UNCDF LoCAL
LOCAL CLIMATE ADAPTIVE LIVING FACILITY

ADAPTATION RESULTS

LoCAL in Bangladesh: 2013–2016

AN ASSESSMENT

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Acronyms

DoF	Department of Fisheries
FAO	Food and Agricultural Organization
FYM	Farmyard Manure
GDP	Gross Domestic Products
GHG	Green House Gas
HVC	High Value Crops
ICS	Improved Cooking Stoves
IGA	Income Generating Activities
IPCC	Intergovernmental Panel on Climate Change
IFM	Integrated Farm Management
LGI	Local Government Institute
LDP	Local Development Planning
NGO	Non-Government Organization
PRA	Participatory Rural Appraisal
SHLS	Solar Home Lighting System
SPV	Solar Photovoltaic
SNA	Sub-National Authority
T.Aman	Transplanted *Aman* (Local variety of Paddy)
Union	Lowest Tier of Rural Local Government
Upazila	Sub-District (Rural Local Government)
UZP	Upazila Parishad
UNO	Upazila Nirbahi Officer
UNFCCC	United Nations Framework Convention on Climate Change
UP	Union Parishad
UZP	Upazila Parishad
WARPO	Water Resources Planning Organization
WHO	World Health Organization
WB	World Bank

1 Introduction

The United Nations Capital Development Fund has supported a country pilot of its Local Climate Adaptive Living Facility (LoCAL) in Bangladesh since 2013. The pilot activities commenced with participatory climate change adaptation planning in two drought-prone upazilas[1] in north-west Bangladesh. The two upazila parishads (UZPs) were awarded performance-based climate resilience grants PBCRGs), which are the standard LoCAL instrument for financing the costs of climate change adaptation actions through local government budgets. The two UZPs used the PBCRG resources for priority climate-adaptive schemes, including infrastructure and services to build climate resilience in the most vulnerable sections of the local communities. The purpose of the pilot was to learn lessons and develop appropriate systems and procedures to facilitate scaling-up of the PBCRG, with the aim that all local governments in climate-vulnerable areas would be able to access this financing.

This report describes the achievements of the LoCAL pilot in Bangladesh including an assessment of the schemes implemented, taking into account discussions with scheme beneficiaries and other stakeholders. The report reflects on the experience and draws lessons to be applied in a second phase of LoCAL to be implemented at a somewthat larger scale.

[1] *The upazila, or sub-district, is the second lowest tier of rural local government in Bangladesh. Upazilas are sub-divided into unions. Each level is governed by a council known as the UZP/union parishad.*

2 Background

ABOUT LoCAL

According to a 2009 Organisation for Economic Co-operation and Development (OECD) guidance note and a 2010 multi-United Nations agency discussion note, there are three main reasons why local governments are key actors in climate change adaption and resilience building:

- Climate change adaption falls within their core mandate and responsibilities. Historically, local governments have been mandated with land use planning, environmental and construction regulation, and investments in infrastructure, including irrigation and drainage and defense from natural hazards. These activities are fundamental to climate change adaption and in building community resilience.
- Climate change adaption responses differ from place to place and are highly context sensitive. Local governments are well positioned to understand the diversity and complexity of local ecosystems as well as the needs and priorities of local communities. Even large-scale investments require complementary actions at the local level to become fully effective.
- Climate change adaption requires effective coordination between various stakeholders with different mandates and interests. Local governments have the legitimacy and convening power to coordinate, co-finance and interact with stakeholders including national-level institutions, civil society bodies, the private sector and various local government departments. Yet there is strong evidence that most local governments in least developed countries (LDCs) are unable to contribute effectively to climate change adaptation and resilience building due to an inability to absorb the incremental costs of climate change adaptation, a lack of appropriate budgetary allocations from the national level, a lack of financing for revenue generating private and public-private adaptation actions at the local level, and the fact that the main sources of climate finance are often only available to and accessed through application to national programmes.

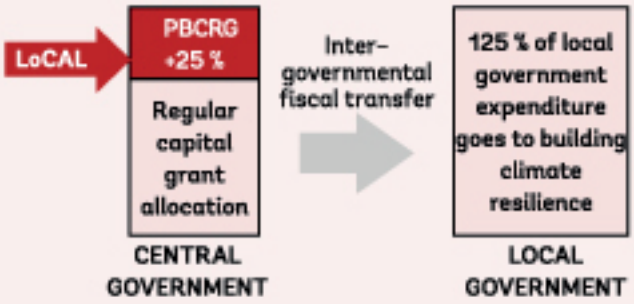
LoCAL objectives and results

LoCAL was initiated to provide a mechanism to enable the mainstreaming of climate change adaption into local government planning and budgeting systems, increase awareness and response to climate change at the local level, and increase the amount of finance available to local governments for climate change adaption.

LoCAL operates through **performance based climate resilience grants** that ensure programming and verification of climate change expenditures at the local level. It uses the demonstration of its effect to trigger further flows for local adaptation (see Figure 1), including national fiscal transfers and access to global climate finance for local governments (through their national governments) and for private sector and public-private adaptation initiatives.

LoCAL's development goal is to promote climate change resilient communities and economies by increasing financing for and investment in climate change adaptation at the local level in least developed countries.

FIGURE 1: **The LoCAL approach**



Its outcome is increased local government access to climate finance to implement climate change adaptation activities in target countries by mainstreaming climate change adaptation into local government planning and budgeting systems, increasing the awareness of and response to climate change at the local level, and increasing the amount of climate change adaptation finance available to local governments and local economies.

LoCAL is built upon two decades of UNCDF experience in these areas of work and with performance-based grants, from which the lessons learned have been captured. LoCAL applies the UNCDF core approach to local development finance this is to mobilize, allocate, invest and make accountable increased resource flows to the local level for sustainable, inclusive and equitable local development in this case, characterized by resilience to climate change.

LoCAL's three phases

LoCAL operates through three phases.

■ Phase I involves initial scoping, followed by testing in a small number (two to three) of local governments. Phase I is usually financed directly with global project seed capital and has a budget of less than USD 250,000. It can include co-financing from government or other partners. Phase I introduces the PBCRG over one or two fiscal cycles; it tests the minimum conditions and performance measures of the PBCRG and the relevance of the investment menu (eligible adaptation measures). It provides the necessary experience and lessons for refinement of the approach and the design of Phase II in conjunction with the appropriate national authorities and partners.

■ Phase II takes place in around 5–10 per cent of local governments (at the appropriate tier) in a country. Phase II is usually financed by UNCDF together with financing partners and has a budget of up to USD 5 million. This funding can come directly through the LoCAL project or from parallel financing, if government or other development partners make resources available to the LoCAL methodology. The purpose of this phase is to demonstrate LoCAL effectiveness and create the conditions for a full national rollout of the approach.

■ Phase III is full national rollout of the PBCRG in the country based on the results and lessons of the previous phases. It is gradually extended to all local governments (at the appropriate tier). Phase III is expected to be financed by central government through a re-adjustment of the architecture of existing resources to enable financing of local adaptation; as well as through financing from international organizations, financing institutions and funds such as the Green Climate Fund.

In Phase III, LoCAL becomes the national system for channeling adaptation finance to the local level. Ideally, all sub-national administrations can access climate change adaption financing based on vulnerability. Financing will be from a variety of sources including multilateral funds, bilateral donors, national domestic revenues and revenues assigned to the sub-national administration. The private sector is expected to play an increasingly important role. This may require adaptation of national policies and planning guidelines (for both climate change and decentralization), as well as integrating climate change adaptation into the budgeting and intergovernmental fiscal transfer system (budgeting guidelines, operating manuals, budget coding) and national and local monitoring systems. UNCDF's role will shift from financing agency to provider of technical assistance, support and quality assurance. A long-term capacity-building and institutional strengthening programme may be required (see Box 1).

BANGLADESH AND CLIMATE CHANGE

Bangladesh has a land area of 144,000 square kilometers and is located in the northern tropical belt between latitudes 20° and 27°N, and longitudes 88° and 93°E[3]. With a population of about 164 million, Bangladesh is one of the most densely populated large countries in the world. The location of the country at the head of the Bay of Bengal and to the south of the Himalaya mountain range has profound impacts on its climate. The majority of the territory is low lying about 60 per cent of the land area is within a 5-metre elevation above sea level and consists largely of the floodplains and deltaic deposits of three major rivers: the Brahmaputra (Jamuna), the Ganges (Padma) and the Meghna. These rivers have a combined peak discharge of 180,000 cubic meters/second and carry about 2 billion tones of sediment each year.

Bangladesh has a tropical monsoon climate with a mild winter from October to March a hot, humid summer from March to June; and a rainy season from June to October. The annual mean temperature is about 26°C across most of the country. Annual average rainfall varies from 1,500 millimeters in Rajshahi to 2,150 millimeters in central Dhaka; it rises near the eastern border to 2,900 millimeters in the south-east at Chittagong and 4,200 millimeters in the north-east at Sylhet. About 70 per cent of this rainfall occurs during the monsoon season.

About 53 per cent of Bangladesh is arable land, and a further 6 per cent is planted with trees or other perennial crops. The most important crops are rice followed by potatoes, jute, wheat and maize. Agriculture accounts for about 20 per cent of the country's gross domestic product (GDP), but about 60 per cent of the population depends directly or indirectly on agriculture for their livelihoods.

Bangladesh can be divided into four broad climatic and ecological zones: the river floodplains, the coastal zones, the wetlands and the drought-prone Barind Tract areas. Table 2.1 summarizes key country data.

BOX 1 : **Climate-resilient LoCAL communities**

LoCAL helps communities address their climate vulnerabilities. Investments are identified through participatory processes and co-financed by the budget resources of the local government. Common types of investment include:

- Water for agriculture, preventing crop losses in drought-prone areas
- Flood-resilient transport infrastructure
- Climate-smart agriculture extension: training farmers to adopt resilient seed varieties and cropping systems to reduce climate risk
- Household level energy and health security
- Co-management of agro-aquatice resources
- Model climate resilient household development
- Model climate resilient community development

[3] *The data in this section are drawn from the CIA World Factbook (http://www.ciaworldfactbook.us/), Wikipedia, the Bangladesh Climate Change Strategy and Action Plan, the UK Meteorological Office*

TABLE 1: Selected Country Data From UNFCCC Country Brief 2014

Item	Amount	Global rank	Global share (%)
Carbon dioxide (CO2) emissions from fuel combustion (2012)[a]	59.6 Mt CO^2 eq.	51	0.19
Population (2013)[b]	156.59 Million	8	2.20
Per capita carbon dioxide emissions (2012)[a]	0.39 t CO^2	123	
GDP size, based on purchasing power parity (2013)[b]		39	0.39
GDP size, based on exchange rates (2013)[b]		58	0.17
UNDP Human Development Index (2013)[c]		146	
GDP structure (2013)[b]	Agriculture: 17%, industry: 29% services: 54%		
Share of GDP (2013)[b]	Imports: 31%,exports: 23%		

Note : a – International Energy Agency (IEA); b – World Bank, World Development Indicators; c – United Nations Development Programme, Human Development Indicators;
[**Source:** Emissions Database for Global Atmospheric Research (EDGAR), This Country Brief was generated on: 25/09/2015]

Charcteristics of rural communities and disaster vulnerability

Bangladesh is widely recognized to be one of the world's most vulnerable countries to climate hazards under existing climate conditions (i.e. before the effects of climate change). Major natural disasters, including floods, cyclones and to a lesser extent droughts, can cause a devastating loss of life and damage to property, crops and infrastructure. Conversely, Bangladesh is noted among the least developed countries for its high level of disaster preparedness. Extreme climate events in recent years have caused much lower numbers of deaths than similar events typically caused in earlier decades.

About 72 per cent of Bangladesh's population lives in rural areas. Due to the very high population density, shortages of land and of assets such as drinking water are a problem in many areas. For this reason, the poorest and most marginalized members of the community are often forced to live in sites which are vulnerable to flooding and to farm the most marginal land thus increasing their vulnerability to climate risks (see Box 2 and Table 2)

Rural livelihoods mainly involve farming and fishing, together with remitted income from the domestic urban sector and from the large numbers of Bangladeshis working overseas, particularly in the Middle Eastern states.

Floods

Much of Bangladesh is subject to flooding from rivers (floodwaters flowing downstream from the Himalayan Mountains), local rainstorms, tidal flooding during storms in coastal areas or a combination of these factors. Flash floods can also be a problem in the country's hilly south-eastern area. In an average year, about one-quarter of Bangladesh is inundated; once every four to five years, a major flood affects over 60 per cent of the country. The most extreme event in recent years occurred in 2007 and affected about 13.7 million people and caused over 1,000 deaths in Bangladesh, with widespread damage also occurring in neighboring countries.

In addition to their immediate effects, river floods and coastal storm surges cause erosion and loss of residential and agricultural land on a large scale. River floods also cause new land to be created, the shifting 'char' river islands

BOX 2 : Multiple climate issues in a rural *upazila*

Bholahat Upazila in the Nawabganj District of north-west Bangladesh is a relatively remote area on the Indian border. The population consists mainly of farm households; the most important crops are rice and mango. The area is naturally drought-prone. Water shortages have been exacerbated by water extraction from a dam constructed on the upstream Indian section of the Mohananda River and probably by excessive pumping of groundwater for irrigation. Groundwater levels are falling rapidly, and the local people are worried that in as little as 5–10 years, they could face severe water shortages. The arsenic content in the groundwater is also a serious problem in this area.

The local residents have observed increased drought and the delayed arrival of the harvest season and of the monsoon. Unusual weather patterns have favoured insect attacks on the rice crop; in turn, this has led to excessive use of unregulated pesticides, causing environmental problems. Mango farmers have experienced a death of trees and fruit falling before it is ripe; it is believed that this is associated with unusually hot weather. The local residents do not fully understand the reasons for climate change, but believe it may be associated with smoke from brick kilns or even emissions from mobile telephone masts.

Bholahat is affected by flooding as well as drought, and severe floods can occur when the gates on the Indian dam are opened. The most severe event of this type occurred in 1998, which flooded the whole area.

which become homes and farmland for some of Bangladesh's poorest communities.

Tropical cyclones and storm surges

Tropical cyclones of high intensity can affect Bangladesh either early (April and May) or late in the wet season (September to November). During these storms, wind speeds can exceed 200 kilometers per hour and accompany intense precipitation. Severe damage to coastal communities can occur, especially when the cyclone is combined with a high tide. The narrowing of the Bay of Bengal at the northern end amplifies the storm surge. For this reason, storm surges in Bangladesh are more severe than in neighboring countries and can reach seven meters height (see Box 3).

Droughts

Droughts can occur due to failure of the monsoon rains and can particularly affect the relatively dry north-western part of the country. One such event occurred in 2010 when seasonal rainfall was about 19 per cent less than the long-term average.

Causes of drought in Bangladesh are related to climate variability and non-availability of surface water resources. The immediate cause of a rainfall shortage may be due to one or more factors including absence of moisture in the atmosphere or large-scale downward movement of air within the atmosphere which suppresses rainfall. Changes in such factors involve changes in local, regional and global weather and climate. While it may be possible to indicate the immediate cause of a drought in a particular location, it often is not possible to identify an underlying cause.

BOX 3: Tropical Cyclone Sidr

Tropical Cyclone Sidr reached Bangladesh on 15 November 2007 as a Category 4 storm, bringing torrential rains and wind speeds of up to 240 kilometers per hour, according to the World Meteorological Organization. The storm developed near the Andaman Islands in the Bay of Bengal and is regarded as the worst to hit Bangladesh since 1991. The number of fatalities resulting from Sidr is reported to be 4,234 with nearly 9 million people affected in total (Scheuren et al., 2007). Cyclone Sidr came after months of repeated floods — the result of one of the worst monsoon seasons Bangladesh had experienced in years.

SOURCE: UK Meteorological Office.

TABLE 2: **Summary of principal climate risks to Bangladesh rural communities**

Climatic Hazards	Trend	Extent geographical areas	Return Period with large scale damage	Impact
Fluvial/Riverine Floods	Fluvial/riverine Floods occurs in every year	Adjacent areas of major river	Approximately 10/12 years	Almost 80% of the total area of the country is prone to flooding
Flash Floods	Occurs mainly in beginning of the monsoon season	North-west, north, north-east and hill areas of Bangladesh	Yearly phenomena	Damage crops and livelihoods assets
Cyclones and Storm Surges	Tropical cyclones hits 2-3 times in a decade	South and south-eastern parts of the country	Return period of category 4 type cyclone approximately 15-20 Years	Extensive damage to coastal in frastructure's and livelihood
Drought /hot spells	Common phenomena	Drought concentrating mainly in north-western Barind tract region	Major droughts occurred in Bangladesh are 1951, 1957, 1958, 1961, 1972, 1975, 1979, 1981, 1982, 1984 and 1989.	Slow on-set disaster but largely impact agriculture and livelihood
Cold spells	Common phenomena	North, North-East, North-Western Part of Bangladesh	In 5-7 years	Damage and disturbs crops and livelihoods

Short-term drought episodes can be linked to global atmospheric and oceanic circulation features. For example, the El Nino/southern oscillation (ENSO) phenomenon, which results from development of warm surface water off the Pacific coast of South America, affects the levels of rainfall in many parts of the world, including monsoon rainfall in Bangladesh. On a larger scale, the link between sea surface temperature and rainfall has been suggested as a possible cause of long, dry regimes. Increasing levels of carbon dioxide and other greenhouse gasses have been suggested as causes of rainfall changes, which are, in turn, attributed as climate change. There is strong evidence that climate change will alter the rainfall pattern and as a result more frequent droughts are expected. Among the local-level causes are human-induced changes resulting from vegetation loss due to over exploitation of resources and deforestation.

The north-western regions of Bangladesh are particularly vulnerable to droughts. A strong drought can cause greater than 40 per cent damage to broadcast *aus (paddy)*. During the *kharif* season, it causes significant destruction to the transplanted *aman (paddy)* crop, affecting approximately 2.32 million hectares every year. In the *rabi (crop)* season, about 1.2 million hectares of agricultural land face droughts of varying magnitudes. Apart from the agricultural loss, droughts have important effects on livestock populations, land degradation, health and employment.

Bangladesh is at higher risk from droughts. Between 1949 and 1991, droughts occurred in Bangladesh 24 times. Very severe droughts hit the country in 1951, 1957, 1958, 1961, 1972, 1975, 1979, 1981, 1982, 1984 and 1989. Past droughts have typically affected about 47% area of the country and 53% of the population (WARPO, 2005).

Climate trends

Since 1960, the climate of Bangladesh has become warmer. This trend is observed in both the hot season (March to May) and the cool season (December to February). This trend is slightly greater during the cool season at than in the hot season 0.24°C per decade versus 0.19°C per decade. There has been a reduction in the number of cool nights and an increase in the number of warm nights, though the corresponding trends for cool and warm days are less clear. There has been a small but significant increase in precipitation overall.

Climate change projections

It is predicted that average temperatures in Bangladesh could increase by between 3° and 3.5°C by 2100; Table 2.3 provides alternative projections. Precipitation is projected to increase by up to 20 per cent in the north of the country and by 5–10 per cent in the rest of the country[3].

Heavier and more erratic rainfall during the monsoon season is likely to cause increased flooding associated with over-topping of embankments, river bank erosion and increased sedimentation in riverbeds. This problem could be exacerbated in the short to medium term by the melting of the Himalaya glaciers. Once the glaciers have fully melted, river flows would reduce and saline intrusion would increase.

Sea level rise will have a severe impact on Bangladesh. It is estimated that a 1-metre rise in sea level would cause inundation of about 10 per cent of the land area. Sea level rise is associated with increased vulnerability to storm surges and increased salinization of cropland and groundwater in coastal areas. Sea level rise will also cause severe damage to the Sundarbans mangrove forest, which is a World Heritage site.

Areas of Bangladesh that are already drought prone will be further affected. Winter and pre-monsoon temperatures will rise significantly. The following consequences are possible, as outlined by the Bangladesh Climate Change Cell in its 2006 training materials : a sharp rise in evapotranspiration and diminishing rainfall will further reduce available flows in rivers. As a result, salinity will penetrate inland, restricting crop planting choices. Also, lowering of rainfall runoff will either limit irrigation or put increased economic constraints on the already poor farmers. Increased surface temperature will lead to a release of more carbon from the topsoil; this in turn will reduce soil fertility. Increased water demand for irrigation will lead to withdrawals from already meagre surface water systems, further decreasing lean season flow in the rivers. An additional quarter of a million hectares of land will be affected by salinity, on top of the 3.05 million hectares already affected. This will force farmers to grow crops of economically lesser returns.

The impact of climate change on the frequency and severity of cyclones is less clear. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) foresees increasingly frequent and severe storms, but the UK Meteorological Office cautions that there is a high degree of uncertainty surrounding these predictions. There is no such uncertainty regarding the vulnerability of coastal areas to the effects of cyclones; these will become more

[3] *UK Meteorological Office, based on A1B emissions scenario*

TABLE 3: **Global circulation model estimates of temperature and precipitation changes in Bangladesh.**

Year	Temperature change (°C) mean (Standard deviation)			Rainfall change (%) mean (Standard deviation)		
	Annual	DJF	JJA	Annual	DJF	JJA
Baseline average	-	-	-	2278 mm	33.7 mm	1343.7
2030	1.0 (0.11)	1.1 (0.18)	0.8 (0.16)	3.8 (2.30)	-1.2(12.56)	+4.7 (3.17)
2050	1.4 (0.16)	1.6 (0.26)	1.1 (0.23)	+5.6 (3.33)	-1.7(18.15)	+6.8 (4.58)
2100	2.4 (0.28)	2.7 (0.46)	1.9 (0.40)	+9.7(5.8)	-3.0(31.6)	+11.8 (7.97)

Note: December, January and February (DJF) represents the months of December, January and February, usually the winter months. JJA represents the months of June, July and August, the monsoon months. **Source:** Agrawala et al., 2003.

severe due to sea level rise as well as due to increasing population, making it more difficult to live and farm in the country's most vulnerable locations.

Government of Bangladesh policy response

In 2008, the country prepared the Bangladesh Climate Change Strategy and Action Plan, which was revised in 2009. The BCCSAP outlines the following six key pillars under which Bangladesh planned to undertake 37 climate change action programmes during 2009–2013, requiring an investment portfolio of USD 5 billion:

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

The BCCSAP states that 'the needs of the poor and vulnerable, including women and children, will be mainstreamed in all activities'. It identifies priority actions for climate change adaptation, many of which fall within the capacity and mandate of local governments to implement.

3 The Bangladesh Pilot Phase of LoCAL

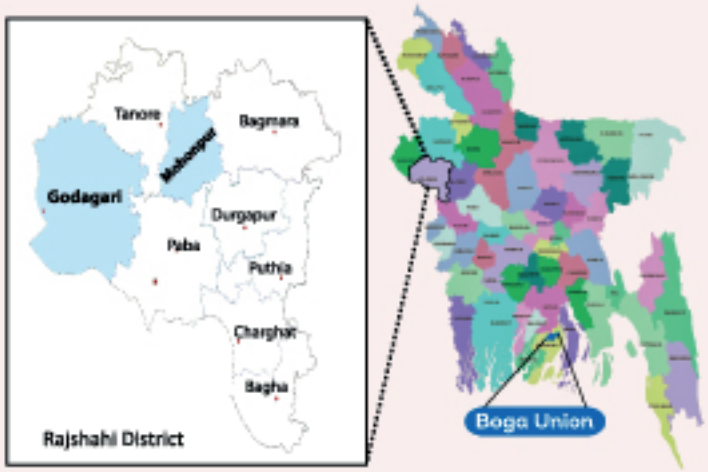
The Bangladesh country pilot of LoCAL was implemented by the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MLGRDC). Implementation of the pilot began in May 2014.The first PBCRG were transferred to the budgets of the Upazila Parishads (UZP) of Godagari and Mohanpur Upazilas in financial year 2015-16.

TARGET AREAS

Godagari Upazila and Mohanpur Upazila, both in Rajshahi District in northwest Bangladesh, were selected as the first areas for pilot of the LoCAL methodology in the country (see figure 2). These Upazila, were identified as being highly vulnerable to drought and having significant numbers of poor, marginalized and climate vulnerable households and communities. In addition to drought which is a general problem in these areas, communities located close to the Ganges river are subject to seasonal flooding and vulnerable to loss of agriculture land and even displacement due to riverine erosion.

Godagari is largely within the raised terrace of old alluvium known as the Barind tract. Mohanpur lies outside the main Barind tract but shares characteristics of low rainfall and relatively elevated land, which reduces surface water availability. The selection of these two Upazila was made based on consideration of the climate vulnerability of these areas but also taking into consideration that the problems of drought receives less attention than other climate hazards from agencies implementing climate change adaptation programmes in Bangladesh.

FIGURE 2: **LoCAL Phase I target areas**



Hence, while areas vulnerable to cyclone and sea-level rise receive considerable support for adaptation, the selected LoCAL pilot areas enjoy rather little alternative or pre-existing sources of finance for climate change adaptation.

IMPLEMENTATION PROCESS

Activities at the Upazila level began with worshops conducted on 21st July 2014 In Godagari and on

FIGURE 3: **The Barind Tract**

22nd July 2014 in Mohonpur. These workshops initiated a planning process which was conducted primarily through the Upazila Development Coordinating Committee (UDCC). This important committee is chaired by the Chair of the Upazila Parishad and brings together representatives of Upazila level technical departments, together with representatives of the Union Parishads. Through discussions in this committee, climate change related threats were assessed, priorities for climate adaptation actions were agreed and potential schemes for financing from the PBCRG resources were identified.

With assistance from LoCAL, each Upazila prepared a five-year Climate Change Adaptation Plan. Schemes were identified and designs prepared during the 2014-15 financial year, with implementation responsibilities for each scheme assigned either to a Union Parishad or to a technical department in most cases.

The PBCRG awards (see Table 4) were approved in the 2015-16 financial year budgets of the UZP. Funds were transferred through the Local Government Division (LGD) of the Ministry of Local Government, Rural Development and Cooperatives (MoLGRDC) to bank accounts operated by the UZP. In some cases the lower tier Union Parishad (UP) were selected as the implementing agency for the schemes; in the case that the implementing agency was the UP, the UZP then advanced funds to the bank account of the UP.

SCHEMES

The UZP identified a total of 301 (21 types) small size schemes, effectively completed by the end of June 2016. LoCAL in Bangladesh serves directly 4,776 and indirectly 523,504 beneficiaries. A summary of the schemes is presented in table 4. The most common type of scheme particularly in Godagari was integrated interventions based around rehabilitation of ponds serving poor, marginalized and landless communities. Other type of scheme includes model resilient drought tolerant high value cropping and household and community development, organic fertilizer production. The circumstances of the beneficiaries varied in some cases, the beneficiaries has been recently

TABLE 4: **Bangladesh target areas, population and PBCRG awards**

Target Areas, Population and PBCRG Awards			
Upazila	**# Unions**	**# Population**	**PBCR Grant Award (USD) 2015-16**
Godagari	9	330,924	126,017
Mohonpur	6	170,021	112,505
Bauphal (Boga Union)	1	22,559	25,478
			TOTAL: 264,000

TABLE 5: **Summary of PBCRG-financed schemes in Bangladesh**

Godagari Upazila, Rajshahi		
Scheme Type	Type of Beneficiaries	No. of schemes
Integrated schemes for marginal communities centered on pond construction/rehabilitation	Poor/Marginalized communities with no land, including ethnic minorities	6
Climate resilient and rice equivalent yielding and crop diversification	Marginal farmers	20
Climate resilient high value croppings, crop intensification (intercropping)	Marginal farmers	5
Climate adaptive (drought tolerant) seedling and sapling	Marginal farmers	1
Renewable Energy	Climate vulnerable households	65
Organic fertilizer production and women headed entrepreneurship development	Women entrepreneurs	20
Community drinking water supply with Solar photovoltaic pump	Remote community	1
Fodder seed stock production (Napier Grass) for livestock	Livestock farmers	13
Model climate resilient community development	Remote community	1
cliamte resilient model household development	Remote households	10
Sub-total for Godagari		142

Mohonpur Upazila, Rajshahi		
Scheme Type	Type of Beneficiaries	No. of schemes
Integrated schemes for marginal communities centered on pond construction/rehabilitation	Poor/marginalized indigenous communities with no land, including ethnic minorities	1
Renewable energy (Co-digestion type biogas digester for domestic cooking and sanitation)	Climate vulnerable remote rural households	40
Climate adaptive (drought tolerant) seedling and sapling	Marginal farmer	2
Fish sanctuary development & increasing native variety of fish stocks	Fishermen community	4
Climate resilient high value croppings, crop intensification (intercropping)	Marginal farmer	1
Farmyard manure (FYM) production	Marginal farmer	45
Fodder seed stock production (Napier grass) for livestock	Livestock farmer	20
Vermicomposting organic fertilizer production	Women entrepreneur	10
Stack layer homestead organic farming	Women headed rural household	2
Renewable energy (Solar PV water pumping for community access to drinking water)	Climate vulnerable remote community	2
Rainwater harvesting	Remote climate vulnerable community	5
Agro-aquatic resources co-management	Marginal farmer, fishermen community	2
Community access to drinking water	Climate vulnerable remote community	12
Capacity building	Marginal farmer, fishermen community	10
Sub-total for Mohonpur		156

Boga Union, Bauphal Upazila, Patuakhali		
Scheme Type	Type of Beneficiaries	No. of schemes
Social afforestation scheme along the coastal embankment	Coastal community	2
Excavation silted canal for retention of rain water, aquaculture	Fermars	1
Sub-total for Boga Union		3

displaced by climate-related events such as river erosion; in one scheme, the beneficiaries were an ethnic minority community that had been long established at the location but enjoyed no formal individual land rights. The set of interventions varied from scheme to scheme, but mainly included re-excavation or improvement of a communal pond, fish stocking, development of vegetable and/or tree crops around the perimeter of the pond and formation of a community group or cooperative to manage the scheme including managing the proceeds of the fish harvest. Formation of a cooperative has the additional benefit of strengthening the land rights of the community although this will not extend to creation of formal, transferable titles.

Second group of scheme type involved demonstration of various climate-resilient or water-efficient agriculture techniques. These schemes included green sheds for seedling production, demonstration of inter-cropping of tree and annual crops, etc. Two types of organic fertilizer production (vermicompost and farmyard manure) were supported; the vermicompost* demonstration succeeded in creating aviable small enterprise for demonstration to (woman) farmer, who was able to sell the product as an input to the locally important betel leaf production. Renewable energy interventions included co-digestion (animal dung & human excreta) domestic biogas plant installtion for energy and health security, model climate resilient household, model resilient community development for sustainable living.

A community solar power (centralized PV grid) scheme and bio-digesters for cliamte induced displaced community sheltering on the river bank.

Table 5 is more detail on some of the main schemes; further information is provided in fact sheets in Annex 3 and Annex 4.

BOX 4: **Case study — integrated community based adaptation scheme**

The re-excavation of a pond in Godagari has allowed 39 climate-displaced community access to public resources. The pond is used both for water and as a fish farm. A vegetable plot and field school support farmers in raising additional income from multi-crop farming.

'Now I don't have to worry about the floods, my son can go back to school and I can even earn some income from selling the vegetables', noted Mrs Jasmine

Benificiary, Napitpara, Godagari Upazila; photo © C. Jancloes/ LoCAL-UNCDF

*Vermicompost is produced through digestion of cow dung by a suitable species of worm. In association with these schemes, beneficiaries have been encouraged to switch from traditional use of cow dung as a cooking fuel to other alternatives, using improved stove designs.

Integrated schemes

The PBCRG schemes have been welcomed by the beneficiaries. Majority of PBCRG funds were used to support vulnerable communities facing complex difficulties resulting from poverty, insecure livelihoods and lack of access to land and water. In some communities, this vulnerability was associated with or increased by the ethnic minority status of the beneficiaries. Women in particular suffer from economic insecurity, loss of land and home caused by climate events, and the burden of collecting water from distant points (see Box 4). The integrated schemes assisted the communities with water supplies (based on pond improvements) and income generating activities (vegetable production and aquaculture) while building social capital through the formation of cooperative groups to manage the schemes.

Climate-resilient agriculture

A number of climate-resilient agriculture demonstrations were implemented in cooperation with the department of agriculture extension in each upazila. The scheme types included the following.

- **Integrated farming of drought-tolerant crops suitable for the low-rainfall Barind Tract areas.** These schemes were designed to assist local farmers in switching from environmentally degrading traditional agriculture to less irrigation-dependent, diversified cropping of high-value crops.

- **Green shed demonstrations.** Green sheds create controlled, water-efficient environments for production of seeds and seedlings which are then sold to other farmers for market-driven vegetable production. The sheds are used to make drought-tolerant varieties available to local farmers and are facilitating a shift from seasonal to year-round production.

- **Agroforestry (guava) production for water management.** Using this technique, crops are planted in between rows of guava trees. The farmers benefit in terms of the guava produce but also gain improved shade and reduced evaporation loss in the production of the crops (see Box 5).

- **Napier grass.** The Livestock Department of Mohanpur helped develop a demonstration and seed production plot for Napier grass, which is a highly sustainable fodder crop suitable for cattle farmers with limited land. Napier grass is a high-yield, year around fodder crop that can be grown in combination with legumes. It is simple to cultivate, and local farmers are developing their own Napier grass plots using seed from the demonstration plot.

Organic fertilizer production (vermicompost, manure)

Agricultural soils in Bangladesh generally and in the Barind Tract in particular have relatively low organic content. This reduces the soil fertility and water-holding capacity, in turn necessitating th use of larger amounts of scarce water to grow crops. Unsustainable agriculture practices including the over-use of chemical fertilizer are leading to further degradation of soil quality. Using naturally produced organic fertilizer can improve soil fertility and improve the efficiency of water use. Two types of organic fertilizer production have been demonstrated with poor and vulnerable farmers using LoCAL funds.

- Farmyard manure is produced by farmers using animal dung and suitable locally available plant matter including water hyacinth. The manure is produced in a specially constructed pit with two chambers: composting takes place in one chamber while ready-to-use compost is stored in the other, ensuring a continuous supply.

- Vermicompost is produced from cow dung using specially selected earthworms in a dark

BOX 5:**Case study — guava intercropping**

A drought-resistant crop is being tested in Panch para Village, Godagari Upazila. Thai guava is being planted on a 1.4-hectare plot of land to demonstrate to local farmers how it is possible to grow high-value crops that do not rely heavily on water while maintaining good soil quality.

Eggplans, green chillies with Guava plantation, Mohanpur Upagila: photo©Sajjad/ LoCAL-UNCDF

environment. The resulting compost is a valuable cash product; it is in particular demand in betel leaf production, which is an important local economic activity. Vermicompost production is thus a suitable cash-generating activity for women farmers. The scheme interventions including construction of a shed for vermicompost production. It is also possible to use shaded areas in or under existing structures. Because cow dung is traditionally used for cooking fuel, the schemes also included promotion of improved cooking stoves and the use of alternative fuels including locally available sticks and leaves. Fumes from traditional cooking stoves cause respiratory problems, so the schemes are expected to produce additional benefits for women's health.

Renewable energy (solar, bio-digester, integrated climate-resilient households)

The schemes selected for PBCRG funding include a number of demonstrations of renewable energy technologies (RET). While RET is not inherently climate-adaptive (and the reduction in greenhouse gas emissions expected would be small) there is a strong climate change adaptation logic in that access to a clean, sustainable energy supply with low recurrent costs increases the opportunities for poor and vulnerable households to save cash, save time on activities such as fuel collection and undertake additional livelihood or educational activities (for example, increased opportunity for children to study using solar electric lighting). Only one such scheme has been implemented, a community solar electric scheme (see box 3.3).

Other good schemes include demonstration of bio-digesters which produce cooking gas from fermentation of animal dung and human excreta and also produce a valuable bio-slurry fertiliser as residue model. some model schemes are demonstration of "climate resilient households" integrating bio-digesters, rainwater harvesting facility, farmyard manure, stack-layer organic gardening, aquaculture, solar PV home system as, aquaculture etc.

BOX 6: **Solar electric scheme**

Thirteen families are now connected to a central community solar grid in Nimtola Village, Godagari Upazila. The communities engaged in climate adaptation in their own way and set up a maintenance fund for centralized solar PV system (battery, loads, panel).

Solar photovoltaic grid, Godagari Upagila; photo © C. Jancloes/ LoCAL-UNCDF

Fisheries demonstration

Freshwater fish production from wild capture and aquaculture is an important component of Bangladesh agricultural economy and food security, with about 58 per cent of total protein intake deriving from this source. Fish stocks and, in particular, native species are under pressure from over-exploitation, reduced natural habitats and the effects of climate change. The integrated community climate resilience schemes included community fishery activities, together with other measures as described above. Some schemes implemented in Mohonpur (Annexure–I) provides strategic support to fisheries production by creating a refuge for the culture of endangered native fish species, together with associated demonstrations of integrated farm management.

ASSESSMENT

Implementation of the PBCRG schemes has demonstrated the capacity of local authorities to identify appropriate schemes promoting climate adaptation in poor and vulnerable communities, and to implement the schemes to a high standard.

Each upazila prepared a climate change adaptation plan through a structured series of workshops and meetings with the participation of local communities, UPs and technical departments at the upazila level. In all, eight technical departments were involved in the planning and execution of PBCRG-financed schemes under the leadership of the UNO[5].

The close cooperation between the technical departments and local governments including mobilizing the technical expertise of the departments to support schemes implemented by the UPs is one of the major strengths of the pilot. Moreover, Implementation of the schemes has helped build social capital (through community groups and cooperatives for operation and maintenance), which is a valuable additional gain for community climate resilience.

The intention of the LoCAL pilot was to test and demonstrate a mechanism that is capable of being scaled up, potentially to all climate vulnerable local authorities nationwide. It is not always the case that what works at a small scale will work at a large scale. In the LoCAL approach which mobilizes the capacity and mandate of local authorities for climate change adaptation, appropriate interventions should be those that are within the mandate and technical capacity of local authorities and do not raise complex governance issues. For this reason, PBCRGs are intended primarily to finance public infrastructure and related services. The majority of schemes (and the great majority of spending as a proportion of the PBCRGs) in the Bangladesh pilot are clearly within this category. There may be a need to exercise care in regard to schemes that provide significantly valuable private goods to a limited number of individual households (for example, bio-digesters). Good development practice is to finance such interventions through a combination of loans and subsidies rather than outright grants, but this level of complexity is difficult to support through PBCRGs. Large benefits to selected households may also create perceptions of unfairness, with negative impacts for the programme as a whole.

Climate change adaptive benefits can be direct (e.g. directly reducing the risk of impacts from climate events such as floods or droughts) or indirect (improving the economic security of vulnerable households). Hence, a wide range of interventions in support of poor and climate vulnerable communities can justly be claimed as contributing to climate resilience. It is important that, for any given scheme, there is a clear rationale of the expected climate change adaptive benefits. Other types of benefits including environmental conservation and greenhouse gas emissions reduction are not in themselves a sufficient justification for use of PBCRG funds on a scheme.

Overall, the investments have strongly prioritized the poorest and most climate vulnerable sections of the community with sustainable strategies to help them overcome their most pressing climate-related problems and improve their livelihoods in a resilient, sustainable manner.

[5] *Upazila Nirbahi Officer (often abbreviated UNO is the chief executive of an upazila (sub-district) and a junior-level officer of the Bangladesh Civil Service (Administration Cadre)*

CHALLENGES ENCOUNTERED IN IMPLEMENTATION

The LoCAL pilots transferred grants to the upazilas, which comprise the second tier of local government. The results of the pilot demonstrate the advantages gained from access to the technical capacity existing at the upazila level. A second advantage is that the entire upazila becomes the planning space in which highest priority needs can be identified and larger schemes selected as compared to a situation in which grants are distributed evenly to each union within the upazila. However, this approach also caused difficulties because the PBCRGs are relatively small compared with other resources available at the upazila level; in fact, they are too small to be suitable for truly strategic infrastructure schemes at that level. In contrast, the UPs have the advantage of being closer and more directly accountable to the target communities. The UPs give high priority to implementation of PBCRG schemes, as the resources are of significant size compared to their other budgetary resources.

Implementation of the LoCAL pilot was disrupted and sometimes delayed by changes in responsible government officials, both in local government and at the central level. This problem could be more acute once LoCAL is scaled up and thus does not benefit from intensive support from UNCDF.

The time for implementation proved to be quite long, because the government procedures for planning, fiscal transfer and execution of schemes are time-consuming and sometimes cumbersome. Coordination among the different technical departments (engineering, agriculture, public health, etc) can also be challenging, as there is no clear existing framework within which to effectively integrate the efforts of these agencies.

There are relatively little data available on local-level climate trends and climate change impacts at the local level. This makes the process of identifying the highest-priority climate change challenges and appropriate adaptation measures problematic.

Although the challenge posed by climaterelated hazards is familiar in Bangladesh, effective long-term planning for climate change adaptation requires new knowledge, new skills and a new approach. Establishing this capacity is a time-consuming process much more so than the mere construction of physical infrastructure, which can be accomplished quite quickly. LoCAL is designed to facilitate long-term change, so it is expected that difficulties will be encountered in the early stages of piloting the methodology.

4 Way forward

The LoCAL pilot phase in Bangladesh has successfully demonstrated the potential for local governments to take an important role in climate change adaptation. Further, it has tested systems and generated useful knowledge and insights to inform the design of the second phase.

The Government of Bangladesh should therefore proceed with UNCDF to design Phase II of LoCAL. As described above, Phase II represents a modest scale-up to around 5–10 per cent of local authorities nationally, typically using funding mobilized by UNCDF from bilateral partners. Successful implementation of this phase is expected to lead to Phase III full scale-up, with funding mobilized by the national government in about three years.

Target areas for Phase II should be selected based on their vulnerability to climate change. For continuity, it is highly desirable (although not absolutely essential) for the Phase I pilot local authorities to be included in Phase II. Given the range of climate threats faced by vulnerable rural communities in Bangladesh, it may also be appropriate to include areas threatened by flood and/or coastal zone hazards such as cyclones and saline intrusion.

In the pilot phase, PBCRGs were granted directly to the second-tier UZPs. The lower-tier UPs are represented on the UZPs and actively participated in the planning and implementation of PBCRG schemes. There are a number of advantages to targeting the grants to the UZPs, including the opportunity to select the highest priorities from within a larger planning space, the possibility of implementing larger projects and the stronger technical capacity at the UZP level. However, during implementation, it was found that the small size of the PBCRG compared with other resources available at the upazila level meant that authorities at this level did not see PBCRG scheme implementation as a priority; in fact, implementation responsibilities for a number of schemes were assigned to UPs. The UPs have better knowledge about local-level climate vulnerabilities and the needs of vulnerable communities. They also have considerable experience in implementing small scale infrastructure schemes.

Overall, the involvement of both the UZP and UP levels is considered a notable strength of the pilot and should be maintained in Phase II. This could be done through either of two options:

- The PBCRG is awarded to the UZP, making the upazila the planning space, but implementation responsibilities are assigned to the UP level in areas where priority schemes are selected.

- The PBCRG is awarded to the UP (either all the UPs in an upazila or a particular union could be selected based on vulnerability criteria), but the UZP has the. coordinating role and strong arrangements are in place for technical assistance from upazila-level technical departments.

The size of the PBCRGs in Phase II should be linked to the general budget resources of the

local governments. The PBCRGs should be large enough as to be significant in relation to non-earmarked resources, but not so large as to dominate. If a UP is the grantee, it is suggested that the size of the PBCRG be from 25–50 per cent of the UP general-purpose basic block grant.

Minimum conditions should be applied to the PBCRGs. In the first year of implementation, the minimum conditions should be similar to those applied in the pilot phase i.e. satisfactory audit report and completion of the climate change adaptation planning steps. In subsequent years, additional conditions should be applied to grant awards and to the actual release of funds based on achievement of at least a minimum required score in the performance assessment and disbursement of at least a minimum acceptable percentage of the previous year's grant allocation.

Local governments in Bangladesh are subject to annual performance assessments in relation to their basic block grant allocations. The additional performance assessment for LoCAL should not be a separate exercise, but rather should consist of a set of supplementary assessment criteria applied to local authorities receiving PBCRGs. The supplementary criteria should focus on **(i)** performance in implementation of PBCRG-financed activities, and **(ii)** demonstrated readiness and capacity for planning and implementation of climate change adaptation.

Eligible expenditures of the PBCRG should be limited to public or community infrastructure and services. This can include supporting some household-level installations where these are part of a community system (e.g. the household connections of a community solar electric scheme) or limited private goods for demonstration purposes (e.g. agriculture inputs).

Large household-level installations such as bio-digesters should not be directly financed by LoCAL. The reasons for this limitation are that **(i)** the role and mandate of local governments are primarily for public services; **(ii)** programmes for provision of private goods need more complex procedures, safeguards and capacity to ensure that targeting is equitable and transparent; **(iii)** the number of beneficiaries who can be assisted by private goods schemes is likely to be small; and **(iv)** there is a reputational risk in that if targeting is not perceived to be fair and transparent, or if jealousies are created, there could be serious negative impacts on LoCAL as a whole.

The design of the LoCAL pilot called for schemes to be co-financed by local governments using their discretionary resources with the PBCRG used as a top-up. Conceptually, the base costs of development activities are financed by regular budget resources (i.e. the basic block grant) with PBCRGs used to pay the incremental costs arising from the need to adapt to climate change. This approach is applied successfully in other LoCAL countries, but was not applied in the pilot phase in Bangladesh. It is recommended that cofinancing requirements be retained as part of the system but need not apply to all types of schemes. Generally, where a PBCRG is used to pay the climate-proofing costs of general infrastructure (e.g. roads, school buildings), co-financing should apply. Where a PBCRG is used for schemes that directly address climate vulnerabilities particularly for poor and vulnerable communities there should be flexibility for 100 per cent financing, although co-financing should be actively encouraged.

Annexes

ANNEX 1: CLIMATE CHANGE ADAPTATION IN LOCAL GOVERNMENT PLANNING

Capacity development of Local Governments in climate-smart local development planning (LDP) process :

UNCDF LoCAL attempts to create turnaround trajectories over to self-esteemed LGI's bottom-up and climate smart inclusive planning mechanism targeting to achieve Sustainable Development Goals (SDG) by the local level actors. Typically, rural LGIs in Bangladesh highly decentralized but less instrumental in integrated planning. Fundamentally, LoCAL in Bangladesh established new paradigm of climate-smart five year planning, and corresponding budgeting framework, immediate sector-wise climate resilience socio-economic development priorities, investment plan, micro-level procurement process, probable sources of finances, indicative resource mobilization gaps and allocation of locally generated revenues to mainstream resilience/adaptive activities.

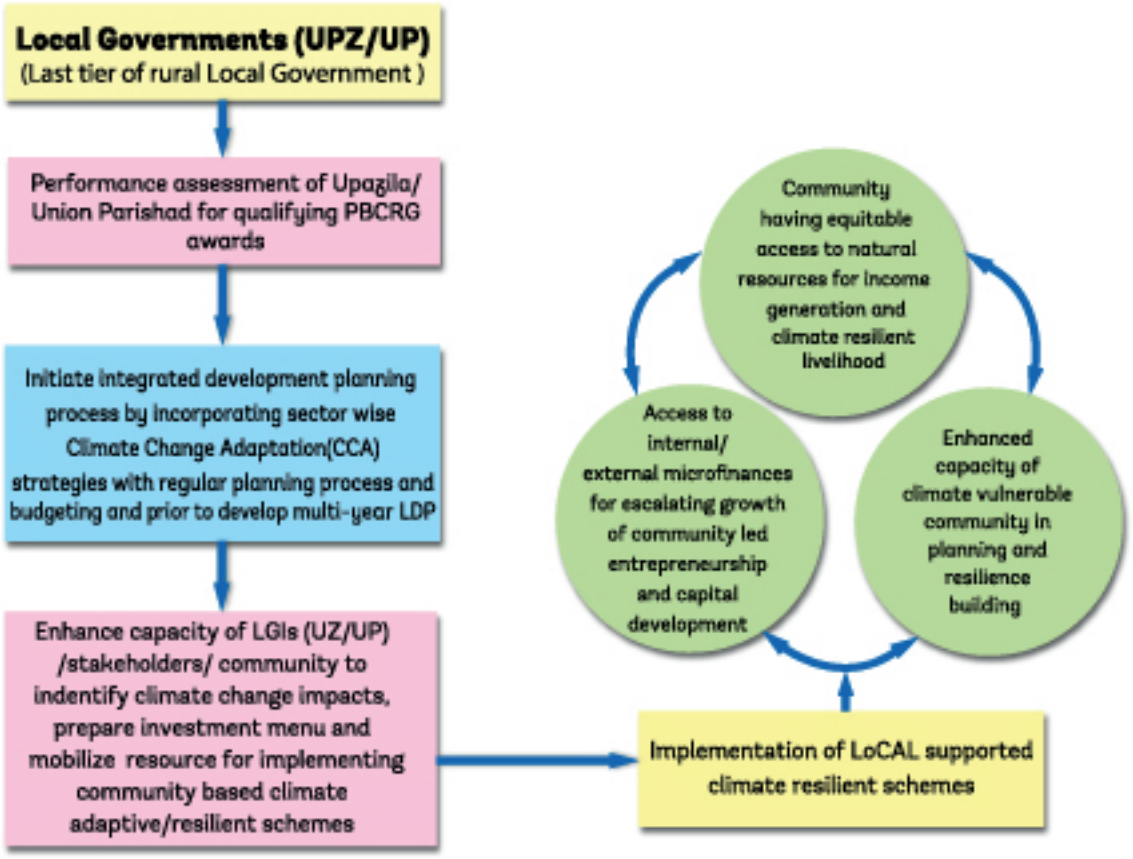


Figure : LoCAL implementation mechanism in Bangladesh

CCA integrated Five year Development Planning Process initiated by Upazila by placing Climate Change issues at centre level

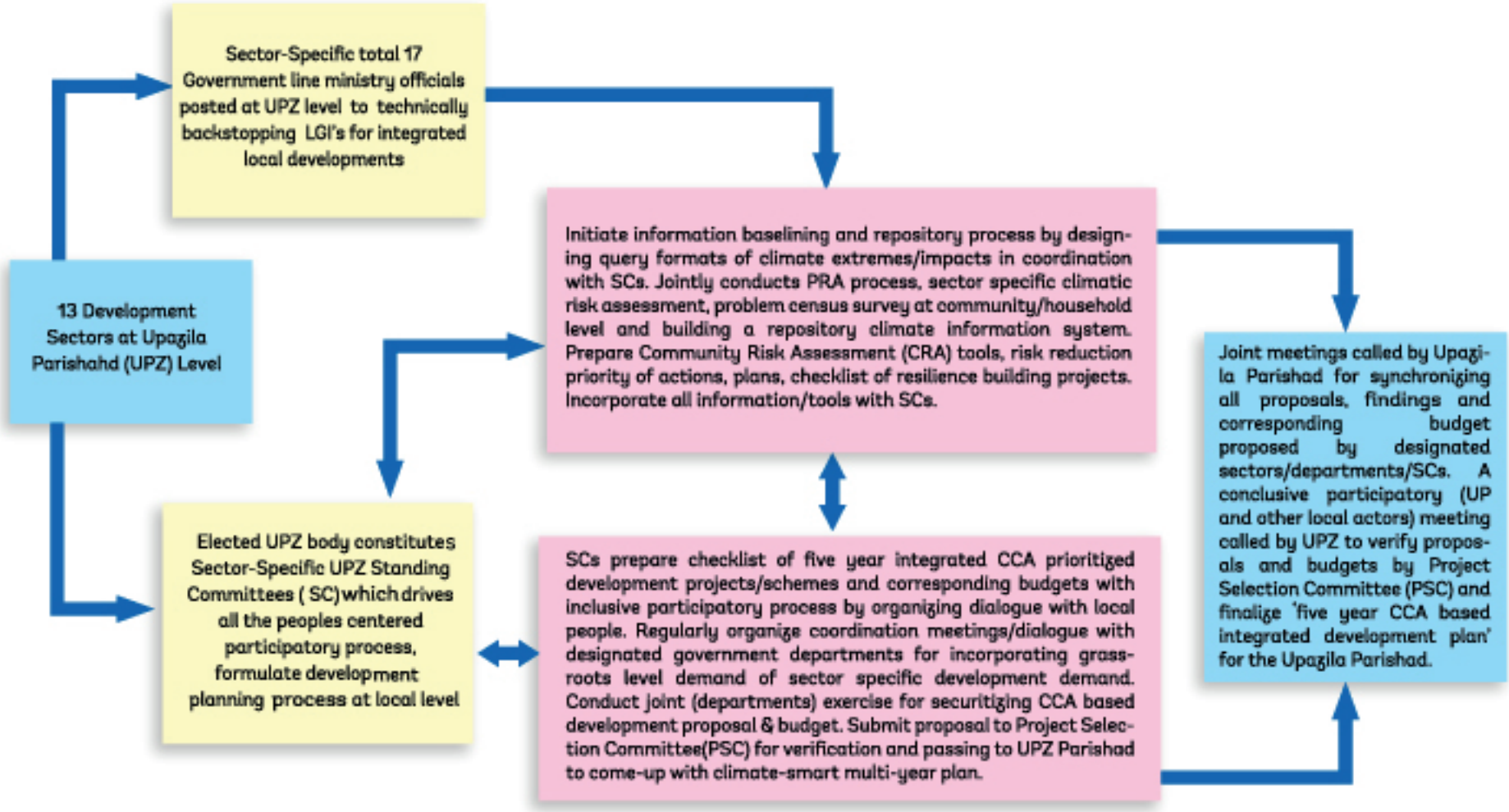


Figure: Climate Change Adaptation Five year planing process

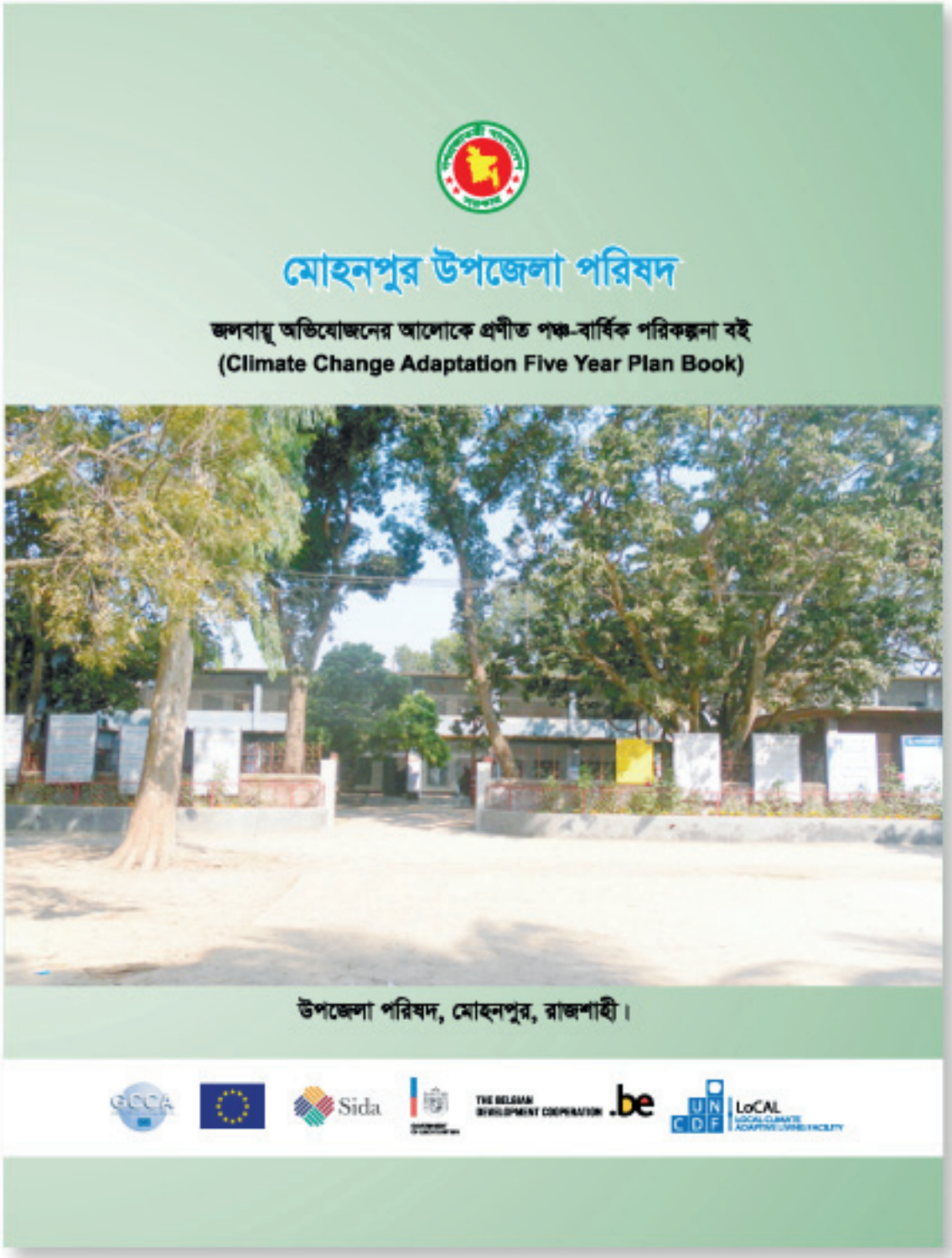


Figure : Climate Change Adaptation Plan book published for Mohonpur and Godagari Upazila

ANNEX 2: LoCAL INVESTMENT BENEFITS

LoCAL investment	Investment Benefits
Installation of co-digestion biogas digester for household energy, health, food security and sustainable uses of biomass resources.	LoCAL pilot demonstration of co-digestion biogas digester providing clean energy for domestic cooking. This clean energy sources contributory for limiting indoor air pollution and deforestation in the locality. Households of the locality already are encouraged to install this facility.
Surface Water Management and Integrated Farm Management (IFM).	Regular physical infrastructures rehabilitation/reconstruction programmes of Upagila Parishads are being diversified and scaled-up with LoCAL top-up. LoCAL supported water retention and associated integrated farm management (IFM) schemes provided livelihood support to hundreds of climate vulnerable household in drought prone Barind Tract.
Community based reserved sanctuaries developed in Mohonpur Upagila for increasing native varieties of fish stocks.	Reserved sanctuaries are increasing native variety (endangered species) of fish stocks.
Women empowerment through farmyard vermicomposting organic fertilizer production.	Women headed vermicomposting organic manure production created social entrepreneurships. Its highly contributory to improving soil health, boosting production of cash crop (betel leaf) and popularizing organic farming in the drought hit areas.
Green shed-cum agri-nurseries development.	Climate friendly green shed facilitates seed bed preparation. Seedling and sapling largely facilitating crop diversification and drought tolerant cropping in the locality.
Farmyard manure (FYM) production for drought resilient agro-ecology development.	FYM production facility encouraged farm families for production of bio-fertilizer from household biomass resources. Understanding of farmers about the importance of organic fertilizer in enriching soil organic matter (OM) and water holding capacity. FYM contributed to drought resistance farming and high yielding in the drought affected areas.
Climate resilient model rural household development.	Vulnerable remote rural households have been supported to absorb local climatic shocks. The components of model resilient household includes; co-digestion type biogas digester rainwater harvesting facility, excavation mini-pond/dug-well for water retention, farmyard manure production, vertical stack-layer organic vegetable farming, solar home lighting etc. Hundreds of household in the locality are being encouraged to replicate the model.
Renewable energy options for climate victim community (Community Solar PV Grid & biogas digester) displaced along the Padma riverside.	Home lighting from community Solar PV grid system (capacity 800wp) and domestic biogas based cooking facility provides incentives to households to drives other household based income generating activities.
Model climate resilient community development.	An isolated remote community in Barind tract area (Godagari Upagila) has been made climate resilient. The components of model resilient community includes; 4.5 cubic meter co-digestion type biogas digester, rainwater harvesting facility, excavation mini-pond for water retention and aquaculture, farmyard manure production facility, homestead vertical stack layer organic vegetable farming, seedling/sapling facility, solar home lighting system etc. The model community demonstrates capacity on how to become resilient by harnessing own resources.
Demonstration of drought tolerant, less irrigation dependent and vertically expanding (double) cropping (in barren land).	Hundreds of farm families are encourage to cropping intensification, diversification and drought tolerant varieties of cropping.

LoCAL investment	Investment Benefits
Cultivation of climate resilient and environmentally friendly Napier Grass for livestock.	The pilot demonstration plots of Napier grass production encouraged farm families of the locality. Lots of farmer planted drought resistant Napier grass for round the year feeding of livestock.
Community mobilization for co-management of agro-aquatic resources.	Encourages farm family for co-management of their agro-ecological resources. LoCAL supported community (e.g. in a floodplain zone having around 50 acres of land which belongs to eight farmers) for commercially fish farming during rainy season and cash crop farming in dry season for capital development.
Capacity enhancement training imparted to farm families for climate resilience practice.	• Enhanced capacity of farm family on High Value Crops (HVC) farming, • Enhanced capacity fishermen community on aqua/fish culture, culturing native fish species , increasing native varieties of fish stock and capacity enhancement for sustainable management of fish pond, • Enhanced capacity rural women in developing vermicomposting entrepreneurship, management of biogas plant and slurry , efficient biomass uses.
Rain water harvesting facility and community access to safe drinking water in drought affected areas.	Social awareness about rainwater harvesting. Solar PV/ electrical powered water access points providing safe drinking water in drought affected remote communities.
Drought Tolerant Agroforestry Development (Guava Cultivation).	Agroforestry demonstration plots developed for sustainable land management, cultivating minimum water consuming all varieties of seasonal crops as intercropping pattern for high yielding, cropping intensity and rotation. The intercropped agro-forestry automatically improves soil health by nitrogen fixation and enrichment of nutrient cycle, which is supportive for building agro-ecological resiliencies to climate change.
Homestead based vertical stack layer organic vegetable cultivation for round the year food security.	LoCAL incentives for exclusive homestead land use plan and sustainable practices to develop vertically expanding (vertically stack layer agriculture) organic vegetable farming for round the year vegetable production. Vermicomposting organic fertilizer uses for growing organic vegetables in a hanging and vertically stack layer system. In each layer different types of vegetable are being cultivated. This system does work in any given climatic conditions and resilient. Pilot demonstration encouraged other farmers in the locality.
Social afforestation.	Coastal community are encouraged to social afforestation with plantation of fruit bearing, medical and other deep rooted trees over the dam for surge protection and erosion control.

ANNEX 3: SCHEME OVERVIEWS

Full List of Schemes: Godagari Upazila

Union/Village	Name of Scheme / Investment / Adaptation measure	Beneficiaries	Sectors
Village : Napit para Union : Deopara.	Enhance community adaptive capacity to climate change by re-excavation of pond for surface water and integrated farm management (IFM), fish culture.	Climate induced internally displaced landless peoples.	Agriculture & Irrigation , Fisheries & Livestock, Rural Development & Cooperative.
Agalpur Cluster village Mouza - Agalpur, Union – Gogram.	Strengthening adaptive capacity of cluster community against localized drought by excavation of pond for retention of surface water, fish culture and IFM.	Climate induced internally displaced landless peoples living at Cluster village.	Agriculture & Irrigation , Fisheries & Livestock, Rural Development & Cooperative.
Village : Babu Dyeing Union : Mohonour.	Strengthening adaptive capacity of indigenous community against localized drought by re-excavating pond for retention of surface water, fish culture and IFM.	Climate induced internally displaced landless peoples.	Agriculture & Irrigation , Fisheries & Livestock, Rural Development & Cooperative.
Village : Thakur Joubon Union : Mohonour , Upazila : Godagari.	Strengthening capacity of indigenous cluster community to localized drought by re-excavating pond for retention of surface water, fish culture and IFM.	Climate induced internally displaced landless peoples.	Agriculture & Irrigation , Fisheries & Livestock, Rural Development & Cooperative.
Village: Chandlai , Union : Mohanpur.	Enhance adaptive capacity of landless community to climate change by surface water and IFM.	Climate victim landless indigenous households.	Agriculture & Irrigation,Fisheries & Livestock, Rural Development & Cooperative.
All Union of Godagari Upazila.	Demonstration of drought tolerant, minor irrigation depending and vertically expanding (double) cropping's (30 plots in barren land) e.g. country bean @ 40 plots, taro-stolons@22 plots, okra/ladies Finger@20 Plots, Gourd (bottle/sweet) @ 40 Plots, Moringa@20 plots).	Marginal/poor farmers.	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative.
Village : Digram, Union : Mohanpur, Upazila : Godagari.	Development GREEN SHED for climate tolerant seedling / sapling, pilot demonstration of off-season vegetables and high value crop demonstration.	Marginal/poor farmers.	Agriculture & Irrigation.
Village : Nimtola, Union : Deopara, Upazila : Godagari.	Renewable energy option for livelihood adaptability of vulnerable communities to climate change (community solar PV grid system for lighting and biogas plant for cooking).	Climate vulnerable communities living on the bank of Padma.	Physical Infrastructures & Communications, Fisheries & Livestock, Rural Development & Cooperative.
Village : Parulia, Union : Mohanpur, Upazila : Godagari.	Enhance resilience of climate induced displaced and isolated indigenous community to climate change.	Climate induced internally displaced landless 14 households.	Fisheries & Livestock, Rural Development & Cooperative.

Full List of Schemes: Godagari Upazila

Union/Village	Name of Scheme / Investment / Adaptation measure	Beneficiaries	Sectors
All union of Godagari	Empowerment (women)and community based climate adaptive green entrepreneurship development (vermicomposting, homestead organic farming).	20 women headed entrepreneurs.	Fisheries & Livestock, Rural Development & Cooperative.
Union : Mohonpur Union : Gogram, Union : Deopara	Releasing fish fingerlings to community ponds.	Community ponds at Napit Para, Agalpur, Parulia , Thakur Joubon, Chandlai Khoribona, Boliadangi Asrayan.	Fisheries & Livestock, Rural Development & Cooperative.
Matikata Union Upazila, Upazila : Godagari	Solar PV pumping with overhead tank water supply to around 18 households.	Drought affected remote community.	Rural Development & Cooperative.
All over Godagari Upazila	Drought tolerant agroforestry development (Guava Cultivation).	Marginal farmers.	Agriculture & Irrigation, Rural Development & Cooperative.
Village : Balikahati, Union : Mohonpur, Upazila : Godagari	Balikahati model climate resilient community development.	Remote and isolated rural community.	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative, Physical Infrastructures.
Union : Gogram, Union : Matikata, Union : Rishikul, Union : Deopara Union : Godagari	Climate resilient model rural household development for ensuring livelihood, food & energy security.	Climate victim remote individual rural households in Gogadari Upazila.	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative.
All over Godagari Upazila	Cultivation of Napier Grass, drought tolerant green fodder for Livestock.	Farm Family.	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative.

Full List of Schemes: Mohonpur Upazila

Location Union/Village	Name of Scheme / Investment / Adaptation measure	Beneficiaries	Sectors
Village : Jhalpukur Union : Gashigram, Upazila : Mohonpur	Enhance adaptive capacity of indigenous community to climate change with construction of water retention structure for surface water, IFM, aquaculture & pisciculture.	Ethnic indegenous households.	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative, Physical Infrastructures.
All over Mohonpur Upazila	Farmyard based vermicomposting organic fertilizer production and green women headed entrepreneurship development.	Women entrepreneurs.	Fisheries & Livestock, Rural Development & Cooperative, Agriculture & Irrigation.
Village : Mallikpur Union: Dhuroil	Development GREEN SHED for drought tolerant seed bed preparation and off-season cropping.	Marginal farmers.	Agriculture & Irrigation, Rural Development & Cooperative, Physical Infrastructures & Communications.

Full List of Schemes: Mohonpur Upazila

Union/Village	Name of Scheme / Investment / Adaptation measure	Beneficiaries	Sectors
Mohonpur Upazila Parishad Complex	Climate Resilient Fisheries Eco-pond /Sanctuaries Development, Culturing Endangered Native Fish Species and Integrated Farm Management (IFM).	Farm Family	Fisheries & Livestock, Agriculture & Irrigation , Rural Development & Cooperative, Physical Infrastructures & Communications.
Village : Khoyra, Union : Mougachhi,	Development GREEN SHED for drought tolerant Seed bed preparation and off-season cropping.	Female headed farmers community	Agriculture & Irrigation, Rural Development & Cooperative, Physical Infrastructures & Communications.
Village : Panchpara Union : Dhuroil	Agro-Forestry (HVC) development to demonstrate efficient water management techniques (Guava Cultivation).	Farmers	Agriculture & Irrigation, Rural Development & Cooperative.
All over Mohonpur Upazila (6 Union)	Farmyard manure(FYM) compost fertiliger production for drought resilient agro-ecology development.	Farmers	Fisheries & Livestock, Agriculture & Irrigation, Rural Development & Cooperative.
All over Mohonpur Upazila (6 Union)	Cultivation of Climate Resilient & Environmentally Friendly Napier Grass for green fodder.	Farmers	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative.
5 Unions of Mohonpur Upazila	Community mobilization for co-management of agro-aquatic resources.	Fishermen community	Fisheries & Livestock, Agriculture & Irrigation , Rural Development & Cooperative.
All over Mohonpur Upazila (6 Union)	Household energy security and health security by sustainable uses of biomass resources through installation co-digestion type of biogas digester and uses of bio-slurry as organic fertiliger for organic farming.	Marginal households	Fisheries & Livestock, Agriculture & Irrigation , Rural Development & Cooperative.
All over Mohonpur Upazila (6 Union)	Climate Tolerant Vertically expanding and organic farming to maximize the uses of homestead.	Marginal households	Agriculture & Irrigation.
Mohonpur Upazila	Installation of solar Photovoltaic pump set hand tube well and submersible water pump and access to drinking water facility to remote off-grid community.	Remote rural households	Agriculture & Irrigation , Rural Development & Cooperative.
Mohonpur Upazila	Community mobilization and installation of rainwater harvesting facility at household level in drought prone areas.	Remote rural households	Agriculture & Irrigation , Rural Development & Cooperative.
Mohonpur Upazila	Capacity enhancement training on Vermicomposting, Biogas Plant and Efficient Biomass uses.	Women entrepreneurs	Fisheries & Livestock, Rural Development & Cooperative.
Mohonpur Upazila	Capacity enhancement training on High Vale Crops (HVC) farming.	Farmers	Agriculture & Irrigation.

List of Scheme Boga Union, Upazila : Bauphal, Patuakhali District

Location Union/Village	Name of Scheme / Investment / Adaptation measure	Beneficiaries	Sectors
Union : Boga, Bauphal Upagila	Social Afforestation Scheme - Tree Plantation along the embankment (2.1 Km) for protecting embankment from storm and tidal surges (with 20 species of plants including fruit bearing trees, coconut, Medicinal plants etc.)	Coastal community	Agriculture & Irrigation, Fisheries & Livestock, Rural Development & Cooperative, Physical Infrastructures
Phultala canal, Union : Boga, Bauphal Upagila	Excavation of 0.5 Km silted canal for retention of rain water, irrigation facilities during dry seasons , canal side tree plantation and fishermen community based fish farming	Marginal farmer	Agriculture & Irrigation, Rural Development & Cooperative, Physical Infrastructures

ANNEX 4: **SCHEME FACT SHEETS**

Following are brief descriptions of typical Schemes financed by pilot PBCRGs in two drought affected upazilas of the Rajshahi District of Bangladesh.

FACTSHEET A1: **Water retention and surface water management for community empowerment and enhance resilience to climate change in drought prone areas**

Surface water and integrated farm management in Godagari Upazila; photo © Sajjadul/LoCAL-UNCDF

Description	The drought-prone Upazilas selected for the LoCAL pilot contain hundreds of open water-bodies including almost 6,000 ponds, and a few canals that are a lifeline for agrarian ecosystems and livelihoods. In particular, the traditional water ponds are a good source for supplementary irrigation for transplanted aman rice production in case of severe drought during the monsoon (kharif II) season in Godagari and Mohonpur. Normally, these waterbodies are used to harvest rainwater and provide supplementary (emergency) irrigation to rice fields. Unfortunately, over the past three decade, drought spells have intensified with lower annual rainfall, making for a severe surface water crisis. Due to climatic disturbance and rainfall variabilities, almost 60 per cent of these open water-bodies are heavily silted and remain dry. LoCAL grants provided for excavation and re-excavation for retention of monsoon water and fish culture which are now building adaptive capacity of climate induced internally displaced 300 households in Godagari and Mohonpur Upazilas.
Impact of climatological drought of the locality	■ Rainfall deficit in any season and non availability of groundwater in Barind tracts causes drought. ■ Characteristics of meteorological drought in the Barind tracts are associated with the reduction in monsoon season rainfall. ■ Hydrological drought is associated with reduction of surface water resources in thou-sands of ponds, few rivers, canals and traditional beel (open waterbody). ■ Agricultural drought is associated with deficient soil moisture and crop losses. ■ Drought conditions are further aggravated by operating hundreds of deep tube wells, shallow tube well and hand pumps in dry months. ■ Hot spells contribute to low moisture retention capacity of the soil, highly variable rainfall and low adaptive capacity of farmers. ■ Delayed monsoon, surface water scarcity impacts livelihood of the marginalized and pro-poor people of the region.

Resilience intervention	■ To mitigate the crisis, Upazila Committees on fisheries/agriculture/Local Government Engineering Department and concerned Union Parishad jointly organized excavation/re-excavation works for retention of rain water for aquaculture, agriculture, homestead gardening. ■ The livelihoods of some 300 families of Cluster village of Godagari/Mohonour Upazila, i.e. Jhalpukur Tribal Fisheries Communities at Gashigram Union of Mohonpur, Napitpara at Deopara Union, Babudying, Thakur Joubon, Parulia and Chandlai at Mohonpur Union of Godagari Upazila have been improved by undertaking several income generating activities. ■ The surface water management scheme demonstrates Integrated Farm Management (IFM) practices to the locality. ■ Surface water retention in monsoon and facilitating small surface irrigation to homestead gardening/household surrounding agricultural activities during dry season. ■ Supplementary source of ground water recharging. ■ Strengthening household income generation capacities by fish culture and agriculture. ■ Supplying sources of protein (fish/poultry)/nutrients to climate vulnerable households.

Integrated Farm Management (Pond side vegetable garden, fish and aquaculture culture) at ethnic indigenous community pond in Mohonpur Upazila; photo © Sajjadul/LoCAL-UNCDF

FACTSHEET A 2: **Household energy and health security by sustainable use of biomass resources through installation of co-digestion type of biogas digester and use of bio-slurry as organic fertilizer**

Co-digestion of biogas digester and uses of bio-slurry as organic fertilizer , Mohonpur Upojila: Photo©Sojadul/LoCAL-UNCDF

Description

One of the most successful interventions is installation of household level co-digestion type (human excreta, animal dung, poultry liters and kitchen waste based) biogas plant at rural households that are being affected by environmental degrading and indoor air polluting traditional cooking methods where excessive of population will have to depend on limited natural resources. Rural Local Governments are piloting and scaling up co-digestion type biogas plant for domestic cooking which is bringing three gains e.g. household energy, health and food security of the rural areas.

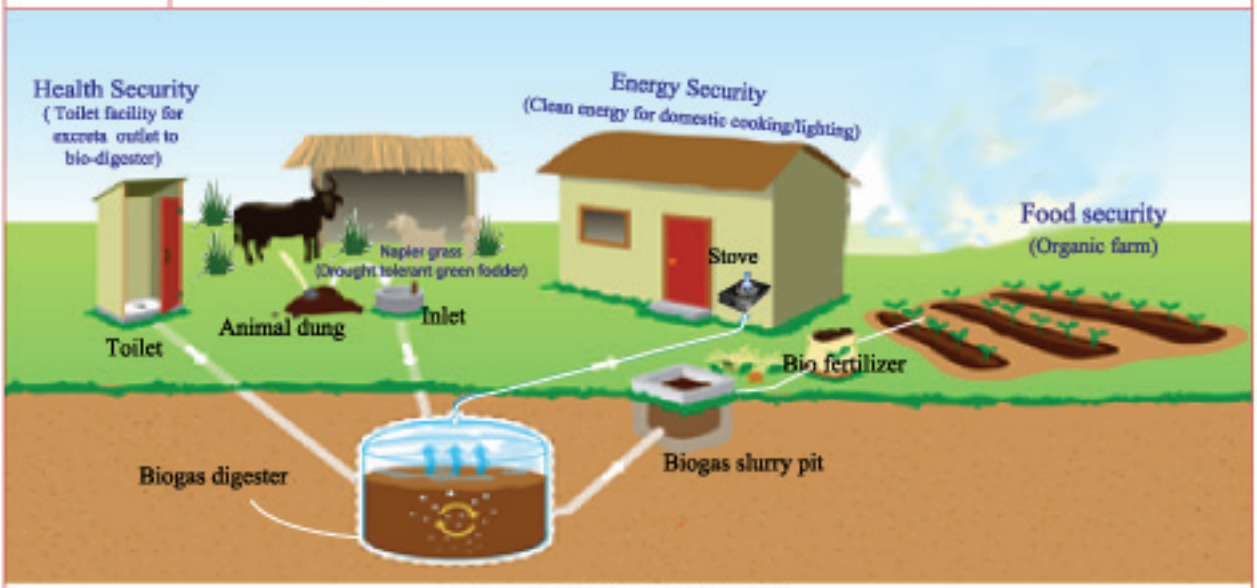


Figure : Household green energy model

Impacts induced by climate change	■ Almost 80% of the 30 million households of Bangladesh depend on biomass based cooking e.g firewood, agriculture straws/residues, paddy husk and bran, straw, bagasse, jute sticks, and forest residues (i.e. stem and main branches), twigs, leaves, bark, roots, woody debris , tree leafs, and animal dung stick/cake etc which is largely contributing indoor air pollution and degrading vegetation coverage and contributing to deforestation (WB : to 2015 says forest coverage only 11%) in Bangladesh. On the other hand most pressing factors is now that indoor air pollution contributed to 49 400 deaths per year according to WHO 2004 report.
Resilience intervention	■ Addressing the most burning issues of reducing carbon emissions from household sources, two Upazila Prishad in Bangladesh established new paradigm of ensuring household level energy, health and food security through installation of co-digestion type of biogas plant which ensure multiple benefits at household level. The biogas plant is supplying green energies to households. Co-digestion type domestic 3 type domestic 3 Cubic Meter (105 cft) bio-gas plant have been installed around 75 rural households in Mohonpur and Godagari Upazilas of Rajshahi District.
Number of beneficiaries	Direct beneficiaries are climate vulnerable 75 households and indirectly 90,759 households of the locality .

Renewable energy (biogas) based cooking facility in rural household of Mohonpur Upagila Upagila: Photo ©Sajjadul/LoCAL-UNCDF

FACTSHEET A3: Agro-Forestry (HVC) development to demonstrate efficient water management techniques

Drought-tolerant agrofrestry development, multiple crops in a single plot- eggplant, green chilli with guava plantation, Mohonpur Upajila: Photo©Sajjadul/LoCAL-UNCDF

Description	Farmers in Bangladesh are not familiar with sustainable agricultural practices and management of agro-ecologies in a given agro-climatic conditions. This has been identified as major setback of agricultural adaptation to climate change. LoCAL has encouraged farmers on sustainable land management, cultivating less water consuming varieties of seasonal crops in inter cropping pattern for high yielding and profit maximization, cropping intensity and rotation for nitrogen fixation, enrichment of nutrient cycle to soil for developing agro-ecological resiliencies to climate change.

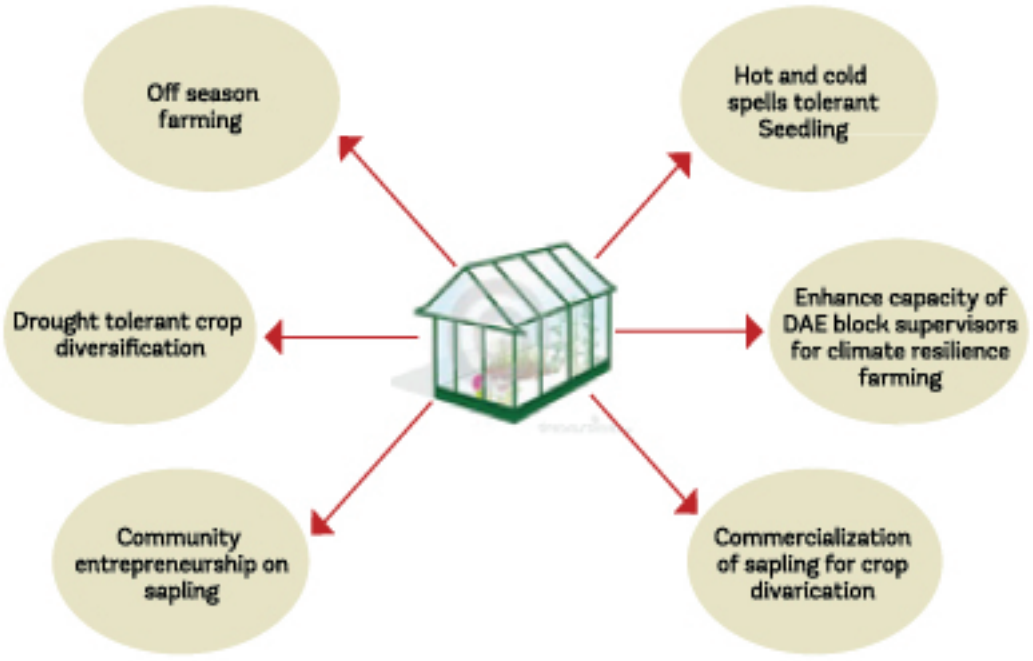
Land preparation for other vegetable cultivation with guava plantation, Mohonpur Upajila: Photo©Sajjadul/LoCAL-UNCDF

Resilience intervention	■ Guava plot demonstration in Mohonpur and Godagari Upazila created awareness among farmers about judicial water management techniques, cultivation of less consuming and environment friendly high value crops. ■ Guava planted in such a way that farmers can cultivate all seasonal green vegetables as intercrop for profit maximization. ■ Cropping intensification round the year contributory to carbon sequestration and green shield against drought/hot spells in dry months. ■ Agroforestry highly adaptive to climate change for keeping healthier environment favorable local microclimate, protection through provision of permanent cover, improving efficiency of use of soil, water and climatic resources, contribution to soil fertility improvement, reducing carbon emissions and increasing level of carbon sequestration. ■ The productivity of the land can be enhanced as the trees provide forage, firewood and other organic materials that are recycled and used as natural fertilizers. ■ Agro-forestry promotes the year-round and long-term yield. ■ Protection and improvement of soils (especially when legumes are included) and of water sources. ■ Land degradation through adoption of practices that reduce erosion and loss of organic carbon.
Number of beneficiaries	Direct beneficiaries 10 farmers and indirect beneficiaries 90,759 farm families.

FACTSHEET A4: Green shed development for seedling /sapling in drought condition

Green shed nursery four drought tolarent seeding/sapling, Mohonpur Upazila: Photo©Sajjadul/LoCAL-UNCDF

Description	The quality of seedlings and saplings in drought prone area is deteriorating due to climate extreme (hot and cold spells). Most of the marginal farmers suffer for not having quality seeds in time for planting. Farmers sometimes apply indigenous knowledge to build bamboo structures with poly-shed coverings for seed beds for saplings; this is not fully sustainable because of the unpredictability of microclimatic disturbances and weather-induced tornadoes and local storms. Considering the climatic facts, pest manifestation and unavailability of seeds in the locality, green shed have been installed in several locations of Mohonpur and Godagari Upazila which are also facilitating entrepreneurship of commercialization of seedlings. The green shades are encouraging farmers for growing off-season vegetables in unfavorable climatic conditions like hot/cold spells, high humidity, and unseasonal and sometimes high precipitation etc. and sometimes high precipitation etc.
Climate change impact	■ In drought conditions seed priming hampered because of high temperature and moisture stress. ■ Localized climate early warning system is not available ■ The open space seedling and sapling preparation largely hampered by soil moister conditions weather conditions, climatic factors etc.

Resilience intervention	■ The green shed facilitate germination, growth of seeds uninterruptedly to localized climatic anomalies (heat, cold spells related injuries, temperature, humidity, high precipitation) as well as against pathogenic infection, pests, weeds, etc. ■ Community led entrepreneurship has been facilitated by commercialization of seedlings and growing off-season vegetables ■ Two green sheds have been installed in Mohonpur and one in Godagri Upazila ■ Private entrepreneurship has been facilitated for commercial marketing of seedlings. ■ The green sheds are encouraging farmers to grow off-season vegetables. ■ The sheds have introduced locally adaptive varieties of vegetables which are tolerant of heat, cold injury, temperature, humidity and high precipitation; and are climate resilient and eco-friendly. ■ The green sheds provide favorable growth conditions — i.e. for germination as well as for the growth of seeds. ■ Younger plants are better cared for, as it is easy in a small nursery area to protect against pathogenic infection, pests and weeds; and to control for sunlight, cold spells, rain, etc. ■ The sheds enable year-round availability of winter vegetable seedlings and saplings, which ensure high value. 
Number of beneficiaries	Direct beneficiaries are three marginal farmers community and indirectly 90,759 farmers of the Upazilas.

FACTSHEET A5 : **Farmyard manure (FYM) production for enriching soil health and water holding capacity to adapt agriculture in drought conditions**

Farmyard manure (FYM) production facility at farm house of Mohonpur Upazila, photo © Sajjadul/LoCAL-UNCDF

Description	Until 1990, most of the rural farm families in Bangladesh had farmyard annexed to homestead for producing bio fertilizer (animal dung, crop residues, tree leafs and kitchen waste, leaf etc) for organically fertilizing lands. But for quick and high yielding, the chemical fertilizer dependent modern agricultural methods replaces those organic practices. As a result, household based organic biomass resources(dung/residues) now being dispersedly decomposed and become wastes. For sustainable crop production, soils should have at least 5% organic matter(OM). Unfortunately, in most of Bangladesh agro-ecologies, the soil having only 1 to 1.8% OM. The low organic matter content in the soils reduces soil fertility and limits water-holding capacity. This combination of factors contributes to severe production constraints in the drought prone areas of north-west of Bangladesh. Farmyard manure (FYM) and water hyacinth compost are the most important sources of organic matter and a key factor in conserving soil moisture to cope with drought, as well as improving and sustaining soil fertility and productivity in Barind Track.
Climate change impact	■ Argo-ecology now degraded due to climate change characterized by lesser rainfall in drought prone areas and subsequently causing absence of soil organic matter. ■ Soil fertility is gradually declining by overuse of agricultural land uses, excessive use of chemical fertilizers, indiscriminate pesticides as well as climate variability (delayed monsoon and lesser rainfall).

Resilience intervention	■ To strengthen the resilience of farming systems requires enhancement at levels of organic matter in soils for better soil moisture retention and water infiltration. ■ The preservation and increased application of farm yard manure, which is organic matter prepared from various kinds of locally available animal dung mixed with other organic materials is a suitable technology to augment the organic matter content in soils. ■ It also enhances the water holding capacity and fertility of soils whose productivity has been negatively affected by recurrent exposure to droughts.
Number of beneficiaries	87 FYM shed installed in rural household and indirectly benefited 90,759 household in both of Mohonpur and Godagari Upazila.

Figure : Farmyard manure production

FACTSHEET A6 : **Women empowerment through farmyard vermicomposting organic fertilizer production**

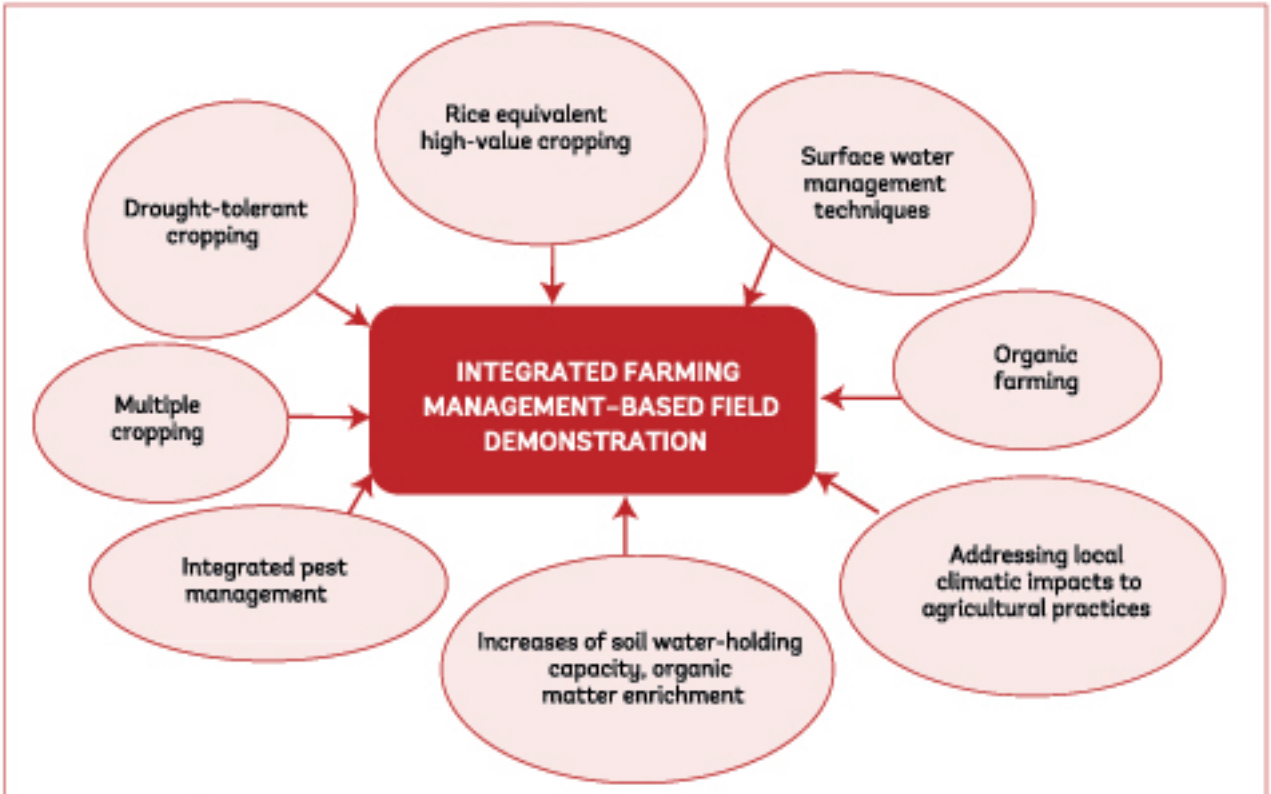
Empowered women engaged in farmyard vermicomposting bio-fertilizer production at Mohonpur Upazila; photo ©Sajjadul/LoCAL-UNCDF

Description	Overexploitation of agriculture land, excessive use of chemical fertilizers and pesticides heavily declined soil fertility and microorganisms. On the other hand, climate variability (delayed monsoon and lesser rainfall) factors affecting agro-ecology in drought prone areas of Bangladesh. Moreover, soil's natural fertility enrichment component animal dung is being inappropriately used by rural poor household to produce domestic cooking fuel as dung cake and dung stick. This traditional method causes indoor air pollution and related diseases of women and children.
Climate change impact	■ Until mid of 1980s the agro-ecologies was organically richer and being fertilized by natural process and other essential micro-organisms. ■ This natural process was disturbed by several factors e.g. drying up of soil moister component, lesser rainfall pattern to agro-ecology, increases of global temperature, humidity, declining and decaying of soil's essential micro-organisms, excessive chemical fertilizer, pesticides.

Resilience intervention	30 Women has been trained as green entrepreneur and provided supports for setting-up animal dung based vermicomposting organic fertilizer production facility. Each beneficiary earning around 10,000 to 20,000 BDT monthly. Vermicomposting organic fertilizer provides large quantities of nitrogen for the soil, add other kinds of organic matter for improving topsoil depth, water-holding capacity, nutrient content, friability, texture of the soil; thereby plant become resilient in in drought conditions.
Number of beneficiaries	30 women headed entrepreneurs and indirectly benefited 90,759 household in both of Mohonpur and Godagari Upazila.

Figure : Women headed Green-entrepreneurship development model

FACT SHEET A7: **Drought tolerant crop diversification**



Description	Godagari Upazila is topographically undulating, having compact and low fertile soils . The region climatologically characterized by low average rainfall (1,500 millimeters annually), high temperature with limited soil moisture storage and poor crop productivity. But still cropping pattern dominated by high water consuming (triple cropping) rice production (from monsoon Transplanted aman rice to irrigation dependent boro paddy even in drought season).
Climate change impact	■ Crop production situation is worsening due to a range of soil, water and climate related constraints. ■ An increase in atmospheric temperature of 3° C would cause an 11 per cent decrease in soil organic matter content. ■ Declining soil fertility, accelerated soil erosion and soil salinity are the major soil-related constraints to crop production. ■ Global warming and climate change exacerbate this situation.

Resilience intervention	■ LoCAL facility has supported schemes to shift farmers from agro-ecology degrading traditional paddy based agriculture practices to less irrigation consuming integrated farming for diversification of cropping pattern. Drought resilient agricultural block demonstration on multiple High Value Crops (HVC) e.g country beans(cultivated in barren lands), okra, vertically expanding double/multiple cropping lentils/pulses/wheat with different types of gourds are being demonstrated as Integrated Farming Management (IFM). The water management technique reduce dependencies on underground water. This is demonstrating farmers of how diversification facilitate safeguarding against pest & reduces disease, improve weed management, judicious use of chemical fertilizer and increasing use of organic manure with legume based cropping pattern to store soil fertility, improving topsoil depth, water-holding capacity, nutrient content etc for climate adaptive agricultural. This demonstration is motivating hundreds of farmers to go for HVC and IFM.
Number of beneficiaries	Direct beneficiary 200 farmers and indirectly 53,759 farmers benefited.

Drought affected barren land converted to agricultural land by cultivation less water consuming country-bean at Godagari Upagila ; photo © Sajjadul/LoCAL-UNCDF

FACTSHEET A8 : **Climate adaptive sanctuary management for culturing endangered native variety of fish species**

Climate adaptive sanctuary management for culturing endangered native variety fish species in Mohonpur: photo ©Sojjodul/LoCAL-UNCDF

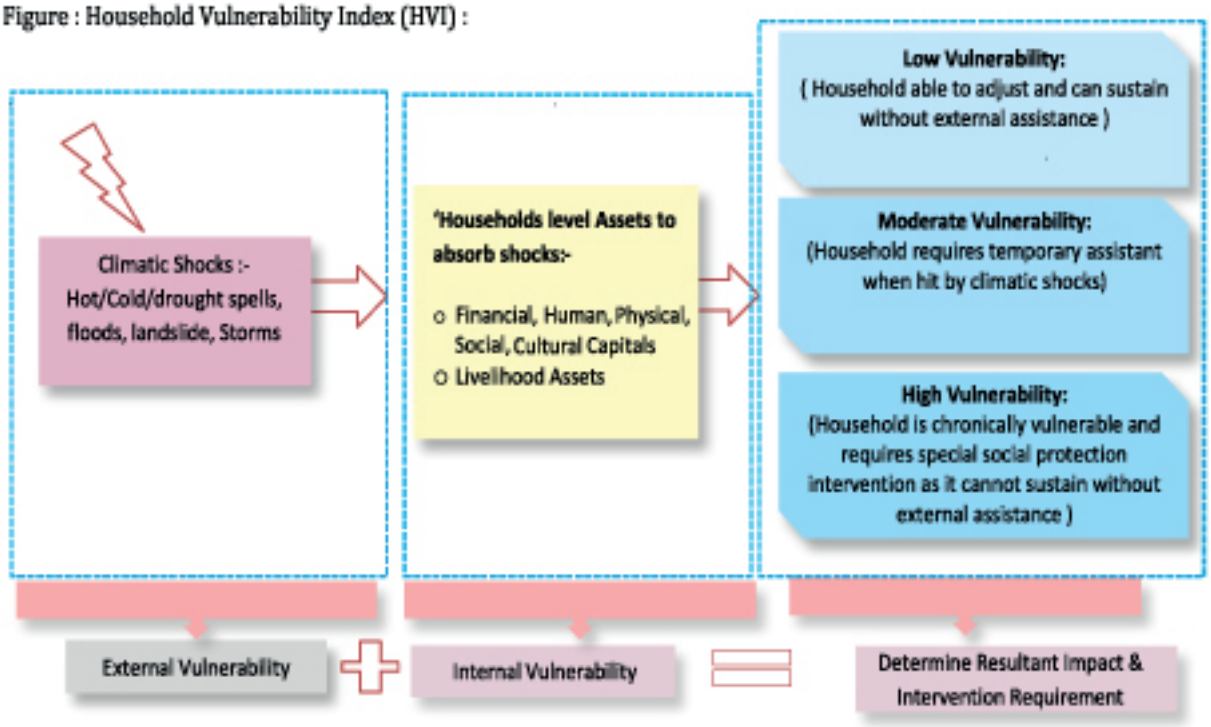
Description	Fish and fisheries sector contribute 58% of total protein intake for Bangladeshis with an economy of 4.43% to GDP contribution, 2.73% to foreign export earnings (DoF, 2012). Bangladesh is the world's largest delta having 230 rivers including tributaries and vast aquatic resources (both closed and open water bodies). According to DoF (2012) there are around 289 native fisheries varieties, 24 fresh water prawn and 12 exotic species (DoF, 2012) were found. Those species were available in all open water bodies, rain-fed agro-ecologies until the 1990s. But due to climatic perturbation, lesser rainfall over the seasons, heavy extraction of ground water and drying of waterbodies largely contribute to diminishing of aquatic resources. On the other hand breeding migration, fishing pressure affect fish stocks. As a result 54 species of native fish stock (out of 289) endangered.
Climate change Impact	■ Most of the open water bodies(Pond, Canal) silted, reduced the depth and dried in summer seasons due to intensification of drought with characteristic of lesser rainfall and shrinkages number of aquatic sources in the Barind tract region; ■ Severe drought, abiotic factors(temperature, humidity, rainfall) and uncontrolled use of pesticides in agriculture has endangered natural fish habitat.

Resilience intervention	■ Three reserve natural sanctuaries developed in Mohonpur Upazila Parishad for protecting, culturing and demonstrating native varieties of fish stock that are already endangered. ■ Integrated Farm Management (IFM) demonstration on pond side by cultivating vegetables and other vine vegetables round the year. ■ Water hyacinth, planktons, water lily etc. cultivated to develop natural pond ecology and food cycle.
Number of beneficiaries	Three reserve sanctuaries benefitted around 1500 fishermen of the locality.

Integrated farm with sanctuary pond in Mohonpur Upazila: photo ©Sajjadul/LoCAL-UNCDF

FACTSHEET A9 : Climate adaptive model homestead development for livelihood, food , energy & health security

Figure : Household Vulnerability Index (HVI) :



Description	Most of rural households and its yard (open space) have been unsustainably developed in terms of land utilization, energy harness/consumption pattern, inorganic farming practices to absorb climate stressors. These practices are often linked to poverty factor. LoCAL incentives provided to climate vulnerable households to develop as a sustainable and adaptive model to absorb climatic shocks. Above figure showing flowchart of determining household vulnerability to climate change.
Climate change impact	Household level traditional cooking (Firewood's/residues) practices create indoor air pollution and contribute to deforestation. During dry season multiple factors are affecting rural households i.e decreasing of soil fertility, low cropping, dried pond, inadequate access to running water for drinking, irrigation and other uses. Lower rainfall and extreme hot spells are drying out surface water bodies.
Resilience intervention	■ Installation of co-digestion type domestic biogas plant in remote households for energy and health security. ■ Slurry/manure based homestead organic farming in drought condition for food security. ■ Household yard compost manure production facility for agricultural adaptation to drought. ■ Installation of rainwater harvesting facility and water retention pond for agriculture. ■ Solar home lighting system (SHLS) to replace kerosene fueled lamp. ■ Installation of Improve Cooking Stoves for efficient uses of firewood/residues. ■ Plantation of fruit bearing trees/bamboo shurb . ■ Water protection pond for irrigation and aquaculture.
Number of beneficiaries	Directly 65 households and indirectly 53,759 households of Godagari Upazila.

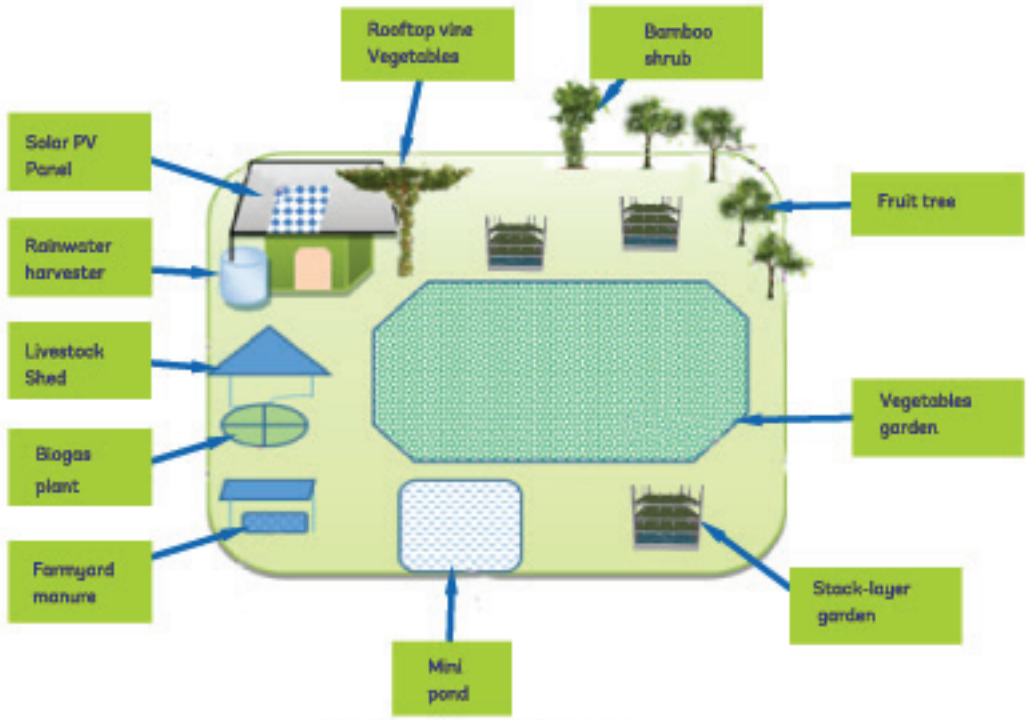


Figure : Model of resilient household

Solar painel on rooftop and biogas plant with model household at Godagari : photo ©Sajjadul/LoCAL-UNCDF

FACTSHEET A10 : **Model climate resilient community development for ensuring livelihood, food , energy & health security**

Solar PV painel installed at model climate resilient community in Godagari : photo ©Sajjadul/LoCAL-UNCDF

Description	The model applied to an isolated remote rural marginalized community whose livelihood is entirely based on agro-ecologies at Balikahati of Godagari Upazila. The community consisting of five households with 22 people living as compacted nuclei housing pattern and having 13 acres of cultivable lands along with other agri-aquatic resources for sustaining livelihood.
Resilience practice	■ 4.5 cm3 production capacity co-digestion (animal dung, kitchen waste and human excreta) type biogas plant installed (serving two families) for energy , health and food security for more than 25 years. ■ Solar Photovoltaic Home Lighting System . ■ Farmyard manure(FYM) and bio-slurry are the sources for organic fertilizer to enrich soil health, moister conditions and water hold capacity in drought condition. ■ Rainwater harvesting system for drinking water facility and water retention to community annexed pond for aquaculture, livelihood and essential irrigation support . ■ Multiple stack-layered/ vine organic vegetable gardens for round the year food security. ■ Homestead annexed eco-pond development to facilitate aquaculture, pisciculture for ensuring protein intake and generating household capital. ■ Fruit tree plantation to absorb climatic shocks, environmental balance and food security. ■ One remote community become resilient by applying the model.
Number of beneficiaries	Model applied to one climate vulnerable community which indirectly motivated 53,759 households of the locality for building resilience.

Biogas digester installed with model climate resilient community : photo ©Sajjadul/LoCAL-UNCDF

Rainwater harvester with model climate resilient community : photo ©Sajjadul/LoCAL-UNCDF

FACT SHEET A11: Renewable energy option for climate vulnerable Community (Community Solar PV Grid & biogas) living along the riverside

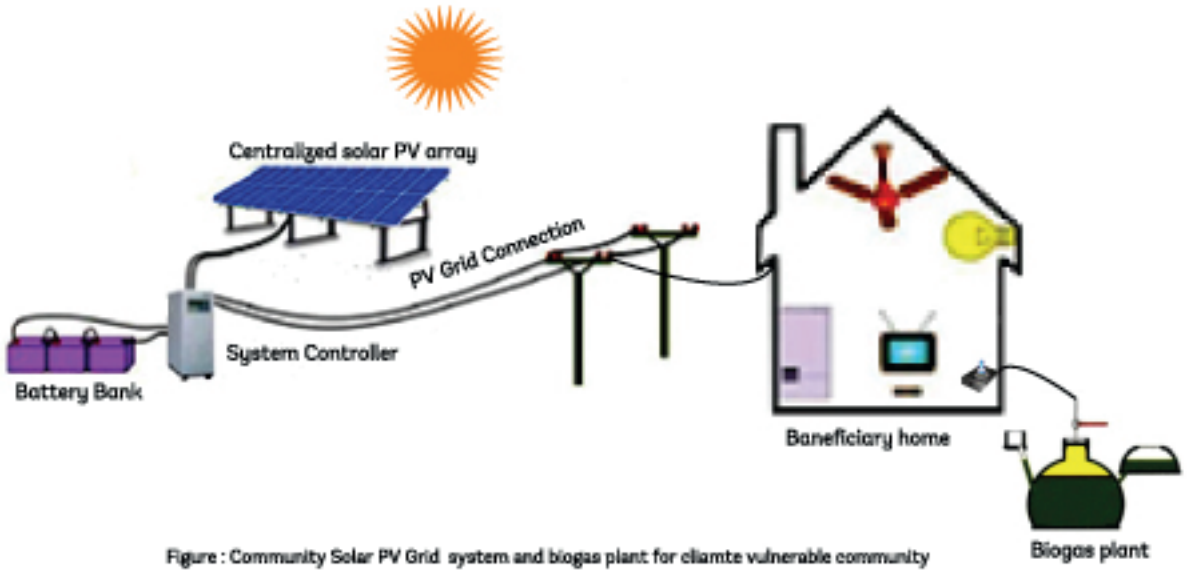


Figure : Community Solar PV Grid system and biogas plant for cliamte vulnerable community

Description	In Godagari Upazila, hundreds of climate victim internally displaced community sheltering over the bank of Padma (Ganges) River with built-up thatched, houses with no access to electricity and abject livelihood conditions. Most of them are landless day laborer living from hand-to-mouth and having little access to means of livelihood.
Climate change impact	Global climatic perturbations such as occurrence of massive floods over the return period of 10/12 years contributing river banks erosion and displacing adjacent settlements. Simultaneously are most recurrent climate change impacts in the past 3 decades characterizes as lesser rainfall and low runoff pattern causing dynamically changes of river course, massive silts deposition and other factors concurrently intensifying/escalating climatic hazards (hot/cold spells, droughts, local tornadoes etc) over the locality and disrupting livelihoods of most vulnerable river-side communities.
Resilience intervention	■ Installation of Solar PV powered mini-grid and stand-alone home lighting system for supplying clean power to climate victim households. ■ Installation of co-digestion domestic biogas digester for providing clean energy to vulnerable household for cooking.
Number of beneficiaries	One centralized community solar PV grid system and biogas digester for the climate vulnerable Community living along the riverside and indirectly other 53,759 households of the locality .

Electricity coming from community Solar PV Grid system at Nimtola, Godagari : photo ©Sajjadul/LoCAL-UNCDF

Student can read with solar light at Nimtola, Godagari : photo ©Sajjadul/LoCAL-UNCDF

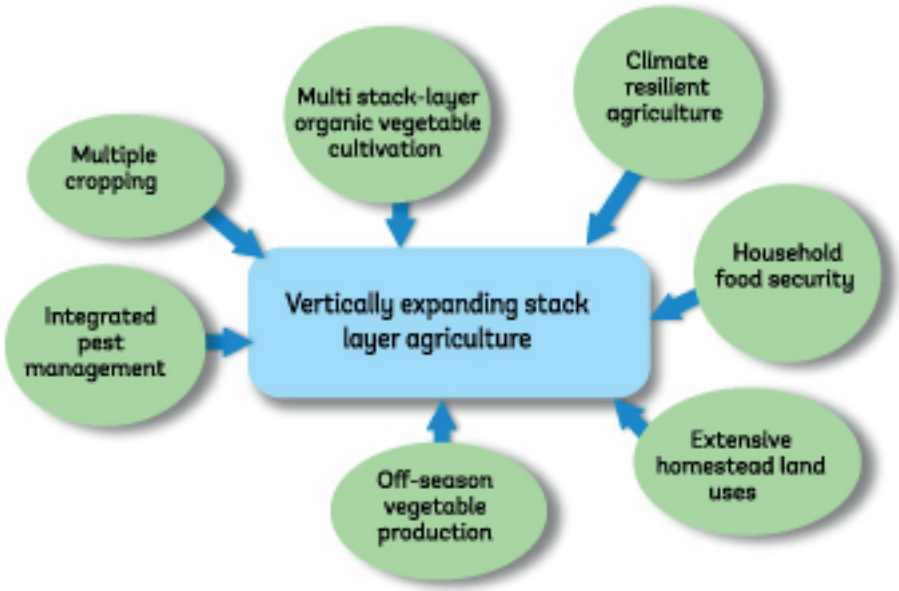
FACT SHEET A12: **Community mobilization for co-management of agro-aquatic resources**

Community mobilization for co-management of agro-aquatic resources in Mohonpur : photo ©Sajjadul/LoCAL-UNCDF

Description	Thirty years back, around 70 % of total areas of Mohonpur Upazila covered by perennial waterbodies e.g. floodplains, beels, canals, ponds. But due to climate change most of the water bodies converted from perennial to seasonal ponds affected by multiple factors e.g the lesser rainfall retention to waterbodies and over extraction of ground water, siltation etc. During dry season all the floodplain converted to dried ecology and in the rainy season this low land converted to water retention pond for around five months. Farmers can only harvest single crop and earn less revenues from agro-ecology unless commercially farm fish. LoCAL incentives provided to three large groups of community in Boroipata, Laloich beel and Jhalpukur for agro-fisheries co-production, management, maximization of revenues and capital development in cooperative mannered.
Resilience intervention	■ Native species of fingerlings cost of total 10,000 USD being released to two fishermen community of large size waterbody (54 acres and 50 acres beel), one community pond at Mohonpur Upazila and other seven community ponds at Godagari Upazila where community mobilizes for increasing production of native varieties of fish stocks . Those cooperative societies will be able to develop at least 40,000 USD, which will be seed capital to run other mode of IGA for livelihood resiliencies. ■ Field based training imparted to build capacity of the community for sustainable management of fish pond, closed waterbody. Culturing native variety of fish stock, developing pond ecology (water hyacinth, planktons) for natural feeding cycle and encouraging farmers to grow high value crops in low agricultural land of floodplain areas during dry months. ■ Sustainable pond management with aquaculture and Integrated Farm Management (IFM). ■ Sanctuaries management for natural breeding. ■ Incentive based fishermen community led fish culturing and capital development through cooperative mannered. ■ Strengthening resilience of climate vulnerable fishermen community already vulnerable to climate change.
Number of beneficiaries	Directly benefitted three fishermen communities and indirectly 53,759 individual farm families of the Mohonpur Upazila.

FACT SHEET A13: **Homestead based vertical stack layer organic vegetable cultivation for round the year food security**

Homestead based vertical stack layer organic vegetable cultivation in Mohonpur Upazila : photo ©Sajedul/LoCAL-UNCDF

Description	Most of the open spaces of the homestead premise of marginalized rural households in Bangladesh can be transformed to organic vegetable garden to ensure food security. Unfortunately this practice is not in place. LoCAL support to encourage farm family for exclusive homestead land use planning and sustainable living practices. Objective of the vertically expanding stack-layer agriculture and organic farming is to grow vegetables round the year. This model is practiced in Mohonpur Upazila where vermicomposting bio-fertilizer is used for growing organic vegetables in a hanging and vertically stack-layer structure. In each layer different types of vegetable are being cultivated. This system can work in any given climatic conditions. Pilot demonstration created a lots of enthusiasm among the households.
Resilience intervention	
Number of beneficiaries	Climate vulnerable two farmers are directly benefited and encouraged 53,759 individual farmers of the Mohonpur Upazila.

FACT SHEET A14: **Community access to drinking water facility by installation of solar photovoltaic pump set, hand tube well, submersible water pump**

Description	Solar photovoltaic (DC) submersible pump installed in Mohonpur and Godagari Upazila for supplying drinking water to remote off-grid 30 households. Electrical AC powered submersible pump and hand tube well also installed in remote isolated households of Mohonpur Upazila for supplying drinking water to drought affected community.
Number of beneficiaries	Drought affected 70 households of Mohonpur and Godagari Upazila getting access to drinking water .

Hand tube well setup in drought affected settlements : photo ©Sajjadul/LoCAL-UNCDF

FACT SHEET A15: Community mobilization and installation of rainwater harvesting facility at household level in drought prone areas

Community mobilization and household rainwater harvesting facility installed at drought prone areas in Mohonpur and Godagari Upazila: photo@Sajjadul/LoCAL-UNCDF

Description	In dry season household experience severe water shortage because of lowering ground water table for operating irrigation pump sets. In this situation harvested rain could be the alternate sources for meeting the crisis. Rainwater harvesting system installed in Mohonpur and Godagari Upazila for creating awareness about harvesting and utilization of rainwater at household level. Training imparted to mobilize community for raising awareness about rainwater harvesting and utilization. Different types of rainwater harvester demonstrated to rural women. Training objectives are following; ■ Community mobilization and awareness raising about rainwater harvesting at household level in drought prone areas. ■ Community capacity development and household level rainwater harvester installation techniques. ■ Demonstrate various types of household level rainwater harvester and storage system. ■ Dissemination of benefits of rainwater harvesting.
Number of beneficiaries	Rainwater harvester installed in five households in Mohonpur Upazila.

FACT SHEET A16: **Cultivation of Napier grass for feeding livestock**

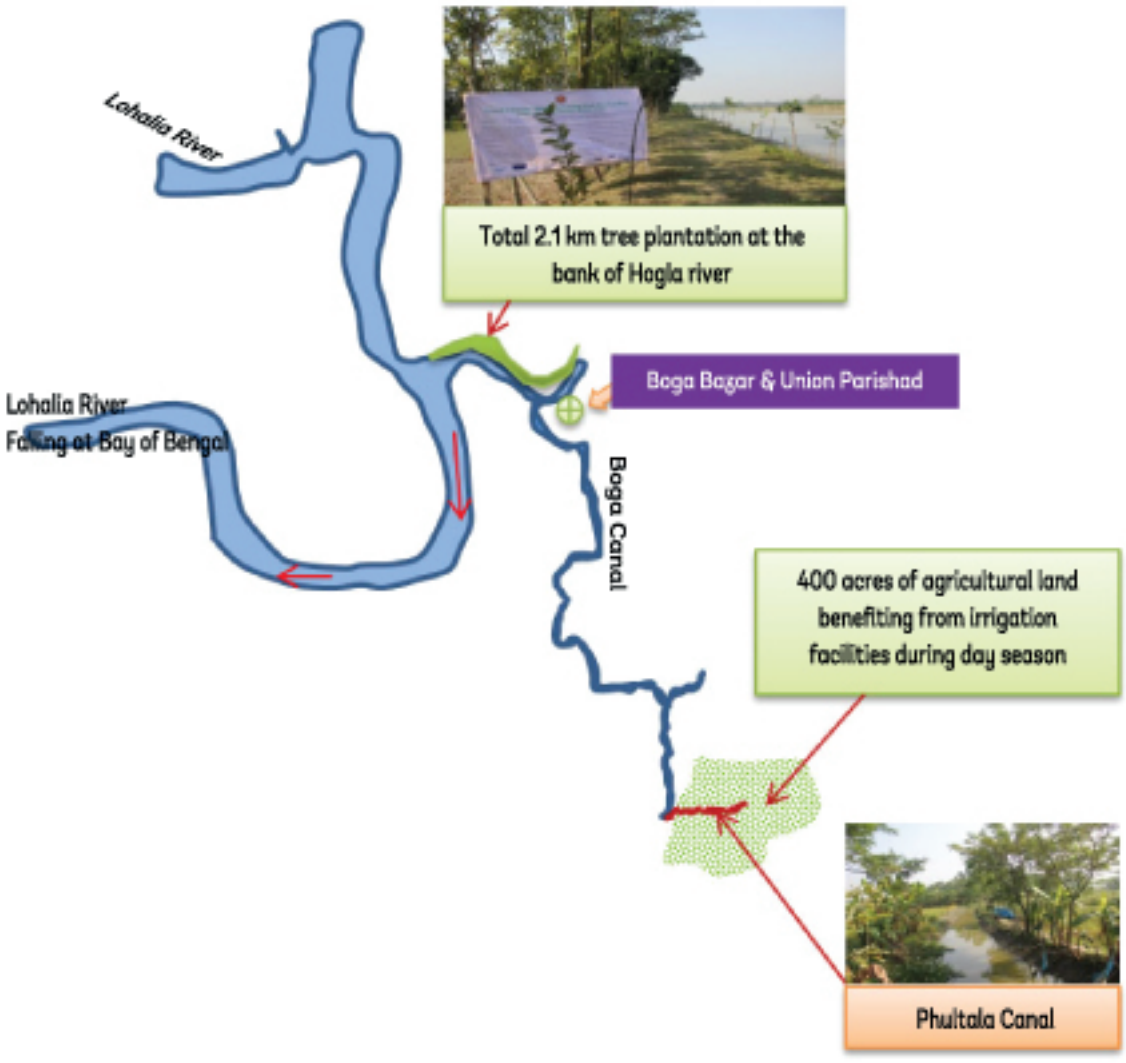
Cultivation of Napier grass for livestock feeding in Mohonpur : photo ©Sajjadul/LoCAL-UNCDF

Description	Livestock sub-sector directly contributes 3% of GDP to national economy. Livestock in Bangladesh is recognized as dividend inputs for agro, food processing and other subsidiary industries. Cattles are dominant amongst livestock and totaling 26.8 million (BBS: October 2010) which becomes the major sources of animal protein, source of biomass and generating household based revenues.
Climate change impacts	■ The Intergovernmental Panel on Climate Change (IPCC) predicted that by 2100 the increase in global average surface temperature may be between 1.8° C and 4.0° C. With increases of 1.5° C to 2.5° C, approximately 20 to 30 per cent of plant and animal species are expected to be at risk of extinction (FAO, 2007) with severe consequences for food security in developing countries. ■ A number of climatic hazards(drought, flood, tropical storm) as well as anthropogenic process (agricultural, industrial pollution) are reducing green fodder/agricultural production in Bangladesh. ■ Absence of safe green grazing land in the LoCAL intervention drought-prone areas. ■ Shrinkage of natural grazing land due to intensive crop production, evaporation of open water bodies and heavy extraction of groundwater. ■ Reduced soil moisture and water-holding capacity under extreme hot/dry spell conditions in dry (pre-monsoon) seasons. ■ Heavy contamination of traditional sources of green fodder (agricultural residues) by the health hazardous chemical pesticides and fertilizers.

Resilience intervention	■ LoCAL supported pilot demonstration plot encourages marginal farmers to cultivate Napier grass for safer fodder/feeds for the cattle. ■ Napier grass is high yielding, improves soil fertility through nitrogen fixation and creates high-quality mulch for controlling erosion of topsoil. ■ Its deep root system makes it highly adaptive to extremes drought. ■ It can be planted as intercrop with legumes and can be harvested year round.
Number of beneficiaries	33 farmers planted Napier grass in both of Mohonpur and Godagari Upazila, those are benefiting 90,759 farm family of the Upazilas.

FACT SHEET A17: **Excavation of dried cannel for water retention and enhance adaptive capacity of climate vulnerable coastal farmers**

Description	The Phultala canal crossing over the Boga Union was navigational channel and transportation route for boats/small vessels until 1980s. Over the past four decades, the lesser water flows from the upstream largely impacted the entire southern riverine geomorphology and most of the navigational tract now turned to dead/silted canals, and those are partly converted to swamp (pest growing) and partly to grazing land due to climate change. The silted Phultala canal being re-excavated and almost 400 acres of agricultural land now having access to irrigation facilities, community led fish culture, essential irrigation facilities during dry season. With LoCAL support for re-excavation of Phultala canal, the surrounding agro-fishermen community is now well adapted to climate change.
Benefits	■ Water retention and irrigation facility for 400 acres of agricultural land in Boga Union. ■ Fruit tree plantation and fish culture.



FACT SHEET A18: **Social afforestation for protection of embankment from tidal/storm surges and river (Hogla) bank erosion**

Social afforestation programme over the embankment of Hogla river in Boga Union : photo ©Sajjadul/LoCAL-UNCDF

Description

A. Tree Plantation : 1.5Km (from north of Boga ferry ghat to sluice gate via food godwon) Union : Boga, Upazila : Bauphal, District : Patuakhali;

- Protection of 1.5Km embankment from tidal/storm surge and erosion.
- Plantation of 5,000 trees (20 variety of diversified species) over the embankment for protecting top-soil and erosion control.
- Supply seasonal fruits as a part of food security of the cliamte vulnerable communities.
- Encouraging social afforestation for food security and climate resilient livelihoods.
- Plantation of traditional fruit bearing trees and medicinal plants.

B. Tree Plantation : 0.5Km (from Hogla bridge to sharif bari), Union : Boga, Upazila : Bauphal, District : Patuakhali;

- Protection of 0.6Km embankment from tidal/storm surge and erosion.
- Plantation of 2,500 trees for supply seasonal fruits as a part of food security.
- Encouraging social afforestation for food security and climate resilient livelihoods.
- Plantation of traditional fruit bearing trees and medicinal plants.

FACT SHEET A19: **Capacity building training to farm family on High Value Croppings**

Description	Encouraging farmers to crop diversification/rotation and high value cropping (HVC) and discouraging double/triple rice cropping. Training imparted to 300 farmers about climate resilient cropping, agro-ecology management, water management techniques, organic farming, techniques on soil heath improvement, moister condition and water holding capacity to adapt drought conditions. Graduate farmers on biological pest control, home grown bio-pesticides, insect trapping method, IFM and sustainable/organic farming techniques etc.

FACT SHEET A20: **Capacity building training imparted to farm family on efficient biomass uses technique, Vermicomposting and Biogas Plant**

Description	Training imparted to women entrepreneurs/enthusiasts about green entrepreneurship development through farmyard vermicomposting and demonstration of LoCAL promoted women headed vermicomposting sites. Training imparted to create mass awareness about co-digestion type (human excreta, animal dung , poultry liters and kitchen waste) of biogas for sustainable renewable energy based household cooking. Site visit for demonstration of biogas plants organized to eliminate the cultural taboos/barrier against human excreta based biogas for rural cooking. Training also imparted to farm family about Integrated Farming Management (IFM), green fodder (Napier Grass) production and increasing of livestock population.

FACT SHEET A21: **Capacity building training to fishermen community on aquatic resources management**

Capacity building training to fishermen community on aquatic resources management : photo ©Sajjadul/LoCAL-UNCDF

Description	Training imparted to fishermen community(total 100 fishermen) about co-management of agriculture (fish culture to paddy field) and sustainable aquaculture management, increasing native varieties of fish stocks, eco-pond management, develop pond based natural food cycle (planktons, water hyacinth etc) for feeding fish population from natural sources. Lessons also imparted on how to culture native fish species in different types of waterbodies, fish hatching/breeding, rearing of fry /fingerlings, different types of fish culture methods on open water bodies (culturing in cage/net/pen etc).

ANNEX 5: PEOPLE INTERVIEWED

Local Government Officials :

SL	Name	Title	Name of Upazila
1.	Md Ishaq	Upazila Chairman	Godagari
2.	Md. Kamruzzaman	Male Vice Chairman	Godagari
3.	Most. Roushan Ara Begum	Female Vice Chairman	Godagari
4.	Md. Khalid Hossain	Upazila Nirbahi Officer(Chief Executive Officer)	Godagari
5.	Mr. Alamgir Kabir	Upazila Nirbahi Officer(Chief Executive Officer)	Mohonpur
6.	Md. Abdus Samad	Upazila Chairman	Mohonpur
7.	Md. Abul Kalam Azad	Male Vice Chairman	Mohonpur
8.	Most. Banesa Begum	Female Vice Chairman	Mohonpur
9.	Md. Khayer Uddin Mollah	Upazila Agriculture Officer	Mohonpur
10.	Dr. Fazlul Haque	Upazila Livestock Officer	Mohonpur
11.	Md. Amimul Ahsan	Upazila Fisheries Officer	Mohonpur

Guava Cultivation Farmers:

Sl	Name	Title
1.	Md. Alamgir Hossain	Farmer
2.	Md. Belal Uddin	Farmer
3.	Ayish Uddin	Farmer
4.	Abu Taleb	Farmer

Community member at Napit Para Community Pond :

SL	Name	Title	SL	Name	Title
1.	Md. Azar Ali,	Community Leader (Male)	23.	Sri. Rabi	Male member
2.	Most. Jesmin	Community Leader (Female)	24.	Sri Pushpo	Female member
3.	Mrs. Bharthi	Female member	25.	Sri Shaymol	Male member
4.	Mrs. Ruma,	Female member	26.	Sri. Randu	Male member
5.	Most. Babita	Female member	27.	Sri. Shimul	Male member
6.	Mrs. Anita	Female member	28.	Md. Shamim	Male member
7.	Most. Rajina	Female member	29.	Md. Ripon	Male member
8.	Mrs. Shagori	Female member	30.	Md. Anwarul	Male member
9.	Most. Adori	Female member	31.	Md. Farukh	Male member
10.	Ms. Sharogi	Female member	32.	Md. Jabbar	Male member
11.	Most. Baby	Female member	33.	Md. Milon	Male member
12.	Most. Habiba	Female member	34.	Md. Surizzaman	Male member
13.	Most. Sheuli	Female member	35.	Md. Sukur	Male member
14.	Most. Memjan	Female member	36.	Md. Hurmuz Ali	Male member
15.	Most. Faima	Female member	37.	Md. Hasan	Male member
16.	Mrs. Parula	Female member	38.	Md. Mokbul	Male member
17.	Most. Parvin	Female member	39.	Md. Sharif	Male member
18.	Mr. Michel Biswas	Male member	40.	Mrs. Laily	Female member
19.	Sri. Subash Das	Male member	41.	Md. Bacchu	Male member
20.	Sri. Sukumar Roy	Male member	42.	Md. Tarikul	Male member
21.	Ms. Lakshmi	Female member	43.	Sri. Ajit	Male member
22.	Sri. Bandi Nath	Male member	44.	Md. Lalchand	Male member

Community PV Gird at Niltoma :

SL	Name	Title	SL	Name	Title
1.	Din Bondhu Mia	Caretaker of Solar System	10.	Md. Sayed	Member
2.	Md. Rajib Hossain	Member	11.	Md. Masum	Member
3.	Mrs. Razia Khatun	Member (Female)	12.	Md. Golam Hossain	Member
4.	Sri. Ananda Kumar Mondal	Member (male)	13.	Sri. Shudhin	Member
5.	Mrs. Lata Rani	Member (Female)	14.	Sri. Sunil	Member
6.	Md. Abdul Baki	Member	15.	Sri. Subash	Member
7.	Mrs. Sharala	Member (Female)	16.	Md. Uzzal	Member
8.	Md. Ayub Ali	Member	17.	Sri. Shari Charan	Member
9.	Mrs. Sunita Rani	Member (Female)	18.	Mrs. Shangkari Mondal	Member (Female)

Vermi composting site at Mohonpur Upazila :

SL	Name	Title
1.	Mrs Parvin Begum	Community Leader
2.	Mrs. Monjara Begum	Member (Female)
3.	Mrs. Sanoyara	Member (Female)
4.	Mrs. Rajzia Begum	Member (Female)
5.	Mrs. Raushan Ara Begum	Member (Female)
6.	Mrs. Joshna Begum	Member (Female)
7.	Mrs. Dilara Begum	Member (Female)
8.	Mrs. Bilkis Begum	Member (Female)
9.	Mrs. Momtaz	Member (Female)
10.	Mrs. Mahfuja	Member (Female)

Jhalpukur Indigenous community pond site :

SL	Name	Title	SL	Name	Title
1.	Mrs. Shilpi	Female member	17.	Sri Dulal	Community Leader (Male)
2.	Mrs. Lilaboti	Female member	18.	Sri Bhobesh	Male member
3.	Mrs. Shabana	Female member	19.	Sri Kartik	Male member
4.	Mrs. Alomoti	Female member	20.	Sri Ranjit	Male member
5.	Mrs. Maya	Female member	21.	Sri Bacchu	Male member
6.	Mrs. Panchami	Female member	22.	Sri Milon	Male member
7.	Mrs. Shaymoli	Female member	23.	Sri Gour	Male member
8.	Mrs. Sheba Rani	Female member	24.	Sri Ratan	Male member
9.	Mrs. Madhobi	Female member	25.	Sri Anil	Male member
10.	Mrs. Parul	Female member	26.	Sri Sunil	Male member
11.	Mrs. Sharwasshati	Female member	27.	Sri Paritoy	Male member
12.	Mrs. Adori	Female member	28.	Sri Netai	Male member
13.	Mrs. Shilpi	Female member	29.	Sri Niranjan	Male member
14.	Mrs. Shilpi	Female member	30.	Sri Nrittya	Male member
15.	Most. Faima	Female member			
16.	Mrs. Parula	Female member			

ANNEX 6: **DOCUMENTS REVIEWED**

Government Documents :

•BCCSAP, ' Bangladesh climate change strategy and action plan' Government of the Peoples Republic of Bangladesh, 2009.

•CDMP, Economic Modeling of Climate Change Adaptation Needs for Physical Infrastructures in Bangladesh, Comprehensive Disaster Management Programme , June 2009.

•CC, 'Climate Change, Gender and Vulnerable Groups in Bangladesh' Climate Change Cell, Department of Environment, June 2009.

•OUTLINE PERSPECTIVE PLAN OF BANGLADESH 2010-2021, 'MAKING VISION 2021 A REALITY' General Economics Division, Planning Commission, Government of The People's Republic of Bangladesh.

Other Documents :

•Agrawala, S., T. Ota, A.U. Ahmed, J. Smith and M. van Aalst, 2003. Development and Climate Change in Bangladesh: Focus on Coastal Flooding and the Sunderbans. Organization for Economic Co-operation and Development (OECD), pp. 13.

•Ahmed, A.U., Alam, M. and Rahman, A.A., 1998. Adaptation to Climate Change in Bangladesh: Future Outlook.In Vulnerability and Adaptation to Climate Change for Bangladesh.

•Rome, 2007, ADPC, Selvaraju Ramamasy and Stephan Baas, FAO , 'Climate variability and change: adaptation to drought in Bangladesh' A resource book and training guide.

The United Nations Capital Development Fund (UNCDF) is the UN's capital investment agency for the world's 48 Least Developed Countries (LDCs). UNCDF uses its capital mandate to help LDCs pursue inclusive growth. UNCDF uses 'smart' Official Development Assistance (ODA) to unlock and leverage public and private domestic resources; it promotes financial inclusion, including through digital finance, as a key enabler of poverty reduction and inclusive growth; and it demonstrates how localizing finance outside the capital cities can accelerate growth in local economies, promote sustainable and climate resilient infrastructure development, and empower local communities. Using capital grants, loans, and credit enhancements, UNCDF tests financial models in inclusive finance and local development finance; 'de-risks' the local investment space; and proves concept, paving the way for larger and more risk-averse investors to come in and scale up.

LoCAL provides a mechanism to integrate climate change adaptation into local governments' planning and budgeting systems, increase awareness and response to climate change at the local level, and increase the amount of finance available to local governments for climate change adaptation.

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