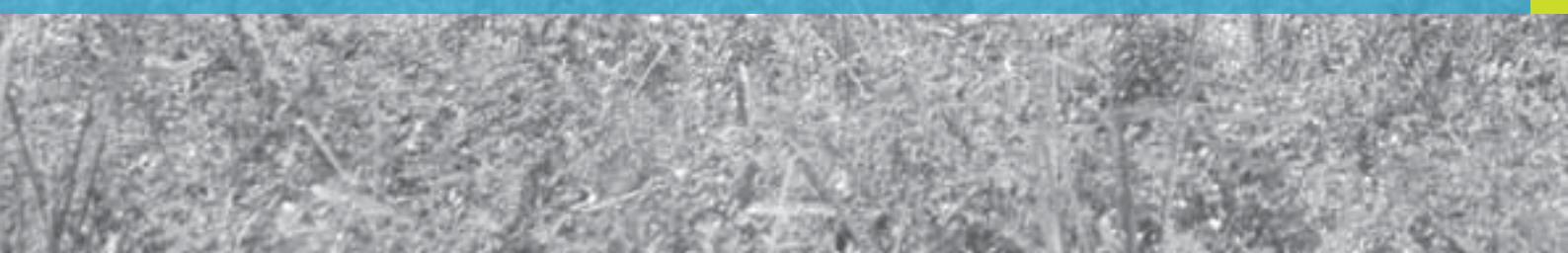
Determinants and Effectiveness of Local-Level Adaptation to Climate Change: Case Studies of Two Initiatives in Bangladesh

Summary

October 2012

ADAPTATION KNOWLEDGE PLATFORM

REGIONAL CLIMATE CHANGE ADAPTATIONKNOWLEDGEPLATFORM for Asia



Acknowledgements

This report summarizes the findings of the case studies on the determinants and effectiveness of local-level adaptation to climate change in Bangladesh that the Regional Resource Centre for Asia and the Pacific (RRC.AP) had supported under the aegis of the Regional Climate Change Adaptation Knowledge Platform for Asia (Adaptation Knowledge Platform).

Conducted from February to June 2012, the case studies draw on Adaptation Knowledge Platform's work in progress to disseminate and exchange adaptation knowledge among a wider audience.

This report was prepared by Dwijen Mallick and Nazzina Mohsin of the Bangladesh Centre for Advanced Studies (BCAS) with assistance and inputs from Mozaharul Alam, United Nations Environment Programme Regional Office for Asia and the Pacific (UNEP ROAP), and Hiromi Inagaki, RRC.AP.

We extend special thanks to Dr. Atiq Rahman, Executive Director of BCAS, Dr. Abu Wali Raghib Hassan, Project Director of Disaster & Climate Risk Management in Agriculture (DCRMA), Ministry of Agriculture of the Government of Bangladesh, and Dr. Anowara Begum Shelly, Director of Caritas Fisheries Programme, Dhaka, for supporting this endeavor by sharing their documents and opinions. We are also grateful to the countless institutions, organizations, and individuals that provided key inputs and insights for the brief. We welcome your suggestions and comments.

Edited by Manraj Grewal
Layout by Lowil Espada

Bangkok, Thailand
October 2012

How to obtain the digital copy:

The Determinants and Effectiveness of Local-level Adaptation to Climate Change: Case Studies of Two Initiatives in Bangladesh - Summary can be electronically downloaded from the www.asiapacificadapt.net.

Determinants and Effectiveness of Local-Level Adaptation to Climate Change: Case Studies of Two Initiatives in Bangladesh

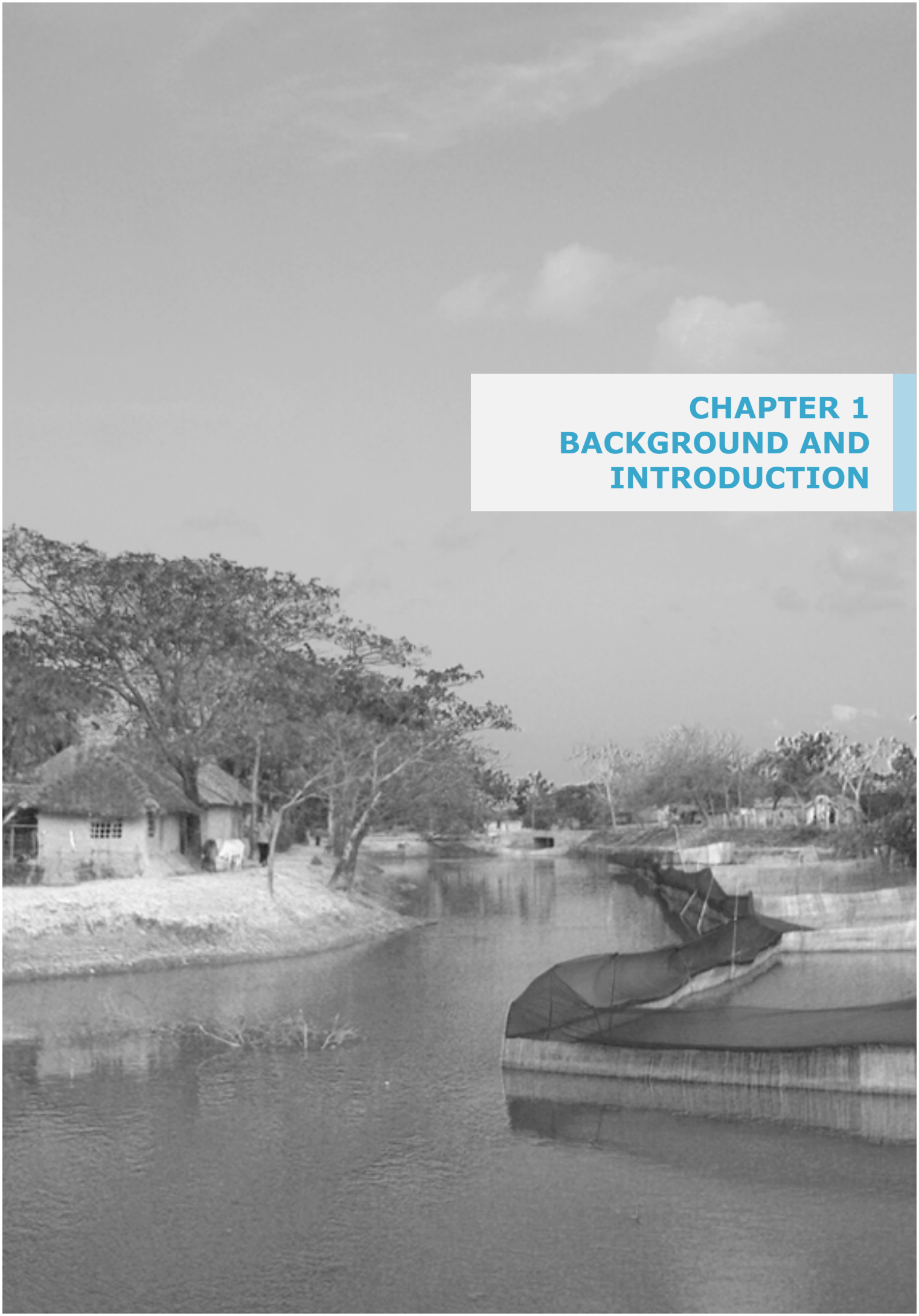
Summary

October 2012

CONTENTS

ACRONYMS

ADPC	Asian Disaster Preparedness Centre
AKP	Regional Climate Change Adaptation Knowledge Platform for Asia
AR4	4th Assessment Report of IPCC
ARCAB	Action Research on Climate Change Adaptation in Bangladesh
BADC	Bangladesh Agricultural Development Corporation
BARI	Bangladesh Agriculture Research Institute
BCAS	Bangladesh Centre for Advanced Studies
BCCSAP	Bangladesh Climate Change Strategies and Action Plan
CBA	Community Based Adaptation
CBO	Community Based Organization
DAE	Department of Agricultural Extension
DPHE	Department of Public Health and Engineering
DRR	Disaster Risk Reduction
FAO	Food and Agriculture Organization
FGD	focused group discussions
GaIn	Global Adaptation Index
GoB	Government of Bangladesh
IIED	International Institute for Environment and Development
IPCC	Intergovernmental Panel on Climate Change
KII	key informant interviews
LACC	Livelihood Adaptation to Climate Change
LAPA	Local Adaptation Programme of Action
LGED	Local Government and Engineering Department
LLA	local level adaptation
M&E	Monitoring and Evaluation
NAPA	National Adaptation Programme of Action
NGO	Non Governmental Organization
PR	Participatory Research
PVA	Participatory Vulnerability Assessment
PVCA	participatory vulnerability and capacity assessment
R&D	Research and Development
RWHS	**Rain Water Harvesting System**
TAR	**Third Assessment Report of IPCC**
UNEP	**United Nations Environment Programme**
UNFCCC	**United Nations Framework Convention on Climate Change**
WRI	**World Resources Institute**



CHAPTER 1
BACKGROUND AND INTRODUCTION

NEED FOR NEW KNOWLEDGE ON LOCAL-LEVEL ADAPTATION AND ITS EFFECTIVENESS

Bangladesh ministries, including the ministries of agriculture, environment and forest, water, health, rural development, food and disaster management, children and women affairs, relevant departments and NGOs have been implementing a number of local level adaptation (LLA) projects with their limited resources and capacity in response to the National Adaptation Programme of Action (NAPA) and the Bangladesh Climate Change Strategies and Action Plan (BCCSAP). Already known as a pioneering country in the field of LLA, Bangladesh recognizes the growing interest in approaches, determinants, planning and implementation processes and effectiveness of LLA among policy makers, practitioners, researchers, development agencies, and vulnerable communities. In particular, there is a strong need for updated information and knowledge on climate change trends, risks and vulnerability of human and ecological systems; adaptation options and technologies; planning, implementation, and evaluation of LLA. It is also important to obtain in-depth knowledge and understanding of various local and external factors that govern LLA and its effectiveness.

OBJECTIVES AND SCOPE OF CASE STUDIES

The Regional Resource Centre for Asia and the Pacific (RRC.AP), a UNEP collaboration centre located in the Asian Institute of Technology, entrusted to the Bangladesh Centre for Advanced Studies (BCAS) the task of conducting an in-depth research into the determinants and effectiveness of local-level adaptation to climate change as part of an initiative called the Regional Climate Change Adaptation Knowledge Platform for Asia (AKP). Thirteen countries were identified as focal countries for the AKP's first three years of operation. Among these, Bangladesh was recognized as the most advanced in terms of its efforts to mainstream adaptation into overall development planning. The focus of the country's activities for 2010–2011 reflects this approach, with efforts to strengthen existing processes, and to learn lessons from the Bangladesh experience that is of generic significance. There was a special thrust on supporting the existing community-level adaptation activities, especially those of NGOs. Further consultations among AKP partners and stakeholders in Bangladesh brought to the fore the need for research on factors that influence and determine the effectiveness of LLA. The primary aim of the research was to better understand how the local conditions and external factors determine the effectiveness of local-level adaptation initiatives. The specific objectives include:

- Investigating the existing knowledge on various characteristics of and factors influencing LLA, and its effectiveness;
- Investigating the context-specific factors that determine the effectiveness of local-level adaptation initiatives undertaken in Bangladesh; and
- Verification of the findings of these activities with national and local stakeholders.

ANALYTICAL FRAMEWORK

There are many definitions of adaptation in literature, and this research follows some of the simpler ones. Adaptation to climate change takes place through adjustments to reduce vulnerability or enhance resilience in response to observed and expected changes in climate and associated extreme events. Adaptation occurs in physical, ecological and human systems, which involves changes in social and environmental processes, perceptions of climate risks, practices and functions to reduce potential damages or to realize new opportunities. Biological adaptation is slow and reactive, whereas individuals and societies adapt to both observed and expected changes through autonomous, anticipatory, and planned actions. However, adaptive capacity is uneven across and within societies, and there have been limits and barriers to adaptation (Adger et al, 2007). Enhancement of adaptive capacity is a necessary condition for reducing risks and vulnerability, particularly for the most affected regions, nations, and socio-economic groups (Smit et al, 2001: in TAR of IPCC).

For investigating the effectiveness of LLA, it is necessary to examine the characteristics, types and enabling factors of LLA initiatives or the determinants of LLA, as termed in this report. As suggested by Smit et al (2001), characteristics, types

and forms of local adaptation are classified primarily according to what climate-related stimuli (drought, salinity, cyclone, etc) systems adapt to; who adapt (vulnerable groups, farmers, forest people and ecosystems); how adaptation occurs; and what the outcomes (relating to ecological regeneration, social protection, livelihood promotion, and disaster risk reduction) are. Enabling factors and conditions for implementing LLA relate to dynamic social processes, economic resources, technological arrangements and knowledge diffusion; biophysical and political contexts that may vary over time, location, sectors and scales (ibid).

These factors can be classified as local and external. The former may include participatory planning and engagement of targeted beneficiaries or vulnerable communities their recognition of project approaches and interventions. The latter may include an enabling national policy and institutional supports resources from government and donor partners.

The paper further discusses the effectiveness of LLA. Even though certain factors and conditions may enable development and implementation of adaptation initiatives at a local level, there is no guarantee that these adaptation initiatives will lead to effective adaptation. Local and external factors and determinants enabling LLA may pose differing levels of effectiveness in different ecosystems and social systems. But how can we measure the effectiveness of LLA? According to UNFCCC (2010) an adaptation initiative or measure can be termed effective if its outcomes and outputs meet its expressed objectives. Effectiveness of LLA is hence determined by the level at which outputs and outcomes of adaptation measures introduced at a local level meet the expressed objectives of the measures. As described earlier, the main objective of an adaptation initiative is to reduce vulnerability or enhance the resilience of human and ecological systems. Hence, the effectiveness of LLA initiatives should be measured by how well they contribute to reducing the level of risks and vulnerability or building local capacity and resilience in different systems.

Chapter 2 discusses the determinants of local adaptation; the internal and external factors influencing effective adaptation; and the indicators for measuring the effectiveness of LLA.

METHODOLOGIES OF CASE STUDIES

The paper resorted to an extensive review of literature and consultations with experts to gather existing knowledge about the characteristics of LLA, the various factors enabling LLA and the determinants of its effectiveness. Over a hundred documents were collected from government offices, research organizations, NGOs, UNFCCC, UN agencies, international development partners and websites.

Context-specific factors enabling LLA and determinants of the effectiveness of LLA were investigated through the case studies of two existing LLA initiatives undertaken in the salinity-affected coastal zone and the drought-prone upland of Bangladesh (detailed information on the case study sites is given below). Information collected from the case studies included the physical impacts of climate change and social vulnerability; views of local actors and stakeholders in the two initiatives about

Box_1 Key Issues of FGDs and KIIs

Following were the key issues raised during FGDs and KIIs:

- Climate risks and vulnerability in the local and social contexts that the projects have documented through participatory research
- Local characteristics, factors, and determinants of adaptation actions
- Views and learning about the local planning, and engagement of local actors
- Key components and strategies of local adaptation promoted by the projects; and their relevance, effectiveness, and efficacy
- The level of blending of local and external/ scientific knowledge or innovation in an adaptation technology
- The level of adaptive capacity and resilience in natural, human, and institutional systems with short-term and long- term outcomes
- Good adaptation practices of communities under the projects to tackle the impacts of climate change; and
- The early learnings of the communities, and the challenges ahead.

the planning and implementation processes; and project outcomes in terms of enhancing the adaptive capacity of the vulnerable communities, regeneration of ecosystem services, livelihood protection, and disaster risk reduction.

The case studies mainly employed qualitative methods and participatory reflections of project staff and communities collected through focus group discussion (FGDs) and key informant interviews (KII). Box 1 lists the questions asked during FGDs and KIIs. Participatory research (PR) techniques were followed to collect local evidence and views of vulnerable communities and local actors about the project approaches, adaptation strategies, and outcomes.

Case study in the coastal area:

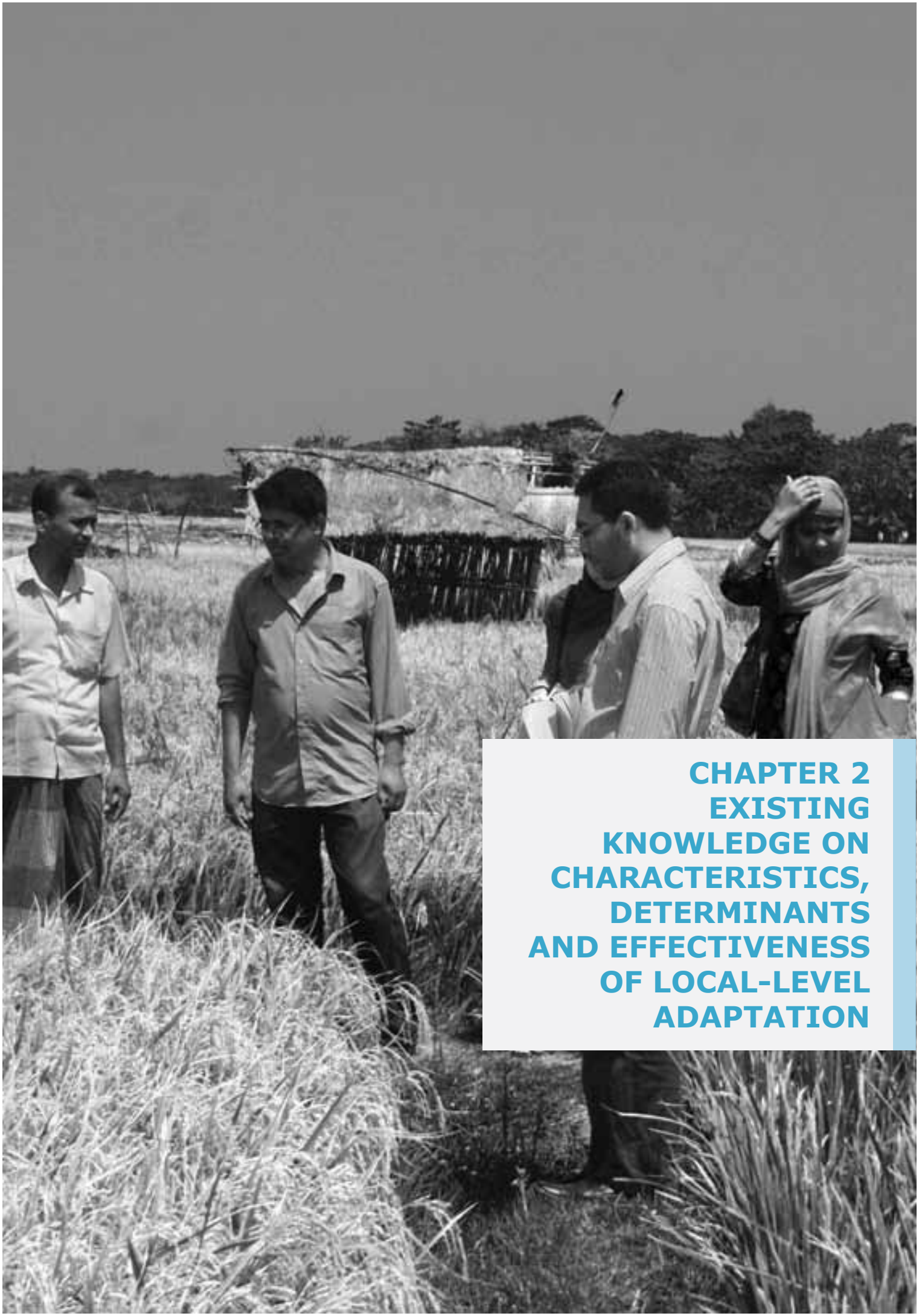
The project chosen for the study was called "Enhancing Coping and Adaptation of Coastal Community to reduce Vulnerability to Climate Change" It was implemented by Caritas Bangladesh, a national development agency with strong community links. The local actions of the coastal adaptation project emphasized on participatory planning, communication of climate risks, DRR, and livelihood protection. The project villages were located in the Shyamnagar Upzila of Satkhira District in the southwest coastal Bangladesh.

Figure_1 Map of Bangladesh showing the Project Locations

Case study in the drought-prone area:

The other project chosen for this study was called Livelihood Adaptation to Climate Change (LACC) and it was implemented by the Department of Agricultural Extension (DAE) of the Government of Bangladesh in the northwestern upland of Bangladesh. The study villages were located in the Nachole Upzila in Chapai Nawabganj district (Figure 1 shows the project locations). The initial phase of the DAE project was implemented in partnership with FAO. The second phase of the project is being directly managed and implemented by the DAE, which emphasized technology and knowledge transfer, local innovation and institution building to enhance resilience in ecosystem and social systems.

The study team collected detailed information about the local contexts, characteristics and determinants such as geophysical conditions, climatic factors, and social vulnerability. It also studied the enabling factors, including local institutional arrangements, and participation of vulnerable people in planning and implementation. The views of the local actors and stakeholders were solicited to gauge the effectiveness of local adaptation actions.



CHAPTER 2 EXISTING KNOWLEDGE ON CHARACTERISTICS, DETERMINANTS AND EFFECTIVENESS OF LOCAL-LEVEL ADAPTATION

KEY CHARACTERISTICS AND APPROACHES OF LOCAL-LEVEL ADAPTATION

Local-level adaptation involves an alteration in awareness and interest of the vulnerable communities as well as their activities in response to climate change stresses and stimuli (Smit et al, 2001). The characteristics of local adaptation are primarily determined by who adapts to what climate trends, risks and vulnerability; how do they adapt to the changes and impacts; and finally what are the immediate outcomes (awareness raised, adaptive capacity and resilience built and vulnerability reduced) as well as long-term results such as protection of lives and livelihoods, sustainability of ecosystem productivity, and their services and contribution to local-level sustainable development.

A recent study by UNEP and BCAS on 'Adaptation and Development – Perspectives from Bangladesh' has highlighted key elements of local adaptation. These include stakeholder engagement and participatory planning; reduction in risk and vulnerability; new knowledge generation and dissemination of awareness about climate change and its impacts, livelihood protection and resilience building; better adaptive capacity, poverty reduction, DRR, and enhancement of social safety net (Haider, 2012).

Both the local and external factors are important for planning and implementation of LLA, which has to consider the climate-related vulnerability from two dimensions: i) an external dimension consisting of risks, shocks and stresses to which people are subject; and ii) an internal dimension encompassing the means to understand the risks and vulnerability and withstand or adjust to the damaging impacts (Duarte, 2007).

Hence, the biophysical aspects of vulnerability are largely external to the local community, and in many cases they are unable to resist and moderate the processes (such as temperature rise, drought and erratic rainfall, sea level rise, salinity intrusion, floods, cyclones and tidal surges) and their impacts.

The social dimensions of vulnerability to climate change are primarily internal as these relate to the level of awareness, asset base and capacity of the human and social systems to formulate and implement adaptation measures considering the current and future risks and vulnerability Thus, both physical and social vulnerability and the capacity in local community, macro socio-economic conditions, technological arrangements and institutional capacity, and the national policy environment determine the planning and implementation of appropriate local level adaptation actions, and their effectiveness.

The World Resources Institutes (WRI) in their recent report has identified a number of characteristics for effective decision making in relation to adaptation. These include responsiveness, flexibility, robustness and durability. The local drivers and determinants may include long-term changes in climate and weather patterns, extremes, level of exposure, sensitivity, vulnerability and adaptive capacity of the local ecosystems and communities. Engagement of actors and stakeholders, including public institutions and vulnerable communities, in decision-making and planning besides action-relevant information and resources have been suggested as key elements in effective planning and implementation of local adaptation (WRI et al, 2011).

McGray (2007) and Huq et al (2003) call for linking local adaptation to sustainable development. The range of adaptation activities may include a continuum of responses to climate change to pursue development on the one hand, and very explicit adaptation measures on the other. Thus, the vulnerability-oriented adaptation efforts overlap with traditional development practices, where the development activities take little or no account of the specific impacts of climate change. At the other end, highly specialized adaptation action may fall outside the realm of conventional development. Hence, there is an urgent need for building synergies and continuum between development and adaptation, which can be broadly categorized into four types of adaptation efforts. These are: addressing the drivers of vulnerability; building response capacity, managing climate risk; and confronting climate change.

FACTORS AND DETERMINANTS OF LOCAL-LEVEL ADAPTATION

Climate experts and adaptation practitioners have identified a number of determinants of local, regional and sectoral adaptation. The determinants and enabling factors have been identified in the light of various contexts such as physical, ecological, social, knowledge dissemination and awareness building, enabling technological, institutional, and political setting. Adaptation to climate change takes place in dynamic social, economic, technological, biophysical and political contexts that vary over time, location, and sector. This complex mix of conditions determines the capacity of systems to adapt. The main features of communities or regions that seem to determine their adaptive capacity are economic wealth, technology, information and skills, infrastructure, institutions, and equity (Smit et al, 2001).

Appropriate technology is an important determinant of local adaptation. Lack of technology can seriously impede a nation's ability to implement adaptation options by limiting the range of possible responses. Technology generation, transfer, and local innovation are an important basis for LLA. Successful adaptation requires new knowledge and information about risks, vulnerability and available options, the capacity to assess them, and the ability to implement the most suitable ones. Hence, research and knowledge management are important inputs for planning and implementation of an effective LLA. The chapter 18 of IPCC's fourth assessment report mentions that the current knowledge of adaption, adaptive capacity and government policies is insufficient for reliable adaptation measures. Hence, in-depth research is required to enhance the effectiveness of local adaptation. Participatory and local-level planning exercise is essential to ensure effective implementation of adaptation. Participatory research (PR) can help understand the local context, needs and priorities of the community for adaptation. The PR can also reduce knowledge and technology gaps.

Participatory risk assessment is another important factor in planning, engaging vulnerable community and implementing effective LLA. The cross-cutting risks induced by climate change may trigger new climatic hazards, and affect the present formula being used for adapting to changes. It is important to analyze and assess potential risks in the local and regional context, and formulate policies with an eye on long-term policy frameworks. The adaptation plans and implementation programs should also be closely connected to disaster risk management strategies. Further, findings of climate change risk assessments should be integrated into DRR planning. Informed policy decisions are also vital for an effective LLA.

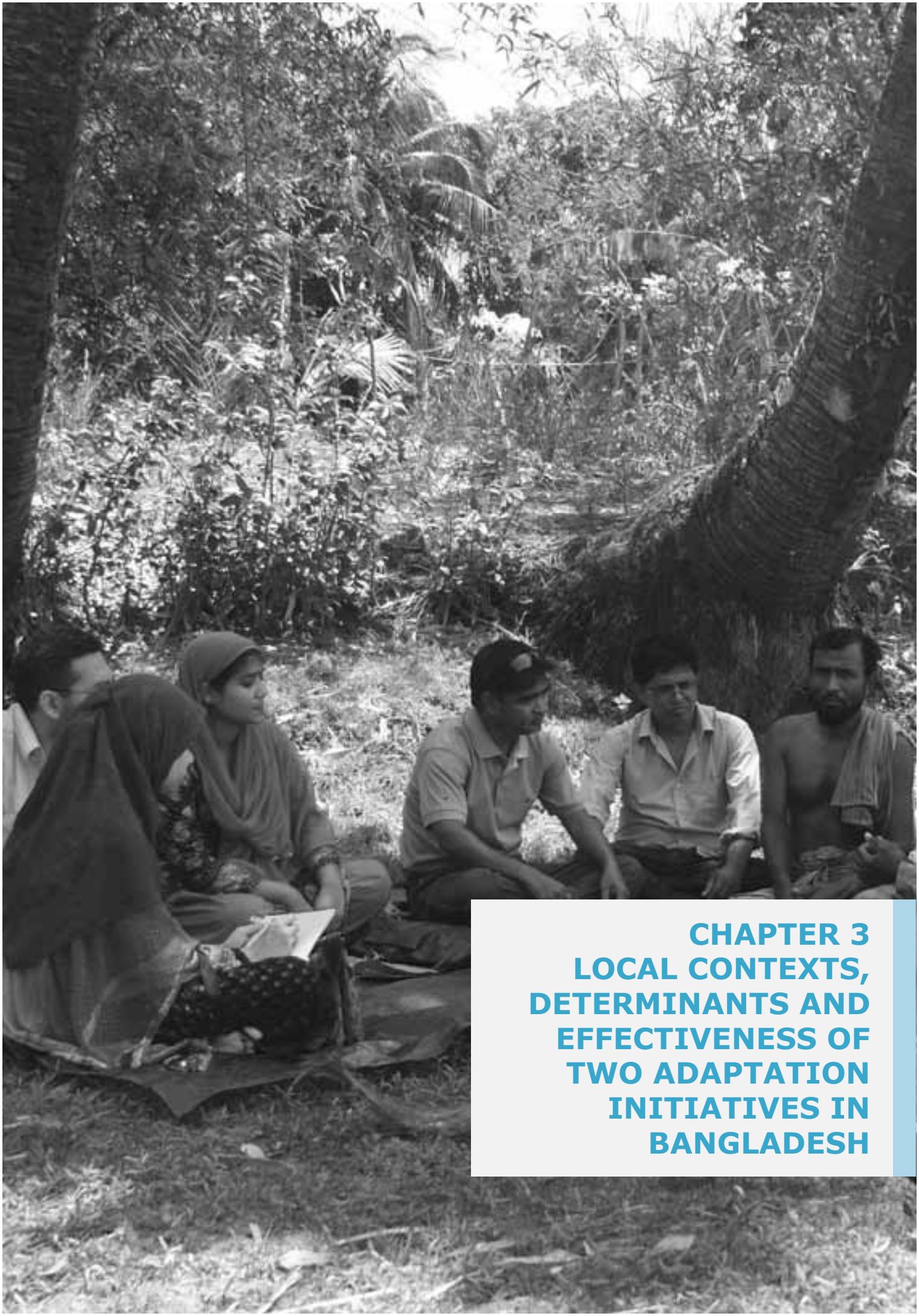
Long-term funding too is essential for the effective implementation of LLA. Many adaptation initiatives undertaken at a local level are unable to sustain due to lack of sufficient funds for long-term planning and implementation. Financial support to least developed countries (LDCs), including Bangladesh, is needed with priority being accorded to long-term adaptation strategies and implementation of large-scale projects to tackle the impacts of climate change. Compared to LDCs, the wealthy nations are better prepared to bear the costs of adaptation to climate change impacts and risks.

EFFECTIVENESS OF LOCAL-LEVEL ADAPTATION

UNFCCC (2010) states that effectiveness of adaptation implies that outcomes and outputs of an adaptation initiative or measure meet its expressed objectives. As an adaptation action essentially aims to reduce vulnerability or enhance the resilience of human and ecological systems, the effectiveness largely depends on how well adaptation measures contribute to reducing vulnerability or enhancing resilience besides lowering exposure and sensitivity of different affected systems and subsystems. For example, drought management and fresh water conservation introduced by agricultural departments can be termed effective if the level of bio-physical vulnerability-related risks faced by farmers is reduced.

A few more studies have also identified similar factors as determinants of the effectiveness/success of adaptation. For example, the ARCAB project suggests that reduction in climate change risk and vulnerability as well as institutional and technical sustainability of adaptation initiatives determine their effectiveness (IIED and BCAS, 2011). Doria et al (2009) have identified a number of criteria for measuring successful adaptation. These include reduction of risk from climate hazards, reduction of exposure and sensitivity to climate variability and hazards by increasing adaptive capacity and the level of resilience in addressing the impacts on economic and social development processes.

Smit et al (2001) further argue that enhancement of adaptive capacity is a necessary condition for reducing climate-related risks and vulnerability. This means that the effectiveness in reducing the risks and vulnerability is inherently associated with the level of improvement in adaptive capacity in various systems such as natural, human, social and economic. The adaptive capacity is determined by economic wealth, technology, information and skills, infrastructure, institutions and equity (Smit et al, 2001). Hence, measuring the effectiveness of LLA requires understanding how well these economic, technological, institutional and social conditions are improved. For example, poverty alleviation needs to be considered as a necessary condition for building the capacity to design and implement adaptation measures that address possible climate risks, and can be subsequently integrated into local adaptation process. Also, a community or a society vulnerable to climate change impacts should promote sharing of right information about weather and climate change impacts in local contexts, blending of scientific and local knowledge, enhancement of institutional capacity and engagement of local government in implementing adaptation actions (BCAS, 2010 and Adger et al, 2007).



CHAPTER 3
LOCAL CONTEXTS, DETERMINANTS AND EFFECTIVENESS OF TWO ADAPTATION INITIATIVES IN BANGLADESH

LOCAL CONTEXTS: CLIMATE RISKS AND VULNERABILITIES

Southwestern Coastal Zone: The biophysical condition of the southwestern coastal zone is highly vulnerable to salinity, sea level rise, frequent cyclones, and storm surges. Significant swathes of the coastal area are already facing salinity intrusion, which will become more pronounced due to sea level rise. Coastal agriculture, forests, biodiversity, drinking and domestic water use, among others, are key vulnerable areas, and need new approaches and technologies to deal with existing and future salinity and cyclonic problems in the coastal area. In the context of biophysical vulnerability, the project carried out field reconnaissance and participatory vulnerability assessment (PVA) in the Munshiganj union in the Shyamnagar Upazila under Satkhira district.

The increased salinity in the locality has affected water, soil, agriculture, vegetation, mangrove forest, fisheries and livelihoods of the communities and households. It has also posed serious health risks due to scarcity of drinking water. The locals say cyclones with tidal surges that increase the width of the rivers are also damaging human settlements, homesteads, infrastructure, productive land and natural resources, thereby shrinking the livelihoods assets and potential of the poor and marginal community.

The physical environment and the climatic factors have increased the social vulnerability of the poor communities. In the villages in Munshiganj, about 60%–70% of the people are poor. Of them, about 40% are extremely poor and live on wage labor, collection of forestry products from the Sundarbans and subsistence fishing, while others are engaged in agriculture, shrimp/fish farming and small trading. The poor, marginal people, women and children suffer the most from salinity intrusion, decrease in agricultural productivity, increasingly frequent cyclones, and tidal surges. They have limited capacity and resources to deal with shocks and vulnerability to climate change. They are also engaged in risky jobs such as fishing in the offshore areas, and collecting materials from the mangrove forest for their survival. Before the project, they lacked proper understanding and awareness about the emerging changes in nature, environment, climate and society. They also did not have adequate disaster preparedness at family and community levels (BCAS and Caritas, 2008). The poor people and women, particularly the fishers, forest product collectors, wage earners and small farmers were extremely vulnerable due to lack of capacity and awareness about climate change impacts on their lives and livelihoods.

Northwestern Upland: The Barind (upland in the Northwestern part of Bangladesh) in Rajshahi Division has been experiencing drought condition for the last 2–3 decades. In the recent years, the drought has aggravated due to temperature rise and poor rainfall in the region. This has affected soil moisture, fertility and agricultural productivity. People face severe water scarcity in both long summers and dry winters. Nachole is one of the severely drought-hit upazilas. Agricultural productivity has decreased in many of the drought affected villages and most of the people suffer from food scarcity, malnutrition, and livelihood insecurity.

Nachole is part of the Barind tract, whose distinctive geographical feature consists of a group of dry terraces in uplifted blocks. It covers an area of 8,720 sq kms in northwestern Bangladesh, and is located between the floodplains of two major rivers, the Padma and the Jamuna. Around 532,000 hectares of the 773,000 hectares of the Barind tract are cultivable despite dry soil and inadequate ground and surface water. Lack of rainfall has created difficulties for the farmers by drying up the natural sources of water. The usual rainy season for the Barind Tracts lasts from late April to October but due to long spells of dry weather, the rainfall is often not enough to adequately water the soils for a longer period of time. The temperature too often exceeds 40 degree Celsius (Hassan, 2012). Considering the increasing impacts of drought in the region, the DAE of the Ministry of Agriculture undertook the LACC project in three Upazilas, including Nachole in Chapai Nawabganj district.

The project has identified the following issues as those impacting agriculture and livelihoods in Nachole and greater Barind Tracts:

- High evaporation rate and temperature
- Extreme agricultural drought and dryness
- Dried up canals and water bodies; and
- Damage to agricultural crops.

ADAPTATION STRATEGIES OF THE TWO INITIATIVES

Local adaptation objectives, outputs, outcomes and strategies were formulated based on the examination of the local contexts, climatic factors (e.g. drought, salinity and cyclones), and current coping and adaptation needs of the vulnerable communities. The main purpose of the two adaptation projects (implemented by Caritas Bangladesh and DAE of the GoB) was to enhance the adaptive capacity of the vulnerable communities and ecosystems to tackle climate impacts, risks and vulnerability in the local contexts (salinity and drought) and protect the lives and livelihoods of the common people. There were several commonalities in the adaptation strategies of the two projects to achieve their goals. (Please see expressed purposes/objectives of the projects and expected outputs/outcomes in Matrix 1). The common strategies included the following:

- Participatory planning and social mobilization
- To improve understanding about risks and vulnerability;
- Awareness raising and communication of climate risks;
- Improve coping abilities and strengthen DRR;
- Conservation of natural resources and enhancement of ecosystem services
- Facilitate local innovation and technology generation;
- Promotion of food and livelihood security;
- Local capacity and institution building; and
- Learning, sharing and policy advocacy.

Matrix 1: Key Features of the Two LLA Projects

Key Issues	Project Features	
	Adaptation of Coastal Community	**LACC in Drought Prone Areas**
Purposes/ objectives	To enhance the adaptive capacity of the poor, marginal and vulnerable community to address the impacts of increasing salinity, cyclone, tidal surges, erosion and possible sea level rise	To enhance adaptive capacity to tackle the drought impacts for sustainable agriculture and food security of the marginal farmers
Expected outputs/ outcomes	• To make the selected community and stakeholders aware of the present and future salinity intrusion, tidal inundation, and impacts of cyclones on their lives and livelihoods, besides the associated risks and vulnerability; • To improve coping mechanism, and enhance adaptive capacity of the vulnerable community for livelihood diversification • To communicate climate risks and improve community disaster preparedness • To share learning, experiences and advocacy to influence the policy and decision making process at regional, national and international levels.	• To improve understanding and awareness of the selected farming community and stakeholders about the present and future impacts (such as temperature rise, lack of rainfall or its pattern change, weather and seasonal pattern change, reduction of ground water-level) on their lives and livelihoods and associated risks and vulnerability; • To enhance knowledge transfer and local innovation • To improve coping mechanism and enhance adaptive capacity for food and livelihood security • To share learning, experiences and advocacy to influence policies and decisions of the government and actors.
Key Strategies	• Awareness raising and communication of climate risk • Promotion of safe drinking water for the community (through rain water harvesting) • Fresh water conservation for agriculture and domestic use of water • Social forestry, tree plantation and bio-resources conservation • Climate-resilient agriculture and crop diversification • Promotion of alternative livelihood activities; and • Strengthening of disaster preparedness at household and community level.	• Better understanding on the climate impacts, risks and vulnerability • Better farm and agronomic management • Crop diversification, intensification and introduction of drought-tolerant crop varieties and farming practices • Water conservation, efficient and multiple use of scarce water resources • Introduction of new technologies and innovation in water and farm management • Alternative enterprise development (integrated homestead gardening and pond fish culture) • Institutional adjustment • Knowledge dissemination • Community development (farmers' field schools and farmers' clubs)

ADAPTATION ACTIONS OF THE TWO INITIATIVES

Adaptation Actions in the Coastal Zone: The adaptation activities were demand driven and relevant to the local contexts. The local adaptation used both local and external knowledge and resources. The main objectives of the local adaptation actions and innovations were to increase local capacity, diversity in livelihood, reduce disaster risk and conserve natural resources (water, mangrove forests, and bio-resources) which were being severely affected by the growing salinity and climatic extremes. Following are some of the effective local adaptation actions:

- Creation of awareness about climate risks
- Setting up of an environment school
- Rainwater harvesting
- Re-excavation of ponds, and water conservation for drinking and domestic use
- Canal re-excavation and conservation of rain water for irrigation
- Community-led mangrove afforestation
- Integrated agriculture and aquaculture; and
- Crab fattening in saline water.

Adaptation Actions in the Drought-prone Upland: The land of the Barind Tracts is very dry with poor fertility due to its geographical location, and the impacts of climate change. For this reason, the DAE and the farmers work closely to help promote drought-resilient sustainable farming. Decisions are made based on climatic changes observed in the previous seasons, and the local adaptation actions are identified through field tests and experiences. The adaptation strategies were developed via participatory research and consultations with the affected people, including the farmers. The research took the farmers' experiences over generations into account to understand how the farming cycles have been influenced by the impacts of seasonal and weather pattern changes. The key interventions included:

- Farmers' field school and farmers' clubs;
- Water conservation and irrigation management;
- Mini-pond for water conservation and drought management;
- Crop diversification and intensification;
- Drought-tolerant crop varieties;
- Integrated homestead gardening;
- Organic inputs and pest management;
- Knowledge dissemination; and
- Linking farmers with local government and development agencies.

FACTORS AND DETERMINANTS OF THE TWO INITIATIVES

A number of local and external factors and determinants were instrumental in the effective implementation of the two projects. The local factors included participatory planning and engagement of community and targeted beneficiaries; inputs of the vulnerable community and actors about project approaches and interventions; awareness, training and capacity building; integration of local knowledge, needs and priorities into local adaptation strategies; local innovation and support from local government bodies such as the Union Council, Local Government Engineering Department (LGED), Department of Public Health Engineering (DHPE), and community organizations. High levels of climate vulnerability, widespread poverty, food and livelihood insecurity among the majority of the locals were critical local conditions and factors that necessitated adaptation interventions. The key external factors included an enabling national policy environment and institutional support (Bangladesh's NAPA guideline and research partnership of DAE with FAO as well as IIED and BCAS support to Caritas); resources from government and donor partners; R&D, technology and knowledge transfer.

Determinants of Local-level Adaptation in Coastal Ecosystems

There have been a number of local determinants (such as geophysical conditions, climate stresses and social vulnerability), technological interventions (rainwater harvesting, new varieties of crops and water management), institutional support (formation of community-based organization and engagement of local government) and external factors (support from Caritas Australia and collaboration between BCAS and Caritas Bangladesh) that determined the designing and implementation of local adaptation, which yielded some early good results for the vulnerable communities.

The high level of vulnerability due to climatic factors and poverty primarily determined the planning and implementation of the local-level adaptation. Targeting the vulnerable community and engaging it purposefully in planning and implementation was an important determinant for the effective implementation of the project. The second most important enabling condition was the interest shown by the community members, and their active participation in the project. Other important determinants such as knowledge, technology, capacity building and resource allocation are discussed below.

Local Factors: Participatory planning and communicating of climate risk were initial steps toward successful implementation of local-level adaptation. Blending of scientific knowledge with local knowledge was an important determinant for demonstrating effective local adaptation in agriculture, water conservation, and livelihood diversification. The scientific and technological information blended with existing practices and indigenous knowledge motivated the farmers of Munshiganj to return to crop cultivation.

Earlier, as the land became unsuitable for growing traditional crops due to salinity intrusion, the farmers had little choice but to take to shrimp farming. However, this too had a negative impact on the local environment as frequent cyclones damaged the banks of shrimp farms, leading to further intrusion of saline waters. Besides, in recent years, the plague-hit shrimp farms had been suffering losses, which compelled the farmers to explore alternatives. Ironically, one of the alternative options turned out be revisiting agriculture with scientifically-improved seeds of saline-tolerant rice varieties. Sharing of scientific and technical knowhow with marginalized and vulnerable communities was a major determinant in the effective implementation of adaptation. Had it not been for the advanced saline-resilient rice varieties, the farmers who had once lost hope of cultivating rice, would not have been able to return to farming in the face of the fast changing climatic variables. Improvement of the early warning system for crop sowing will also play a determining role for a positive output from the technically-adjusted farming system.

Along with scientific knowledge and local innovation, training workshops for disseminating knowledge about improved crop varieties and their proper upkeep played a determining role for effective adaptation. Affected communities require capacity building programs such as hands-on training to understand the potential of the improved seeds or organized crab farming to overcome the risks posed by climate change to their socio-economic development. The demonstrations and knowledge-sharing process inspire the affected people to accept and utilize the innovation. The farmers of Munshiganj and the implementing agency agreed that continuous research on rice varieties and other saline-tolerant crops, vegetables and fruits will help them in sustaining adaptation in the long term.

The rainwater harvesting technology at the primary school reduced the risks of various types of water-borne diseases resulting primarily from saline water. However, the water stored at the school is insufficient to serve the entire community. The setting up of at least 8–10 such rainwater harvesting storage systems would help the entire community to significantly benefit from the technology.

Support from the local government (Union Parishad and Upazila officials) was critical for implementing adaptation activities such as canal digging for fresh water conservation. Linkage with local government and gaining institutional support for the vulnerable communities—government land was allotted for fresh water conservation, irrigation management and fish culture; the agricultural extension department also gave the community fertilizers and seeds of salt-tolerant rice—can also be considered important local determining factors for effective implementation of LLA in the coastal ecosystem.

External Factors: The key external factors that influenced the coastal project of Caritas included directives from national policies and strategies identifying the coastal area as the most vulnerable ecosystem in Bangladesh, and the adaptation strategies of NAPA which mooted urgent adaptation actions in the coastal agriculture, while addressing the issues of salinity and water management, coastal afforestation and disaster preparedness. Caritas' participation in the NAPA formulation process also encouraged them to customize their institutional policy and strategies for climate-resilient development and take adaptation actions in coastal ecosystems. The other external factors included research collaboration with International Institute

for Environment and Development (IIED), BCAS and support from donors.

Policy-makers, researchers, non-government agencies and donors need to come together to ensure that improved technologies and knowledge are shared with the vulnerable communities free of cost or at a subsidized cost. Institutional backing and an increase in such programs will enhance the community's resilience. Empowerment and capacity building of the local-level staff members of both Government and non-government sectors will also promote information sharing for better outputs. Large-scale and longer duration adaptation programs too will result in climate-resilient sustainable development.

Determinants of Local-level Adaptation in Drought-prone Upland

The key determinants of LLA in drought-prone upland were geophysical conditions, climatic factors, high levels of poverty, and social vulnerability. The other determinants and enabling conditions included knowledge and capacity building to grasp technological information about cropping pattern and better farm management. Clear guidance and advice was needed for practical and meaningful actions to draw positive results in the changed conditions. The agricultural community required capacity building and awareness to understand what was happening to their livelihoods, what the future risks would be, and how the impacts of climate could be tackled with new knowledge and technologies.

Local Factors: There were a number of enabling and local factors for effective implementation of LLA in the drought-prone area. These included local participatory planning with farmers, awareness creation and communication of risks; innovation and technology transfer (promotion of drought-tolerant varieties, mini-pond for water conservation, cropping diversity and integrated farming), purposeful engagement of project staff, training and capacity building, and institutional support from line agencies such as BADC and BARI, which provided seeds of drought-tolerant rice and vegetables along with fertilizers.

The DAE disseminated essential knowledge about new technologies for water management in an intensifying drought condition. It worked closely with farmers to share knowledge and build their capacity to understand climate change related variables, and respond to the change with new technologies such as drought-tolerant crops and integrated farming. In line with that, it worked on developing field schools and climate schools for farmers which later became self-sustaining clubs dedicated to sharing of knowledge and technologies. The DAE utilized the workshop programs in these schools to train the farmers and their female family members, who also play a significant role in crop and seed management, food security, family health and nutrition.

Participatory discussions with the farming community were therefore key to understanding indigenous knowledge. This process of knowledge sharing helped the implementing agency to identify primary issues resulting from the impacts of climate change, and disseminate proper scientific information and technologies needed for an effective agricultural solution. Availability of resources was one of the important determinants for effective implementation of adaptation techniques. DAE, the implementing agency in this case, continues to seek resources such as scientific information, relevant technologies, drought-tolerant seeds, fertilizers, financial support, and human resources to implement the project successfully.

The farmers shared their everyday experiences of dealing with temperature rise or late arrival of the winter, but they could not clearly understand why the changes were taking place. The DAE gave them a clear insight into their current and future environmental and climatic surroundings, and they were able to understand why existing farming practices were failing despite their hard work. They were also able to see the rationale behind changing the cropping patterns to ensure soil health for the following seasons. Subsequently, they shifted from the traditional variety of rice to alternative crops such as wheat, lentils, and chickpeas.

Sharing of technologies and blending of scientific and indigenous knowledge were the key determinants for ensuring successful adaptation in agriculture, water, and farm management. The advancement of cropping technologies on the basis of scientific innovation and participatory research provided strong support for adapting to changes. However, it was also crucial to gain a thorough understanding of indigenous knowledge that the farmers have been relying upon for centuries. Adjustments were made

in the cropping patterns by combining scientific information with existing knowledge. This resulted in better management of crops as the farmers understood how the new information could be used along with their existing practices.

Local institution and capacity building of farmers through field schools and clubs linked with government departments to access information; community interest in gaining new skills for integrated farming and water management in the intensifying drought conditions, and introduction of new crops were important local determinants for effective LLA in the drought prone area.

External Factors: These included the expertise for assessing climate risks and vulnerability, development of local adaptation strategies with the help of FAO and Asian Disaster Preparedness Centre (ADPC) scientists, and mobilization of resources from FAO and CDMP-II projects. The national policy on environment and climate strategies (NAPA and BCCSAP) and support from government and donors were other important external factors. Independent monitoring and supervision of the project also helped to achieve the desired outcomes. Dissemination of information about climate change and adaptation through radio and TV also constituted key external factors for the project.

Common and Different Determinants of Local-level Adaptation

There were a number of common determinants of LLA in the two ecosystems. They included dissemination of right information, new knowledge, and promotion of awareness about climate change trends, its impacts, associated risks and vulnerability and adaptation needs. Affected communities in both the ecosystems took an active part in the LLA, which formed an important basis for effective planning and implementation of the two initiatives. Other common elements and determinants included participatory vulnerability and capacity assessment (PVCA), Local Adaptation Plan of Action (LAPA) and harmonization of local knowledge with external knowledge and technology.

However, there was a difference in biophysical and social determinants of LLA between two ecosystems. For example, frequency and intensity of floods and their impacts on the resource base, livelihood and infrastructure were the key determinants for local adaptation undertaken in the floodplain of the north and central parts of Bangladesh. The coastal Bangladesh faces a different set of climatic stresses, which include salinity, water-logging, cyclones, tidal surges and high tides.

Social determinants such as level of poverty, livelihood typologies and local institutional arrangement (formal and informal) also vary according to the ecosystem.

But community organizations (farmers' clubs in Nachole and CBOs in Shyamnagar), high level of participation by local actors in the face of disaster risks and need for collective action; new livelihood options; and local technological innovations such as water conservation in canals and mini-ponds, rainwater harvesting, and crab cultivation, can be considered common determinants, but in different local contexts.

EFFECTIVENESS OF LOCAL-LEVEL ADAPTATION

The effectiveness of the two adaptation initiatives can be assessed by analyzing whether or not the outcomes of the initiatives met their expressed objectives. The main objectives of the two adaptation projects were to enhance the adaptive capacity of the vulnerable communities and ecosystems to tackle climate change risks and vulnerability in the local contexts, and protect the lives and livelihoods of the common people. The key outcomes included rise in awareness and propagation of new knowledge, transfer of local innovation and technology, improvement in agricultural and farming systems, increase in farm productivity, enhancement of food and social security, capacity building of local institutions, promotion livelihoods of the poor and vulnerable community in the changed conditions, strengthening of DRR practice, and regeneration of ecosystem services.

The adaptation project implemented by Caritas resulted in good outcomes in terms of better awareness, social mobilization, motivation and local actions. The construction of Rainwater Harvesting and Purification System (RWHS), water conservation ponds and canals have improved ecological services and enhanced productivity in agriculture, fisheries and home-based vegetable growing, thereby

enhancing the livelihood potentials and outcomes in terms of availability and access to food, better heath and family wellbeing. The knowledge exchange, technology transfer leading to the introduction of saline-tolerant rice and local innovation also helped in protecting resources and enhancing productivity. They also helped in harnessing benefits from the changing environment through crab cultivation. All these efforts have improved the local livelihoods and reduced risk and vulnerability caused by climate change, natural disasters, environmental degradation, and other social factors.

These initiatives are an effective beginning of the adaptation process in the coastal villages, and their legacy lies in the continuation of efforts by the community, local actors and government. The project has played an important role in addressing extreme poverty by improving livelihoods and economic status of the poor and marginalized people. It has also addressed health issues caused by the intrusion of saline water, and raised awareness about the importance of plantation and preservation of the Sundarbans' ecosystem among the youth and their families. There has also been an improvement in infrastructure with the construction of embankments and excavation of ponds and canals to allow non-saline water conservation for farming and household use.

Local innovative actions such as aquaculture were introduced on the basis of canal development for irrigation. This has significantly improved the lives of the people practicing aquaculture. Some of the farmers are working toward returning to the agriculture sector, while also remaining involved in crab farming. Despite being located in a remote and highly vulnerable area of the country, the multi-initiative livelihood programs are helping to raise the local community's economic status slowly but steadily. The initiative has motivated a number of community members to undertake crab-fattening programs, thus reducing the risks of financial hardship in the community. The livelihoods diversification promoted by this program has played a determining role for poverty reduction.

The project played a positive role in distributing improved varieties of seeds to the farmers besides providing start-up aid for crab fattening. Thanks to this small but meaningful support, the farmers are now producing good quantity of rice and crabs. The early warning systems and disaster preparedness have also built local capacity and resilience, thereby curtailing the level of risk and vulnerability among the coastal community.

In addition, the adaptation actions implemented by the DAE in the drought-prone Nachole resulted in a set of good outcomes in terms of awareness raising about climate change impacts, local capacity building, improvement of farming systems, increase in agricultural productivity and enhancement of ecosystems services. The climate change risk analysis of the drought-prone area has been worked out, and the project is working toward tackling the risks with successful implementation of a number of adaptation measures in its pilot phase. The actions that are being taken by the DAE have helped to reduce climate change risks among the community members, particularly the farmers and their families whose livelihoods were in jeopardy before the intervention.

The locals have been very enthusiastic about receiving technical support from the DAE. The farmers who attended the DAE farmers' school are benefitting from the knowledge and experience about adaptation that they have gained from the workshops. The DAE tackled the existing issues after consulting the locals about their needs and requirements, and is continuing to provide support to the farmers with regular visits to the community, which has played a strong role in the effective implementation of the adaptation techniques.

The soil fertility and quality has improved ever since DAE introduced multiple crops. The land, which had once became uncultivable due to drought, is now being used to grow paddy and wheat through effective adaptation measures. The DAE partnership with farmers in Nachole is exemplary, and worthy of being replicated in other parts of the country.

Further, continued scientific research and support to the farmers will ensure long-term effectiveness of adaptation strategies, and safeguarding of livelihoods in this drought-prone Barind Tract. Made more resilient by this project, the farmers are now self-sufficient in sharing and gathering knowledge, and utilizing it for better farm management. The farmers, who were able to produce better quality and quantity of grains, are sharing their seeds with their less-fortunate counterparts. The community

bonding has become stronger through the farmers' school, which is now sustaining itself through its alumni initiatives of turning it into a cooperative club for sharing knowledge.

DETERMINANTS LEADING TOWARD ACHIEVEMENT OF GREATER EFFECTIVENESS

All the determinants of LLA identified above were instrumental in planning and implementation of the two adaptation initiatives. The factors that led to the achievement of the objectives of the initiatives included participatory planning, research support, awareness raising and communication of climate risks, training and capacity building, knowledge creation, innovation and technology generation, resource transfer, and local institution building.

a. Participatory research (PR) and local planning: Both the Caritas and DAE projects invested a lot of their time and effort in PR and local planning, which helped the projects and the communities to understand risks and vulnerability in the contexts of salinity and drought. It also helped them to identify appropriate adaptation strategies and actions for agriculture, water management, afforestation, livelihood promotion and DRR. In the drought-prone upland, the DAE and FAO supported farmer-led action research for drought-resilient crops, water and farm management which increased agricultural productivity and ensured food security. BCAS and IIED provided research support to Caritas for conducting participatory vulnerability assessment (PVA) and local planning in the coastal ecosystems that resulted in the development of locally appropriate adaptation action plan, which was implemented by the communities, NGOs and local government.

b. Awareness creation and communication of climate risk: The PR generated a lot of information about local and regional-level climate change trends, risks and vulnerability faced by different categories of people, and the current coping and adaptation needs of the communities. The co-learning by the community, climate scientists and development practitioners improved awareness about climate risks at the community, local and regional levels, and engaged community and actors in adaptation and DRR related actions. Both the projects used popular communication tools (posters, leaflets and folk songs) for building awareness and communicating climate risks, which in turn resulted in community unity and collective actions to address climate change.

c. Training and capacity building: Both the projects provided orientation and capacity building trainings in climate-resilient agriculture, water and natural resources management (conservation of pond, canal digging for rainwater harvesting) and alternative livelihoods (crab farming in coastal villages) to farmers, women, vulnerable communities and local actors. The new skills and knowledge gained by the people helped them to increase their farm productivity besides promoting livelihoods, and regenerating ecosystem services, thus contributing to achieving the goals and objectives of the local adaptation initiatives.

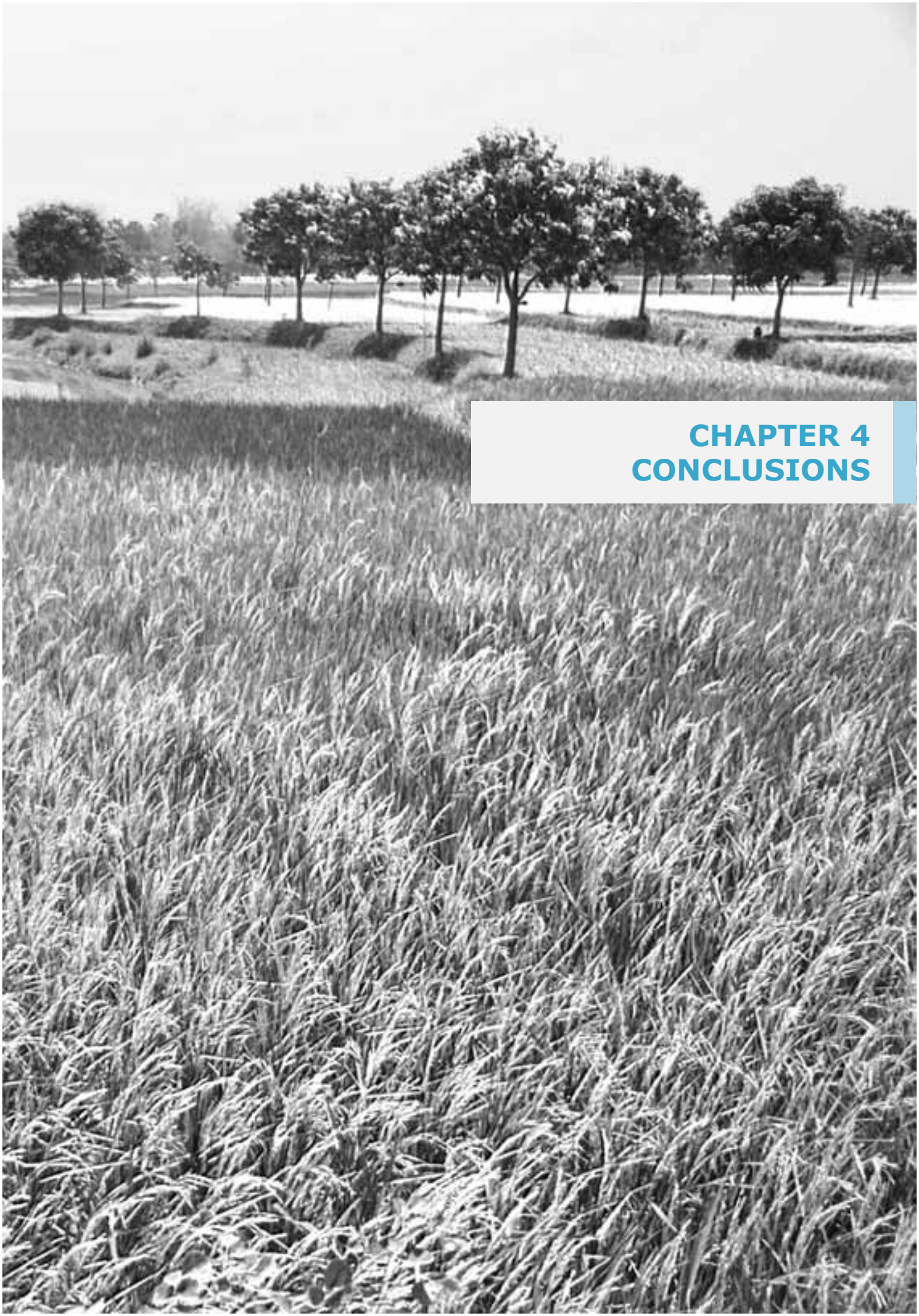
d. New knowledge, innovation and technology: The projects supported knowledge generation and dissemination, local innovation, and technology generation for drought and salinity-tolerant crops, cropping diversity and intensity considering the climate stresses in both initiatives. Only a few of the demonstrations were successful as adaptation activities are relatively new in both project sites. There is a great need for further R&D to improve the effectiveness of the demonstrated technologies and explore other options for irrigation management and livelihood improvement in view of the future climatic stresses and impacts. However, technology transfer and local innovations were more effective in drought-prone areas than in the coastal ecosystem, which has been degraded to a great extent due to salinity and frequent natural disasters. It was difficult to get higher yield from new varieties of rice in the coastal area.

e. Resources transfer: The initial resources allocation from FAO and government of Bangladesh for the DAE project was a great help in initiating the project in the drought-prone area. The donor support for the Caritas project was equally important for launching research and community action for local adaptation. Further resources are required to upscale the approaches and initiatives.

f. Local institution building: Efforts were made to build local institutions in both the projects. The farmers' schools and clubs were introduced and strengthened by DAE, while Caritas formed CBOs (Community-based Organization) to implement the activities at the local and community levels. The local organizations are also linked with government agencies and development organizations. They are now taking a lead in advancing local adaptation, natural resources conservation, DRR, and livelihood promotion of the poor and vulnerable groups.

g. Policy environment: National policy environment and climate change strategies were great external supports to the LLAs of both DAE and Caritas.

h. Monitoring and supervision: The DAE project staff observed that monitoring and supervision was extremely helpful for achieving higher levels of effectiveness. The Caritas project also followed a participatory M&E plan.



CHAPTER 4
CONCLUSIONS

The characteristics, types and forms of local adaptation depend primarily on climate stimuli and the level of vulnerability; who have to adapt (their knowledge, resources and technology base) and how do they adapt to the changes, and the policy environment of the country and the institutions concerned. Local adaptation actions are being carried out across the developing world (WRI et al, 2011 and UNFCCC, 2010), but on a limited scale. Adaptation varies across ecosystems and social systems, and so do its determinants as the adaptive capacity of the communities is related to the physical, economic, social, institutional and technological conditions that either facilitate or impede effective local adaptation. A complex mix of conditions and determinants may enable the community to adapt better. Policy and institutional support, knowledge and information dissemination, technological innovation and purposeful engagement of actors and stakeholders can enhance capacity and promote local adaptation. The effectiveness of LLA can be measured by assessing the key outcomes and results in relation to risks and vulnerability reduction, capacity and resilience building, and development outcomes.

Adaptation calls for a comprehensive and participatory approach, taking into account the nature and extent of the problems, causalities, and consequences. Hence, the following issues must be addressed in order to formulate and implement successful and more effective adaptation:

- Defining risk and vulnerability in the local and social contexts;
- Participation planning and engagement of local actors and local government institutes (LGIs) through Participatory Vulnerability Assessment (PVA) and LAPA;
- Capacity of the vulnerable communities and different actors and stakeholders for implementing LAPA;
- Improving coping by blending of local and external/scientific knowledge;
- Building resilience with short-term and long-term outcomes;
- Protection of resources, lives, and livelihoods;
- Effective synergies between adaptation, DRR, and development;
- Strengthening local institutional capacity and linkages with relevant actors;
- Enhancing social protection, safety net, and public services.
- Coordination among the actors and stakeholders; and
- Regular monitoring and supervision.

Adaptation is an evolving field, and many new but related issues are being included in the adaptation basket besides the conventional DRR, livelihood, development, and ecosystem management. Both qualitative and quantitative methods are required for measuring the effectiveness of local adaptation and understanding the various factors that determine it. There is a growing interest in using appropriate tools and methods for measuring the effectiveness of local adaptation.

The local contexts of the two initiatives are different as one relates to a coastal ecosystem, while the other concerns a drought-prone upland of Bangladesh. The adaptation strategies and actions were identified after considering the climatic factors, natural disasters, and the associated risks and vulnerability faced by the local communities, including small farmers, fishers, forest produce collectors, and women. The effectiveness of the two projects was determined by a set of common and diverse local determinants. Participatory planning, awareness raising and communication of climate risks, social mobilization and community interest, local capacity and institution building (farmers' clubs and CBOs); improvement in farm production and management of natural resources; and blending of scientific knowhow with indigenous knowledge were some of the common determinants that led to a greater level of effectiveness of the two local adaptation initiatives in Bangladesh.

A wide range of local and external factors were instrumental in the planning and implementation of the two adaptation initiatives with a few of them holding the key to achieving the goal, objectives and subsequent effectiveness of the initiatives. The key determinants, which had a greater impact, included participatory planning and research support, awareness and communication of climate risk, training and capacity building, knowledge sharing, innovation and technology generation, resources transfer, and local institution building. The effectiveness of the two adaptation initiatives was assessed mainly in terms of relevance, inputs, outputs and outcomes of the interventions after meeting the locals and the project staff. A more rigorous evaluation involving quantitative and qualitative approaches is needed to gauge the effectiveness and the cost–benefit analysis of the project interventions.

REFERENCES

Adger W N, Agrawal S, Mirza M M Q and Smit B (2007) Assessment of Adaptation Practices, Options, Constraints and Capacity, Working Group-II, AR4, IPCC, Cambridge University Press, UK

BCAS (2010) Local Capacity Building for Advancing Community Adaptation to Climate Change in Bangladesh. Project Brief, BCAS, Dhaka

BCAS and Caritas (2008) Field Reconnaissance Report, Enhancing Coping and Adaptation Capacity of the Coastal Community to Reduce Vulnerability to Climate Change Project, SSN, BCAS and Caritas Bangladesh Dhaka

Doria Miguel de Franca, Boyd E and Adger W N (2009) Using Expert Elicitation to define Successful Adaptation, ELSEVIER (Environmental, Science and Policy Journal), Oxford, UK

Duarte M (2007) Adapting to Climate Change: Understanding the Social Dimensions of Vulnerability and Resilience, Environment Matters, Annual Review (July 2006-June 2007); The World Bank

Haider S S (2012) Adaptation and Development: Perspectives from Bangladesh. Research Paper of BCAS, SEI and AKP, BCAS, Dhaka

Hassan A W R (2012) Case Study on Drought and Agriculture, Disaster and Climate Change Risk Management in Agriculture (DCCRMA) project document, Department of Agriculture (DAE), Khamar Bari, Farmgate, Dhaka

Huq S, Rahman A, Konate M, Sokona Y, and Reid H (2003) Mainstreaming Adaptation to Climate Change in Least Developed Countries. Policy Paper by IIED, BCAS and ENDA, Published by IIED, UK

IIED and BCAS (2011) Participatory and Monitoring and Evaluation for CBA. Project Briefing paper of ARCAB, BCAS, Dhaka

McGray H, Hammill A and Bradley R (2007) Weathering the Storm – Options for Framing Adaptation and Development, World Resources Institute, USA

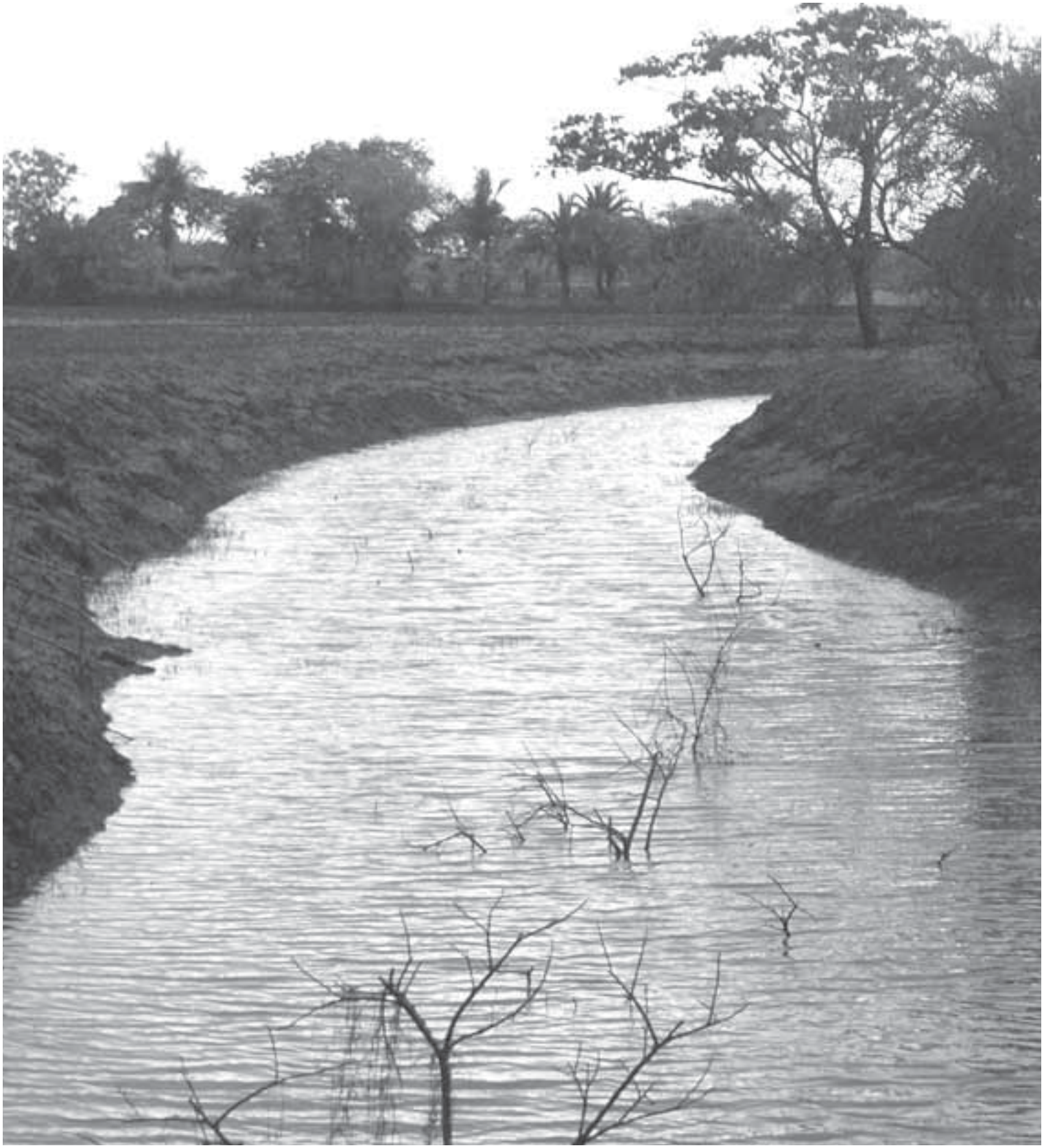
Smit B, Burton I, Challenger B, Huq S, Klein R and Yohe G (2001) Adaptation to Climate Change in the Context of Sustainable Development and Equity, in Third Assessment Report of IPCC, Cambridge University Press, UK

UNFCCC (2010) Synthesis report on efforts undertaken to monitor and evaluate the implementation of adaptation projects, policies and programmes and the costs and effectiveness of completed projects, policies and programmes, and views on lessons learned, good practices, gaps and needs, UNFCCC Subsidiary body for scientific and technological advice, Thirty-second session

WRI, UNDP, UNEP and World Bank (2011) Decision Making in a Changing Climate: Adaptation Challenges and Choices, WRI, Washington

ANNEX 1: LIST OF EXPERTS AND PROJECT STAFF INTERVIEWED

SL	Name	Affiliation
1	**Dr. Abu Wali Raghib Hassan** Project Director Disaster & Climate Risk Management in Agriculture	Department of Agricultural Extension Khamar Bari, Farmgate, Dhaka
2	**Dr. Mazharul Aziz** Deputy Project Director Disaster & Climate Risk Management in Agriculture	Department of Agricultural Extension Khamar Bari, Farmgate, Dhaka
3	**Dr. Anowara Begum Shelly** Director, Caritas Fisheries Program	Caritas Bangladesh
Discussions in Drought-prone Area of Chapai Nawabgonj		
4	**Md. Jahedul Haq** Upazila Agriculture Officer	Nachole, Chapai Nawabgonj
5	Climate Field School	Shibpur Shiala, Nachole
6	Shobdolpur village – Farmers' ICM Club	Shobdolpur, Sonaichandi, Nachole, Chapai Nawabgonj
7	Pump operator of Barindra Multi-purpose Development Authority (BMDA)	Shobdolpur, Nachole, Chapai Nawabgonj
Discussions in coastal area of Satkhira		
8	Project Implementation team, Mr. Shanjib, Mr Prashanta and Mr. Chandrashakhor	Munshigonj Unit Office, Caritas Bangladesh, Shymnagar, Satkhira
9	Dhankhali Registered Non Government Primary School Committee	Dhankhali, Shymnagar, Satkhira
10	Environment School Management Committee	Mothurapur village, Munshigonj, Shymnagar, Satkhira
11	Farmers of crab fattening in saline water bodies	Harinagar, Munshigonj, Shymnagar, Satkhira
12	Farmers Group of Saline Tolerant Agriculture and Aquaculture	Harinagar, Munshigonj, Shymnagar, Satkhira
13	Beneficiaries of canal re-excavation and conservation of freshwater for irrigation and fish culture	Shymnagar, Satkhira
14	Beneficiaries of pond re-excavation and installation of Pond Sand Filter	Kulltali village, Munshigonj, Shymnagar, Satkhira



Secretariat

Adaptation Knowledge Platform
Regional Resource Centre for Asia and the Pacific (RRC.AP)
Outreach Building, P.O. Box 4, Klong Luang
Pathumthani 12120, Thailand
Tel: +662 524 5386/5384;
Email: info@climateadapt.asia
Website: http://www.climateadapt.asia

October 2012
Photo credits : BCAS, 2012