, N. (2008). Local institutions and climate change adaptation. *Social Development Notes*, No. 113. Washington, DC: World Bank, Retrieve January 28, 2019, from <https://openknowledge.worldbank.org/handle/10986/11145>

- Ahammad, R. (2011). Constraints of pro-poor climate change adaptation in Chittagong city. *Environment and Urbanization*, 23(2), 503-515.
- Ahmed, I., Deaton, B. J., Sarker, R., & Virani, T. (2008). Wetland ownership and management in a common property resource setting: A case study of Hakaluki Haor in Bangladesh. *Ecological Economics*, 68(1-2), 429-436.
- Ahmed, A. U., Huq, S., Nasreen, M., & Hassan, A. W. R. (2015). Climate change and disaster management, sectoral inputs towards the formulation of the 7th Five Year Plan (2016–2021). *Bangladesh Planning Commission, Dhaka, Bangladesh*, 63. Retrieved January 11, 2019, from http://nimc.portal.gov.bd/sites/default/files/files/nimc.portal.gov.bd/page/6c53bd88_a d69_4ccf_bbae_d45b70dbc0bf/017%207th%20FYP%20and%202021%20Climate-Change-and-Disaster-Management.pdf
- Ahmed, A. (2016). Conserving the ecologically critical areas (ECAs) in Bangladesh environment. *The Daily Observer*. Retrieved from 18 March 2019, <https://www.observerbd.com/details.php?id=28143>.
- Ahmed, A. U., Mondal, P., & Islam, M. (2017). Community-based adaptation: An analysis of best practices in the south-western region of Bangladesh. *Dhaka, CARE Bangladesh*. Retrieved March, 28, 2018, from <https://doi.org/10.1101/2022.01.16.476498>.
- Akter, A. (2011). People's perceptions of environmental pollution in Mokosh Beel, Bangladesh. Dhaka: Department of Environment. Retrieved July 20, 2019, from <https://dlc.dlib.indiana.edu/dlc/bitstream/handle/10535/7300/1331.pdf?sequence=1&isAllowed=y>.
- Akter, S., Saha, S. K., Kabir, M. H., Mamun, S. A., & Islam, M. S. (2017). Fluctuations in water quality at Hakaluki haor of Bangladesh. *Bangladesh Journal of Environmental Science*, 32, 35-40.
- Alam, K., Shamsuddoha, M., Tanner, T., Sultana, M., Huq, M. J., & Kabir, S. S. (2011). The political economy of climate resilient development planning in Bangladesh. *IDS Bulletin*, 42(3), 52-61.
- Alam, A.B.M.S., Chowdhury, M.S.M. & Sobhan, I. (2012). Biodiversity of Tanguar Haor: A Ramsar site of Bangladesh. Dhaka: IUCN Bangladesh. Retrieved on May 29, 2022, from <https://portals.iucn.org/library/sites/library/files/documents/2012-021-v.3.pdf>
- Alam, K., Tanner, T., Shamsuddoha, M., Rashid, A. K. M., Sultana, M., Huq, M. J., Kabir, S.S., & Ullah, S. (2013). Planning “exceptionalism”? Political economy of climate resilient development in Bangladesh. In R. Shaw, F. Mallick & A Islam (Eds.), *Climate Change Adaptation Actions In Bangladesh* (pp. 387-417). Tokyo, Springer.
- Alam, A. B. M. S., Badhon, M. K., & Sarker, M. W. (2015). Biodiversity of Tanguar Haor: A Ramsar Site of Bangladesh Volume III: Fish. *IUCN, International Union for Conservation of Nature, Bangladesh Country Office, Dhaka, Bangladesh*. Retrieved January 5, 2020, from <https://portals.iucn.org/library/sites/library/files/documents/2012-021-v.3.pdf>

- Alam, M. T., & Islam, M.M. (2018). Potentials of modernization in fisheries sector of Bangladesh: Study on the people's profile technologies and policies. Project Completion Report. National Agricultural Technology Program-Phase II Project (NATP-2). Bangladesh Agricultural Research Council (BARC).
- Alam, E., Momtaz, S., Bhuiyan, H. U., & Baby, S. N. (2018). Climate change impacts on the coastal zones of Bangladesh: Perspectives on tropical cyclones, sea level rise, and social vulnerability. In R. Shaw, F. Mallick, & A. Rahman. (Eds.), *Climate Change Impacts, Mitigation and Adaptation in Developing Countries* (pp. 145-166). Cham, Springer.
- Alam, M., Sarker, B., Uddin, I., & Ahmed, A. (2020). Contributing Factors of Boro-Rice Production in Hakaluki Haor of Bangladesh. *International Journal of Sustainable Agricultural Research*, 7(4), 267-274.
- Alam, S., Rahman, M., & Arif, A. A. (2021). Challenges and opportunities in artisanal fisheries (Sonadia Island, Bangladesh): The role of legislative, policy and institutional frameworks. *Ocean and Coastal Management*, 201, 1-12.
- Alam, E., & Mallick, B. (2022). Climate change perceptions, impacts and adaptation practices of fishers in southeast Bangladesh coast. *International Journal of Climate Change Strategies and Management*. 12(2), 191-211.
- Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American Behavioral Scientist*, 59(2), 254-269.
- Alexander, D. E. (2013). Resilience and disaster risk reduction: an etymological journey. *Natural Hazards and Earth System Sciences*, 13(11), 2707-2716.
- Alizadeh-Choobari, O., Ahmadi-Givi, F., Mirzaei, N., & Ovlad, E. (2016). Climate change and anthropogenic impacts on the rapid shrinkage of Lake Urmia. *International Journal of Climatology*, 36(13), 4276-4286.
- Allen, K. M. (2006). Community-based disaster preparedness and climate adaptation: Local capacity-building in the Philippines. *Disasters*, 30(1), 81-101.
- Allison, E. H., Ratner, B. D., Åsgård, B., Willmann, R., Pomeroy, R., & Kurien, J. (2012). Rights-based fisheries governance: from fishing rights to human rights. *Fish and Fisheries*, 13(1), 14-29.
- Almenar, J. B., Elliot, T., Rugani, B., Philippe, B., Gutierrez, T. N., Sonnemann, G., & Geneletti, D. (2021). Rights-based fisheries governance: From fishing rights to human rights. *Fish and Fisheries*, 13(1), 14-29.
- Alshehri, S. A., Rezgui, Y., & Li, H. (2015). Delphi-based consensus study into a framework of community resilience to disaster. *Natural Hazards*, 75(3), 2221-2245.
- Amerasinghe, N. M., Thwaites, J., Larsen, G., & Ballesteros, A. (2017). Future of the funds: Exploring the architecture of multilateral climate finance. *World Resources Institute*. Retrieved January 19, 2019, from <https://www.wri.org/research/future-funds-exploring-architecture-multilateral-climate->

finance?utm_source=feedburner&utm_medium=feed&utm_campaign=Feed%3A+WRI_News_and_Views+(WRI+Insights+Blog%2C+News%2C+and+Publications+%7C+World+Resources+Institute)

- An, S., & Verhoeven, J. T. (2019). Wetland functions and ecosystem services: Implications for wetland restoration and wise use. In S. An & J.T.A Verhoeven (Eds), *Wetlands: Ecosystem Services, Restoration and Wise Use* (pp. 1-10). Cham, Springer.
- Anderson, G., Mack, C., Khan, M. Z. H., Khondker, R., & Hyman, E. (2017). Climate finance in Bangladesh: Situation analysis. Washington, DC: USAID. Retrieved 12 October 2020, from https://pdf.usaid.gov/pdf_docs/pa00mv2d.pdf
- Archer, D., Almansi, F., DiGregorio, M., Roberts, D., Sharma, D., & Syam, D. (2014). Moving towards inclusive urban adaptation: approaches to integrating community-based adaptation to climate change at city and national scale. *Climate and Development*, 6(4), 345-356.
- Armitage, D. (2005). Adaptive capacity and community-based natural resource management. *Environmental Management*, 35(6), 703-715.
- Armitage, D., Berkes, F., Dale, A., Kocho-Schellenberg, E., & Patton, E. (2011). Co-management and the co-production of knowledge: Learning to adapt in Canada's Arctic. *Global Environmental Change*, 21(3), 995-1004.
- Arora-Jonsson, S. (2011). Virtue and vulnerability: Discourses on women, gender and climate change. *Global Environmental Change*, 21(2), 744-751.
- Asadzadeh, A., Kötter, T., Salehi, P., & Birkmann, J. (2017). Operationalising a concept: The systematic review of composite indicator building for measuring community disaster resilience. *International Journal of Disaster Risk Reduction*, 25, 147-162.
- Ashley, L., Zhumanova, M., Isaeva, A., & Dear, C. (2015). Examining changes in local adaptive capacity resulting from climate change adaptation programming in rural Kyrgyzstan. *Climate and Development*, 8(3), 281-287.
- Atkinson, P.A. and Coffey, A.J. (2011). Analyzing documentary realities, In Silverman, D. (Eds.) *Qualitative Research* (pp. 77–92). London, Sage Publications.
- Ayers, J., & Forsyth, T. (2009). Community-based adaptation to climate change. *Environment: Science and Policy for Sustainable Development*, 51(4), 22-31.
- Ayers, J. M., & Huq, S. (2009). The value of linking mitigation and adaptation: A case study of Bangladesh. *Environmental Management*, 43(5), 753-764.
- Ayers, J., & Dodman, D. (2010). Climate change adaptation and development I: The state of the debate. *Progress in Development Studies*, 10(2), 161-168.
- Ayers, J. (2011). Resolving the adaptation paradox: Exploring the potential for deliberative adaptation policy-making in Bangladesh. *Global Environmental Politics*, 11(1), 62-88.

- Ayers, J., & Huq, S. (2013). Adaptation, development and the community. In J. Palutikof, S. L. Boulter, A. J. Ash, M. S. Smith, M. Parry, M. Waschka & D. Guitart (Eds.), *Climate Adaptation Futures*, (pp.201-214). Oxford: Wiley.
- Ayers, J., Huq, S., Wright, H., Faisal, A. M., & Hussain, S. T. (2014). Mainstreaming climate change adaptation into development in Bangladesh. *Climate and Development*, 6(4), 293-305.
- Aziz, M. S. B., Hasan, N. A., Mondol, M. M. R., Alam, M. M., & Haque, M. M. (2021). Decline in fish species diversity due to climatic and anthropogenic factors in Hakaluki Haor, an ecologically critical wetland in northeast Bangladesh. *Heliyon*, 7(1), e05861.
- Bahadur, A. V., Ibrahim, M., & Tanner, T. (2013). Characterising resilience: Unpacking the concept for tackling climate change and development. *Climate and Development*, 5(1), 55-65.
- Bangladesh Climate Change Trust (BCCT) Act 2010. (2016). Dhaka: Department of Environment and Forest. Retrieved February 23, 2019 from <http://nda.erd.gov.bd/files/1/Publications/CC%20Policy%20Documents/Climate%20Change%20Trust%20Act%202010.pdf>
- Bangladesh Climate Change Resilience Fund (BCCRF). (2012). Annual report 2012 (English). Washington, D.C.: *World Bank*. Retrieved May 05, 2019, from <http://documents.worldbank.org/curated/en/267181468210282725/Bangladesh-Climate-Change-Resilience-Fund-BCCRF-annual-report-2012>
- Bangladesh Climate Change Resilience Fund (BCCRF). (2016). Bangladesh climate change resilience fund annual report 2016. World Bank. Retrieved January 22, 2019, from <https://documents1.worldbank.org/curated/en/194721498048042073/pdf/116486-AR-BCCRF-AR-2016-Final-Proof-PUBLIC.pdf>
- Bangladesh Environment Conservation Act (BECA). (1995). Government of Bangladesh Retrieved January 12, 2019, from <http://extwprlegs1.fao.org/docs/pdf/bgd42272.pdf>
- Banks, N., Hulme, D., & Edwards, M. (2015). NGOs, states, and donors revisited: Still too close for comfort??. *World Development*, 66, 707–718.
- Barkat, A., Gazi, M., Suhrawardy and Rahman, M.I. (2019). A study on haor governance and haor dwellers' rights in Bangladesh. Human Development Research Center, Dhaka. Retrieved January 18, 2020 from <https://bit.ly/3jjmf3i>
- Barnett, J., (2001). Adapting to climate change in Pacific Island Countries: The problem of uncertainty. *World Development*, 29(6), 977–993.
- Barnett, J., & Campbell, J. (2010). *Climate change and small island states: Power, knowledge, and the South Pacific*. London, Routledge.
- Barrett, S. (2013). Local level climate justice? Adaptation finance and vulnerability reduction. *Global Environmental Change*, 23(6), 1819-1829.

- Barrett, G. (2015). Deconstructing community. *Sociologia Ruralis*, 55,182–204.
- Bassett, T. J., & Fogelman, C. (2013). Deja vu or something new? The adaptation concept in the climate change literature. *Geoforum*, 48, 42-53.
- Baxter, H. (2019). Creating the conditions for community resilience: Aberdeen, Scotland—An example of the role of community planning groups. *International Journal of Disaster Risk Science*, 10(2), 244-260.
- Bazeley, P., & Jackson, K. (2013). *Qualitative Data Analysis with NVivo*. London, SAGE Publications.
- Bebbington, A. (2005). Donor-NGO relations and representations of livelihood in nongovernmental aid chains. *World Development*, 33 (6), 937–950.
- Belton, B., van Asseldonk, I. J. M., & Thilsted, S. H. (2014). Faltering fisheries and ascendant aquaculture: Implications for food and nutrition security in Bangladesh. *Food Policy*, 44, 77-87.
- Bennett, E., Neiland, A., Anang, E., & Bannerman, P., Rahman, A.A., Huq, S., Bhuiya, S., Day, M., Fulford-Gardiner, M. and Clerveaux, W., (2001). Towards a better understanding of conflict management in tropical fisheries: Evidence from Ghana, Bangladesh and the Caribbean. *Marine Policy*, 25(5), 365–376.
- Bennett, N. J. & P. Dearden. (2014). Why local people do not support conservation: Community perceptions of marine protected area livelihood impacts, governance and management in Thailand. *Marine Policy*, 44, 107–116.
- Berger, R., and J. Ensor. (2014). Introduction: Progress in adaptation. In R. Berger, J. Ensor, & S. Huq (Eds.), *Community-based Adaptation to Climate Change: Emerging Lessons* (pp. 1–13). Rugby, Practical Action Publisher.
- Bergman, M. M. (2011). The good, the bad, and the ugly in mixed methods research and design. *Journal of Mixed Methods Research*, 5(4), 271-275.
- Berkes, F. (2004). Rethinking community-based conservation. *Conservation Biology*, 18(3), 621-630.
- Berkes, F. (2007). Understanding uncertainty and reducing vulnerability: Lessons from resilience thinking. *Natural Hazards*, 41(2), 283-295.
- Berkes, F., & Ross, H. (2013). Community resilience: toward an integrated approach. *Society & Natural Resources*, 26(1), 5-20.
- Berkes, F., & Ross, H. (2016). Panarchy and community resilience: Sustainability science and policy implications. *Environmental Science & Policy*, 61, 185-193

- Berrang-Ford, L., Biesbroek, R., Ford, J. D., Lesnikowski, A., Tanabe, A., Wang, F. M., ... & Heymann, S. J. (2019). Tracking global climate change adaptation among governments. *Nature Climate Change*, 9(6), 440-449.
- Betzold, C., & Weiler, F. (Eds.). (2018). *Development Aid and Adaptation to Climate Change in Developing Countries*. Cham, Springer.
- Birkhofer, K., Diehl, E., Andersson, J., Ekroos, J., Früh-Müller, A., Machnikowski, F., ... & Smith, H. G. (2015). Ecosystem services—current challenges and opportunities for ecological research. *Frontiers in Ecology and Evolution*, 2, 87.
- Bloor, M., Frankland, J., Thomas, M., & R. Kate (Eds.). (2001). *Focus Groups in Social Research*. London, Sage Publications.
- Bodin, Ö., & Crona, B. I. (2009). The role of social networks in natural resource governance: What relational patterns make a difference?. *Global Environmental Change*, 19(3), 366-374.
- Bolton, E. B. (1991). Developing local leaders: Results of a structured learning experience. *Community Development Society*, 21(1), 119-143.
- Bonanno, G. A. (2004). Loss, trauma, and human resilience: Have we underestimated the human capacity to thrive after extremely aversive events? *American psychologist*, 59(1), 20.
- Borrini-Feyerabend, G., Farvar, M. T., Nguingiri, J. C., & Ndangang, V. A. (2007). Co-management of natural resources. Organizing, negotiating and learning-by-doing. Heidelberg, Germany. Retrieved September 11, 2020, from <https://portals.iucn.org/library/node/7839>.
- Bowen, G. A. (2009). Document analysis as a qualitative research method. *Qualitative Research Journal*, 9(2), 1443-9883.
- Brooks, N. (2003). Vulnerability, risk and adaptation: A conceptual framework. Tyndall Centre for Climate Change Research Working Paper, University of East Anglia. Retrieved 23 June 2021, from <https://gsdrc.org/document-library/vulnerability-risk-and-adaptation-a-conceptual-framework/>.
- Brooks, N., Anderson, S., Burton, I., Fisher, S., Rai, N., & Tellam, I. (2013). An operational framework for Tracking Adaptation and Measuring Development (TAMD). Climate Change Working Paper No. 5. London: IIED. Retrieved January 10, 2019, from <https://pubs.iied.org/sites/default/files/pdfs/migrate/10038IIED.pdf>
- Brosius, J. P., Tsing, A. L., & Zerner, C. (Eds.). (1998). *Communities and Conservations: Histories and Politics of Community-Based Natural Resource Management*. Lanham, AltaMira Press.
- Brown, K. (2003). Integrating conservation and development: A case of institutional misfit. *Frontiers in Ecology and the Environment*, 1(9), 479-487.

- Brown, K. & Westaway, E. (2011). Agency, capacity, and resilience to environmental change: lessons from human development, well-being, and disasters. *Annual Review of Environment and Resources*, 36, 321-342.
- Brown, K. (2014). Global environmental change I: A social turn for resilience? *Progress in Human Geography*, 38(1), 107-117.
- Bruneau, M., Chang, S. E., Eguchi, R. T., Lee, G. C., O'Rourke, T. D., Reinhorn, A. M., . . . von Winterfeldt, D. (2003). A framework to quantitatively assess and enhance the seismic resilience of communities. *Earthquake Spectra*, 19, 733-752.
- Bryman, A. (2004) *Social Research Methods (Second Edition)*. New York, Oxford University Press.
- Bryman, A. (2012). *Social Research Methods (Fourth Edition)*. Oxford, Oxford University Press.
- Bryman, A. (2016). *Social Research Methods (Fifth Edition)*. Oxford, University Press.
- Buggy, L., and K. E. McNamara. (2016). The need to reinterpret “community” for climate change adaptation: A case study of Pele Island, Vanuatu. *Climate and Development* 8 (3): 270–280.
- Buikstra, E., Ross, H., King, C. A., Baker, P. G., Hegney, D., McLachlan, K., & Rogers-Clark, C. (2010). The components of resilience—Perceptions of an Australian rural community. *Journal of Community Psychology*, 38(8), 975-991.
- Bullock, A., & Acreman, M. (2003). The role of wetlands in the hydrological cycle. *Hydrological Earth System Science*, 7, 358–389.
- Burton, D. (Ed.). (2000). *Research Training for Social Scientists: A Handbook for Postgraduate Researchers*. Los Angeles, Sage Publications.
- Burton, C. G. (2012). The development of metrics for community resilience to natural disasters. PhD Thesis, University of South Carolina.
- Buxton, N. (2016). COP 21 charades: Spin, lies and real hope in Paris. *Globalizations*, 13(6), 934-937.
- Byomkesh, T., Nakagoshi, N., & Shahedur, R. M. (2009). State and management of wetlands in Bangladesh. *Landscape and Ecological Engineering*, 5(1), 81-90.
- Cafer, A., Green, J., & Goreham, G. (2019). A community resilience framework for community development practitioners building equity and adaptive capacity. *Community Development*, 50(2), 201-216.
- Cai, H., Lam, N. S. N., Qiang, Y., Zou, L., Correll, R. M., & Mihunov, V. (2018). A synthesis of disaster resilience measurement methods and indices. *International Journal of Disaster Risk Reduction*, 31, 844–855.

- Callesen, G. M., Pedersen, S. M., Carolus, J., Johannesdottir, S., López, J. M., Kärrman, E., ... & Barquet, K. (2022). Recycling Nutrients and Reducing Carbon Emissions in the Baltic Sea Region—Sustainable or Economically Infeasible? *Environmental Management*, 69(1), 213-225.
- Campos, M., Velázquez, A., & McCall, M. (2014). Adaptation strategies to climatic variability: a case study of small-scale farmers in rural Mexico. *Land Use Policy*, 38, 533–540.
- Cannon, T. (2008). 'Reducing People's Vulnerability to Natural Hazards', *Communities and Resilience* (working paper RP2008/34). Helsinki: United Nations University, Retrieved January 27, 2019, from <https://www.wider.unu.edu/publication/reducing-people%E2%80%99s-vulnerability-natural-hazards>
- Capon, S. J., Chambers, L. E., Mac Nally, R., Naiman, R. J., Davies, P., Marshall, N., ... & Williams, S. E. (2013). Riparian ecosystems in the 21st century: Hotspots for climate change adaptation?. *Ecosystems*, 16(3), 359-381.
- Carmen, E., Fazey, I., Ross, H., Bedinger, M., Smith, F. M., Prager, K., ... & Morrison, D. (2022). Building community resilience in a context of climate change: The role of social capital. *Ambio*, pp. 1-17.
- Cartagena, M.G. (2019). Community resilience, capitals, and power relations: Stories from the Waimakariri District about the aftermath of the 2010-2011 Canterbury Earthquakes in New Zealand. PhD Thesis, Massey University, New Zealand.
- Carter, T.L., Parry, M.L., Nishioka, S. & Harasawa, H. (Eds.). (1994). Technical guidelines for assessing climate change impacts and adaptations. Report of Working Group II of the Intergovernmental Panel on Climate Change. University College London and Centre for Global Environmental Research.
- Carwardine J, Klein CJ, Wilson KA, Pressey RL, Possingham HP. (2009). Hitting the target and missing the point: Target-based conservation planning in context. *Conservation Letters*, 2, 4–11.
- Cavaye, J., & Ross, H. (2019). Community resilience and community development: What mutual opportunities arise from interactions between the two concepts? *Community Development*, 50(2), 181-200.
- Centre for Natural Resources (CNRS). (2002). Bio-physical characteristics of *Hakaluki Haor*. Dhaka, Bangladesh.
- Chandler, D. (2014). *Resilience: In the Governance of Complexity*. London, Routledge.
- Chandra, A., Acosta, J., Howard, S., Uscher-Pines, L., Williams, M., Yeung, D., Garnett, J., & Meredith, L. S. (2011). Building community resilience to disasters: A way forward to enhance national health security. Santa Monica: Rand Health quarterly. Retrieve January 15, 2019, from

https://www.rand.org/content/dam/rand/pubs/technical_reports/2011/RAND_TR915.pdf

- Chandra, A., Williams, M., Plough, A., Stayton, A., Wells, K. B., Horta, M., & Tang, J. (2013). Getting actionable about community resilience: The Los Angeles county community disaster resilience project. *American Journal of Public Health, 103*(7), 1181-1189.
- Chandra, R., & Uniyal, V. P. (2022). Assessment of local adaptive capacity of mountain farmers: A way forward for sustainable livelihood development. *Asia-Pacific Journal of Rural Development, 31*(2), 172-194.
- Chapin, F. S., Lovcraft, A. L., Zavaleta, E. S., Nelson, J., Robards, M. D., Kofinas, G. P., ... & Naylor, R. L. (2006). Policy strategies to address sustainability of Alaskan boreal forests in response to a directionally changing climate. *Proceedings of the National Academy of Sciences, 103*(45), 16637-16643.
- Chausson, A., Turner, B., Seddon, D., Chabaneix, N., Girardin, C. A., Kapos, V., ... & Seddon, N. (2020). Mapping the effectiveness of nature-based solutions for climate change adaptation. *Global Change Biology, 26*(11), 6134-6155.
- Chelleri, L., Minucci, G., & Skrimizea, E. (2016). Does community resilience decrease social–ecological vulnerability? Adaptation pathways trade-off in the Bolivian Altiplano. *Regional Environmental Change, 16*(8), 2229-2241.
- Child, B., Mupeta, P., Muyengwa, S. and Lubilo, R., 2014. Community-based natural resource management: Micro-governance and face-to-face participatory democracy. In *Governance for Justice and Environmental Sustainability* (pp. 156-179). Routledge.
- Chishakwe, N., Murray, L., & Chambwera, M. (2012). Building climate change adaptation on community experiences: Lessons from community-based natural resource management in southern Africa. Retrieved January 5, 2020, from <https://www.osti.gov/etdeweb/biblio/22073490>
- Choudhury, J. K., & Faisal, A. M. (2005). Plant resources of haors and floodplains: An overview. Dhaka: IUCN. Retrieved March 11, 2019, from <https://portals.iucn.org/library/sites/library/files/documents/2005-079.pdf>
- Chowdhury, M. T. H., Sukhan, Z. P., & Hannan, M. A. (2010). Climate change and its impact on fisheries resource in Bangladesh. In *Proceeding of International Conference on Environmental Aspects of Bangladesh (ICEAB10)*, Japan. Retrieved October 10, 2019, from <https://portals.iucn.org/library/sites/library/files/documents/2005-079.pdf>
- Chowdhury, T. A., & Chowdhury, S. S. (2011). Performance evaluation of agricultural banks in Bangladesh. *International Journal of Business and Management, 6*(4), 75.
- Chowdhury, F. A. (2012). Climate change finance and governance: Bangladesh perspectives. London: IIED, Retrieved January 5, 2019, from

<http://dspace.bracu.ac.bd/xmlui/bitstream/handle/10361/11659/Climate%20Change%20Finance%20and%20Governance.pdf?sequence=1>

- Choudhury, M., & Haque, C. E. (2016). “We are more scared of the power elites than the floods”: Adaptive capacity and resilience of wetland community to flash flood disasters in Bangladesh. *International Journal of Disaster Risk Reduction*, 19, 145-158. <https://doi.org/10.1016/j.ijdr.2016.08.004>
- Chowdhury, M. A. T. (2017). Freshwater Wetlands in Bangladesh: The Need for Alternative Governance. In P. Swarnakar, S. Zavestoski & B. K. Pattnaik (Eds.), *Bottom-up Approaches Governance and Adaptation for Sustainable Development: Case Studies from India and Bangladesh*, (pp. 23 - 368). New Delhi, Sage Publications.
- Chowdhury, N. K., Ahmed, M., Rahman, L., Das, M., Bhuiyan, N. A. B., & Ahamed, G. S. (2018). Present status of fish biodiversity in wetlands of Tahirpur Upazila under Sunamganj district in Bangladesh. *International Journal of Fisheries and Aquatic Studies*, 6, 641-645.
- Choudhury, M. U. I., Uddin, M. S., & Haque, C. E. (2019). “Nature brings us extreme events, some people cause us prolonged sufferings”: the role of good governance in building community resilience to natural disasters in Bangladesh. *Journal of Environmental Planning and Management*, 62(10), 1761-1781.
- Chuma, G. B., Mondo, J. M., Sonwa, D. J., Karume, K., Mushagalusa, G. N., & Schmitz, S. (2022). Socio-economic determinants of land use and land cover change in South-Kivu wetlands, eastern DR Congo: Case study of Hogola and Chisheke wetlands. *Environmental Development*, 100711.
- Cinderby, S., Haq, G., Cambridge, H., et al. (2016) Building community resilience: Can everyone enjoy a good life? *Local Environment*, 21(10), 1252–1270.
- Clar, C. (2019). Coordinating climate change adaptation across levels of government: The gap between theory and practice of integrated adaptation strategy processes. *Journal of Environmental Planning and Management*, 62(12), 2166-2185.
- Coastal and Wetland Biodiversity Management Project (CWBMP). (2004). Plant biodiversity (coastal and wetland biodiversity management project). Department of Environment, Government of the People’s Republic of Bangladesh. Retrieved February 11, 2019, from <https://nacom.org/projects/project-5/>
- Coastal and Wetland Biodiversity Management Project (CWBMP). (2005), Strategic aspects of plant biodiversity management in Hakaluki Haor, Department of Environment, Government of the People's Republic of Bangladesh.

- Cobbinah, P. B., Asibey, M. O., Boakye, A. A., & Addaney, M. (2022). The myth of urban poor climate adaptation idiosyncrasy. *Environmental Science & Policy*, 128, 336-346.
- Cohen-Shacham, E., Walters, G., Janzen, C., & Maginnis, S. (2016). Nature-based solutions to address global societal challenges. Gland: IUCN. Retrieved January 11, 2019, from https://serval.unil.ch/resource/serval:BIB_93FD38C8836B.P001/REF
- Cohen-Shacham, E., Andrade, A., Dalton, J., Dudley, N., Jones, M., Kumar, C., Maginnis, S., Maynard, S., Nelson, C. R., Renaud, F. G., Welling, R., & Walters, G. (2019). Core principles for successfully implementing and upscaling Nature-based Solutions. *Environmental Science & Policy*, 98, 20-29.
- Coirolo, C., Commins, S., Haque, I., & Pierce, G. (2013). Climate change and social protection in Bangladesh: are existing programmes able to address the impacts of climate change? *Development Policy Review*, 31, 74-90.
- Coles, E., & Buckle, P. (2004). Developing community resilience as a foundation for effective disaster recovery. *The Australian Journal of Emergency Management*, 19(4), 6-15.
- Commodore, A., Wilson, S., Muhammad, O., Svendsen, E., & Pearce, J. (2017). Community-based participatory research for the study of air pollution: a review of motivations, approaches, and outcomes. *Environmental Monitoring and Assessment*, 189(8), 1-30.
- Conroy, C. Rai, A., Singh, N. and Chan, M. K. (1998) Conflicts affecting participatory forest management: Some experiences from Orissa. (Revised version of a paper presented at the Workshop on Participatory Natural Resource Management in Developing Countries held on 6–7th April 1998. Oxford, Mansfield College.
- Creswell, J. W. (1994). *Research Design: Qualitative and Quantitative Approaches*. London, Sage Publications.
- Creswell, J. W. & Vicki L. Plano Clark. (2011). *Designing and Conducting Mixed Methods Research*. Thousand Oaks, Sage Publications.
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. Thousand Oaks, Sage publications.
- Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A., & Sheikh, A. (2011). The case study approach. *BMC Medical Research Methodology*, 11(1), 1-9.
- Cui, G., Liu, Y., & Tong, S. (2021). Analysis of the causes of wetland landscape patterns and hydrological connectivity changes in Momoge National Nature Reserve based on the Google Earth Engine Platform. *Arabian Journal of Geosciences*, 14(3), 1-16.
- Cutter, S. L. (2016). The landscape of disaster resilience indicators in the USA. *Natural Hazards*, 80(2), 741-758.
- Cutter S. L. (2020). Community resilience, natural hazards, and climate change: Is the present a prologue to the future? *Norsk Geografisk Tidsskrift*, 74, 200–208.

- Dahl, R. (1998) *On Democracy*, Yale University Press, New Haven, CT
- Dalimunthe, S. A. (2018). Who manages space? Eco-DRR and the local community. *Sustainability*, 10(6), 1705.
- Dandotiya, B., & Sharma, H. K. (2022). Climate change and its impact on terrestrial ecosystems. In information resources management association (Ed.) *Research Anthology on Environmental and Societal Impacts of Climate Change* (pp. 88-101). IGI Global.
- Danielsen, F., Burgess, N. D., Balmford, A., Donald, P. F., Funder, M., Jones, J. P., ... & Yonten, D. (2009). Local participation in natural resource monitoring: A characterization of approaches. *Conservation Biology*, 23(1), 31-42.
- Danielsen, F., Enghoff, M., Magnussen, E., Mustonen, T., Degteva, A., Hansen, K. K., ... & Plieninger, T. (2017). Citizen science tools for engaging local stakeholders and promoting local and traditional knowledge in landscape stewardship. *The Science and Practice of Landscape Stewardship*, 80-98.
- Danielsen, F., Enghoff, M., Poulsen, M. K., Funder, M., Jensen, P. M., & Burgess, N. D. (2021). The concept, practice, application, and results of locally based monitoring of the environment. *BioScience*, 71(5), 484-502.
- Dashti, S., Sabzghabaei, G. R., & Jafari Azar, S. (2018). Strategic planning of environmental protection in wetland ecosystems (Case study: Ghareh Gheshlagh wetland watershed). *Irrigation Sciences and Engineering*, 41(3), 201–216.
- Datta, Dipankar. (2007). Sustainability of community-based organizations of the rural poor: Learning from concern's rural development projects, Bangladesh. *Community Development Journal*, 42(1), 47–62.
- David, A., Braby, J., Zeidler, J., Kandjinga, L., & Ndokosho, J. (2013). Building adaptive capacity in rural Namibia: Community information toolkits on climate change. *International Journal of Climate Change Strategies and Management*. 5(2),1756-8692.
- Davies, T. R. H., & Davies, A. J. (2018). Increasing communities' resilience to disasters: An impact-based approach. *International Journal of Disaster Risk Reduction*, 31, 742–749.
- Davies, G. T., Finlayson, C. M., Pritchard, D. E., Davidson, N. C., Gardner, R. C., Moomaw, W. R., ... & Whitacre, J. C. (2020). Towards a universal declaration of the rights of wetlands. *Marine and Freshwater Research*, 72(5), 593-600.
- Dawes, S. S., Cresswell, A. M., & Cahan, B. B. (2004). Learning from crisis: Lessons in human and information infrastructure from the World Trade Center response. *Social Science Computer Review*, 22(1), 52-66.
- Decrop, A. (1999). Triangulation in qualitative tourism research. *Tourism Management*, 20(1), 157-161.

Denscombe, M. (2014). *The Good Research Guide: For Small-Scale Social Research Project*: London, McGraw-Hill Education.

Department of Environment (DoE). (2015). Community based Ecosystem Conservation and Adaptation in Ecologically Critical Areas of Bangladesh: Responding to Nature and Changing Climate. Dhaka: Ministry of Environment and Forests, Government of the People's Republic of Bangladesh. Retrieved November 19, 2019, from <https://portals.iucn.org/library/node/45957>.

Department of Environment (DoE). (2019). Good practices and innovations in implementing Rio conventions in Bangladesh. Department of Environment, Ministry of Environment, Forest and Climate Change, Dhaka, Bangladesh. Retrieved June 9, 2020, from https://doe.portal.gov.bd/sites/default/files/files/doe.portal.gov.bd/page/f49635bc_066f_4d55_936e_9cba165c39b0/2020-01-21-12-08-3f4c65875a9e59f0ba28f924eb318626.pdf

Department of Environment and Energy (DoEE). (2019). Wetlands and climate change. *Australian Government*. Retrieved January 18, 2020, from <https://www.awe.gov.au/sites/default/files/documents/wetlands-climate-change.pdf>

Department of Fisheries (DoF). (2016). National fish week 2016 compendium (In Bengali). Department of Fisheries, *Ministry of Fisheries and Livestock, Bangladesh*. Retrieved April 18, 2019, from http://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page/4cfbb3cc_c0c4_4f25_be21_b91f84bdc45c/Yearbook%20of%20Fisheries%20Statistics%20of%20Bangladesh%2C%202015-16.pdf

Department of Fisheries (DoF). (2017). National fish week 2017 compendium (In Bangla). Department of Fisheries, *Ministry of Fisheries and Livestock, Bangladesh*. Retrieved March 16, 2019, from https://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page/4cfbb3cc_c0c4_4f25be21_b91f84bdc45c/2020-10-20-11-57-8df0b0e26d7d0134ea2c92ac6129702b.pdf

Department of Fisheries (DoF). (2018). Fisheries Resources Survey System (FRSS). Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh. Retrieved January 11, 2019, from https://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page/4cfbb3cc_c0c4_4f25_be21_b91f84bdc45c/2020-10-20-11-57-8df0b0e26d7d0134ea2c92ac6129702b.pdf

Department of Fisheries (DoF). (2019). National fish week 2019 compendium (In Bengali). Department of Fisheries, Ministry of Fisheries and Livestock, Bangladesh. Retrieved January 12, 2020, from https://fisheries.portal.gov.bd/sites/default/files/files/fisheries.portal.gov.bd/page/4cfbb3cc_c0c4_4f25_be21_b91f84bdc45c/2020-10-20-11-57-8df0b0e26d7d0134ea2c92ac6129702b.pdf

- Department of Fisheries (DoF). (2020). Yearbook of fisheries statistics of Bangladesh 2019-20. Fisheries Resources Survey System (FRSS), No. 37. Ministry of Fisheries and Livestock, Bangladesh.
- Desai, V. (2008). Community participation in development, In Potter, R B, (Eds.) *The Companion to Development Studies* (pp. 115–119). Routledge, London.
- Desai, V., & Potter, R. B. (2013). *The Companion to Development Studies*. London, Routledge.
- Desta, M. A., Zeleke, G., Payne, W. A., & Abebe, W. B. (2021). Temporal and Spatial changes in Crop Patterns, Use of inputs and Hydrological Alteration in the case of Fogera floodplain, Ethiopia. *Ecologies*, 2(4), 380-396.
- Deubelli, T. M., & Mechler, R. (2021). Perspectives on transformational change in climate risk management and adaptation. *Environmental Research Letters*, 16(5), 053002.
- Devine, J. (2006). Community-based organization – new fad or old hat?”. *Community Development Journal*, 41(4), 521–527.
- Dewan, C., Mukherji, A., and Buisson, M.C. (2015). Evolution of water management in coastal Bangladesh: From temporary earthen embankments to depoliticized community-managed polders. *Water International*, 40(3), 401–416.
- Dewan, C. (2020). ‘Climate change as a spice’: Brokering environmental knowledge in Bangladesh’s development industry. *Ethnos*, 1-22.
- Dey, N. C., Parvez, M., & Islam, M. R. (2021). A study on the impact of the 2017 early monsoon flash flood: potential measures to safeguard livelihoods from extreme climate events in the haor area of Bangladesh. *International Journal of Disaster Risk Reduction*, 59, 102247.
- Diefenbach, T. (2009). Are case studies more than sophisticated storytelling?: Methodological problems of qualitative empirical research mainly based on semi-structured interviews. *Quality & Quantity*, 43(6), 875-894.
- Dilling, L., Prakash, A., Zommers, Z., Ahmad, F., Singh, N., de Wit. S., Nalau, J., Daly, M. & Bowman, K. (2019). Is adaptation success a flawed concept? *Nature Climate Change*, 9, 572–574.
- Dixon, A., Wood, A., & Hailu, A. (2021). Wetlands in Ethiopia: Lessons from 20 years of research, policy and practice. *Wetlands*, 41(2), 1-14.
- Dodman, D., Ayers, J., and Huq, S. (2009). Building resilience, in World Watch Institute (Eds.), *State of the World 2009: Into a Warming World*. Washington, DC: World Watch Institute, Retrieved January 21, 2019, from https://www.unisdr.org/preventionweb/files/7841_SOW09chap51.pdf
- Dodman, D., Mitlin, D., and Co, J.R., (2010). Victims to victors, disasters to opportunities: community-driven responses to climate change in the Philippines. *International Development Planning Review*, 32(1), 1–26.

- Dodman, D., and D. Mitlin. (2013). Challenges for community-based adaptation: Discovering the potential for transformation. *Journal of International Development* 25(5): 640–659.
- Doherty B., Ensor J., Heron T., & Prado P. (2019). Food systems resilience: Towards an Interdisciplinary research agenda. *Emerald Open Research*, 1, 1–16
- Doloisio N., & Vanderlinden J.P. (2020). The perception of permafrost thaw in the Sakha Republic (Russia): Narratives, culture and risk in the face of climate change. *Polar Science*, 26, 100589
- Douglas, S. (2021). Building organizational resilience through human capital management strategy. *Development and Learning in Organizations: An International Journal*, 35(5), 19-21.
- Dovers, S. R. and Handmer, J. W. (1991). Uncertainty, sustainability and change. *Global Environmental Change* 2, 262-276.
- Drolet, J. (2012). Climate change, food security, and sustainable development: A study on community-based responses and adaptations in British Columbia, Canada. *Community Development*, 43(5), 630–644.
- Dugarova, E., Utting, P., & Cook, S. (2013). Social drivers of sustainable development. *United Nations*. Retrieved April 13, 2020, from <https://cdn.unrisd.org/assets/legacyfiles/301infofiles/8D3BD0D6511694EDC1257CD60035665E/Social%20Drivers%20of%20Sustainable%20Development%20-%20Background%20Note.pdf>
- Dumaru, P. (2010). Community-based adaptation: Enhancing community adaptive capacity in Druadrua Island, Fiji. *Wiley Interdisciplinary Reviews: Climate Change* 1(5), 751–763.
- Dunn, K. (2016). Interviewing, in I. Hay & M. Cope (Eds.), *Qualitative Research Methods in Human Geography* (pp. 149-188), Ontario: Oxford university press.
- E3G Research Team. (2011). Climate change: New frontiers in transparency and accountability. London: Open Society Foundation. Retrieved 23 May, 2020, from <https://www.transparency-initiative.org/reports/501/climate-change-new-frontiers-in-transparency-and-accountability/>
- Eakin, H. C., Lemos, M. C., & Nelson, D. R. (2014). Differentiating capacities as a means to sustainable climate change adaptation. *Global Environmental Change*, 27, 1-8.
- Economic Relations Division (ERD). (2018). Journey with green climate fund: Bangladesh's country programme for green climate fund: 2018. Ministry of Finance, Government of the Peoples' Republic of Bangladesh. Retrieved January 21, 2019, from http://nda.erd.gov.bd/files/1/Country%20Programme/Bangladesh_GCF-CP_Draft.pdf
- Eicken, H., Danielsen, F., Sam, J. M., Fidel, M., Johnson, N., Poulsen, M. K., Lee, O.A, Spellman, K.V., Iversen, L. Pulsifer, P. & Enghoff, M. (2021). Connecting top-down and bottom-up approaches in environmental observing. *BioScience*, 71(5), 467-483.

- Ekstrom JA, Moser SC, & Torn M. (2010). Barriers to adaptation: A diagnostic framework. Public interest energy research (PIER) program final research project. Berkeley: Lawrence Berkeley National Laboratory Berkeley. Retrieved 30 March 2020 from http://www.susannemoser.com/documents/Ekstrom-Moser-Torn_2011_BarriersFrameworkReport_CEC-500-2011-004.pdf
- Ekström, M., Kuruppu, N., Wilby, R. L., Fowler, H. J., Chiew, F. H., Dessai, S., & Young, W. J. (2013). Examination of climate risk using a modified uncertainty matrix framework—Applications in the water sector. *Global Environmental Change*, *23*(1), 115-129.
- El Chami, D., Trabucco, A., Wong, T., Monem, M. A., & Mereu, V. (2022). Costs and effectiveness of climate change adaptation in agriculture: a systematic review from the NENA region. *Climate Policy*, 1-19.
- Ellis, B. H., & Abdi, S. (2017). Building community resilience to violent extremism through genuine partnerships. *American Psychologist*, *72*(3), 289–300.
- Ellison, A. M., Felson, A. J., & Friess, D. A. (2020). Mangrove rehabilitation and restoration as experimental adaptive management. *Frontiers in Marine Science*, *7*, 327.
- Engle, N. L., & Lemos, M. C. (2010). Unpacking governance: building adaptive capacity to climate change of river basins in Brazil. *Global Environmental Change*, *20*(1), 4-13.
- Engle, N. L. (2011). Adaptive capacity and its assessment. *Global Environmental Change*, *21*(2), 647-656.
- Enqvist, J. P., Tengö, M., & Bodin, Ö. (2020). Are bottom-up approaches good for promoting social–ecological fit in urban landscapes?. *Ambio*, *49*(1), 49-61.
- Ensor, J. and Berger, R. (2009). *Understanding Climate Change Adaptation: Lessons from Community-based Approaches*. Rugby, Practical Action Publishing.
- Ensor, J. E., Park, S. E., Attwood, S. J., Kaminski, A. M., & Johnson, J. E. (2018). Can community-based adaptation increase resilience? *Climate and Development*, *10*(2), 134-151.
- Ensor, J. E., Abernethy, K.E., Hoddy, E.T., Aswani, S., Albert, S., Vaccaro, I., Benedict, J.J. & Beare, D.J. (2018). Variation in perception of environmental change in nine Solomon Islands communities: Implications for securing fairness in community-based adaptation, *Regional Environmental Change*, *18*(4), pp. 1131–1143.
- Eriksen, S., Schipper, E. L. F., Scoville-Simonds, M., Vincent, K., Adam, H. N., Brooks, N., Harding, B., Lenaerts, L. Liverman, D., Mills-Novoa, M. & Mosberg, M. (2021). Adaptation interventions and their effect on vulnerability in developing countries: Help, hindrance or irrelevance?. *World Development*, *141*, 105383.
- Erwin, K. L. (2009). Wetlands and global climate change: the role of wetland restoration in a changing world. *Wetlands Ecology and management*, *17*(1), 71-84.

- Esteban, T. A. O., & El Kaftangui, M. (2020). Building resilience through collective engagement. *Architecture MPS*. Retrieved January 21, 2021, from <https://discovery.ucl.ac.uk/id/eprint/10090807/1/AMPS-17-1.pdf>
- Fabricius, C. (2004). The fundamentals of community-based natural resource management. In C. Fabricius, E. Koch, S. Turner & H. Magome (Eds.), *Rights, Resources and Rural Development: Community-based Natural Resource Management in Southern Africa*, (pp.3-43). London, Routledge
- Fabricius, C., & Collins, S. (2007). Community-based natural resource management: Governing the commons. *Water Policy*, 9(S2), 83-97.
- Fan, Y., & Lyu, X. (2021). Exploring two decades of research in community resilience: A content analysis across the international literature. *Psychology Research and Behavior Management*, 14, 1643.
- Fatemi, M., Okyere, S. A., Diko, S. K., & Kita, M. (2020). Multi-level climate governance in Bangladesh via climate change mainstreaming: Lessons for local climate action in Dhaka city. *Urban Science*, 4(2), 24.
- Faulkner, L., Ayers, J., & Huq, S. (2015). Meaningful measurement for community-based adaptation. *New Directions for Evaluation*, 2015(147), 89–104.
- Fazey, I., Carmen, E., Chapin III, F. S., Ross, H., Rao-Williams, J., Lyon, C., Conon, I.L.C., Searle, & Knox, K. (2018). Community resilience for a 1.5 C world. *Current Opinion in Environmental Sustainability*, 31, 30-40.
- Feilzer, M. (2010). Doing mixed methods research pragmatically: Implications for the rediscovery of pragmatism as a research paradigm. *Journal of Mixed Methods Research*, 4(1), 6-16.
- Feka, Z. N. (2015). Sustainable management of mangrove forests in West Africa: A new policy perspective? *Ocean & Coastal Management*, 116, 341-352.
- Fenton, A., Gallagher, D., Wright, H., Huq, S., & Nyandiga, C. (2014). Up-scaling finance for community-based adaptation. *Climate and Development*, 6(4), 388-397.
- Fenton, A., Paavola, J. and Tallontire, A. (2017). Autonomous adaptation to riverine flooding in Satkhira District, Bangladesh: Implications for adaptation planning, *Regional Environmental Change*, 17(8), pp. 2387–2396.
- Fidelman, P. (2021). Assessing the adaptive capacity of collaborative governance institutions. In R. Djalante & B. Siebenhüner (Eds.), *Adaptiveness: Changing Earth System Governance* (pp. 69-82). Cambridge: Cambridge University Press.
- Finance Division. (2021). Climate finance for sustainable development, *Budget Report 2020-21*. Retrieved January 5, 2022, from https://mof.portal.gov.bd/sites/default/files/files/mof.portal.gov.bd/page/6e496a5b_f5c1_447b_bbb4_257a2d8a97a1/2020-2021_Climate_BR_English.pdf

- Finkbeiner, E. M., Oleson, K. L., & Kittinger, J. N. (2017). Social resilience in the Anthropocene Ocean. In P. Levin & M. R. Poe (Eds.), *Conservation for the Anthropocene Ocean* (pp. 89-106). London, Academic Press.
- Finlayson, C., Moomaw, W. R., & Davies, G. T. (2017). The second warning to humanity and wetlands. *Wetland Science and Practice*, 34(4), 118-120.
- Fischer, A., & McKee, A. (2017). A question of capacities? Community resilience and empowerment between assets, abilities and relationships. *Journal of Rural Studies*, 54, 187-197.
- Fischer, H. W. (2021). Decentralization and the governance of climate adaptation: Situating community-based planning within broader trajectories of political transformation. *World Development*, 140, 105335.
- Fischlin, A., Midgley, F. G. Price, J. T., Leemans, R. Gopal, B. Turley, Rounsevell, C. M. D., Dube, O. P. Tarazona, J. Velichko, A. A. (2007). Ecosystems, their properties, goods, and services. In M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson (Eds.), *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 211-272). Cambridge, Cambridge University Press.
- Flick, U. (2014). *An Introduction to Qualitative Research*. Sage Publications, Los Angeles.
- Flood Action Plan (FAP). (1995). Potential impacts of flood control on the biological diversity and nutritional value of subsistence fisheries in Bangladesh. Flood Action Plan 16 Environmental Study, Flood Plan Coordination Organisation, Dhaka: Ministry of Water Resources.
- Flyvbjerg, B. (2006). Five misunderstandings about case-study research. *Qualitative Inquiry*, 12(2), 219-245.
- Folke, C. (2006). Resilience: The emergence of a perspective for social–ecological systems analyses. *Global Environmental Change*, 16, 253-267.
- Folke, C., Carpenter, S. R., Walker, B., Scheffer, M., Chapin, T., & Rockström, J. (2010). Resilience thinking: integrating resilience, adaptability and transformability. *Ecology and Society*, 15(4).
- Folke, C., R. Biggs, A. V. Norström, B. Reyers, and J. Rockström. (2016). Social-ecological resilience and biosphere-based sustainability science. *Ecology and Society* 21(3), 41.
- Food and Agriculture Organization (FAO). (2018). The state of world fisheries and aquaculture 2018 - Meeting the sustainable development goals. Food and Agriculture Organisation, Rome, Italy. Retrieved March 02, 2019, from <https://www.fao.org/documents/card/en/c/I9540EN/>
- Ford, J. D., Stephenson, E., Cunsolo Willox, A., Edge, V., Farahbakhsh, K., Furgal, C., Harper, S., Chatwood, S., Mauro, I., Pearce, T. & Austin, S. (2016). Community-based

- adaptation research in the Canadian Arctic. *Wiley Interdisciplinary Reviews: Climate Change*, 7(2), 175-191.
- Forsyth, T. (2013). Community-based Adaptation: A Review of Past and Future Challenges. *Wiley Interdisciplinary Reviews: Climate Change*, 4 (5): 439–446.
- Forsyth, T. and Evans, N. (2013). What is autonomous adaption? Resource scarcity and smallholder agency in Thailand, *World Development*, 43, pp. 56–66.
- Frankenberger, T., Mueller, M., Spangler, T., Alexander, S. (2013). Community resilience: Conceptual framework and measurement feed the future learning agenda. Rockville. Retrieved April 12, 2019, from https://www.agrilinks.org/sites/default/files/resource/files/FTF%20Learning_Agenda_Community_Resilience_Oct%202013.pdf
- Fraser, T. (2021). Japanese social capital and social vulnerability indices: Measuring drivers of community resilience 2000–2017. *International Journal of Disaster Risk Reduction*, 52, 101965.
- Freduah, G., Fidelmana, P. & Smith T. F. (2018). Mobilising adaptive capacity to multiple stressors: Insights from small-scale coastal fisheries in the Western Region of Ghana. *Geoforum*, 91, 61–72
- Freshwater, D. (2015). Vulnerability and resilience: two dimensions of rurality. *Sociologia Ruralis*, 55, 497–515.
- Frey, J., & Berkes, F. (2014). Can partnerships and community-based conservation reverse the decline of coral reef social-ecological systems?. *International Journal of the Commons*, 8(1), 26-46.
- Frohlich, M. F., Jacobson, C. L., Fidelman, P., & Smith, T. F. (2018). The relationship between adaptive management of social-ecological systems and law: A systematic review. *Ecology and Society*, 23(2), 1-19.
- Fylan, F. (2005). Semi-structured interviewing. In Miles, J., & Gilbert, P. (Eds.), *A Handbook of Research Methods for Clinical and Health Psychology*. Oxford: Oxford University Press.
- Gagliano, M., McCormick, M. I., & Meekan, M. G. (2007). Temperature-induced shifts in selective pressure at a critical developmental transition. *Oecologia*, 152(2), 219-225.
- Galaz, V., Olsson, P., Hahn, T., Folke, C., & Svedin, U. (2008). The problem of fit among biophysical systems, environmental and resource regimes, and broader governance systems: Insights and emerging challenges. In O. B. Young, L. A. King, & H. Schroeder, (Eds.). *Institutions and Environmental Change: Principal Findings, Applications, and Research Frontiers*. Cambridge, MA: MIT Press.
- Gallopín, G. C. (2006). Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change*, 16, pp. 293-303.

- Galvin, M. (2019). Making community-based adaptation a reality: Different conceptualizations, different politics. *Human Geography*, 12(1), 50–63.
- Gardner, R. C., & Finlayson, C. (2018). Global wetland outlook: State of the World's wetlands and their services to people. Ramsar Convention Secretariat. Retrieved October 20, 2020, from https://medwet.org/wp-content/uploads/2018/09/ramsar_gwo_english_web.pdf
- Gaymer, C. F., Stadel, A. V., Ban, N. C., Cárcamo, P. F., Ierna Jr, J., & Lieberknecht, L. M. (2014). Merging top-down and bottom-up approaches in marine protected areas planning experiences from around the globe. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 24(S2), 128-144.
- General Economics Division (GED). (2012). Climate public expenditure and institutional review (CPEIR). General Economics Division (GED), Bangladesh Planning Commission, Government of Bangladesh. Retrieved May 20, 2019, from <https://oldweb.lged.gov.bd/UploadedDocument/UnitPublication/1/756/BDP%202100%20Abridged%20Version%20English.pdf>
- General Economic Division (GED). (2018). Bangladesh delta plan 2100: Bangladesh in the 21st Century. Dhaka: Bangladesh Planning Commission. Retrieved January 12, 2019, from <https://oldweb.lged.gov.bd/UploadedDocument/UnitPublication/1/756/BDP%202100%20Abridged%20Version%20English.pdf>
- Gerring, J. (2004). What is a case study and what is it good for?. *American Political Science Review*, 98(2), 341-354.
- Ghale, Y. A. G., Baykara, M., & Unal, A. (2019). Investigating the interaction between agricultural lands and Urmia Lake ecosystem using remote sensing techniques and hydro-climatic data analysis. *Agricultural Water Management*, 221, 566–579.
- Gill, P., Stewart, K., Treasure, E., & Chadwick, B. (2008). Methods of data collection in qualitative research: interviews and focus groups. *British Dental Journal*, 204(6), 291-295.
- Gitz, V., Meybeck, A., Lipper, L., Young, C. D., & Braatz, S. (2016). Climate change and food security: Risks and responses. Food and Agriculture Organization of the United Nations (FAO) Report, Retrieved January 22, 2019, from <https://www.fao.org/3/i5188e/I5188E.pdf>
- Global Witness. (2012). *Safeguarding REDD+ finance: Ensuring transparent and accountable international financial flows*. Global Witness. Retrieved August 10, 2019, from <http://www.globalwitness.org/sites/default/files/library/Safeguarding%20REDD+%20Finance.pdf>
- Goldberg, L., Lagomasino, D., Thomas, N., & Fatoyinbo, T. (2020). Global declines in human-driven mangrove loss. *Global Change Biology*, 26(10), 5844-5855.

- Golebie, E. J., Aczel, M., Bukoski, J. J., Chau, S., Ramirez-Bullon, N., Gong, M., & Teller, N. (2022). A qualitative systematic review of governance principles for mangrove conservation. *Conservation Biology*, 36(1), e13850.
- Gooch, M. & Warburton, J. (2009). Building and managing resilience in community-based NRM groups: An Australian case study. *Society and Natural Resources*, 22, 158–171.
- Grasso, M. (2010). An ethical approach to climate adaptation finance. *Global Environmental Change*, 20(1), 74-81.
- Gray, D. E. (2014). Theoretical perspectives and research methodologies. *Doing research in the Real World*, 3, 15-38.
- Greene, J. C., Kreider, H., & Mayer, E. (2005). Combining qualitative and quantitative methods in social inquiry. In B. Somekh & C. Lewin (Eds.), *Research Methods in the Social Sciences* (pp. 274-281). London, Sage Publications.
- Grenier, L. (1998). *Working with Indigenous Knowledge: A Guide for Researchers*. Ottawa: International Development Research Centre.
- Grimble, R. and Wellard, K. (1997). Stakeholder methodologies in natural resource management: A review of principles, contexts, experience and opportunities. *Agricultural Systems* 55, 173–193.
- Gruber, J. S. (2010). Key principles of community-based natural resource management: A synthesis and interpretation of identified effective approaches for managing the commons. *Environmental management*, 45(1), 52-66.
- Guerrero, A. M., Bodin, Ö., McAllister, R. R., & Wilson, K. A. (2015). Achieving social-ecological fit through bottom-up collaborative governance: an empirical investigation. *Ecology and Society*, 20(4), 1-14.
- Guerry, A.D., Polasky, S., Lubchenco, J., Chaplin-Kramer, R., Daily, G.C., Griffin, R., Ruckelshaus, M., Bateman, I.J., Duraiappah, A., Elmqvist, T. and Feldman, M.W. (2015). Natural capital and ecosystem services informing decisions: From promise to practice. *Proceedings of the National Academy of Sciences*, 112(24), 7348-7355.
- Guideline for the Formulation, Approval, Amendment, Implementation and Fund Release of the Projects of the Government, Semi-Government and other Autonomous Body (2012). Ministry of Environment, Forest and Climate Change. The Government of the People's Republic of Bangladesh.
- Guleria, S., & Edward, J. K. (2012). Coastal community resilience: Analysis of resilient elements in 3 districts of Tamil Nadu State, India. *Journal of Coastal Conservation*, 16(1), 101-110.
- Gupta, J., Termeer, C., Klostermann, J., Meijerink, S., van den Brink, M., Jong, P., ... & Bergsma, E. (2010). The adaptive capacity wheel: a method to assess the inherent characteristics of institutions to enable the adaptive capacity of society. *Environmental Science & Policy*, 13(6), 459-471.

- Habibullah, M. S., Din, B. H., Tan, S. H., & Zahid, H. (2022). Impact of climate change on biodiversity loss: Global evidence. *Environmental Science and Pollution Research*, 29(1), 1073-1086.
- Halim, A., Sharmin, S., Rahman, H., Haque, M., Rahman, S., & Islam, S. (2018). Assessment of water quality parameters in baor environment, Bangladesh: A review. *International Journal of Fisheries and Aquatic Studies*, 6(2), 269-263.
- Hannum, K.M., Martineau, J.W., & Reinelt, C. (2007). *The Handbook of Leadership Development Evaluation*. New York: Wiley
- Haque, M., Rouf, M., & Khan, Z.H. (2013). Challenges in climate finance governance and the way out. Working paper of CFG project, Dhaka: Transparency International Bangladesh. Retrieved June 29, 2020, from <https://www.ti-bangladesh.org/beta3/index.php/en/activities/4086-tib-demands-effective-measures-to-ensure-governance-and-reduce-corruption-in-climate-finance-2>
- Haque, S. A., Islam, M. F., Rahman, M. C., Islam, M. S., & Rahman, M. M. (2021). Supply chain and logistics of fish: A case study of Jamalpur district markets in Bangladesh. *Asian Journal of Agricultural Extension, Economics & Sociology*, 39(7), 8-27.
- Haque, M. (2022). Indigenous Knowledge and Practices of the Small Ethnic Communities of Asia-Pacific Island Countries in Facing Hydro-Meteorological Hazards. In G. M. T. Islam, S. Shampa, & A. I. A. Chowdhury (Eds.), *Water Management: A View from Multidisciplinary Perspectives* (pp. 143-153). Cham, Springer.
- Haroon, A. Y., & Kibria, G. (2017). Wetlands: biodiversity and livelihood values and significance with special context to Bangladesh. In B. A. K. Prusty, R. Chandra, & P. A. Azeez (Eds.), *Wetland Science* (pp. 317-346). New Delhi, Springer.
- Hasan, M. Z., Islam, M. F., Haque, S. A., Islam, M. S., Rahman, M. M., & Miah, M. I. (2021). Dose Optimization of Ovotide Hormone for Induced Breeding of Freshwater Gang Magur, *Hemibagrus Menoda*. *Research in Agriculture Livestock and Fisheries*, 8(1), 171-179.
- Haverkamp J. (2021). Collaborative survival and the politics of livability: Towards adaptation otherwise. *World Development*, 137, 105152
- Hedger, M. (2011). Climate finance in Bangladesh: Lessons or development cooperation and climate finance at the national level. EDC 2020 Policy Brief. Retrieved January 22, 2019, from http://www.edc2020.eu/fileadmin/publications/EDC_2020_-_Policy_Brief_no_14_-_Climate_Finance_in_Bangladesh.pdf
- Heijmans, M. M., Magnússon, R. Í., Lara, M. J., Frost, G. V., Myers-Smith, I. H., van Huissteden, J., Jorgenson, M. T., Fedorov, A. N., Epstein, H. E. Lawrence, D. M. & Limpens, J. (2022). Tundra vegetation change and impacts on permafrost. *Nature Reviews Earth & Environment*, 3(1), 68-84.

- Heltberg, R., Siegel, P. B., & Jorgensen, S. L. (2009). Addressing human vulnerability to climate change: Toward a “no regrets” approach. *Global Environmental Change*, 19(1): 89–99.
- Heltberg, R., Gitay, H. & Prabhu, R. G. (2012). Community-based adaptation: Lessons from a grant competition. *Climate Policy*, 12, 143–163.
- Hemmerling, S. A., DeMyers, C. A., & Carruthers, T. J. (2022). Building resilience through collaborative management of coastal protection and restoration planning in Plaquemines Parish, Louisiana, USA. *Sustainability*, 14(5), 2974.
- Hennink, M. M. (2014). *Focus Group Discussions*. New York, Oxford University Press.
- Hill, M., & Engle, N. L. (2013). Adaptive capacity: Tensions across scales. *Environment Policy Governance*, 23, 177–192.
- Holling, C. S. (1973). Resilience and stability of ecological systems, *Annual Review of Ecology and Systematics*, 4, 1–23.
- Hossain, M. K. (2009). Birth of a climate change policy and related debates: Analysing the case of Bangladesh. Paper Present on Environmental Policy: A multinational conference on policy Analysis and Teaching Methods Conference. Retrieve December 10, 2020, from <http://www.umdcipe.org/conferences/epckdi/abstracts/6.pdf>
- Hossain, M. S., Rahman, M. F., Thompson, S., Nabi, M. R. and Kibria, M. M. (2013). Climate change resilience assessment using livelihood assets of coastal fishing community in Nisjhum Dwip, Bangladesh. *Pertanika Journal Science & Technology*, 21(2), 397 - 422.
- Hossain, M. S. (2019). Climate change affects wetland resources in Bangladesh: A case study on Hakaluki Haor. *Scientific Research Journal*, 10(1), 37-63.
- Hossain, M., & Rabby, A. (2019). Institutional constraints to fishers' resilience: Community based fishery management in Bangladesh. *International Journal of the Commons*, 13(1), 507-27.
- Hossen, M., Netherton, C., Rahman, M. R., & Salehin, M. M. (2022). Governance perspective for climate change adaptation: Conceptualizing policy-community interface in Bangladesh. Preprint Article. <https://doi.org/10.21203/rs.3.rs-1446538/v1>
- Hughes, L. (2011). Climate change and Australia: key vulnerable regions. *Regional Environmental Change*, 11(1), 189-195.
- Huq, S., and H. Reid. (2007). Community-Based Adaptation: A vital approach to the threat climate change poses to the poor an IIED briefing. London: London: IIED. Retrieved January 16, 2019, from <https://pubs.iied.org/sites/default/files/pdfs/migrate/17005IIED.pdf>
- Huq, S and Rabbani, G. (2011). Climate change and Bangladesh: Policy and institutional development to reduce vulnerability. *Journal of Bangladesh Studies*, 13, 1-10.

- Huq, N., Bruns, A., Ribbe, L., & Huq, S. (2017). Mainstreaming ecosystem services-based climate change adaptation (EbA) in Bangladesh: status, challenges and opportunities. *Sustainability*, 9(6), 926.
- Hussain, M., Faisal, A. M., & Khan, M. M. H. (2005). *Re-excavation: A Major Step in Wetland Restoration in the Floodplains*. New Delhi: IUCN
- Hussain, F. A., and M. M. Ahmad. (2019). Effects of climate finance on risk appraisal: A study in the southwestern coast of Bangladesh. *Advances in Meteorology*, 2019, 1-16.
- Hussain, F. A., & Ahmad, M. M. (2020). Effect of climate finance on adaptation in the southwestern coastal region of Bangladesh. *Development in Practice*, 30(7), 905-922.
- Integrated Protected Area Co-management (IPAC). (2009). Integrated protected area co-management, RRA/PRA findings of Hakaluki Haor, Bangladesh. Retrieved January 13, 2019, from https://profile.bsfmstu.ac.bd/files/publication_file_Diversity%20assemblages%20of%20fish%20genetic%20resources%20and%20conservation%20necessities%20in%20Hakaluki%20Haor,%20an%20ecologically%20sensitive%20natural%20wetland%20in%20north-eastern%20Bangladesh_1629261709.pdf
- Intergovernmental Panel on Climate Change (IPCC). (2007). Climate change 2007: Synthesis report. Contribution of working groups I, II and III to the fourth assessment report of IPCC. [Core Writing Team, Pachauri, R.K and Reisinger, A. (Eds.)]. Geneva: IPCC. Retrieved June 24, 2019, from https://www.ipcc.ch/site/assets/uploads/2018/02/ar4_syr_full_report.pdf
- Intergovernmental Panel on Climate Change (IPCC). (2014). IPCC fifth assessment report. IPCC, Geneva. Retrieved January 13, 2019, from <https://www.ipcc.ch/assessment-report/ar5/>
- Intergovernmental Panel on Climate Change (IPCC). (2021, in press). Climate change 2021: The physical science basis. Contribution of working group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (Eds.)]. Cambridge, MA, Cambridge University Press.
- International Federation of Red Cross and Red Crescent Societies. (2012). The road to resilience Bridging relief and development for a more sustainable future, IFRC discussion paper on resilience, Geneva. Retrieved June 12, 2021, from <https://www.ifrc.org/sites/default/files/1224500-Road-to-resilience-EN-LowRes-2.pdf>
- International Institute for Environment and Development (IIED). (2014). *Climate finance governance in Bangladesh: Synergies in the financial landscape*. Policy and Planning Briefing. London: IIED. Retrieved June 17, 2021, from <https://www.jstor.org/stable/resrep01574?seq=1>

- International Union for Conservation of Nature (IUCN). (2004). Introduction to community based haor and floodplain resource management, Dhaka: IUCN.
- International Union for Conservation of Nature (IUCN). (2013). Wetlands Governance in Asia. In: IUCN. Retrieved January 12, 2019, from https://www.iucn.org/sites/dev/files/import/downloads/mekong_wetlands_governance_draft_final_280410.pdf
- International Union for Conservation of Nature (IUCN). (2015). Community based ecosystem conservation and adaptation in ecologically critical areas of Bangladesh. Dhaka: IUCN. Retrieved January 14, 2019, from <https://portals.iucn.org/library/sites/library/files/documents/2015-053.pdf>
- Iqbal, M. M., Nasren, S. H. A. M. I. M. A., Hossain, & M. A. A. M. M. (2015). Fish assemblage including threatened species in Hakaluki Haor, Sylhet, Bangladesh. *Journal of Aquaculture in The Tropics*, 30(3-4), 233-246.
- Ireland, P. (2012). Climate change adaptation: Business-as-usual aid and development or an emerging discourse for change? *International Journal of Development*, 11(2), 92–110.
- Irfanullah, H. M. (2016). What does Bangladesh tell us about innovation in climate change adaptation? Climate Change in the Bay of Bengal Region: Exploring Sectoral Cooperation for Sustainable Development, Coastal Association for Social Transformation (COAST) Trust, Bangladesh.
- Irfanullah, H. Md. (2020). 2020 has been a year of nature-based solutions. So what awaits us in 2021? *The Daily Star*. Retrieved January 12, 2021, from <https://www.thedailystar.net/opinion/news/2020-has-been-year-nature-based-solutions-2016377>.
- Irfanullah, H. M. (2021a). Capitalising on nature-based solutions. *Crisis Response Journal*. 16(2), 26–27.
- Irfanullah, H. M. (2021b). How crucial is nature for our prosperity? *The Daily Star*. Retrieved January 29, 2022, from <https://www.thedailystar.net/views/opinion/news/how-crucial-nature-our-prosperity-2919221>
- Islam, S. N., & Gnauck, A. (2007). Salinity intrusion due to freshwater scarcity in the Ganges catchment: a challenge for urban drinking water and mangrove wetland ecosystems in the Sundarbans region, Bangladesh. In *Proceedings of 6th World Wide Workshop for Young Environmental Scientists*. University of Paris.
- Islam, M., Saha, N., & Rahman, M. (2011). Economic activities decrease biodiversity in Hakaluki Haor, the largest inland freshwater ecosystem in Bangladesh. *International Journal of Environmental Science*, 2(2), 946-956.
- Islam, A., Shaw, R., & Mallick, F. (2013). National adaptation programme of action. In R. Shaw, F. Mallick, A. Islam (Eds.) *Climate Change Adaptation Actions in Bangladesh* (93-106) Tokoyo, Springer.

- Islam, M. S., & Islam, M. (2014). Land-ocean interface and the existence of late-Holocene mangrove forest in the Arial Beel area of Bangladesh. *The Journal of Noami*, 31 (1&2), 1-18.
- Islam, G. M. N., T. S. Yew, and K. K. Viswanathan. (2014). Poverty and livelihood impacts of community-based fisheries management in Bangladesh. *Ocean & Coastal Management*, 96, 123–129.
- Islam, M. A., Shitangsu, P. K., & Hassan, M. Z. (2015). Agricultural vulnerability in Bangladesh to climate change induced sea level rise and options for adaptation: A study of a coastal Upazila. *Journal of Agriculture and Environment for International Development (JAEID)*, 109(1), 19-39.
- Islam, M. T., & Nursey-Bray, M. (2017). Adaptation to climate change in agriculture in Bangladesh: The role of formal institutions. *Journal of Environmental Management*, 200, 347-358.
- Islam, R., & Walkerden, G. (2017). Social networks and challenges in government disaster policies: A case study from Bangladesh. *International Journal of Disaster Risk Reduction*, 22, 325-334.
- Islam, M. M., Kar, C., Kundu, G. K., Mondal, G., & Khan, M. S. (2018). Current status and barriers to fisheries co-management: Evidence from an Oxbow Lake of Bangladesh. *Bangladesh Journal of Zoology*, 46(2), 105-116.
- Islam, M., Rakib, M. R., Sufian, M., & Raihan Sharif, A. H. M. (2018). Detection of climate change impacts on the Hakaluki *Haor* wetland in Bangladesh by use of remote sensing and GIS. In Bangladesh. In N. Islam, M. N. Rakib, M. A. Sufian, & A. H. M. R. Sharif (Eds.), *Climate Change Impacts, Mitigation and Adaptation in Developing Countries* (pp. 195-214). Cham, Springer.
- Islam, M. M., Islam, N., Habib, A., & Mozumder, M. M. H. (2020). Climate change impacts on a tropical fishery ecosystem: implications and societal responses. *Sustainability*, 12(19), 7970.
- Islam, M. R. (2021). Water, sanitation and hygiene practices among disaster-affected char land people: Bangladesh experience. *Natural Hazards*, 107(2), 1167-1190.
- Islam, M. S., Haque, S. A., Islam, M. F., Rahman, M. M., Rahman, M., Das, P. S., & Karmakar, M. (2021). Diversity assemblages of fish genetic resources and conservation necessities in Hakaluki Haor, an ecologically sensitive natural wetland in north-eastern Bangladesh. *Journal of South Pacific Agriculture*, 24.
- Islam, M. S., Okubo, K., Islam, A. H. M., & Sato, M. (2022). Investigating the effect of climate change on food loss and food security in Bangladesh. *SN Business & Economics*, 2(1), 1-24.
- Ison, R. (2008). Systems thinking and practice for action research. *The Sage handbook of action research participative inquiry and practice*, 2, 139-158.

- Jing, B., Wu, L., Mao, H., Gong, S., He, J., Zou, C., Song, G., Li, X. & Wu, Z. (2016). Development of a vehicle emission inventory with high temporal–spatial resolution based on NRT traffic data and its impact on air pollution in Beijing–Part 1: Development and evaluation of vehicle emission inventory. *Atmospheric Chemistry and Physics*, 16(5), 3161-3170.
- Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher*, 33(7), 14-26.
- Johnson, B. (2008). Living with tensions: The dialectic approach. *Journal of Mixed Methods Research*, 2(3), 203-207.
- Jones, B. T. & Murphree, M.W. (2004). Community based natural resource management as a conservation mechanism: lessons and directions. In: B. Child (Ed.), *Biodiversity, Rural Development and the Bottom Line*. London, Earthscan.
- Jones, E., Schuttenberg, H., Gray, T., & Stead, S. (2015). The governability of mangrove ecosystems in Thailand: Comparative successes of different governance models. In E. Jones, H. Shuttenberg, T. Gray & S. Stead (Eds.), *Interactive Governance for Small-Scale Fisheries*. Cham, Springer.
- Kabir, M. R., Khan, S., Chowdhury, S., Jahan, S., Islam, K. A., & Zayed, N. M. (2021). Corruption possibilities in the climate financing sector and role of the civil societies in Bangladesh. *Journal of Southwest Jiaotong University*, 56(2), 55-64
- Kakuba, S. J., & Kanyamurwa, J. M. (2021). Management of wetlands and livelihood opportunities in Kinawataka wetland, Kampala-Uganda. *Environmental Challenges*, 2, 100021.
- Karim, A. (2021). Capacity need for ECA governance in Bangladesh. *The Independent*. Retrieved December 31, 2021, from <https://m.theindependentbd.com/post/257938>
- Kativhu, S., Mwale, M., & Francis, J. (2018). Approaches to measuring resilience and their applicability to small retail business resilience. *Problems and Perspectives in Management*, 16(4), 275-284.
- Kaushik, V., & Walsh, C. A. (2019). Pragmatism as a research paradigm and its implications for social work research. *Social Sciences*, 8(9), 255.
- Kawulich, B. B. (2005). Participant observation as a data collection method. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research*, 6(2), 1-9.
- Kearns, R. A. (2016). Placing observation in the research toolkit. In I. Hay & M. Cope (Eds.) *Qualitative Research Methods in Human Geography* (pp.313-333). Oxford university press.
- Keck, M., & Saktapolrak, P. (2013). What is social resilience? Lessons learned and ways forward. *Erdkunde*, 67(1), 5-19.

- Keddy, P. A. (2010). *Wetland ecology: Principles and Conservation*. Cambridge, MA: Cambridge university press.
- Kellert, S. R., Mehta, J. N., Ebbin, S. A., & Lichtenfeld, L. L. (2000). Community natural resource management: promise, rhetoric, and reality. *Society & Natural Resources*, 13(8), 705-715.
- Kennedy, G., Richards, M., Chicarelli, M., Ernst, A., Harrell, A., & Stites, D. (2013). Disaster mitigation: initial response. *Southern Medical Journal*, 106(1), 13-16.
- Kenter JO, O'Brien L, Hockley N, Ravenscroft N, Fazey I, Irvine KN, Reed MS, Christie M, Brady E, Bryce R, Church A, Cooper N, Davies A, Evely A, Everard M, Fish R, Fisher JA, Jobstvogt N, Molloy C, Orchard-Webb J, Ranger S, Ryan M, Watson V, Williams S. (2015). What are shared and social values of ecosystems? *Ecology Economics*, 111, 86–99
- Khan, S. M., Haq, E., Huq, S., Rahman, A. A., Rashid, S. M. A., & Ahmed, H. (1994). *Wetlands of Bangladesh*. Dhaka: Bangladesh Centre for Advanced Studies (BCAS).
- Khan, S. M. M. H., & Haque, C. E. (2010). Wetland resource management in Bangladesh: implications for marginalization and vulnerability of local harvesters. *Environmental Hazards*, 9(1), 54-73.
- Khan, A. S., Ramachandran, A., Usha, N., Aram, I. A., & Selvam, V. (2012). Rising sea and threatened mangroves: a case study on stakeholders, engagement in climate change communication and non-formal education. *International Journal of Sustainable Development and World Ecology*, 19 (4), 330–338.
- Khan, A. F., Mustafa, M. G., & Naser, M. N. (2016). Effective supervision of inland capture fisheries of Bangladesh and its hurdles in managing the resources. *Bandung*, 3(1), 1-12.
- Khan, M., Watkins, M., Aminuzzaman, S., Khair, S., & Khan, M. Z. H. (2022). Win-win: designing dual-use in climate projects for effective anti-corruption in Bangladesh. *Climate and Development*, 1-14.
- Khatri, D. B. (2018). Climate and development at the third pole: Dynamics of power and knowledge reshaping community forest governance in Nepal. *Swedish University of Agricultural Sciences*. Retrieved January 14, 2019, from https://pub.epsilon.slu.se/15564/14/khatri_d_180629.pdf
- Khatun, M. A., Baten, M. A., Farukh, M. A., & Faruk, M. O. (2022). The impact of climate change on ecosystem services and socio-economic conditions of Char Dwellers in Northern Regions of Bangladesh. *Journal of Governance and Accountability Studies*, 2(1), 29-48.
- Khazai, B., Anhorn, J., & Burton, C. G. (2018). Resilience performance scorecard: measuring urban disaster resilience at multiple levels of geography with case study application to Lalitpur, Nepal. *International Journal of Disaster Risk Reduction*, 31, 604–616.

- Kibria, G., Yousuf Haroon, A. K., Nugegoda, D., & Rose, G. (2010). *Climate change and chemicals: environmental and biological aspects*. New Delhi: New India Publishing Company.
- Kibria, G., & Yousuf Haroon, A. K. (2017). Climate change impacts on wetlands of Bangladesh, its biodiversity and ecology, and actions and programs to reduce risks. In B. A. K. Prusty, R. Chandra & P. A. Azeez (Eds.), *Wetland Science* (pp. 189-204). New Delhi, Springer.
- Kiddle, G. L., Bakineti, T., Latai-Niusulu, A., Missack, W., Pedersen Zari, M., Kiddle, R., Chanse, V., Blaschke, P. & Loubser, D. (2021). Nature-based solutions for urban climate change adaptation and wellbeing: Evidence and opportunities from Kiribati, Samoa, and Vanuatu. *Frontiers in Environmental Science*, 442, 1-11
- Kingsbury, D. (2004). Community development. In D. Kingsbury, J. Remenyi, J. McKay and J. Hunt (Eds.) *Key Issues in Development*. New York, Palgrave Macmillan.
- Kirkby, Patrick, Casey Williams, and Saleemul Huq. (2018). Community-based adaptation (CBA): Adding conceptual clarity to the approach, and establishing its principles and challenges. *Climate and Development*, 10 (7), 577–589.
- Kirmayer, L. J., Sehdev, M., Whitley, R., Dandeneau, S. F., & Isaac, C. (2009). Community resilience: Models, metaphors and measures. *International Journal of Indigenous Health*, 5(1), 62-117.
- Klein, R.J.T. (2003). Adaptation to climate variability and change: what is optimal and appropriate. In C. Giupponi & M. Shechter (Eds.), *Climate Change in the Mediterranean: Socio-economic Perspectives of Impacts, Vulnerability, and Adaptation* (pp. 32–50). Cheltenham, UK: Edward Elgar.
- Klein, J. A., Tucker, C. M., Steger, C. E., Nolin, A., Reid, R., Hopping, K. A., & Yager, K. (2019). An integrated community and ecosystem-based approach to disaster risk reduction in mountain systems. *Environmental Science & Policy*, 94, 143-152.
- Klijin, E. H., & Koppenjan, J. F. M. S. (2014). Accountable networks. In M. Bovens, Robert E. Goodin, & T. Schillemans (Eds.) *The Oxford Handbook of Public Accountability* (pp.242-258). Oxford, Oxford University Press.
- Kotze, A., Ehlers, K., Cilliers, D. C., & Grobler, J. P. (2008). The power of resolution of microsatellite markers and assignment tests to determine the geographic origin of cheetah (*Acinonyx jubatus*) in Southern Africa. *Mammalian Biology*, 73(6), 457-462.
- Krishna, A. (2003). Partnerships between local governments and community-based organisations: exploring the scope for synergy. *Public Administration and Development: The International Journal of Management Research and Practice*, 23(4), 361-371.
- Krueger, R. A. (2014). *Focus Groups: A practical Guide for Applied Research*. London: Sage publications.

- Kukkala, A. S., & Moilanen, A. (2013). Core concepts of spatial prioritisation in systematic conservation planning. *Biological Reviews*, 88, 443–464.
- Kumar G, & Singh K. (2020). Mapping and monitoring the selected wetlands of Punjab, India, using geospatial techniques. *Journal of the Indian Society Remote Sensing*, 48, 615–625.
- Lachapelle, P. (2008). A sense of ownership in community development: Understanding the potential for participation in community planning efforts, *South African Journal of Science*, 39(2), 52–59.
- Lasage, R., Muis S., Sardella, C. S.E., Van Drunen, M. A., Verburg, P.H., & Aerts H. (2015). A stepwise, participatory approach to design and implement community-based adaptation to drought in the Peruvian Andes. *Sustainability*, 7 (2), 1742–1773.
- Lawler J. J. (2009). Climate change adaptation strategies for resource management and conservation planning. *Annals of the New York Academy of Sciences* 1162, 79–98.
- Leary, N.A. (1999). A framework for benefit-cost analysis of adaptation to climate change and climate variability, *Mitigation and Adaptation Strategies for Global Change*, 4(3–4), 307–318.
- Leary, N., Adejuwon, J., Barros, V., Batimaa, P., Biagini, B., Burton, I., ... & Wehbe, M. (2007). A stitch in time: Lessons for climate change adaptation from the AIACC Project. Washington, DC: International START Secretariat. Retrieved January 12, 2019, from http://www.start.org/Projects/AIACC_Project/working_papers/Working%20Papers/AIACC_WP48_Leary_etal.pdf
- Lebel, L., Anderies, J. M., Campbell, B., Folke, C., Hatfield-Dodds, S., Hughes, T. P., & Wilson, J. (2006). Governance and the capacity to manage resilience in regional social-ecological systems. *Ecology and Society*, 11(1), 1-21.
- Lemly, A. D., Kingsford, R. T., & Thompson, J. R. (2000). Irrigated agriculture and wildlife conservation: conflict on a global scale. *Environmental Management*, 25(5), 485-512.
- Lengnick-Hall, C. A., Beck, T. E., & Lengnick-Hall, M. L. (2011). Developing a capacity for organizational resilience through strategic human resource management. *Human Resource Management Review*, 21(3), 243-255.
- Lewis, D., & Hossain, A. (2008). Beyond ‘the Net’? Institutions, elites and the changing power structure in Rural Bangladesh. In D. N. Gellner & K. Hachhethu (Eds.), *Local Democracy in South Asia Microprocesses of Democratization in Nepal and its Neighbours*. New Delhi, Sage Publications.
- Lewis, D. (2011). *Bangladesh: Politics, Economy and Civil Society*. Cambridge, Cambridge University Press.
- Li, L., Cheshmehzangi, A., Chan, F. K. S., & Ives, C. D. (2021). Mapping the research landscape of nature-based solutions in urbanism. *Sustainability*, 13(7), 3876.

- Littles, C., Karnezis, J., Blauvelt, K., Creason, A., Diefenderfer, H., Johnson, G., Krasnow, L. and Trask, P. (2022). Adaptive management of large-scale ecosystem restoration: increasing certainty of habitat outcomes in the Columbia River Estuary, U.S.A. *Restoration Ecology*, Early View.
- Lorenzoni, I., Nicholson-Cole, S., & Whitmarsh, L. (2007). Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*, 17(3-4), 445-459.
- Lorenzo-Sáez, E., Oliver-Villanueva, J. V., Lemus-Zúñiga, L. G., Urchueguía, J. F., & Lerma-Arce, V. (2022). Development of sectorial and territorial information system to monitor GHG emissions as local and regional climate governance tool: Case study in Valencia (Spain). *Urban Climate*, 42, 101125.
- Lowe, S. R., Sampson, L., Gruebner, O., & Galea, S. (2015). Psychological resilience after Hurricane Sandy: the influence of individual-and community-level factors on mental health after a large-scale natural disaster. *Plos One*, 10(5), e0125761.
- Lundsgaarde, E., Dupuy, K., & Persson, Å. (2018). *Coordination challenges in climate finance* DISS Working Paper 2018: 3, Copenhagen, Danish Institute for International Studies. Retrieved 23 June 2020, from <https://www.sei.org/publications/coordination-challenges-climate-finance/>.
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: A critical evaluation and guidelines for future work. *Child Development*, 71(3), 543-562.
- Luthar, S. S. (2006). Resilience in development: A synthesis of research across five decades. In D. Cicchetti & D. J. Cohen (Eds.), *Developmental Psychopathology: Risk, Disorder, and Adaptation* (pp. 739-795). New Jersey, John Wiley & Sons.
- Lydon, M. (2017). Resilient streets, resilient cities. In D. Lerch (Ed.), *The Community Resilience Reader: Essential Resources for an Era of Upheaval* (pp. 279–291). Washington, Island press.
- Macdonald, S., Monstadt, J., & Friendly, A. (2021). From the Frankfurt greenbelt to the Regionalpark RheinMain: an institutional perspective on regional greenbelt governance. *European Planning Studies*, 29(1), 142-162.
- Magis, K. (2010). Community resilience: An indicator of social sustainability. *Society and Natural Resources*, 23(5), 401-416.
- Malhotra, A., & Roulet, N. T. (2015). Environmental correlates of peatland carbon fluxes in a thawing landscape: do transitional thaw stages matter?. *Biogeosciences*, 12(10), 3119-3130.
- Mamun, A. A. (2010). Understanding the value of local ecological knowledge and practices for habitat restoration in human-altered floodplain systems: a case from Bangladesh. *Environmental Management*, 45(5), 922-938.

- Mamun, S. A., Roy, S., Rahaman, M. S., Jahan, M., & Islam, M. S. (2013). Status of fisheries resources and water quality of Tanguar haor. *Journal of Environmental Science and Natural Resources*, 6(1), 103-106.
- Mamun, A. A., R. K. Brook, and T. Dyck. (2016). Multilevel Governance and Fisheries Commons: Investigating Performance and Local Capacities in Rural Bangladesh. *International Journal of the Commons* 10(1),45–70.
- Mangubhai, S., Nand, Y., Reddy, C., & Jagadish, A. (2021). Politics of vulnerability: Impacts of COVID-19 and cyclone Harold on Indo-Fijians engaged in small-scale fisheries. *Environmental Science and Policy*, 120, 195–203.
- Mansfield, H. C. and Winthrop, D. (2000) *Alexis de Tocqueville, Democracy in America*, University of Chicago Press, Chicago
- Mansuri, G., & Rao, V. (2013). Can participation be induced? Some evidence from developing countries. *Critical Review of International Social and Political Philosophy*, 16(2), 284-304.
- Manyena, S. B. (2006). The concept of resilience revisited. *Disasters*, 30, 434-450.
- Margules C. R., & Pressey R. L. (2000). Systematic conservation planning. *Nature*, 405, 243–253.
- Marshall, C. & Rossman, G. B. (2014). *Designing Qualitative Research*, Sage publications.
- Masten, A. S., & Obradovic, J. (2008). Disaster preparation and recovery: Lessons from research on resilience in human development. *Ecology and Society*, 13(1), 1-16.
- Masud-All-Kamal, M., & Nursey-Bray, M. (2021). Socially just community-based climate change adaptation? Insights from Bangladesh. *Local Environment*, 26(9), 1-17.
- Masud-All-Kamal, M., Nursey-Bray, M., & Hassan, S. M. (2021). Challenges to building social capital through planned adaptation: Evidence from rural communities in Bangladesh. *Current Research in Environmental Sustainability*, 3, 100091.
- Masud-All-Kamal, M., & Nursey-Bray, M. (2022). Best intentions and local realities: Unseating assumptions about implementing planned community-based adaptation in Bangladesh. *Climate and Development*, Online First, 1-10.
- Matland, R. E. (1995). Synthesizing the implementation literature: The ambiguity-conflict model of policy implementation. *Journal of public Administration Research and Theory*, 5(2), 145-174.
- Matthews, B., & Ross, L. (2010). *Research Methods: A Practical Guide for the Social Sciences* New York, Longman.

- Maua, J. O., Mbuvi, M. T. E., Matiku, P., Munguti, S., Mateche, E., & Owili, M. (2022). The difficult choice-to conserve the living filters or utilizing the full potential of wetlands: Insights from the Yala swamp, Kenya. *Environmental Challenges*, 6, 100427.
- Maxwell, S. R., & Maxwell, C. D. (2020). Ecology and criminology? Applying the tenets of procedural justice on compliance to environmental regulations. *Criminology & Criminal Justice*, 22(2), 199-2016.
- McClymont Peace, D. and Myers, E. (2012). Community-based participatory process: Climate change and health adaptation program for northern first nations and Inuit in Canada. *International Journal of Circumpolar Health*, 71, 1–8.
- McKenzie, J. F., B. L. Neiger and R. Thackeray. (2013). *Planning, Implementing, and Evaluating Health Promotion Programs: A Primer*. Boston, Pearson publications.
- McMichael, A. J., Woodruff, R. E., & Hales, S. (2006). Climate change and human health: Present and future risks. *The Lancet*, 367(9513), 859-869.
- McNamara, K. E. (2013). Taking Stock of community-based climate-change adaptation projects in the pacific. *Asia Pacific Viewpoint*, 54(3), 398–405
- McNamara, K. E., & Buggy, L. (2017). Community-based climate change adaptation: A review of academic literature. *Local Environment*, 22(4), 443–460.
- McNamara, K. E., Clissold, R., Westoby, R., Piggott-McKellar, A. E. Kumar, R., Clarke, T., Namoumou, F. et al. (2020). An assessment of community-based adaptation initiatives in the pacific islands. *Nature Climate Change*, 10, 628–639.
- McNamara, K. E., Westoby, R., & Clissold, R. (2022). Lessons for adaptation pathways in the Pacific Islands. *PLOS Climate*, 1(2), e0000011.
- Measham, T. G., & Lumbasi, J. A. (2013). Success factors for community-based natural resource management (CBNRM): Lessons from Kenya and Australia. *Environmental Management*, 52(3), 649-659.
- Meenawat, H., & Sovacool, B. K. (2011). Improving adaptive capacity and resilience in Bhutan. *Mitigation and Adaptation Strategies for Global Change*, 16(5), 515-533.
- Mees, H., & Driessen, P. (2019). A framework for assessing the accountability of local governance arrangements for adaptation to climate change. *Journal of Environmental Planning and Management*, 62(4), 671-691.
- Métais, C., Burel, N., Gilham, J., Tarquinio, C., & Martin-Krumm, C. (2020). Integrative review of the recent literature on human resilience: From concepts, theories, and discussions towards a complex understanding. *European Journal of Psychology*, 18(1), 98-119.
- Middleton, B. A., & Souter, N. (2016). Functional integrity of wetlands, hydrologic alteration and freshwater availability. *Ecosystem Health and Sustainability*, 2(1), e01200.

- Miles, S. B. (2015). Foundations of community disaster resilience: Well-being, identity, services, and capitals. *Environmental Hazards*, 14, 103–121.
- Mileti, D. (1999). *Disasters by Design: A Reassessment of Natural Hazards in the U.S.* Washington, DC, Joseph Henry Press.
- Milupi, I. D., Somers, M. J., & Ferguson, J. W. H. (2017). A review of community-based natural resource management. *Applied Ecology and Environmental Research*, 15(4), 1121-1143.
- Ministry of Environment, Forest and Climate Change (MoEFCC). (2005). The Government of the People's Republic of Bangladesh. *Bangladesh National Adaptation Programme of Action (NAPA)*. Bonn: UNFCCC. Retrieved January 12, 2019, from <https://unfccc.int/resource/docs/napa/ban01.pdf>
- Ministry of Environment, Forest and Climate Change (MoEFCC). (2009). Bangladesh climate change strategy and action plan (BCCSAP) 2009. The Government of the People's Republic of Bangladesh. Retrieved March 18, 2019, from https://www.iucn.org/downloads/bangladesh_climate_change_strategy_and_action_plan_2009.pdf
- Ministry of Environment, Forest and Climate Change (MoEFCC). (2016). National biodiversity strategy and action plan of Bangladesh 2016-2021. *Dhaka: MOEFCC*. Retrieved March 12, 2019, from https://bangladeshbiosafety.org/wp-content/uploads/2021/03/National-Biodiversity-Strategy-and-Action-Plan-of-Bangladesh_2016-2021.pdf
- Ministry of Environment, Forest and Climate Change (MoEFCC). (2021). Nationally Determined Contributions (INDCs) 2021. The Government of the Peoples' Republic of Bangladesh.
- Ministry of Finance. (2014). Bangladesh climate fiscal framework. The Government of the People's Republic of Bangladesh. Retrieved January 14, 2020, from <http://nda.erd.gov.bd/en/c/publication/bangladesh-climate-fiscal-framework-cff-2014>
- Mir, M. and Bala, S.K. (2015). NGO accountability in Bangladesh: Two contrasting cases, *Voluntas: International Journal of Voluntary and Nonprofit Organization*, 26(5), 1831–1851.
- Mitsch, W.J., and Gosselink, J.G., (2000). *Wetlands*. New York, Van Nostrand Reinhold.
- Momtaz, H., Alam, A. K. M. R., & Hoque, S. (2010). A comparative study of phytoplankton diversity in relation to water quality of migratory birds visiting and non-visiting wetlands of Savar. *Bangladesh Journal of Environmental Research*, 8, 31-38.
- Moomaw, W. R., Chmura, G. L., Davies, G. T., Finlayson, C. M., Middleton, B. A., Natali, S. M., Perry, J. E., Roulet, N. & Sutton-Grier, A. E. (2018). Wetlands in a changing climate: Science, policy and management. *Wetlands*, 38(2), 183-205.

- Moore, M., Chandra, A., & Feeney, K. C. (2013). Building community resilience: What can the United States learn from experiences in other countries?. *Disaster Medicine and Public Health Preparedness*, 7(3), 292-301.
- Morgan, J. (2016). Paris COP 21: Power that speaks the truth?. *Globalizations*, 13(6), 943-951.
- Morgan, E. A., Nalau, J., & Mackey, B. (2019). Assessing the alignment of national-level adaptation plans to the Paris Agreement. *Environmental Science & Policy*, 93, 208-220.
- Mosberg, M., Nyukuri, E., & Naess, L. O. (2017). The power of 'know-who': Adaptation to climate change in a changing humanitarian landscape in Isiolo, Kenya. *IDS Bulletin*, 48(4), 79-92.
- Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*, 107(51), 22026-22031.
- Mozumder, M. M. H., Wahab, M., Sarkki, S., Schneider, P., & Islam, M. M. (2018). Enhancing social resilience of the coastal fishing communities: A case study of hilsa (*Tenualosa ilisha* H.) fishery in Bangladesh. *Sustainability*, 10(10), 3501.
- Mulligan, M., Steele, W., Rickards, L., Fünfgeld, H. (2016). Keywords in planning: What do we mean by 'community resilience'? *International Planning Studies*, 21(4), 348-361.
- Murombedzi, J. (1998). The evolving context of community-based natural resource management in sub-Saharan Africa in historical perspective. Proceedings of the international workshop on community-based natural resource management. Washington, D.C. Retrieved August 09, 2019, from http://www.cbnrm.net/pdf/murombedzi_001.pdf
- Mustafa, M. G. (2019). Evaluation of fisheries management techniques in three wetlands in Bangladesh. *Advances in Research*, 20(5)1-14.
- Muzaffar, S. B., & Ahmed, F. A. (2007). The effects of the flood cycle on the diversity and composition of the phytoplankton community of a seasonally flooded Ramsar wetland in Bangladesh. *Wetlands Ecology and Management*, 15(2), 81-93.
- Nagel, T. (1989). *The View From Nowhere*. Oxford, Oxford university press.
- Nagoda, S., & Nightingale, A. J. (2017). Participation and power in climate change adaptation policies: Vulnerability in food security programs in Nepal. *World Development*, 100, 85-93.
- Nambi, A.A., et al. (2015). Farm household level adaptation metrics for agriculture and water sectors. *International Journal of Climate Change Strategies and Management*, 7(1), 27-40.
- National Research Council (NRC). (1995). *Wetlands: Characteristics and Boundaries*. Washington, D.C., National Academies Press.

- Naz, S., Fatima, Z., Iqbal, P., Khan, A., Zakir, I., Ullah, H., Abbas, G., Ahmed, M., Mubeen, M., Hussain, S. & Ahmad, S. (2022). An introduction to climate change phenomenon. In W. N. Jatoi, M. Mubeen, A. Ahmad, M. A. Cheema, Z. Lin, M. Z. Hashmi (Eds.), *Building Climate Resilience in Agriculture* (pp. 3-16). Cham, Springer.
- Nazneen, S., Madhav, S., Priya, A., & Singh, P. (2022). Coastal Ecosystems of India and Their Conservation and Management Policies: A Review. *Coastal Ecosystems*, 1-21.
- Nelson, D. R., Adger, W. N., & Brown, K. (2007). Adaptation to environmental change: Contributions of a resilience framework. *Annual Review of Environment and Resource*, 32, 395-419.
- Neuman, W. L., & Kreuger, L. (2003). *Social Work Research Methods: Qualitative and Quantitative Approaches*. Boston, Allyn and Bacon.
- Neuman, W. L. (2006). *Social Research Methods: Qualitative and Quantitative Approaches (Sixth Edition)*. Boston, Pearson.
- Neuman, W. L. (2011). *Social Research Methods: Qualitative and Quantitative Approaches (Seventh Edition)*. Boston, Pearson.
- Neuman, W. L., & Robson, K. (2012). *Basics of Social Research: Qualitative and Quantitative Approaches*. Columbus, Pearson.
- Newaz, M. W., & Rahman, S. (2019). Wetland resource governance in Bangladesh: An analysis of community-based co-management approach. *Environmental Development*, 32, 100446.
- Newaz, M. W., & Rahman, S. (2022). *Politics of Decentralization and Management of Natural Resources: An Institutional Analysis of Commons in Northeast Bangladesh*. Preprint Article. <http://dx.doi.org/10.2139/ssrn.4040568>
- Nichols, J. D., Koneff, M. D., Heglund, P. J., Knutson, M. G., Seamans, M. E., Lyons, J. E., ... & Williams, B. K. (2011). Climate change, uncertainty, and natural resource management. *The Journal of Wildlife Management*, 75(1), 6-18.
- Nightingale, A. J. (2017). Power and politics in climate change adaptation efforts: Struggles over authority and recognition in the context of political instability. *Geoforum*, 84, 11-20.
- Nishat A. (2003). Management of freshwater wetlands in Bangladesh: Issues and strategy. Dhaka: IUCN. Retrieved on 23 June 2020, from <http://www.doe-bd.org/cwbmp/inception>
- Noman, M., Islam, M. N., & Shoaib, M. (2021). Community-based ecosystem management (CbEM) of Arial Beel at Munshiganj District in Bangladesh by integrating MIMES model. *Modeling Earth Systems and Environment*, 8, 483-497.

- Nomani, S., Tuhin, M., & Hossain, T. (2022). Bangladesh in global environmental politics: Focus on climate diplomacy. *Journal of Alternative Perspectives in the Social Sciences*, 11(3), 415-476.
- Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., & Pfefferbaum, R.L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41, 127–150.
- Nowreen, S., Murshed, S. B., Islam, A. S., Bhaskaran, B., & Hasan, M. A. (2015). Changes of rainfall extremes around the haor basin areas of Bangladesh using multi-member ensemble RCM. *Theoretical and Applied Climatology*, 119(1), 363-377.
- Nurse-Bray, M., Fergie, D., Arbon, V., Rigney, L., Palmer, R., Tibby, J., Harvey, N., & Hackworth, L. (2013). Community based adaptation to climate change: The Arabana, *National Climate Change Adaptation Research Facility, Gold Coast*.
- Oakkas, M. A., & Islam, M. F. (2020). Fishing community in wetland region of bangladesh: Views from the Field Experiences of Hakaluki Haor. *Journal of Underrepresented & Minority Progress*, 4(2), 287-301.
- Oakkas, M. A., Islam, M. F., Jalil, M. A., Al-Agad, M. A., & Islam, F. (2020). Fish, fishing and fishermen: A case of Hakaluki Haor, Bangladesh. *Social Science Journal*, 24, 218-231.
- O’Beirne, P., Battersby, F., Mallett, A., Aczel, M., Makuch, K., Workman, M., & Heap, R. (2020). The UK net-zero target: Insights into procedural justice for greenhouse gas removal. *Environmental Science & Policy*, 112, 264-274.
- O’Donnell, M., Rashid, A. M., Steele, P., Hedger, M., Lee, J., Islam, K. M., Islam, T., Khondker, R. K., Rahman, S., Sarkar, D. K. & Sinha, N. C. (2013). Bangladesh climate public expenditure and institutional review. In R. Shaw, F. Mallick, & A. Islam (Eds.) *Climate Change Adaptation Actions in Bangladesh* (pp. 365-385). Tokyo, Springer.
- O’Donnell, E. C., Lamond, J. E., Thorne, C. R. (2018). Learning and Action Alliance framework to facilitate stakeholder collaboration and social learning in urban flood risk management. *Environmental Science Policy* 80, 1–8.
- Okitasari, M., & Katramiz, T. (2022). The national development plans after the SDGs: Steering implications of the global goals towards national development planning. *Earth System Governance*, 12, 100136.
- Olding, W. (2017). Norway’s international climate and forest initiative: Lessons learned and recommendations: Evaluation synthesis report. Oslo: *NORAD Evaluation Department*. Retrieved January 15, 2019.
https://www.norad.no/contentassets/0a94d37d6a614b44a5e91f15223a8b67/8.17-nicfi_lessons-learned-and-recommendations.-evaluation-synthesis-report.pdf"nicfi_lessons-learned-and-recommendations.-evaluation-synthesis-report.pdf

- Olds, A. D., Pitt, K. A., Maxwell, P. S., Babcock, R. C., Rissik, D., and Connolly, R. M. (2014). Marine reserves help coastal ecosystems cope with extreme weather. *Global Change Biology*, 20(10), 3050–3058.
- Olsson, P., Folke, C., Galaz, V., Hahn, T., Schultz, L. (2007). Enhancing the fit through adaptive co-management: Creating and maintaining bridging functions for matching scales in the Kristianstads Vattenrike Biosphere Reserve, Sweden. *Ecology and Society*, 12(1), 1-17.
- Omukuti, J. (2020). Country ownership of adaptation: Stakeholder influence or government control?. *Geoforum*, 113, 26-38.
- Osman-Elasha, B. & Sanjak, E. (2008). Livelihoods and droughts in Sudan. In N. Leary, C. Conde, J. Kulkarni, A. Nyong, & J. Pulhin (Eds.), *Climate Change and Vulnerability* (pp. 239– 256). London, Earthscan.
- Owen, G. (2020). What makes climate change adaptation effective? A systematic review of the literature. *Global Environmental Change*, 62, 102071.
- Oza, T. M., Lane, R., Adame, M. F., & Reef, R. (2021). Coastal wetland management in the Great Barrier Reef: Farmer perceptions. *Geographical Research*, 59(4), 537-553.
- Parvin, A., & Johnson, C. (2014). Disaster vulnerability in the policy context of Bangladesh: A critical review. In W.L. Filho (Ed.), *Handbook of Climate Change Adaptation, Springer: Verlag* (pp. 877-899). Heidelberg, Springer.
- Patel, S. S., Rogers, M. B., Amlôt, R., & Rubin, G. J. (2017). What do we mean by 'community resilience'? A systematic literature review of how it is defined in the literature. *Plos Currents*, 9.
- Patnaik, H. (2021). Gender and participation in community-based adaptation: Evidence from the decentralized climate funds project in Senegal. *World Development*, 142, 105448.
- Patton, M. Q. (2002). *Qualitative Research and Evaluation Methods*. Thousand Oaks, CA, Sage Publications.
- Pauleit, S., Zölch, T., Hansen, R., Randrup, T. B., & Konijnendijk van den Bosch, C. (2017). Nature-based solutions and climate change—four shades of green. In N. Kabisch, H. Korn, J. Stadler, A. Bonn (Eds.), *Nature-Based Solutions to Climate Change Adaptation in Urban Areas* (pp. 29-49). Cham, Springer.
- Pauley, S. P., Beres, A., Murray, N., Sumners, J. A., Witthaus, K., & Hilgedick, K. (2022). Transformation of a state fish and wildlife agency: Missouri Department of Conservation's effort to remain relevant in a changing world. *Conservation Science and Practice*, 4(2), e613.
- Pender, J. (2008). Community-led adaptation in Bangladesh. *Forced Migration Review*, 31, 54-55.

- Pérez, Á.A., Fernández, B.H., Gatti, R.C. (Eds.) (2010). *Building resilience to climate change: Ecosystem-based adaptation and lessons from the field*. Gland, IUCN.
- Perrings, C. (2006). Resilience and sustainable development. *Environment and Development Economics*, 11(4), 417-427.
- Pervin, M., Barua, P., Imam, N., Haque, M., & Hossain, N. J. (2019). Climate Governance and Finance in Bangladesh. In S. Huq, J. Scow, A. Fenton, C. Stott, J. Taub, H. Wright (Eds.), *Confronting Climate Change in Bangladesh* (pp. 65-83). Cham, Springer.
- Peterson, G. (2000). Political ecology and ecological resilience: An integration of human and ecological dynamics. *Ecological Economics*, 35(3), 323-336.
- Pfefferbaum, B., Pfefferbaum, R. L., & Norris, F. H. (2010). Community resilience and wellness for the children exposed to Hurricane Katrina. In R. P. Kilmer, V. Gil-Rivas, R. G. Tedeschi, & L. G. Calhoun (Eds.), *Helping families and communities recover from disaster: Lessons learned from hurricane Katrina and its aftermath* (pp. 265–285). Washington, D.C., American Psychological Association.
- Pfefferbaum B, Pfefferbaum RL, Van Horn RL. (2015). Community resilience interventions: Participatory, assessment-based, action-oriented processes. *American Behavioral Science* 59, 238–253.
- Phong, N. T., Quang, N. H., & Van Sang, T. (2022). Shoreline change and community-based climate change adaptation: Lessons learnt from Brebes Regency, Indonesia. *Ocean & Coastal Management*, 218, 106037.
- Pielke, R.A.J. (1998). Rethinking the role of adaptation in climate policy. *Global Environmental Change* 8, 159-170.
- Piggott-McKellar, E., McNamara, K. E., Nunn, P. D., & Watson, J. E. M. (2019). What are the barriers to successful community-based climate change adaptation? A review of grey literature. *Local Environment* 24(4), 374–390.
- Piper, H., & Simons, H. (2005). Ethical responsibility in social research. In B. Somekh, C. Lewin (Eds.), *Research Methods in the Social Sciences* (pp. 56-63), Los Angeles, Sage Publications.
- Pittock, J., Hansen, L. J., and Abell, R. (2008). Running dry: freshwater biodiversity, protected areas and climate change. *Biodiversity*, 9, 30–38.
- Pittock, J., Finlayson, C. M., & Howitt, J. (2013). Beguiling and risky: ‘Environmental works and measures’ for wetland conservation under a changing climate. *Hydrobiologia*, 708(1), 111-131.
- Pla, M. A. M., Lorenzo-Sáez, E., Luzuriaga, J. E., Prats, S. M., Moreno-Pérez, J. A., Urchueguía, J. F., ... & Lemus, L. G. (2021). From traffic data to GHG emissions: A novel bottom-up methodology and its application to Valencia city. *Sustainable Cities and Society*, 66, 102643.

- Polash, A. G., Islam, M., Alam, M. M., & Al-Amin, A. Q. (2021). Dynamics of changes in land use and land cover and perceived causes in Hakaluki Haor, Bangladesh. *Journal of Environmental Planning and Management*, 1-20.
- Postel S., & Richter, B. (2003). *Rivers for Life: Managing Water for People and Nature*. Washington, D.C., Island Press.
- Poteete, A. R. (2009). Defining political community and rights to natural resources in Botswana. *Development and Change*, 40(2), 281-305.
- Pressey, & R. L., Adam, P. (1995). A Review of Wetland Inventory and Classification in Australia. In G. Grabherr, L. Mucina, M. B. Dales, C.J.F. ter Braak (Eds.), *Advance in Vegetation Science* (pp. 81–101). Cham, Springer.
- Prior, T., & Eriksen, C. (2013). Wildfire preparedness, community cohesion and social-ecological systems. *Global Environmental Change*, 23(6), 1575–1586.
- Rabbani, G., Rahman, S. H., & Faulkner, L. (2013). Impacts of climatic hazards on the small wetland ecosystems (ponds): Evidence from some selected areas of coastal Bangladesh. *Sustainability*, 5(4), 1510-1521.
- Rahman, M. R., & Begum, S. (2011). Land cover change analysis around the Sundarbans Mangrove Forest of Bangladesh using remote sensing and GIS application. *Journal of Science Foundation*, 9(1-2), 95-107.
- Rahman, H. M. T., Hickey, G.M., & Sarker, S. K. (2012). A framework for evaluating collective action and informal institutional dynamics under a resource management policy of decentralisation. *Ecological Economics*, 83, 32–41.
- Rahman, H. T., Hickey, G. M., & Sarker, S. K. (2015). Examining the role of social capital in community collective action for sustainable wetland fisheries in Bangladesh. *Wetlands*, 35(3), 487-499.
- Rahman, M., Sayeed, M. A., Rasul, M. G., Mondal, M. N., Majumdar, B. C., & Shah, A. A. (2016). Impact of fishing gear on fish biodiversity of Hakaluki Haor in Bangladesh. *International Journal of Fisheries and Aquatic Studies*, 4(6), 257-62.
- Rahman, H. T., Mia, M. E., Ford, J. D., Robinson, B. E., & Hickey, G. M., (2018a). Livelihood exposure to climatic stresses in the north-eastern floodplains of Bangladesh. *Land Use Policy*, 79, 199-214.
- Rahman, H. T., Robinson, B. E., Ford, J. D., & Hickey, G. M. (2018b). How do capital asset interactions affect livelihood sensitivity to climatic stresses? Insights from the Northeastern floodplains of Bangladesh. *Ecological Economics*, 150, 165-176.
- Rahman, H. M. T. & Hickey, G. M. (2019). What does autonomous adaptation to climate change have to teach public policy and planning about avoiding the risks of maladaptation in Bangladesh? *Frontiers in Environmental Science*, 7(2), 1–14.

- Rahman, S. H., Islam, M. N., & Mukta, Z. H. (2020). Exploration of issues in local-level climate finance transparency and accountability in Southwest Bangladesh. *Bangladesh Journal of Environmental Research*, 11, 12-21.
- Rahman, A., Jahanara, I., Jolly, Y. N., Akter, S., Kabir, J., Uddin, M. J., Mamun, K. M., Mohiuddin, A. S. M. & Rahman, M. K. (2022). Soil properties and pollution indices in four designated wetlands in the Sylhet basin of Bangladesh. *Environmental Earth Sciences*, 81(3), 1-17.
- Rai, N., Huq, S., & Huq, M. J. (2014). Climate resilient planning in Bangladesh: a review of progress and early experiences of moving from planning to implementation. *Development in Practice*, 24(4), 527-543.
- Raihan, M. S., Huq, M. J., Alsted, N. G., & Andreasen, M. H. (2010). Understanding climate change from below, addressing barriers from above: Practical experience and learning from a community-based adaptation project in Bangladesh. ActionAid Bangladesh. Retrieved June 20, 2020, from <http://indiaenvironmentportal.org.in/files/understandingccfrombelow.pdf>
- Rajamani, L. (2015). The devilish details: Key legal issues in the 2015 climate negotiations. *Modern Law Review*, 78(5), 826-853.
- Rana, M. P., Sohel, M. S. I., Akter, S., & Alam, M. S. (2010). Haor based livelihood dependency of a rural community: A study on Hakaluki Haor in Bangladesh. *Proceedings of the Pakistan Academy of Sciences*, 47(1), 1-10.
- Rarai, A., Parsons, M., Nursey-Bray, M., & Crease, R. (2022). Situating climate change adaptation within plural worlds: The role of Indigenous and local knowledge in Pentecost Island, Vanuatu. *Environment and Planning E: Nature and Space*.
- Rashid, M. J., Sadhukhan, B., Rashid, N., & Asia, I. S. (2021). Urban resilience in Bangladesh: Integrating local and national planning processes. CDKN Policy Brief. Retrieved on 10 January 2022, from https://cdkn.org/sites/default/files/files/Urban-Resilience-Planning-in-Bangladesh_Final.pdf
- Rastegar, R., & Ruhanen, L. (2021). A safe space for local knowledge sharing in sustainable tourism: an organisational justice perspective. *Journal of Sustainable Tourism*, 1-17.
- Rawlani, A. K., & Sovacool, B. K. (2011). Building responsiveness to climate change through community-based adaptation in Bangladesh. *Mitigation and Adaptation Strategies for Global Change*, 16(8), 845-863.
- Raza, A., Razzaq, A., Mehmood, S.S., Zou, X., Zhang, X., Lv, Y., & Xu, J. (2019). Impact of climate change on crops adaptation and strategies to tackle its outcome: A review. *Plants*, 8(2), 1-29.
- Reed, S. O., Friend, R., Jarvie, J., Henceroth, J., Thinphanga, P., Singh, D., ... & Sutarto, R. (2014). Resilience projects as experiments: Implementing climate change resilience in Asian cities. *Climate and Development*, 7(5), 469-480.

- Regmi, B. R., & Star, C. (2014). Identifying operational mechanisms for mainstreaming community-based adaptation in Nepal. *Climate and Development*, 6(4), 306–317.
- Rego A, & Mehta S. (2005). Opportunities and challenges in risk resilient recovery. *World Hospitals and Health Services: The Official Journal of the International Hospital Federation*, 41(4), 335.
- Reid, H., & Huq, S. (2007). Community-based adaptation: A vital approach to the threat climate change poses to the poor. London, IIED. Retrieved on October 27, 2018, from <https://pubs.iied.org/17005iied>
- Reid, H., M. Alam, R. Berger, T. Cannon, S. Huq, and A. Milligan. (2009). Community-based Adaptation to climate change: An Overview. *Participatory Learning and Action*, 60(1), 11–33.
- Reid, H. & Schipper, E. L. F. (2014). Upscaling community-based adaptation: An introduction to the edited volume, in E. L. F., Schipper, J. Ayers, H. Reid, S. Haq, & A. Rahman, (Eds.) *Community-based Adaptation to Climate Change: Scaling It Up* (pp. 3–21). Oxford, Routledge.
- Reid, H. (2015). Ecosystem and community-based adaptation: Learning from community-based natural resource management. *Climate and Development*. 8(1), 4-9.
- Reilly, J., & Schimmelpfennig, D. (2000). Irreversibility, uncertainty, and learning: Portraits of adaptation to long-term climate change. *Climatic Change*, 45, 253–278.
- Reis, V., Hermoso, V., Hamilton, S. K., Ward, D., Fluet-Chouinard, E., Lehner, B., & Linke, S. (2017). A global assessment of inland wetland conservation status. *Bioscience*, 67(6), 523-533.
- Remling, E., & J. Veitayaki. (2016). Community-based action in Fiji’s Gau Island: A model for the Pacific? *International Journal of Climate Change Strategies and Management*, 8(3), 375–398.
- Revell, P., Dinnie, E. (2020). Community resilience and narratives of community empowerment in Scotland. *Community Development Journal*, 55, 218–236
- Ribot, J. (2014). Cause and response: vulnerability and climate in the Anthropocene. *The Journal of Peasant Studies*, 41(5), 667–705.
- Rijal, S., Rauniyar, A., Thapa, S., Paudel, U., & Gautam, D. (2021). Ecosystem services of wetlands and threats in the context of Nepal. *International Journal of Forest, Soil and Erosion*. 11(2), 1-6.
- Rivaes, R. P., Feio, M. J., Almeida, S. F., Calapez, A. R., Sales, M., Gebler, D., Lozanovska, I. & Aguiar, F. C. (2022). River ecosystem endangerment from climate change-driven regulated flow regimes. *Science of The Total Environment*, 818, 151857.

- Robertson, H. A., & Funnell, E. P. (2012). Aquatic plant dynamics of Waituna Lagoon, New Zealand: Trade-offs in managing opening events of a Ramsar site. *Wetlands Ecology and Management* 20, 433–445.
- Robson, C. (1993). *Real World Research: A Resource for Social Scientists and Practitioners-Researchers*. Massachusetts, Blackwell Publisher Ltd.
- Rodriguez-Llanes, J. M., Vos, F., & Guha-Sapir, D. (2013). Measuring psychological resilience to disasters: are evidence-based indicators an achievable goal?. *Environmental Health*, 12(1), 1-10.
- Rog, S. M., & Cook, C. N. (2017). Strengthening governance for intertidal ecosystems requires a consistent definition of boundaries between land and sea. *Journal of Environmental Management*, 197, 694-705.
- Rojas Blanco, M. (2006). Local initiatives and adaptation to climate change. *Disasters*, 30(1), 140-147.
- Romilly, P. (2005). Time series modelling of global mean temperature for managerial decision-making. *Journal of Environmental Management*, 76(1), 61-70.
- Roncoli, C., Orlove, B. S., Kabugo, M. R., & Waiswa, M. M. (2011). Cultural styles of participation in farmers' discussions of seasonal climate forecasts in Uganda. *Agriculture and Human Values*, 28(1), 123-138.
- Ross H, & Berkes F. (2014). Research approaches for understanding, enhancing, and monitoring community resilience. *Society & Natural Resources*, 27, 787–804
- Ruíz, A. G., Hes, E., & Schwartz, K. (2011). Shifting governance modes in wetland management: A case study of two wetlands in Bogotá, Colombia. *Environment and Planning C: Government and Policy*, 29(6), 990-1003.
- Rus, K., Kilar, V., & Koren, D. (2018). Resilience assessment of complex urban systems to natural disasters: A new literature review. *International Journal of Disaster Risk Reduction*, 31, 311–330.
- Sabates-Wheeler, R., Mitchell, T., & Ellis, F. (2008). Avoiding repetition: Time for CBA to engage with the livelihoods literature? *IDS Bulletin*, 39(4), 53–59.
- Saja, A. M. A., Teo, M., Goonetilleke, A., & Ziyath, A. M. (2018). An inclusive and adaptive framework for measuring social resilience to disasters. *International Journal of Disaster Risk Reduction*, 28, 862–873.
- Sajal, I.A. (2018). Ecologically critical areas of Bangladesh. *IUCN EJournal*, 8, 65-72.
- Salimi, S., Almuktar, S. A., & Scholz, M. (2021). Impact of climate change on wetland ecosystems: A critical review of experimental wetlands. *Journal of Environmental Management*, 286, 112160.

- Saroar, M., Routray, J.K. (2015). Local Determinants of Adaptive Capacity Against the Climatic Impacts in Coastal Bangladesh. In: Leal Filho, W. (eds) Handbook of Climate Change Adaptation. Springer, Berlin, 401-431
- Sarker, M., Islam, N., Peng, Y., Khatun, M., Alam, G. M., Shouse, R. C., & Amin, M. (2021). Climate finance governance in hazard prone riverine islands in Bangladesh: Pathway for promoting climate resilience. *Natural Hazards*, 110, 1115-1132.
- Schensul, S. L., Schensul, J. J., & LeCompte, M. D. (1999). *Essential Ethnographic Methods: Observations, Interviews, and Questionnaires*. Walnut Creek, AltaMira Press.
- Schipper, E. L. F., & Langston, L. (2015). A comparative overview of resilience measurement frameworks: Analysing indicators and approaches. London: Overseas Development Institute. Retrieved October 14, 2019, from <https://cdn.odi.org/media/documents/9754.pdf>
- Schipper, E. L. F., Tanner, T., Dube, O. P., Adams, K. M., & Huq, S. (2020). The debate: Is global development adapting to climate change?. *World Development Perspectives*, 18, 100205.
- Schmuck, R. A. (2006). *Practical Action Research for Change*. Los Angeles, Corwin Press.
- Schneider, P., Lawrence, J., Glavovic, B., Ryan, E., & Blackett, P. (2020). A rising tide of adaptation action: Comparing two coastal regions of Aotearoa-New Zealand. *Climate Risk Management*, 30, 100244.
- Scholz, M. (2015). *Wetland systems to control urban runoff*. Amsterdam, Elsevier.
- Scolobig, A., Prior, T., Schröter, D., Jörin, J., & Patt, A. (2015). Towards people-centered approaches for effective disaster risk management: balancing rhetoric with reality. *International Journal of Disaster Risk Reduction*, 12, 202–212.
- Scott, J. (1990). A matter of Record: Documentary Sources in *Social Research*. Los Angeles, Wiley.
- Seak, S., Schmidt-Vogt, D., & Thapa, G. B. (2012). Biodiversity monitoring at the Tonle Sap Lake of Cambodia: A comparative assessment of local methods. *Environmental Management*, 50(4), 707-720.
- Seddon, N., Sengupta, S., García-Espinosa, M., Hauler, I., & Herr, D. (2019). Nature-based solutions in nationally determined contributions. Gland: IUCN. Retrieved January 12, 2020, from <https://portals.iucn.org/library/efiles/documents/2019-030-En.pdf>
- Seddon, N., Chausson, A., Berry, P., Girardin, C. A., Smith, A., & Turner, B. (2020). Understanding the value and limits of nature-based solutions to climate change and other global challenges. *Philosophical Transactions of the Royal Society B*, 375(1794).

- Seddon, N., Smith, A., Smith, P., Key, I., Chausson, A., Girardin, C., et al. (2021). Getting the message right on nature-based solutions to climate change. *Global Change Biology*, 27(8), 1518–1546.
- Sendzimir, J., Reij, C. P., & Magnuszewski, P. (2011). Rebuilding resilience in the Sahel: regreening in the Maradi and Zinder regions of Niger. *Ecology and Society*, 16(3), 1–29.
- Shackleton, S., & Campbell, B. (2001). Devolution in natural resource management: Institutional arrangements and power shifts: A synthesis of case studies from Southern Africa. Center for International Forestry Research. Retrieved on June 23, 2020, from <https://www.cifor.org/knowledge/publication/885/>
- Shackleton, S., Campbell, B., Wollenberg, E., & Edmunds, D. (2002). Devolution and community-based natural resource management: Creating space for local people to participate and benefit. *Natural Resource Perspectives*, 76(1), 1–6.
- Shafi, S. A., & Payne, G. (2007). Land tenure security and land administration in Bangladesh: Local partnerships for urban poverty alleviation. Final Report, *Dhaka*. Retrieved December 17, 2019, from <http://gpa.org.uk/wp-content/uploads/2014/03/landtenuresec.pdf>
- Shammin, M.R., Wang, A., Sosland, M. (2022). A Survey of Community-Based Adaptation in Developing Countries. In: Haque, A.K.E., Mukhopadhyay, P., Nepal, M., Shammin, M.R. (eds) *Climate Change and Community Resilience* (pp 31–47). Singapore, Springer. https://doi.org/10.1007/978-981-16-0680-9_3
- Sharifi, A. (2016). A critical review of selected tools for assessing community resilience. *Ecological Indicators*, 69, 629–647.
- Sherman, M. H., & Ford, J. (2014). Stakeholder engagement in adaptation interventions: An evaluation of projects in developing nations. *Climate Policy*, 14(3), 417–441.
- Sibanda, B. (2004). Community wildlife management in Zimbabwe: The case of CAMPFIRE in the Zambezi Valley. In C. Fabricius, E. Koch, H. Magome, & S. Turner (Eds.), *Rights, Resources and Rural Development: Community-based Natural Resource Management in Southern Africa* (pp. 248–258). London, Earthscan.
- Simane, B., & Zaitchik, B. F. (2014). The sustainability of community-based adaptation projects in the Blue Nile Highlands of Ethiopia. *Sustainability*, 6(7), 4308–4325.
- Singh, Y., Singh, G., Khattar, J. S., Barinova, S., Kaur, J., Kumar, S., & Singh, D. P. (2022). Assessment of water quality condition and spatiotemporal patterns in selected wetlands of Punjab, India. *Environmental Science and Pollution Research*, 29(2), 2493–2509.
- Smit, B., Burton, I. Klein, R. J. T., & Wandel, J. (2000). An anatomy of adaptation to climate change and variability. *Climatic Change*, 45(1), 223–251.
- Smit, B. & Pilifosova, O. (2001). Adaptation to climate change in the context of sustainable

- development and equity. In J. J. McCarthy, O. F. Canziani, N. A. Leary, D. J. Dokken, & K. S. White (Eds.), *Climate Change 2001: Impacts, Adaptation, and Vulnerability: Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 879-912). Cambridge, Cambridge University Press.
- Smit, B., & Wandel, J. (2006). Adaptation, adaptive capacity and vulnerability. *Global Environmental Change, 16*(3), 282-292.
- Smith, J. L. (2008). A critical appreciation of the “bottom-up” approach to sustainable water management: embracing complexity rather than desirability. *Local Environment, 13*(4), 353-366.
- Smith, A. C., Tasnim, T., Irfanullah, H. M., Turner, B., Chausson, A., & Seddon, N. (2021). Nature-based solutions in Bangladesh: evidence of effectiveness for addressing climate change and other sustainable development goals. *Frontiers in Environmental Science, 5*(1), 1-24.
- Smithers, J., & Smit, B. (1997). Human adaptation climatic variability and change. *Global Environmental Change, 7*(2), 129–146.
- Smithson, J. (2000). Using and analysing focus groups: Limitations and possibilities. *International Journal of Social Research Methodology, 3*(2), 103-119.
- Sovacool, B. K., D’Agostino, A. L., Rawlani, A., & Meenawat, H. (2012). Improving climate change adaptation in least developed Asia. *Environmental Science & Policy, 21*, 112-125.
- Sperling, F., Validivia, C., Quiroz, R., Valdivia, R., Angulo, L., Seimon, A., & Noble, I. (2008). Transitioning to climate resilient development: Perspectives from communities in Peru. Environment Department Papers, The World Bank. Retrieved October 17, 2019, from <https://sanrem.missouri.edu/WBEDP%20115%20Transitioning%20to%20Climate%20Resilient%20Development-Peru.pdf>
- Spires, M., Shackleton, S., & Cundill, G. (2014). Barriers to implementing planned community-based adaptation in developing countries: A systematic literature review. *Climate and Development, 6*(3), 277-287.
- Stern, P. C., Young, O. R., & Druckman, D. (Eds.) (1992). *Global Environmental Change: Understanding the Human Dimensions*, Washington, D.C., National Academy Press.
- St-Jacques, M. C. (2009). Community water strategies: A framework for implementation. Brace Centre for Water Resources Management, McGill University. Retrieved June 16, 2020, from https://www.mcgill.ca/cariwin/files/cariwin/cws_framework_v2_0.pdf
- Stott, C., & Huq, S. (2014). Knowledge flows in climate change adaptation: Exploring friction between scales. *Climate and Development, 6*(4), 382–387.

- Sultana, F. (2009). Community and participation in water resources management: Gendering and naturing development debates from Bangladesh. *Transactions of the Institute of British Geographers*, 34(3): 346–363.
- Sultana, N., & Islam, M. N. (2016). Fishing gears and methods in the Chalan Beel, Bangladesh. *Journal of Fisheries*, 4(2), 377-384.
- Sultana, P., & Thompson, P. (2017). Adaptation or conflict? Responses to climate change in water management in Bangladesh. *Environmental Science and Policy*, 78, 149–156.
- Sultana, R., Irfanullah, H. M., Selim, S. A., Raihan, S. T., Bhowmik, J., & Ahmed, S. G. (2021). Multilevel resilience of fishing communities of coastal Bangladesh against Covid-19 pandemic and 65-day fishing ban. *Frontiers in Marine Science*, 8, 1-15.
- Sunny, A. R., Alam, R., Sadia, A. K., Miah, Y., Hossain, S., & Mofiz, S. B. (2020). Factors affecting the biodiversity and human well-being of an ecologically sensitive wetland of North Eastern Bangladesh. *Journal of Coastal Zone Management*, 23(1), 471.
- Supria, A. (2015). Local level perspectives of wetland management policy and practices in Bangladesh: A case of Hakaloki Haor. Unpublished Master's Thesis, Natural Resources Institute, University of Manitoba, Winnipeg. Retrieved January 19, 2019, from https://umanitoba.ca/institutes/natural_resources/pdf/theses/Ahmed,%20Supria.MNR%202015.pdf
- Tanner, T., Lewis, D., Wrathall, D., Bronen, R., Cradock-Henry, N., Huq, S. & Lawless, C. (2014). Livelihood resilience in the face of climate change. *Nature Climate Change*, 5, 23-26.
- Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining Qualitative and Quantitative Approaches*. London, Sage Publications.
- Tashmin, N. (2016). Can climate finance in Bangladesh be helpful in making transformational change in ecosystem management?. *Environmental Systems Research*, 5(1), 1-10.
- Tasnim, T., Anzum, F., Irfanullah, H. M. d., Seddon, N., and Huq, S. (2020). A roadmap for nature-based solutions in Bangladesh: Promises and challenges. Policy Brief. Dhaka: International Centre for Climate Change and Development (ICCCAD). Retrieved January 10, 2021, from http://www.nbsbangladesh.info/wp-content/uploads/2020/08/ICCCAD-NBSI-Policy-Brief_NbSRoadmap_August2020.pdf.
- Tebet, G., Trimble, M., & Medeiros, R. P. (2018). Using Ostrom's principles to assess institutional dynamics of conservation: Lessons from a marine protected area in Brazil. *Marine Policy*, 88, 174-181.
- Teddlie, C., & Tashakkori, A. (2009). *Foundations of Mixed Methods Research*. Thousand Oaks, Sage Publications.
- Teeffelen, P.V, de Jong, S., & van den Berg, L. (2001). Urban monitoring: New possibilities of combining high spatial resolution Ikonos images with contextual image analysis

- techniques. *IEEE/ISPRS Joint Workshop on Remote Sensing and Data Fusion over Urban Areas, 01EX482*. 265-269.
- Terzano, D., Attorre, F., Parish, F., Moss, P., Bresciani, F., Cooke, R., & Dargusch, P. (2022). Community-led peatland restoration in Southeast Asia: 5Rs approach. *Restoration Ecology*, e13642.
- Thamaga, K. H., Dube, T., & Shoko, C. (2021). Advances in satellite remote sensing of the wetland ecosystems in Sub-Saharan Africa. *Geocarto International*, 1-23.
- Thompson, P. M., Sultana, P. & Islam, N. (2003). Lessons from community-based management of floodplain fisheries in Bangladesh. *Journal of Environmental Management* 69(3), 307–321.
- Tilly, C. (2007) *Democracy*, Cambridge University Press, Cambridge
- Tobore, A., Senjobi, B., Ogundiya, T., & Bamidele, S. (2021). Geospatial assessment of wetland soils for rice production in Ajibode using geospatial techniques. *Open Geosciences*, 13(1), 310-320.
- Tsoi, W., Grown, I., Southwell, M., Mika, S., Lewis, S., Ryder, D., & Frasier, P. (2022). Effects of inundation on water quality and invertebrates in semi-arid floodplain wetlands. *Inland Waters*, 1-29.
- Turnbull, M., Sterrett, C., & Hilleboe, A. (2013). *Toward resilience: A guide to disaster risk reduction and climate change adaptation*. Rugby, Practical Action Publishing.
- Turner, B. L., Matson, P. A., McCarthy, J. J., Corell, R. W., Christensen, L., Eckley, N., Hovelsrud-Broda, G. K., Kasperson, J. X., Kasperson, R. E., Luers, A & Tyler, N. (2003). Science and technology for sustainable development special feature: Illustrating the coupled human-environment system for vulnerability analysis: Three case studies. *Proceedings of the National Academy of Science*, 100(14), 8080-8085.
- Twigg J. (2007). Characteristics of a disaster resilient community: A guidance note. DFID Disaster risk reduction NGO interagency coordination group. Retrieved December 13, 2019, from <http://lib.riskreductionafrica.org/bitstream/handle/123456789/623/characteristics%20of%20a.pdf?sequence=1>
- Tyler, S., Nugraha, E., Nguyen, H.K., Van Nguyen, N., Sari, A.D., Thinpanga, P., Tran, T.T., Verma, S.S., Swanson, D., & Bizikova, L. (2014). Developing indicators of urban climate resilience. *ISET Climate Resilience*. Retrieved March 17, 2019, from http://iset.org/images/pdfs/ISETDevelopingIndicatorsofUCR_140204.pdf.
- Uddin, M. J., Mohiuddin, A. S. M., Hossain, S. T., & Hakim, A. (2013). Eco-environmental changes of wetland resources of Hakaluki haor in Bangladesh Using GIS Technology. *Journal of Biodiversity & Endangered Species*, 1(1), 1-4.
- Uddin, M. S., Haque, C. E., & Khan, M. N. (2020). Good governance and local level policy

- implementation for disaster-risk-reduction: actual, perceptual and contested perspectives in coastal communities in Bangladesh. *Disaster Prevention and Management: An International Journal*.
- United nations development programme (UNDP). (2012). Terminal evaluation: Coastal and wetland biodiversity management at Cox's Bazar and Hakaluki Haor. UNDP, Dhaka. Retrieved July 12, 2019, from <https://erc.undp.org/evaluation/evaluations/detail/6306#>
- United nations development programme (UNDP). (2015). Community Based Adaptation to Climate Change. New York. Retrieved on March 06, 2020, from <https://www.undp.org/publications/community-based-adaptation-climate-change>
- United nations development programme (UNDP). (2016). Scaling up climate action to achieve the sustainable development goals. New York. Retrieve on February 06, 2020, from <https://www.undp.org/publications/scaling-climate-action-achieve-sdgs>
- Van Andel, J., & Aronson, J. (2012) *Restoration ecology: The new frontier*. Chichester, Wiley Blackwell.
- Verhoeven, Jos & Beltman, B. & Bobbink, Roland & Whigham, Dennis. (2006). In J. T. A. Verhoeven, & D. F. Whigham (Eds.), *Wetlands and Natural Resource Management*. Cham, Springer.
- Villagra, P. (2019). Drivers of community resilience to natural hazards: The Experience in Southern Chile. *Environment: Science and Policy for Sustainable Development*, 61(4), 4-17.
- Vogt-Schilb, A., & Hallegatte, S. (2017). Climate policies and nationally determined contributions: Reconciling the needed ambition with the political economy. *Wiley Interdisciplinary Reviews: Energy and Environment*, 6(6), e256.
- Walker, B. & Salt, D. (2006). *Resilience Thinking – Sustaining Ecosystems and People in a Changing World*, Island Press, USA.
- Walker, J. E., Ankersen, T., Barchiesi, S., Meyer, C. K., Altieri, A. H., Osborne, T. Z., & Angelini, C. (2022). Governance and the mangrove commons: Advancing the cross-scale, nested framework for the global conservation and wise use of mangroves. *Journal of Environmental Management*, 312, 114823.
- Walton, A. M., McCrea, R., Leonard, R., & Williams, R. (2013). Resilience in a changing community landscape of coal seam gas: Chinchilla in southern Queensland. *Journal of Economic & Social Policy*, 15(3), 4-28.
- Wang, L., Gong, Z., Shi, L., Hu, Z., & Shah, A. A. (2021). Knowledge mapping analysis of research progress and frontiers in integrated disaster risk management in a changing climate. *Natural Hazards*, 107(3), 2033-2052.

- Wang, Y., Cheng, W., & Jiang, Q. (2022). Study on wetland resources protection in Shandong province. *Environment, Resource and Ecology Journal*, 6(1), 1-8.
- Warner, K. & Afifi, T. (2013). Where the rain falls: Evidence from 8 countries on how vulnerable households use migration to manage the risk of rainfall variability and food insecurity. *Climate and Development*, 6(1), 1-17.
- Warner, K., van der Geest, K., & Kreft, S. (2013). Pushed to the limit: Evidence of climate change-related loss and damage when people face constraints and limits to adaptation. UNU-EHS. Retrieved January 24, 2019, from https://www.ceres.org/resources/reports?gclid=Cj0KCQjwspKUBhCvARIsAB2IYus22u1s7MA1WBc5arWnHSxxbOwB6-8ORXwNdDIUZG5JyhLzfuN_sG0aApF3EALw_wcB
- Webb, E. L., Jachowski, N. R., Phelps, J., Friess, D. A., Than, M. M., & Ziegler, A. D. (2014). Deforestation in the Ayeyarwady Delta and the conservation implications of an internationally-engaged Myanmar. *Global Environmental Change*, 24, 321-333.
- Westcott, G. (2002). Partnerships for capacity development: Communities, government and universities are working together. *Ocean and Coastal Management*, 45(9), 549–571.
- Westoby, Ross, McNamara, K., Kumar, R., & Nunn, P. D. (2020). From community-based to locally led adaptation: Evidence from Vanuatu. *Ambio*, 49, 1466–1473.
- Westoby, R., Clissold, R. & McNamara, K. (2021). Alternative entry points for adaptation: Examples from Vanuatu. *Weather, Climate, and Society*, 13(1), 11–22.
- Wilby, R. L., & Dessai, S. (2010). Robust adaptation to climate change. *Weather*, 65(7), 180-185.
- Wilson, G. A. (2012). Community resilience, globalization, and transitional pathways of decision-making. *Geoforum*, 43(6), 1218-1231.
- Wood, B. D., & Waterman, R. W. (1991). The dynamics of political control of the bureaucracy. *American Political Science Review*, 85(3), 801-828.
- Wright, H., Vermeulen, S., Laganda, G., Olupot, M., Ampaire, E., & Jat, M. L. (2014). Farmers, food and climate change: Ensuring community-based adaptation is mainstreamed into agricultural programmes. *Climate and Development*, 6(4), 318-328.
- Wu, Y., Sang, Z. Q., Zhang, X. C., & Margraf, J. (2020). The relationship between resilience and mental health in Chinese college students: A longitudinal cross-lagged analysis. *Frontiers in Psychology*, 11, 108.
- Yasmin, S. (2018). Climate financing mechanism in Bangladesh: Does the climate change trust fund play its role properly? *European Journal of Social Sciences Studies*, 3(3), 35-48.
- Yates, J. S. (2014). Power and politics in the governance of community-based adaptation. In J. Ensor, R. Berger, & S. Huq (Eds.), *Community-based Adaptation to Climate Change: Emerging lessons*. Rugby, Practical Action Publishing.

- Yin, R. K. (2011). *Qualitative Research from Start to Finish*. New York, The Guilford Press.
- Yin, R. K. (2017). *Case study research and applications: Design and Methods*. Los Angeles, Sage Publications.
- Yin, R. K. (2018). *Case Study Research and Applications: Design and Methods*. London, Sage Publications.
- Zohrabi, M. (2013). Mixed method research: Instruments, validity, reliability and reporting findings. *Theory & Practice in Language Studies*, 3(2), 254-262.
- Zolnikov T. R. (2019) Introduction to climate change vulnerability, adaptation, and resiliency. In Zolnikov T. (Ed.) *Global Adaptation and Resilience to Climate Change*. Cham, Palgrave.

Appendix 1: Ethics Approval Letter

Our reference 33547

09 May 2019

Associate Professor Melissa Jane Nursey-Bray
School of Social Sciences

Dear Associate Professor Nursey-Bray

ETHICS APPROVAL No: H-2019-071
PROJECT TITLE: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

The ethics application for the above project has been reviewed by the Low Risk Human Research Ethics Review Group (Faculty of Arts and Faculty of the Professions) and is deemed to meet the requirements of the *National Statement on Ethical Conduct in Human Research 2007 (Updated 2018)* involving no more than low risk for research participants.

You are authorised to commence your research on: 09/05/2019

The ethics expiry date for this project is: 31/05/2022

NAMED INVESTIGATORS:

Chief Investigator: Associate Professor Melissa Jane Nursey-Bray
Student - Postgraduate Doctorate by Research (PhD): Mr Syed Mohammad Aminur Rahman
Associate Investigator: Dr Thomas Wanner

CONDITIONS OF APPROVAL: Thank you for your responses to the matters raised. The revised ethics application provided on the 5th of May, 2019 has been approved.

Ethics approval is granted for three years and is subject to satisfactory annual reporting. The form titled Annual Report on Project Status is to be used when reporting annual progress and project completion and can be downloaded at <http://www.adelaide.edu.au/research-services/oreci/human/reporting/>. Prior to expiry, ethics approval may be extended for a further period.

Participants in the study are to be given a copy of the information sheet and the signed consent form to retain. It is also a condition of approval that you immediately report anything which might warrant review of ethical approval including:

- serious or unexpected adverse effects on participants,
- previously unforeseen events which might affect continued ethical acceptability of the project,
- proposed changes to the protocol or project investigators; and
- the project is discontinued before the expected date of completion.

Yours sincerely,

Dr Anna Olijnyk
Convenor

Dr Jungho Suh
Convenor

The University of Adelaide



RESEARCH SERVICES
OFFICE OF RESEARCH ETHICS, COMPLIANCE
AND INTEGRITY
THE UNIVERSITY OF ADELAIDE

LEVEL 4, RUNDLE MALL PLAZA
50 RUNDLE MALL
ADELAIDE SA 5000 AUSTRALIA

TELEPHONE +61 8 8313 5137
FACSIMILE +61 8 8313 3700
EMAIL hrec@adelaide.edu.au

CRICOS Provider Number 00123M

ATTACHMENT 1A

PARTICIPANT INFORMATION SHEET- Focus Group Discussions (FGDs)

PROJECT TITLE: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2018-H-2019-071

PRINCIPAL INVESTIGATOR: Melissa Nursey-Bray

STUDENT RESEARCHER: Syed Mohammad Aminur Rahman

STUDENT'S DEGREE: Doctor of Philosophy (PhD)

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

This research project is about to explore the impacts and effectiveness of climate change finance (CCF) projects implemented in the north-eastern wetland areas of Bangladesh. This dissertation will study to find out the mechanisms of funding that means from which sources fund has been managed and how they had been selected the location and beneficiaries of the projects. Moreover, this study will investigate to know the real effects of the implemented projects in the wetland areas and to what extent the local people have been benefited from these projects.

Who is undertaking the project?

This project is being conducted by Syed Mohammad Aminur Rahman. This research will form the basis for the degree of Doctor of Philosophy (PhD) at The University of Adelaide under the supervision of Dr Melissa Nursey-Bray and Dr Thomas Wanner.

Why am I being invited to participate?

You are being invited to join this focus group discussion because you have very good knowledge regarding this wetland, such as, what is happening in this area due to the impacts of climate change. Moreover, you know, many climate change finance projects had been implemented in this area and to what extent the implemented projects are effective in overcoming the impacts.

What am I being invited to do?

You are being invited in this focus group discussion (FGD) to share your perception, views and opinion regarding climate change and the impacts and effectiveness of the climate change finance projects implemented in this area. More specifically, are there any negative impacts of these projects to the nature? Moreover, after implementation of the projects, did you find out any changes, such as, production of fish, crops and overall living standard of this community people? An FGD schedule will be followed to guide the discussion. The FGD will be recorded or notes will be taken. The FGD will take place at any public place at your village.

How much time will my involvement in the project take?

The participation in FGD will take about one hour.

Are there any risks associated with participating in this project?

There are no risks associated with your participation in this research projects. Your privacy will be maintained, and you can withdraw your participation at any time during the research process, if you wish.

What are the potential benefits of the research project?

You will not get any immediate personal benefits from this research project. However, your valuable information may help to take more efficient climate change finance project in this area in near future.

Can I withdraw from the project?

Participation in this project is totally voluntary and depend on your willingness. You can withdraw your participation at any time.

What will happen to my information?

The information provided by you will be used for this PhD project only. No name for the respondent will be recorded. The researcher will use code for every participant. Therefore, your information will be used anonymously. Moreover, the collected information will be stored in a computer using password and in a locked cabinet at The University of Adelaide for five years.

The findings of the research will be published as journal articles and be presented in conferences. No names of the respondents will mention there.

Who do I contact if I have questions about the project?

If you have any queries or questions regarding your participation in this research project, please contact one of the following members:

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Email: Melissa.nursey-bray@adelaide.edu.au , phone: +6188313497.

Dr. Thomas Wanner, Co-supervisor and Senior Lecturer,

Email: thomas.wanner@adelaide.edu.au , Phone: +61-(0)-8-8313 3084.

Syed Mohammad Aminur Rahman, Student Researcher,

Email: syed.rahman@adelaide.edu.au , Phone: +61412781156.

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2018- H-2019-071). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007). If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:
Phone: +61 8 8313 6028

Email: hrec@adelaide.edu.au

Post: Level 4, Rundle Mall Plaza, 50 Rundle Mall, ADELAIDE SA 5000

Bangladesh contact: Syed Mohammad Aminur Rahman, School of Social Sciences, North Terrace, The University of Adelaide. South Australia 5005, by phone +61412781156 / +8801829554151 or by email: syed.rahman@adelaide.edu.au / syedamin22nd@gmail.com

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

If you want to participate, you will need to sign a consent form to agree to participate in this FGD.

Yours sincerely,

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Dr. Thomas Wanner, Co-supervisor

Syed Mohammad Aminur Rahman, PhD Candidate.

ATTACHMENT 1B

PARTICIPANT INFORMATION SHEET- Interviews

PROJECT TITLE: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2018-H-2019-071

PRINCIPAL INVESTIGATOR: Melissa Nursey-Bray

STUDENT RESEARCHER: Syed Mohammad Aminur Rahman

STUDENT'S DEGREE: Doctor of Philosophy (PhD)

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

This research project is about to explore the impacts and effectiveness of climate change finance (CCF) projects implemented in the north-eastern wetland areas of Bangladesh. This dissertation will study to find out the mechanisms of funding that means from which sources fund has been managed and how they had been selected the location and beneficiaries of the projects. Moreover, this study will investigate to know the real effects of the implemented projects in the wetland areas and to what extent the local people have been benefited from these projects.

Who is undertaking the project?

This project is being conducted by Syed Mohammad Aminur Rahman. This research will form the basis for the degree of Doctor of Philosophy (PhD) at The University of Adelaide under the supervision of Dr Melissa Nursey-Bray and Dr Thomas Wanner.

Why am I being invited to participate?

You are being invited to join this focus group discussion because you have very good knowledge regarding this wetland, such as, what is happening in this area due to the impacts of climate change. Moreover, you know, many climate change finance projects had been implemented in this area and to what extent the implemented projects are effective in overcoming the impacts.

What am I being invited to do?

You are being invited in this interviews to share your perception, views and opinion regarding climate change and the impacts and effectiveness of the climate change finance projects implemented in this area. More specifically, are there any negative impacts of these projects to the nature? Moreover, after implementation of the projects, did you find out any changes, such as, production of fish, crops and overall living standard of this community people? An interview schedule will be followed to guide the discussion. The interviews will be recorded or notes will be taken. The interview will take place at any public place at your village.

How much time will my involvement in the project take?

The participation in interviews will take about one hour.

Are there any risks associated with participating in this project?

There are no risks associated with your participation in this research projects. Your privacy will be maintained, and you can withdraw your participation at any time during the research process, if you wish.

What are the potential benefits of the research project?

You will not get any immediate personal benefits from this research project. However, your valuable information may help to take more efficient climate change finance project in this area in near future.

Can I withdraw from the project?

Participation in this project is totally voluntary and depend on your willingness. You can withdraw your participation at any time.

What will happen to my information?

The information provided by you will be used for this PhD project only. No name for the respondent will be recorded. The researcher will use code for every participant. Therefore, your information will be used anonymously. Moreover, the collected information will be stored in a computer using password and in a locked cabinet at The University of Adelaide for five years.

The findings of the research will be published as journal articles and be presented in conferences. No names of the respondents will mention there.

Who do I contact if I have questions about the project?

If you have any queries or questions regarding your participation in this research project, please contact one of the following members:

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Email: Melissa.nursey-bray@adelaide.edu.au , phone: +6188313497.

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What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2018- H-2019-071). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007).

If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

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Bangladesh contact: Syed Mohammad Aminur Rahman, School of Social Sciences, North Terrace, The University of Adelaide. South Australia 5005, by phone +61412781156 / +8801829554151 or by email: syed.rahman@adelaide.edu.au / syedamin22nd@gmail.com

Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

If you want to participate, you will need to sign a consent form to agree to participate in this interviews.

Yours sincerely,

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Dr. Thomas Wanner, Co-supervisor

Syed Mohammad Aminur Rahman, PhD Candidate.

ATTACHMENT 1C

PARTICIPANT INFORMATION SHEET - Observation

PROJECT TITLE: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2018- H-2019-071

PRINCIPAL INVESTIGATOR: Melissa Nursey-Bray

STUDENT RESEARCHER: Syed Mohammad Aminur Rahman

STUDENT'S DEGREE: Doctor of Philosophy (PhD)

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

This research project is about to explore the impacts and effectiveness of climate change finance (CCF) projects implemented in the north-eastern wetland areas of Bangladesh. This dissertation will study to find out the mechanisms of funding that means from which sources fund has been managed and how they had been selected the location and beneficiaries of the projects. Moreover, this study will investigate to know the real effects of the implemented projects in the wetland areas and to what extend the local people have been benefited from these projects.

Who is undertaking the project?

This project is being conducted by Syed Mohammad Aminur Rahman. This research will form the basis for the degree of Doctor of Philosophy (PhD) at The University of Adelaide under the supervision of Dr Melissa Nursey-Bray and Dr Thomas Wanner.

Why am I being invited to participate?

You are being invited to join this research because you have very good knowledge regarding this wetland, such as, what is happening in this area due to the impacts of climate change. Moreover, you know, many climate change finance projects had been implemented in this area and to what extent the implemented projects are effective in overcoming the impacts.

What am I being invited to do?

The research project aims to observe the everyday activities related to your livelihood. Your consent will be sought to observe these activities.

How much time will my involvement in the project take?

Duration of the observation period will depend on your willingness and availability. It will take 20-30 minutes.

Are there any risks associated with participating in this project?

There are no risks associated with your participation in this research projects. Your privacy will be maintained, and you can withdraw your participation at any time during the research process, if you wish.

What are the potential benefits of the research project?

You will not get any immediate personal benefits from this research project. However, your valuable information may help to take more efficient climate change finance project in this area in near future.

Can I withdraw from the project?

Participation in this project is totally voluntary and depend on your willingness. You can withdraw your participation at any time.

What will happen to my information?

The information provided by you will be used for this PhD project only. No name for the respondent will be recorded. The researcher will use code for every participant. Therefore, your information will be used anonymously. Moreover, the collected information will be stored in a computer using password and in a locked cabinet at The University of Adelaide for five years.

The findings of the research will be published as journal articles and be presented in conferences. No names of the respondents will mention there.

Who do I contact if I have questions about the project?

If you have any queries or questions regarding your participation in this research project, please contact one of the following members:

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Email: Melissa.nursey-bray@adelaide.edu.au , phone: +6188313497.

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Email: syed.rahman@adelaide.edu.au , Phone: +61412781156.

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Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

If you want to participate, you will need to sign a consent form to agree to participate in this interview (observation).

Yours sincerely,

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Dr. Thomas Wanner, Co-supervisor

Syed Mohammad Aminur Rahman, PhD Candidate.

ATTACHMENT 1D

PARTICIPANT INFORMATION SHEET- Questionnaire Surveys

PROJECT TITLE: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

HUMAN RESEARCH ETHICS COMMITTEE APPROVAL NUMBER: H-2018-H-2019-071

PRINCIPAL INVESTIGATOR: Melissa Nursey-Bray

STUDENT RESEARCHER: Syed Mohammad Aminur Rahman

STUDENT'S DEGREE: Doctor of Philosophy (PhD)

Dear Participant,

You are invited to participate in the research project described below.

What is the project about?

This research project is about to explore the impacts and effectiveness of climate change finance (CCF) projects implemented in the north-eastern wetland areas of Bangladesh. This dissertation will study to find out the mechanisms of funding that means from which sources fund has been managed and how they had been selected the location and beneficiaries of the projects. Moreover, this study will investigate to know the real effects of the implemented projects in the wetland areas and to what extend the local people have been benefited from these projects.

Who is undertaking the project?

This project is being conducted by Syed Mohammad Aminur Rahman. This research will form the basis for the degree of Doctor of Philosophy (PhD) at The University of Adelaide under the supervision of Dr Melissa Nursey-Bray and Dr Thomas Wanner.

Why am I being invited to participate?

You are being invited to join this questionnaire survey because you have very good knowledge regarding this wetland, such as, what is happening in this area due to the impacts of climate change. Moreover, you know, many climate change finance projects had been implemented in this area and to what extent the implemented projects are effective in overcoming the impacts.

What am I being invited to do?

You are being invited in this surveys to share your perception, views and opinion regarding climate change and the impacts and effectiveness of the climate change finance projects implemented in this area. More specifically, are there any negative impacts of these projects to the nature? Moreover, after implementation of the projects, did you find out any changes, such as, production of fish, crops and overall living standard of this community people? An survey schedule will be followed to guide the discussion. The survey will take place at any public place at your village.

How much time will my involvement in the project take?

The participation in interviews will take about one hour.

Are there any risks associated with participating in this project?

There are no risks associated with your participation in this research projects. Your privacy will be maintained, and you can withdraw your participation at any time during the research process, if you wish.

What are the potential benefits of the research project?

You will not get any immediate personal benefits from this research project. However, your valuable information may help to take more efficient climate change finance project in this area in near future.

Can I withdraw from the project?

Participation in this project is totally voluntary and depend on your willingness. You can withdraw your participation at any time.

What will happen to my information?

The information provided by you will be used for this PhD project only. No name for the respondent will be recorded. The researcher will use code for every participant. Therefore, your information will be used anonymously. Moreover, the collected information will be stored in a computer using password and in a locked cabinet at The University of Adelaide for five years.

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Syed Mohammad Aminur Rahman, Student Researcher,

Email: syed.rahman@adelaide.edu.au , Phone: +61412781156.

What if I have a complaint or any concerns?

The study has been approved by the Human Research Ethics Committee at the University of Adelaide (approval number H-2018- H-2019-071). This research project will be conducted according to the NHMRC National Statement on Ethical Conduct in Human Research (2007).

If you have questions or problems associated with the practical aspects of your participation in the project or wish to raise a concern or complaint about the project, then you should consult the Principal Investigator. If you wish to speak with an independent person regarding concerns or a complaint, the University's policy on research involving human participants, or your rights as a participant, please contact the Human Research Ethics Committee's Secretariat on:

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Any complaint or concern will be treated in confidence and fully investigated. You will be informed of the outcome.

If I want to participate, what do I do?

If you want to participate, you will need to sign a consent form to agree to participate in this interviews.

Yours sincerely,

Dr. Melissa Nursey-Bray, Associate Professor and Principal Supervisor,

Dr. Thomas Wanner, Co-supervisor

Syed Mohammad Aminur Rahman, PhD Candidate.

 ATTACHMENT 2A
CONSENT FORM FOR FGDs

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness
Ethics Approval Number:	H-2019-071

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project, it has also been explained that my involvement may not be of any benefit to me.
5. I agree to participate in the activities outlined in the participant information sheet.
6. I agree to be:
- Audio recorded
- Photographed
7. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University, now or in the future.
8. I have been informed that the information gained in the project may be published in a PhD thesis/book/journal article/conference presentations.
9. I have been informed that in the published materials I will not be identified and my personal results will not be divulged.
10. I agree to my information to be shared on an online digital repository.
 Yes No
11. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
12. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____ Signature: _____

Date: _____

Researcher/Witness to complete:

I have described the nature of the research
to

(print name of participant)

and in my opinion she/he understood the explanation.

Signature: _____ Position: _____

Date: _____

ATTACHMENT 2B

CONSENT FORM FOR QUESTIONNAIRE SURVEYS

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness
Ethics Approval Number:	H-2019-071

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project, it has also been explained that my involvement may not be of any benefit to me.
5. I agree to participate in the activities outlined in the participant information sheet.
6. I agree to be:
- Audio recorded
- Photographed
7. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University, now or in the future.
8. I have been informed that the information gained in the project may be published in a PhD thesis/book/journal article/conference presentations.
9. I have been informed that in the published materials I will not be identified and my personal results will not be divulged.
10. I agree to my information to be shared on an online digital repository.
Yes No
11. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
12. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____ Signature: _____

Date: _____

Researcher/Witness to complete:

I have described the nature of the research
to

(print name of participant)

and in my opinion she/he understood the explanation.

Signature: _____ Position: _____

Date: _____

ATTACHMENT 2C

CONSENT FORM FOR OBSERVATIONS

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness
Ethics Approval Number:	H-2019-071

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project, it has also been explained that my involvement may not be of any benefit to me.
5. I agree to participate in the activities outlined in the participant information sheet.
6. I agree to be:
- Audio recorded
- Photographed
7. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University, now or in the future.
8. I have been informed that the information gained in the project may be published in a PhD thesis/book/journal article/conference presentations.
9. I have been informed that in the published materials I will not be identified and my personal results will not be divulged.
10. I agree to my information to be shared on an online digital repository.
Yes No
11. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
12. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____ Signature: _____

Date: _____

Researcher/Witness to complete:

I have described the nature of the research
to

(print name of participant)

and in my opinion she/he understood the explanation.

Signature: _____ Position: _____

Date: _____

ATTACHMENT 2D

CONSENT FORM FOR INTERVIEWS

1. I have read the attached Information Sheet and agree to take part in the following research project:

Title:	Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness
Ethics Approval Number:	H-2019-071

2. I have had the project, so far as it affects me, and the potential risks and burdens fully explained to my satisfaction by the research worker. I have had the opportunity to ask any questions I may have about the project and my participation. My consent is given freely.
3. I have been given the opportunity to have a member of my family or a friend present while the project was explained to me.
4. Although I understand the purpose of the research project, it has also been explained that my involvement may not be of any benefit to me.
5. I agree to participate in the activities outlined in the participant information sheet.
6. I agree to be:
- Audio recorded
- Photographed
7. I understand that I am free to withdraw from the project at any time and that this will not affect my study at the University, now or in the future.
8. I have been informed that the information gained in the project may be published in a PhD thesis/book/journal article/conference presentations.
9. I have been informed that in the published materials I will not be identified and my personal results will not be divulged.
10. I agree to my information to be shared on an online digital repository.
Yes No
11. My information will only be used for the purpose of this research project and it will only be disclosed according to the consent provided, except where disclosure is required by law.
12. I am aware that I should keep a copy of this Consent Form, when completed, and the attached Information Sheet.

Participant to complete:

Name: _____ Signature: _____

Date: _____

Researcher/Witness to complete:

I have described the nature of the research
to

(print name of participant)

and in my opinion she/he understood the explanation.

Signature: _____ Position: _____

Date: _____

ATTACHMENT 3

Interview guides for the participants involved in focus group discussions (FGDs)



School of Social Sciences, Department of Geography, Environment and Population

PhD Research Topic: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

Name of the Researcher: Syed Mohammad Aminur Rahman

1. Have you noticed whether the climate is changing? If yes, what are the changes you have observed over the last ten years?
2. Community-based Adaptation in the Ecologically Critical Area (*Hakaluki Haor*) was implemented with the participation of the community groups. Did this project bring you together?
3. Did you think the project created a greater platform for addressing biodiversity loss in the *Hakaluki Haor* socio-ecological system?
4. Did this project contribute to alternative income generation options?
5. Did this project reduce dependency on the *Hakaluki Haor* eco-service systems?
6. Did this project affect (i) your social status, (ii) financial situation (iii) ecological condition of the *Hakaluki Haor*? How and in what ways?
7. What does employment mean to you?
8. What do you mean by adaptive capacity? What role do you think the project plays in the development of community adaptive capacity to protect biodiversity in the *Hakaluki Haor*?
9. Did these projects enable you to (a) express your opinion? (b) Were they just? How?
10. Did the project build your skills in (a) advocacy? (b) Lobbying? How?
11. Please explain your role in the projects in relation to participatory decision-making process?
12. How much access do you have in relation to the local union parishad, land office, fisheries office, livestock office, forest and other concerned offices in the negotiation of the project activities.
13. Siltation and soil erosion are two major issues in relation to maintenance of ecosystem services for the *Hakaluki Haor*. Can you provide your observations regarding the re-excavation of *Beels* and *Canals of Hakaluki Haor*?
14. In your view, was the excavation effective in terms of (i) the communities (ii) *Haor* ecology restoration? How and why?

15. Solar based irrigation facilities have been introduced at the *Hakaluki Haor* ecosystem with the aim of diversifying the income sources of beneficiaries. In your view, what were the impacts of this project on (i) crop production, (ii) human resilience and (iii) resilience of the *haor* ecosystem?
16. Scientific evidence suggests that natural swamp forest restoration is critical for the conservation of fish, bird and aquatic wildlife. In your view, were the projects effective in restoring swamp forest in the *Hakaluki Haor* basin? Why/why not?
17. In your view, what were the overall impacts of these projects on adaptive capacity?

ATTACHMENT 4

Interview guides for experts and concerned implementation officers:



School of Social Sciences, Department of Geography, Environment and Population

PhD Research Topic: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

Name of the Researcher: Syed Mohammad Aminur Rahman

1. Could you explain in what ways local people were involved with various steps of the project?
2. Did you face any problems during the implementation period of the project? If yes, please mention what you faced?
3. Is this project environmentally friendly? Please explain, what do you mean by 'environment friendly'?
4. Is there any negative impact to the environment? What are they, if so?
5. With the aim of conserving biodiversity and socio-ecological balance, Community-based Adaptation in the Ecological Critical Areas through Biodiversity Conservation and Social Protection project was implemented at *Hakaluki Haor* ecological system. In your opinion, to what extent did it meet its aims?
6. What impact did it have on biodiversity?
7. Did it restore/create alternative livelihoods? How? Why or why not?
8. Please describe how you think the process of habitat restoration for wildlife worked (or not) in relation to the implemented projects?
9. What are the challenges and opportunities of the CBA-ECA project as an expert/implementer?

10. Did the project help to identify the options for diversified alternative income sources of the communities? If so, how? If not, why not?
11. Did the “Excavation and re-excavation of *Beels* and Canals of *Hakaluki Haor*” project re-establish the connection of the rivers and *Beels* to conserve fish migration routes in the dry season? Why or why not?
12. Solar based irrigation facilities were adopted at *Hakaluki Haor* ecosystem to irrigate crop lands, timely and efficiently to make the *Hakaluki Haor* centric community financially resilient. Can you please discuss the effectiveness of this project to restore/ re-organise the social-ecological balance?
13. What are the impacts of alternative income generation activities on the harvesting natural resources of this wetland?
14. Scientific evidence suggests that impacts of climate change and human induced drivers on the *Hakaluki Haor* ecosystem including *Beels*, canals, rivers, agricultural lands, *kanda* (raised land), and waterfowl habitats create vulnerability of the *Haor* dependent people. What is your view on the effectiveness of the community based ecosystem conservation and adaptation in the ecologically critical area of *Hakaluki Haor* in response to climate change?
15. Do the projects address the main problems in this area? If no, why? If yes, how?
16. What are your suggestions for future planned interventions?

Interview guides for the beneficiaries



School of Social Sciences, Department of Geography, Environment and Population

PhD Research Topic: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

Name of the Researcher: Syed Mohammad Aminur Rahman

1. Have you noticed whether the climate is changing? If yes, what are the changes you have observed over the last ten years?
2. Have those changes had any household level impact? If yes, what are those?
3. Have those changes had any community level impact? If yes, what are those?
4. Do you know that some projects have been implemented in this wetland to address these impacts? If yes, what are those projects?
5. Were you involved in selecting the types and locations of the projects?
6. To conserve biodiversity and social-ecological balance, the Community-based Adaptation in the Ecologically Critical Areas through Biodiversity Conservation and Social Protection project was implemented. In your opinion, did it do any of the following:
 - a. Promote alternative livelihoods
 - b. Build capacity
 - c. Empower the community who are directly dependent on the *Haor* ecosystem services.
7. Restoration of natural swamp forest is one of the means by which social-ecological stability of the *Haor* can be achieved. Do you think that the implemented project was effective in this regard? If not, why?
8. Siltation is one of the key issues for the loss of biodiversity habitats. Do you think that the “Excavation and re-excavation of *Beels* and canals of *Hakaluki Haor*” project to re-establish the connection of the river and *Beels* was effective? If yes, how? If not, why?
9. Solar based irrigation facilities were adopted at *Hakaluki Haor* areas. To what extent did the projects:
 - a. Irrigate crop land. (How and what worked/didn’t work?)
 - b. Impact on the financial resilience of the *Hakaluki Haor* centric community (how and what worked/didn’t work?)
 - c. Restore/ re-organise the social-ecological balance. (how and what worked/didn’t work?)

ATTACHMENT 6

Interview guide for the indirect stakeholders:



School of Social Sciences, Department of Geography, Environment and Population

PhD Research Topic: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

Name of the Researcher: Syed Mohammad Aminur Rahman

1. Have you noticed any climate changes? If yes, what are those changes?
2. What types of climate change have you been observed to occur frequently over the last 10 years?
3. Have those changes had any household level impact? If yes, what are those?
4. Have those changes had any community level impact? If yes, what are those?
5. Do you know that some projects have been implemented in this wetlands to address this impact? If yes, what are those projects?
6. Do you have any knowledge regarding the village conservation groups (VCG)? If yes, what types of activities are they involved in?
7. Do you think participating in the VCG activities empowered people?
8. Do the VCG interventions enhance the resilience of local people? What do you understand by 'resilience'?
9. Do you think that the VCG's members are the most vulnerable people in this wetland areas?
10. Do you think that the projects that have been implemented in this area are effective? If no, why? If yes, how?
11. Do the projects address the main problems in this area? If no, why? If yes, how?
12. What are your suggestions for future planned interventions?
13. Do you think that the projects have changed the dependency on natural resources for their livelihoods? If so, please explain.
14. How the re-excavation projects addressed the siltation problems of the *Beels*?
15. What are the impacts of alternative income generation activities on the harvesting of the natural resources of this wetland?

Appendix 2: Household Survey Questionnaire

ATTACHMENT 7

School of Social Sciences, Department of Geography, Environment and Population

HOUSEHOLD SURVEY QUESTIONNAIRE



School of Social Sciences, Department of Geography, Environment and Population

PhD Research Topic: Climate Finance in the Wetland Areas of Bangladesh: Mechanisms, Impacts and Effectiveness

Name of the Researcher: Syed Mohammad Aminur Rahman

Quantitative Survey for Community Group and Ecological Resilience

Participants: Members of Village Conservation Groups (VCG)

Location:

Village:

Ward:

Union:

Upazila/ sub-district:

District:

A. Empowerment, Accessibility and Equity

- 1) How much participation did you have in selecting the CBA-ECA projects?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

'Participation' means

Aspect	Project selection activities	Tick
	Identifying community needs	
	Prioritizing the needs	

Participation in	Identifying the projects	
	Design and formulation of the projects	
	Assessing impacts of the projects	

- 2) What level of access did you have in implementing the projects?
 (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

'Access' means:

Aspect	Project implementation process	Tick
Access to	Project initiation plan	
	Planned resources	
	Team leader and project manager	
	Conflict resolution process	
	Digital technology	

- 3) How much freedom did you have in expressing your opinions in meetings?
 (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 4) To what extent did you get equal opportunities from the group leader?
 (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 5) Are decisions made your VCG meetings gender-neutral? (Right to have gender-neutral decisions)
 1. Yes [] 2. No []
- 6) If yes, to what extent?
 (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

B. Motivation, Awareness and Training

- 7) Does the leadership training prompt motivation for conserving the ecosystem?
 1. Yes [] 2. No []
- 8) If yes, to what extent?
 (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 9) Has the programme built upon your awareness regarding climate impacts on *Haor* ecosystem?
 1. Yes [] 2. No []
- 10) If yes, to what extent?
 (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 11) Has the training program increase your leadership capacity?
 1. Yes [] 2. No []
- 12) If yes, to what extent?
 (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

‘Leadership capacity’ means

Leadership capacity	Components	Tick
Ability to	Communicate accurately	
	Take responsibility for other group members	
	Present as a credible person	
	Share goals	
	Mentor other group members	

C. Experience, Skills, Knowledge and Ability

13) Do you have any experience of biodiversity protection?

1. Yes [] 2. No []

14) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

15) To what extent, do you think the programme helped you to develop predictive skills to deal with uncertainty?

- (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

16) To what extent, the programme built your capacity to manage the resources of the *Haor*?

- (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

17) How much knowledge of crop diversification did you gain from the projects?

- (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

‘Knowledge of crop diversification’ means:

Aspects	Tick
Do you know, what is crop diversification?	
Do you know, how it is useful for you?	
Do you know, how crop diversification is good for ecosystem?	

18) To what extent, skill development training program built your knowledge sharing skills?

- (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

19) What capacity to undertake risk assessment did you gain from training?

- (i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full

D. Social, Financial and Physical Capacity

- 20) To what extent, did the programme help you to mobilise different community members in the *Haor* area?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 21) How much have your financial situation changed from the overall project benefits?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 22) What level of access do you have to the 'micro capital grants' with the project?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 23) What level of financial management skills have you achieved from the project training programs?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 24) To what extent, has the programme-built community infrastructures (roads, flood shelter, bridges) in the project area?
(i) Not at all, (ii) very little, (iii) partial, (iv) satisfactory, (v) full
- 25) Were any submergible embankments/roads built in your area from the CBA-ECA projects?
1. Yes [], 2. No [].
- 26) If Yes, to what extent are they effective to protect the disasters (such as flood, storm surge):
(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

E. Biological Diversity Conservation (for measuring ecological resilience)

- 27) Since 2009, have you observed any improvement to biodiversity in *Haor* area?
1. Yes [] 2. No []
- 28) If yes, to what extent?
(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 29) Did the 'Excavation and Re-excavation of *Beels* and Canals project' increase fish production of *Hakaluki Haor*?
1. Yes [] 2. No []
- 30) If yes, to what extent?
(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 31) Was the illegal fishing controlled through implementation of these projects?
1. Yes [] 2. No []
- 32) If yes, to what extent?
(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

'Illegal fishing means fishing with illegal current nets and catching the extinct species of fish which are strictly prohibited by the statutory laws'

33) Are the sanctuaries conserving fish diversity?

1. Yes [] 2. No []

34) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

35) Has the goal of the programme 'sustainable fish harvesting' been achieved through the implementation of the projects?

1. Yes [] 2. No []

36) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

37) Has the programme protected 'birds and wildlife' from illegal hunting?

1. Yes [] 2. No []

38) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

'Birds and wildlife' include:

Birds and Wildlife	Tick
Endangered bird Lesser Adjutant	
Pallas Fish Eagle	
Python	
Dhoirolly	
Dolphin	
Vulture	

39) Has the deforestation of swamp forest stopped after implementing the projects?

1. Yes [] 2. No []

40) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

41) Did the swamp forest restoration programme increase tree diversity?

1. Yes [] 2. No []

42) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

43) Did the swamp forest restoration programme protect birds and fish species?

1. Yes [] 2. No []

44) If yes, to what extent?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

Deforestation of swamp forest' means:

Aspects	Tick
Forest with Hijol tree	
Forest with Corotch tree	
Forest with shrubs, grasses and reeds	

45) Do you use improved cooking stove provided by the programme? (Physical capital)

1. Yes [] 2. No []

46) If yes, to what extent are you dependent on it?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

F. Demographic information:

47) Age.....

48) Gender

1. Male [] 2. Female [] 3. Other [] 4. Prefer not to say []

49) Marital status

1. Single [] 2. Married [] 3. Divorced [] 4. Widowed []

50) Do you have children?

1. Yes [] 2. No []

51) If yes, how many children do you have.....

52) Total number of household members.....

53) How many members of your family are involved in earnings.....

54) Occupation.....

55) Average monthly income for household.....(Taka).

56) What is your level of education?

1. Cannot read and write [] 2. Can sign only [] 3. Can read and write []
 4. Primary education [] 5. Secondary [] 6. Higher secondary []
 7. Tertiary [].

57) Religion

1. Islam [] 2. Hinduism [] 3. Buddhism [] 4. Christianity [] 5. Others (specify).....

G. Recent experience with a disaster (such as flood, storm surge, and so on)

58) Did the CBA-ECA projects improve your tolerance and recovering capacity to overcome the shocks caused by the disaster?

1. Yes [] 2. No []

59) If Yes, to what level were they improved?

- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

- 60) Did you have access to information on the disaster that you faced recently?(such as flood of 2017)
1. Yes [] 2. No []
- 61) If yes, to what extent did you access?
(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 62) Did you feel that your social networks were helpful to reduce the disaster impacts?
1. Yes [], 2. [].
- 63) If yes, to what extent were they helpful?
- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 64) Were your learned skills and knowledge from the CBA-ECA projects useful to reduce the ill-impacts of the disaster that you faced recently?
1. Yes [], 2. No [].
- 65) If yes, to what extent were they useful to address the harmful effects?
- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 66) Do you think that the capacity development programs under the CBA-ECA projects were helpful to reduce the disaster recovery time?
1. Yes [], 2. No []
- 67) If yes, to what extent were they helpful to reduce the normalization time?
- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 68) Did you have diverse shelter options during the disaster that you faced recently?
1. Yes [], 2. [].
- 69) If yes, to what extent were the options effective for safety and security?
- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete
- 70) Do you believe that the capacity building under the CBA-ECA projects increased your resource mobilization and innovation capacities which helped you to face the recent disaster confidently?
1. Yes [], 2. No []
- 71) If yes, to what degree of resourcefulness did you have to face the harmful effects of the disaster?
- (i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

H. Impacts of the CBA-ECA projects on the livelihood income

72) Do you believe that your annual net income has increased due to the different income generation projects under the CBA-ECA projects?

1. Yes [], 2. No []

73) If yes, to what degree has your income increased currently.

(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

I. Income comparison

74) Were you the beneficiaries of the MCG projects under the CBA- ECA projects?

1. Yes [], 2. No []

75) If yes, to what extent did the MCG support increase your livelihood income?

(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

76) Were you the beneficiaries of the AIGA support from the CBA-ECA projects?

1. Yes [], 2. No []

77) If yes, to what extent did the AIGA support increase your livelihood income?

(i) very few, (ii) few, (iii), partial, (iv) satisfactory, (v) complete

Appendix 3: Permission from the CNRS for Using Maps of Hakaluki Haor

5/19/22, 6:49 PM

Gmail - Amin: PhD studen- University of Adelaide



Syed Rahman <syedamin22nd@gmail.com>

Amin: PhD studen- University of Adelaide

3 messages

Syed Rahman <syedamin22nd@gmail.com>

Wed, May 11, 2022 at 3:19 PM

To: anis@cnrs.org.bd, Touhidul Islam <touhid.ib@gmail.com>

Dear sir

This is Syed Mohammad Aminur Rahman, PhD student of University of Adelaide, Australia.

I am grateful to CNRS for providing me various support during my field work in Bangladesh. I would like to use some maps prepared by CNRS for Hakaluki Haor.

It would be great if you allow me to use tje maps in my my PhD thesis. I will duly acknowledge the same.

With regards

Syed Mohammad Aminur Rahman
PhD candidate
The University of Adelaide
Australia

M Anisul Islam <anis@cnrs.org.bd>

Wed, May 11, 2022 at 3:34 PM

To: Syed Rahman <syedamin22nd@gmail.com>, Touhidul Islam <touhid.ib@gmail.com>

Dear Mr. Rahman,

Please use the maps. On behalf of CNRS, I am giving you the permission to use it. Please acknowledge the credential.

Thanks and best,

Anisul Islam
Director, CNRS

[Quoted text hidden]

Syed Rahman <syedamin22nd@gmail.com>

Wed, May 11, 2022 at 3:37 PM

To: M Anisul Islam <anis@cnrs.org.bd>

Thank you for your your permission.

With best regards

Syed Mohammad Aminur Rahman
[Quoted text hidden]

Appendix 4: Permission from Rahman et al. (2015) for Using Figure

6/1/22, 6:32 PM

Gmail - Permission to use your article-using a figure: Syed -Phd Student of University of Adelaide



Syed Rahman <syedamin22nd@gmail.com>

Permission to use your article-using a figure: Syed -Phd Student of University of Adelaide

HM Tuihedur Rahman <hm.rahman@mail.mcgill.ca>
To: Syed Rahman <syedamin22nd@gmail.com>

Wed, Jun 1, 2022 at 5:37 PM

Dear Syed,

Thanks for getting in touch with me. You have my permission to use the figure in your thesis. All the best for your thesis.

Kind regards,

Dr. H.M. Tuihedur Rahman
Department of Agricultural and Resource Economics
University of Saskatchewan
Saskatoon, SK
Canada

From: Syed Rahman <syedamin22nd@gmail.com>

Sent: Tuesday, May 31, 2022 8:34 PM

To: HM Tuihedur Rahman <hm.rahman@mail.mcgill.ca>

Subject: Permission to use your article-using a figure: Syed -Phd Student of University of Adelaide

Dear Mr Rahman

Good morning.

This is Syed Mohammad Aminur Rahman, PhD candidate at the University of Adelaide, Australia. In my thesis, I have cited many of your articles. Thanks for your contribution to the literature.

With your permission, I want to use one of the figures from your article (Figure 1. Formal Institutions that manage wetlands in Bangladesh, p. 488). Rahman, H. T., Hickey, G. M., & Sarker, S. K. (2015). Examining the role of social capital in community collective action for sustainable wetland fisheries in Bangladesh. *Wetlands*, 35(3), 487-499.

If you allow me to use this figure, I would be grateful.

With best regards

Syed Mohammad Aminur Rahman
PhD. Candidate
The University of Adelaide, Australia.