

Local Contributions to Operationalising the UNFCCC, CBD and UNCCD

*Case study: Reducing Vulnerability to Climate Change in the Southwest
Coastal Region of Bangladesh*

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1. Introduction

1.1 Location and ecological settings

Bangladesh sits on the 711 km long coastal line of the Bay of Bengal between the coordinates of 20°34' and 26°38' north latitude, and 88°01' and 92°41' East longitude (Rahaman, 1988). The landscape is highly vulnerable being hydrologically sandwiched between the Himalayan mountain chain and a funnel shaped ocean fed by the world's heaviest sediment loaded river system (Rahaman, 1988). The country is a frequent victim of natural disasters like monstrous cyclones, severe floods, extended droughts, intense salinity and vigorous tidal surges.

The Southwest coastal region of Bangladesh is a flat, low lying, deltaic tidal flood plain having an elevation of one meter or less above sea level. The area includes the region from the Tetulia River to the international border of India and Bangladesh located at the Hariabhanga River. Khulna, Satkhira, Bagerhat, Gopalganj, Narail, Jessore are 6 southwest coastal districts (Administrative unit, figure 1). The coastal zone of Bangladesh is delineated into exposed and interior zones based on three criteria: tidal fluctuations; salinity; and cyclone and storm surge risk (PDO-ICZMP, 2004). According to the definition there are 7-exposed *thana*¹ and 40 interior *thana*¹ in the 6 districts. The Sundarbans, world heritage and the single largest block of mangrove forest, is situated here.

The Geographical situation, land characteristics, multiplicity of rivers and the monsoon climate render Bangladesh highly vulnerable to natural disasters. The Southwestern region is affected by floods, tropical cyclones, riverbank erosion, siltation, salinity intrusion, and tidal surges. The Southwestern region is particularly affected by salinity intrusion and siltation, which can lead to waterlogging and flooding. In recent years this area has also faced occasional tornadoes, drought and heavy rainfall.

1.2 Socio-Economic Characteristics of South-West Coastal Region

1.2.1 Population

The current population in the south-west area is about 7.8 millions. The rural-urban population ratio is close to 84:16 except *Khulna* district. Percentage of immigrants in this part of coastal zone is close to 6 percent for each district (except *Khulna* district, where immigrants are about 33 percent of total population).

Table 1.2.1: Population Information in South-West Coastal Region.

District Name	Total Area (Sq.km)	Total Population	Male:Female
Gopalganj	1490	1151800	108.6:100
Khulna	4395	2357940	108.9:100
Bagerhat	3959	1516820	102.8:100
Satkhira	3858	1854120	108.2:100
Jessore	2567	2469680	109.7:100
Narail	990	694900	100.5:100

Source: Bangladesh Bureau of Statistics, 2001

1.2.2 Education level in south-west Coastal region

Education, irrespective of sex, is perceived as an important human asset. This has been analysed in terms of literacy rate of both 7+ years and 15+ years. The literacy rate of South-West coastal region is shown by the following table 1.2.2

¹ *Thana* is an administrative unit of local government of Bangladesh.

Table 1.2.2: Literacy rate in South-West Coastal Region.

Districts	Literacy rate for 7 + ages			Literacy rate for 15 + ages			Literacy rate for all ages		
	Both sex	M	F	Both sex	M	F	Both sex	M	F
Khulna	43.86	52.16	34.56	57	63	51	35.52	24.57	27.75
Bagerhat	44.33	49.54	38.86	58	60	56	35.59	39.84	31.13
Satkhira	30.54	39.73	21.00	45	51	39	23.74	30.94	16.29
Jessore	33.37	41.02	25.07	51	56	46	26.63	32.91	19.89
Narail	35.65	42.23	28.93	48	51	44	28.46	33.67	23.12
Gopalganj	38.23	44.73	31.64	51	54	47	29.74	34.71	24.68

Source: Bangladesh Bureau of Statistics, 2001

1.2.3 Income

Agriculture here is the traditional source of income. Several types of paddy, pulses, oil seed, betel nuts and leaves, winter vegetables and potatoes are main crops all year round. After agriculture fisheries is the second practiced activity in this part of the country. Both open and closed water fisheries are popular here. After that livestock rearing and various types of services are found. However, in Southwest coastal region of Bangladesh, based on amount of income 52% of the households are absolute poor² and 24% of the total households are extreme poor³ (PDO-ICZMP, 2004).

1.2.4 Culture

People traditionally here are dependent on natural resources like agriculture, fisheries and forestry. Agriculture based traditional festivals and fairs are commonly found in this zone. *Nabannya* (festival in harvesting season when various types of sweet meats are made from new rice grains), *Ambabaty* (festival of making the earth fertile with plantation) etc are common festivals here.

1.2.5 Vulnerability to nature and economy in SW Bangladesh: the comparative sketch

Southwest shallow waters and marine zones host diverse categories of marine fish species and other aquatic lives. Coastal water bodies are rich in nutrients as it is the transition zone of fresh water and brackish water, which is adorned with unique wildlife and vegetation. The largest fishing ground in the Bay of Bengal is close to the Sundarbans mangrove forest (Anwar, 1988).

People in Southwest region are highly dependent on the natural resource base in the sustaining their livelihoods. Agriculture and fisheries are important economic sectors, employing a large portion of the population, aquaculture is increasingly being pursued as an alternative livelihood option rural households.

According to a baseline study in the Sundarban Impact Zone 18 percent households are depend on Sundarban resources. The proportion of Sundarban dependent household varies from 4 percent to 27 percent in the southwest region. Among them are shrimp fry collectors (35%), fishers (33%), honey collectors (22%), boatman (4%), *golpata* collectors (3%), shell/crab collectors (2%) and remaining the medicinal plant collector (SBCP, 2001)

More over an extensive aquaculture practices are in the pattern of livelihood in this region. According to department of Fisheries, total shrimp production of Khulna, Satkhira and Bagerhat district is 12385, 8364.73 and 14000 respectively (DoF, 2002)

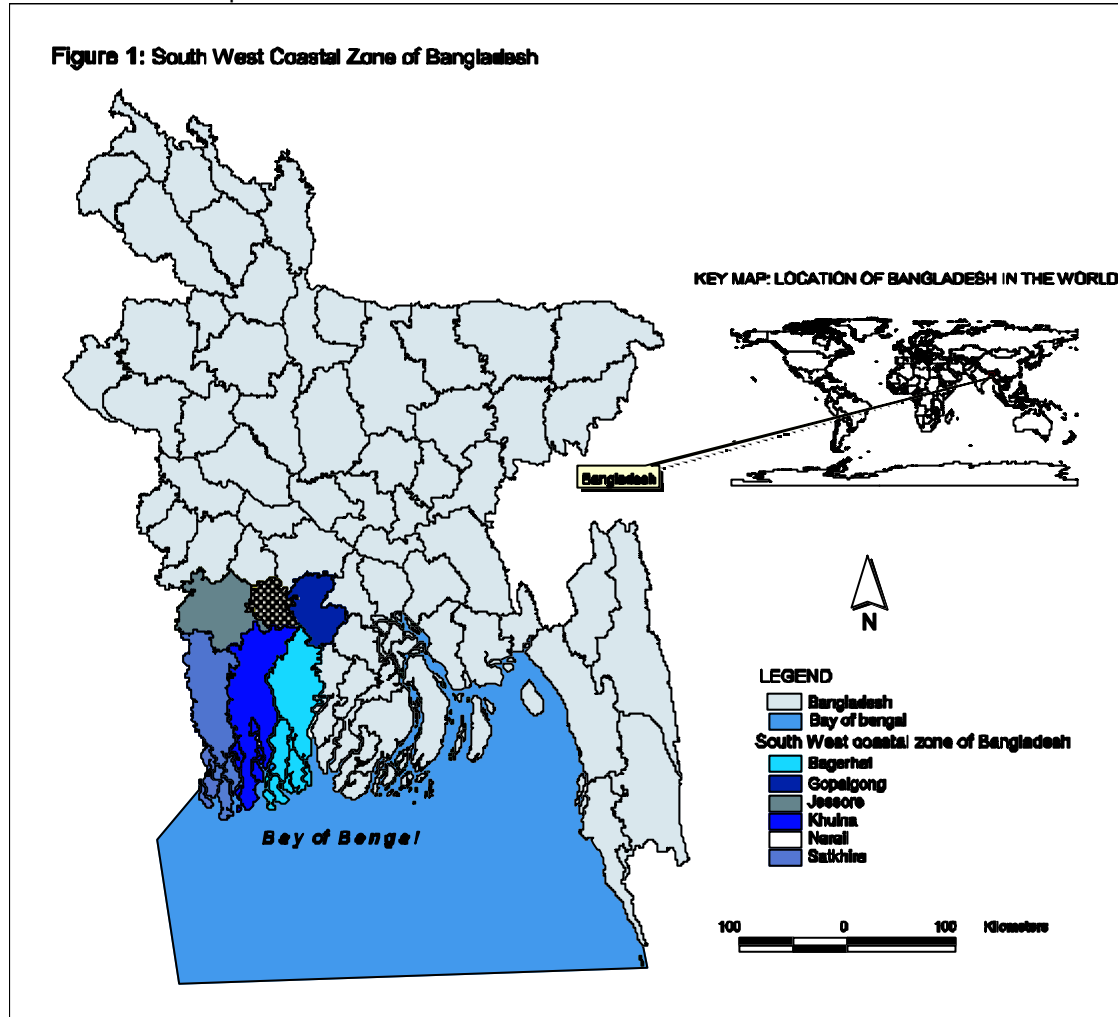
² **Absolute poor** means the poorest groups direct calorie intake usually 2,122 kcal per person per day, food energy intake are expected to reach the caloric threshold and costs of basic expenditure level at which households can afford predetermined basic consumption needs.

³ **extreme poor** means the poorest groups, have only up to 15 decimals of land, suffer chronic food deficit and, take less than 1800 kcal per day, per capita annual income is Tk.3757 and annual household income is 18,785. (Rethinking Rural Poverty: Bangladesh - (BIDS); 1995.)

⁴ **DoE** –Department of Environment

⁵ **MoEF**–Ministry of Environment and Forest

In addition to its contribution to the major economic sectors, the natural resource base provides coastal people with materials for building houses, cooking fuel, raw materials for handicrafts, etc. It is clear that people in this region are highly vulnerable to environmental degradation, climate vulnerability and extreme weather events. In addition to the natural disasters, which have always plagued Bangladesh due to its natural setting, impacts of anthropogenic interventions are creating further challenges to the country's sustainable development. The predicted impacts of climate change will only increase the difficulties coastal people face in securing their livelihoods, maintaining health and safety and achieving sustainable development.



2. Introduction to the organization

Coastal Development Partnership, briefly known as CDP, is working in the south-western part of Bangladesh on the local environmental and socio-economical issues. CDP developed a steadily growing Resource Centre, and began to develop linkages with grassroots level local NGOs, National level organizations and International organizations.

CDP from its establishment is involved with collection and dissemination of information related to the environmental stresses and life struggle of the local people. From the experiences of working with salinity, shrimp cultivation, water-logging, flood and drought issues in the south-western area and peoples struggle and adaptation strategies, CDP is now involved in studying and disseminating information on the people who are the worst victims of climate change related disasters and has also developed a system of Information Management that is steadily improving.

CARE-Bangladesh has initiated the Reducing Vulnerability to Climate Change (RVCC) Project funded by Canadian International Development Agency (CIDA) in the S-W region of Bangladesh to increase the adaptive capacity of the inhabitants of this environmentally

vulnerable region. CDP is one of the 17 Partner organizations of the RVCC project; name CDP-CARE RVCC Partnership Project, serving as the **Central Information Centre (CIC)** on climate change. Collection and dissemination of information through popular publications is one of the major tasks of CDP.

3. Description of activities

3.1 Background

The Southwest Coastal Region of Bangladesh is a tidal floodplain at the southern end of the Ganges delta in Bangladesh. The world's largest single block of mangrove ecosystem the Sunderbans is a part of this region and forms the south most portions bordering on the Bay of Bengal. As land formation is a counting process even now, this region is a dynamic delta enriched by the huge quantities of detritus from the forest, both terrestrial and aquatic. With plenty of fish and rice, this region was considered a region of bounty.

Because of its geographic location, the environment of this region is also highly sensitive. More than 70 percent of the land is low-lying, barely one meter above mean sea-level and below high-tide level. As such, rice cultivation was possible only during the monsoon season, when the surface salinity used to be washed away.

But quite a lot of damage has been caused to the environment, land quality and bio-diversity as a result of human interventions. The first intervention was the Coastal Embankment Project of the 1960's, which, in an attempt to protect the low lying lands as well as the lives and property of the inhabitants from the tidal surges. 4000 km of high embankment were built, out of which 1566 km were in Khulna region alone, with 282 sluices, enclosing all the land within 37 polders. The period coincided with the introduction of High Yielding Varieties (HYV) of rice.

But in the meantime, the heavy loads of floating soil sediments carried by the tides could not enter into the polders to enrich the land with decomposed organic material or compensate for the natural subsidence of the loose delta soil with the soil sediments. These sediments were deposited on the riverbeds when flow ceased at high tide. Gradually, the riverbeds rose higher than the level of the land within the polders. This resulted in permanent water-logging of nearly 120,00 hectares. Thousands of farmer families, both with land and land-less, were rendered destitute. There was heavy out-migration, and many people who lost their occupations resorted to extraction of forest resources from the Sunderban. This large influx of new people caused much damage to the bio-diversity in the Sunderban.

At about the same time as the water-logging occurred, shrimp cultivation began to expand in response to rising market demand from the developed world. Shrimp cultivation caused diversion of land from rice to shrimp, and most of the land-less and share croppers lost their occupations. Shrimp also increased the salinity of water and soil. Water-logging and salinity has caused the death of most of the vegetation in the region, rendering this once bountiful land into a watery desert.

Water-logging, salinity, river silting and river bank erosion are the major issues that affect the lives and livelihoods of the people inhabiting this region. The by-products of these processes are malnutrition, food insecurity, unemployment, lack of safe drinking water and increase in the incidence of water-borne diseases.

The Southwest Coastal Region of Bangladesh has been identified as one of the regions that would be worst affected by global climate change. The region is already experiencing the effects of rising sea levels, water logging, flood, cyclone, poor drainage through river systems, siltation and saline intrusion. As a result, farming systems have been seriously disrupted with few coping mechanisms available to local people to adjust to the new situation.

3.2 Main Activities

The RVCC Project is working in six districts in southwest Bangladesh (Bagerhat, Gopalganj, Jessore, Khulna, Narail and Satkhira) through partnerships with local organizations and communities. The overall project goal is: *to increase capacity to communities in southwest Bangladesh to adapt with the adverse effects of climate change*. The project's purpose is: Communities and institutions in the southwest region demonstrate capacity to raise awareness on climate change, reduce climate change-induced vulnerability, and influence relevant policy. The RVCC Project receives guidance and direction from its Project Advisory Committee. The Project is implemented on the basis of the revised Project Implementation Plan (PIP) that was submitted to CIDA (Canadian International Development Agency) in August 2002 and an Annex to the PIP submitted in June 2003 that were subsequently approved. The project works in partnership with local organizations to: raise awareness of climate change issues and adaptive strategies; implement practical measures to reduce vulnerability at the household and community levels; and to advocate with local, regional and national government for appropriate action on climate-related vulnerabilities.

Names of 17 Partner NGOs

1. AOSED-An Organization for Socio-Economic Development
2. BCAS- Bangladesh Centre for Advanced Studies
3. BRRI- Bangladesh Rice Research Institute
4. CDP-Coastal Development Partnership
5. DDJ-Dak Diye Jai (Bengali)
6. GMK- Gono Milon Kendra (Bengali)
7. GUS-Gono Unnayan Sangstha (Bengali)
8. IDEAL-Institute of Development Education for Advancement of Landless.
9. Nabolok (Bengali)
10. Prodipan (Bengali)
11. Rupantar (Bengali)
12. Sushilan (Bengali)
13. Samadhan (Bengali)
14. SUS-Satkhira Unnayan Sangstha (Bengali)
15. Unnayan (Bengali)
16. Uttaran (Bengali)
17. WRDS-Wetland Resource Development Society

3.2.1 Expected Outcomes

Household Level: The project is improving the capacity of 4,300 vulnerable households to adapt with climate change impacts by making them aware of new livelihood strategies, using a group-based approach. Staff belonging to 9 local partner organizations and 2 research organizations is training and supporting these households.

Community Level: The project is training local partner organizations to work with 14 Union Parishads (lowest tier of elected government) and community leaders to increase their awareness of climate change impacts and to develop and implement community-level adaptation strategies.

Institutional Level: The project is supporting the capacity building of six local organizations in four areas

- i. Collection and dissemination of information related to climate change, including publication of regular newsletters and a climate change information package for use by partner organizations and journalists.
- ii. Advocacy on salinity and its impact on potable water - the most critical climate change-related vulnerability context identified by participants in a vulnerability assessment conducted by the project.
- iii. Awareness campaigns on climate change issues. A local organization is performing climate change-focused pot songs (traditional folk song) and drama shows. Posters and a series of radio programs will be developed, focusing on proven adaptation strategies. Local journalists are participating in field visits and writing articles for the national and regional newspapers. Eco-clubs are conducting awareness sessions on climate change at the village level.
- iv. An 8-session module on climate change has been developed and will be implemented within the secondary school system starting in January 2004, by school teachers that have received training on the impacts of climate change and potential adaptation strategies.

National Level: Project partners are interacting regularly with national-level climate change stakeholders on policy advocacy issues in order to increase awareness of local climate change implications and local people's needs.

3.3 Adaptation Strategies to Reduce Vulnerability to Climate Change

The RVCC approach at the household level consists of building the capacity of 4300 beneficiaries to cope with a particular vulnerability context as it impacts on a specific indicator of household well being. These well-being indicators and vulnerability contexts were chosen on the basis of a vulnerability assessment that was conducted early in the project, and has been refined, as field realities have emerged.

During the vulnerability assessment, the well-being indicators that were identified by the beneficiaries as being most important to them are: **Income, Food, Potable water, Health and personal safety, Housing and safety of property**. The vulnerability contexts that were identified by beneficiaries as being of significant importance to them and were determined to be linked to climate change are: **Salinity (including tidal flood), Flood, Storm, Water logging (including siltation and heavy rainfall), Drought, Cyclone and Loss of Biodiversity**.

Vulnerability context related to climate change						
Salinity	Flood	Water logging	Drought	Storm	Cyclone	Loss of biodiversity
Main Aspects of Adaptation Related to Well-Being of a Household						
Income	Food	Health	Housing	Potable water		

In order to address specific combinations of vulnerability contexts and well-being indicators, seven strategies have been identified. Within these strategies, different measures have been selected for implementation based on the experience of the 17 PNGOs in the project area. A number of activities, for example, cross visits, learning sessions and demonstration plots, may contribute to a particular measure.

In order to address combinations of vulnerability contexts and well-being indicators, eight strategies are identified. Within these strategies both household level and community level adaptation measures have been selected for implementation based on the experience of the PNGOs in the project area. Measures are described below under the corresponding strategy-

Strategy 1: Increase food and income through

agriculture

Drought-resistant crops/vegetables: One PNGO is working with beneficiaries to introduce crops such as groundnuts and watermelon that can be grown under drought conditions when cultivation of usual crops is impossible, thereby increasing food security and decreasing vulnerability to drought.

Embankment cropping: Cultivation of beans, gourds, okra and other vegetables on the embankments between prawn *ghcrs* is being promoted by one PNGO. This maximizes the use of available land for cultivation in waterlogged areas.

Floating gardens: This unique measure involves the cultivation of vegetables on floating beds of water hyacinth, a weed that grows prolifically on ponds and rivers. Four PNGOs have undertaken this measure in their waterlogged project areas, with the technical assistance of WRDS, a research organization with experience in hydroponics.

Homestead gardening: Seven PNGOs are promoting cultivation of vegetables and fruits on homestead plots for consumption and market. The techniques are adapted to the specific

conditions of the beneficiary area, for example in saline areas vegetables are planted in pots and irrigated with lube well water. This is being promoted primarily for water logging and salinity contexts.

Low-cost irrigation: One PNGO is demonstrating the use of treadle pump and other simple technologies for irrigating groundnuts and other crops grown under drought conditions.

Saline-tolerant non-rice crops: The introduction of saline-tolerant varieties of chili, mustard, maize and potato is being undertaken by three PNGOs who are working on the salinity vulnerability context.

Strategy 2: Increase Income through alternative livelihoods

Apiculture & honey processing: Four PNGOs are encouraging beneficiaries to try beekeeping and processing of honey as an income generating measure to reduce vulnerability to drought, water logging and loss of biodiversity.



Cage aquaculture: Six of the PNGOs are promoting small-scale fish farming in cages, which can be implemented in household ponds, common water bodies, or waterlogged areas. Fish can be consumed or sold at market to increase income stability. This measure primarily addresses the waterlogging context.

Cattle rearing: Training on raising cattle for consumption and market is being offered to beneficiaries by five PNGOs to reduce vulnerability of beneficiaries to water logging, drought, salinity and flood.

Cottage industries: Four PNGOs are working with beneficiaries, particularly women's groups, to develop skills in the production of *mele* (reed) mats, recycled paper bags, sewing and bamboo baskets for sale. All these products are widely used locally.

Crab fattening: Five PNGOs are promoting crab fattening, which involves the collection, rearing and feeding of crabs for a period of 15 days to increase their market value. Crab fattening addresses the salinity issue, as the crabs can be kept in brackish ponds.

Drought-resistant tree plantation: Homestead planting of drought-resistant fruit and timber trees for longer-term income generation is being introduced by two PNGOs working in the drought context.

Duck rearing: Nine PNGOs are training beneficiaries to raise ducks to produce meat and eggs for consumption and market. This measure is being implemented to address water logging, flood, salinity, drought and loss of biodiversity.

Goat rearing: Raising goats for consumption and market has been selected as an income and food generating measure by five PNGOs who are working on water logging, drought, salinity and flood.



Mele cultivation: *Mele* is a reed (*Cyperus Tagetiformis*) that is used to produce mats that are widely used for sitting and sleeping on, and can be grown under waterlogged conditions. Five PNGOs are working with beneficiaries to grow *mele*, which can be sold raw or used to produce mats for sale (some groups are being trained to produce the mats under the Cottage industries measure above),

Nursery & homestead afforestation: Establishment of community tree nurseries and distribution, with handling instructions of indigenous varieties of tree saplings (mango, coconut,

sofeda, korai, guava, mehaguni, neem, kewra) to beneficiaries for homestead planting. Four PNGOs are working on this measure for the waterlogging and loss of biodiversity vulnerability contexts.

Pig rearing: One PNGO which works primarily with Hindu and ethnic minority groups is promoting pig raising for consumption and market in the context of salinity.

Poultry rearing: Beneficiaries of eight PNGOs are receiving training on chicken raising to produce meat and eggs for consumption and market to reduce their vulnerability to water logging, salinity, drought and loss of biodiversity.

Prawn-fish poly-culture: Five PNGOs are working with beneficiaries to introduce prawn-fish poly-culture, which involves the culture of prawns and other varieties of fish in fresh water *ghers*. This measure is being promoted to address flood and water logging.

Safe havens for domestic animals: Establishment of safe havens for animals to protect from flood, storm and cyclone is being promoted by one PNGO,

Saline-tolerant tree plantation: Homestead planting of saline-tolerant fruit and timber trees (e.g. *kewra*) for longer term income generation is being promoted by five PNGOs.

Shrimp-fish poly-culture: Shrimp-fish poly-culture involves the same technique as prawn-fish poly-culture, but is implemented in saline water bodies. This measure addresses water logging.

Community fish farming: One PNGO has undertaken fish farming in a community *beel* as an income generating option.

Strategy 3: Increase availability of food

Improvement of food storage: One PNGO is working to promote indigenous techniques for protecting food stores from flood, using bamboo baskets, clay pots and tin storage containers.

Introduction of cooking stoves: The same PNGO is promoting portable cooking stoves made of local materials to improve food security during floods.

Improvement of food storage: One PNGO is working to introduce community-level food storage to improve food security in flood situations.

Strategy 4: improve health conditions and personal safety

Improvement of hygiene and sanitation: One PNGO is working with beneficiaries to raise awareness about personal hygiene and sanitation and promote the use of hygienic latrines.

Protection against cyclones: One PNGO is training beneficiaries in cyclone preparedness and use of cyclone shelters. This measure is complemented by work at the community level to allow ethnic minority groups to access community cyclone shelters.

Strategy 5: Improve access to safe water

Deep tube wells: Two PNGOs have identified deep tube wells as the most appropriate source of safe water for their target communities in areas affected by salinity. The wells will be drilled into a lower confined aquifer that is free of arsenic, and will be operated with a small hand pump. The six wells that have been proposed will each provide safe water to approximately 75 households for cooking and drinking.

Household pond protection: One PNGO is working with beneficiaries to excavate small household ponds and to protect them from contamination, in order to provide a safe source of water for cooking and drinking in saline areas,

Indigenous methods of water collection: One PNGO is promoting an indigenous technique of water collection, which involves collection and storage of rainwater in earthen pots.

Pond-Sand-Filters (PSF): Two PNGOs are addressing safe water through the construction of pond-sand-filters for pond sources. The PSF technology consists of a concrete structure where the water is filtered through a series of graded gravel and sand layers, followed by chlorination. The water is pumped through the filter and accessed by taps.

Rainwater harvesting: Three PNGOs are promoting improved technology for rainwater collection consisting of a collection funnel, a brick tank for storage and a hand pump.

Safe water & sanitation: All three PNGOs who are addressing the potable water well-being indicator are offering trainings to beneficiaries to raise awareness about how to collect and store water safely, and proper sanitation practices.

Strategy 6: Improve safety of housing

Storm-resistant housing: The two PNGOs who are addressing the storm vulnerability context are demonstrating and promoting indigenous storm-resistant construction features.

Wind break tree plantation: The same two PNGOs are working with beneficiaries to encourage planting of trees beside houses and along edges of communities to protect against storms and cyclones.

Strategy 7: Reduce threats

Canal excavation: Three PNGOs are promoting canal excavation for improved drainage to reduce water logging,

Cyclone preparedness: Promotion of construction of cyclone shelters and access to existing shelters for minority groups is being undertaken by one PNGO.

Raising height of embankments: Promotion of raising height of embankments in order to protect from flooding,

Tidal River Management (TRM): TRM is being promoted by three PNGOs to protect communities from water logging.

Strategy 8: Increase income through access to common property

Creating access to common property regimes: Three PNGOs are promoting access to common water bodies for beneficiaries for implementation of project activities.

3.4 Community level approach

Several community level adaptation strategies and corresponding measures have identified that complement the work being done at the household level. The approach taken is to work with UP chairs, members and community leaders to build their capacity to plan and implement community level measures that will reduce threats from the vulnerability contexts. The aim is for each UP to develop an action plan for the measure within the project's lifetime.

- It was realized that an integrated approach, where household and community level activities take place in the same area, resulting in stronger vertical linkages between households and local government, would be more sustainable. Consequently, four PNGOs selected 14 UPs in Jessore, Bagerhat and Satkhira Districts, where they had already established good working relationships based



on their household level activities. The PNGOs working directly with UPs are Nabolok, IDEAL, Samadhan and DDJ.

In addition, the other outcome 1 PNGOs are addressing access to common property for beneficiaries, as well as promoting community fish farming and food storage, in support of their household level activities.

3.5 Advocacy Campaign

The Advocacy campaign is being undertaken by the RVCC in partnership with Uttaran, a local NGO, as well as civil society partners. The objectives of the advocacy campaign are:

- To incorporate drinking water issues in the context of increasing salinity in the southwest region into the National water Policy for Safe Water Supply and Sanitation.
- To ensure that the issue of saline drinking water is incorporated into the final National Water Management Plan (NWMP).



The advocacy campaign partners identified the following target audiences for the campaign: rich individual, people suffering from saline drinking water, NGOs, Local/Divisional/National Departments of Public Health and Engineering, Members of Parliament, local administration, Water Resource Planning Organization (WARPO), Water Development Board/Water Resource Ministry, Local Government and Rural Development Ministry, Prime Minister's Secretariat, donors, media and Union Parishads/ Locally Elected Bodies. Also identified were national and international allies, and possible ways of involving them in the campaign, as well as key messages for the different target audiences.

The tools and media for communicating the key message are:

- i. Grassroots Mobilization: raise awareness through cultural activities, posters, stickers, booklets, public meetings and processions, rallies, etc.
- ii. Persuasion and Lobbying: representation to Ministers and high officials of government, submission of memorandums to the Prime Minister through UNOS, newspaper advertisements and articles, letter campaigns, workshops, seminars and roundtable discussions, etc.
- iii. Media Campaign: press conferences, field visits for journalists, radio and television talk shows, etc.

3.6 Policy level initiatives

A detailed analysis of 12 sector policies focuses on impacts of the national policies on planning and implementation of activities targeted at modifying various threats and risks of climate change and sea level rise, and enhancing local-level resilience through adaptation. The reviewed policies are

- National Water Policy
- National Water and Sanitation Policy
- National Agricultural Policy
- Proposed Integrated Coastal Zone Policy
- Interim Poverty Reduction Strategy Paper
- Local Perspective Planning of Satkhira, Khulna and Bagerhat Districts
- National Shrimp Regulation
- National Water Management Plan (draft)
- National Land Use Planning Manual
- National Fisheries Policy

3.7 Awareness Campaign

The 6 PNGOs namely (CDP, AOSED, DDJ, GUS, Uttaran, Rupantar) working on Outcomes 3 and 4 identified the need for stronger linkages among the partners. Consequently, the 6 PNGOs met to define an awareness campaign.

The objectives of the awareness campaign are:

- To raise the awareness of one million people about climate change causes, effects and adaptation strategies; and
- To increase the capacity of campaign partners in developing awareness tools and information collection and dissemination.

The target audiences for the campaign are:

- Mass population of southwest Bangladesh
- Direct beneficiaries of the RVCC Project
- Students, teachers, School Management Committee members
- Eco-club members
- PNGO staff
- Journalists, local newspaper editors
- Community people of 6 districts where RVCC is working
- GO, NGO, UP representatives and community leaders

The following media/tools are envisioned as part of the campaign:

- Pot song⁶ (Rupantar)
- Drama (Rupantar, Uttaran, 17 grassroots theatre groups, Sudiptee - a CBO of GUS' network)
- Solo folk song (Uttaran)
- Community session (GUS's Eco-club)
- School sessions (AOSED and DDJ; Uttaran)
- Credit group sessions (DDJ and Uttaran)
- PNGOs beneficiary group sessions (9 PNGOs working at household level)
- Workshop/seminars/roundtable discussion (CDP, UTTARAN)
- Trainings/orientation (AOSED, RVCC, Rupantar, PNGO)

- Orientation to coordination meetings organized by Deputy Commissioners and/or TNOs (RVCC, PNGOs)
- GO-NGO coordination meeting (DDJ and RVCC)
- Radio spots (RVCC)
- Posters (RVCC)
- Publications, including: newsletters, booklets, leaflets, climate change information package (CDP, Uttaran)
- Newspaper clippings (CDP)
- Wall writing (Uttaran)
- Newspaper articles (RVCC, Press Clubs, PNGOs)

⁶. **Pot Song** is a traditional folk song that used to be very common in the southwest region. A series of pictures based on a theme are painted onto a long strip of canvas and rolled around two spindles. The pictures are scrolled while a song is sung that explains the pictures, together with dancing and instrument playing.

Examples of awareness initiatives

Pot song and Drama

Rupantor staged 100 *pot song* and drama on climate change. *Pot song* is a traditional folk song that used to be very common in the southwest region. A series of pictures based on a theme are painted onto a long stripe of canvas and rolled around two spindles. The pictures are scrolled while a song is sung that explains the pictures, together with dancing and instrument playing. Booklets about climate change written in prose, distributed after the show. Rupantor also trained 21 grassroots theatre for staging shows consisting of a short drama on climate change vulnerabilities and adaptation options that are relevant to their local context. These theatre groups staged 27 shows in Khulna, Bagerhat, Narail, Jessore and Satkhira Districts. A total of 15,261 people (4,195 female and 10,966 male) attended the drama shows.

Eco-Club Movement

In the project area, many UPs have established Youth Clubs for community building and action. Within the youth clubs, GUS has created 30 Eco-clubs with 19 members in each. The members are Youth Club members who have an interest in environmental issues.

GUS organized village level sharing sessions in conjunction with its Eco-clubs, reaching approximately 7,257 community people (2,636 females and 4,621 males). The Eco-clubs activities are meetings and cultural functions, consisting of short dramas on salinity and different types community base adaptation strategy.



School Program

As students, teachers and school management committees have been identified as a target audience, a school program has been developed by AOSED and DDJ. The school materials that have been developed consist of flip charts and easy reading books for classes VI to IX. As well, a teacher's guideline and training module have been developed for training teachers to use the materials.

A monitoring team has been formed for the school program, consisting of the Thana Education Project Officer/Upazilla Secondary Education Officer, President/Secretary of the Upazilla Teachers Association and a local journalist.



Information Collection and Dissemination

CDP is working as Central Information Center (CIC) of this initiative under the awareness campaign. As CIC, CDP collect successful adaptation strategy and disseminate it to the relevant stakeholders as well as campaign partners. On the other hand CDP collect information about climate change from other sources and disseminate it to partners and relevant stakeholders. Publications such as quarterly newsletter, issue based booklet, leaflet, information package can contribute to improve knowledge base of relevant stakeholder.



Research Initiatives

In addition to the PNGOs who are implementing activities under the four program outcomes of the RVCC project, partnerships have been established with two research organizations to conduct research into water logging-tolerant rice varieties and technologies for floating gardens (hydroponics). These activities directly support household level measures.

Water logging tolerant Rice Varieties

BRRRI (Bangladesh Rice Research institute) finalized the selection of 16 rice varieties, 15 indigenous and 1 High Yielding Variety (HYV), to test. A total of 5 trials were established by 5 NGOs (AOSED, Protiva, Let Us Progress, RUSTIC and Pajia Samaj Kallayan Sangstha), with three sites in fresh water and two in brackish, stagnant water. Each plot measured 3x5 m², and planting was replicated 3 times/trial, for a total of 30 plots/trial. The rice from all five trials was harvested in December 2003 and January 2004.

On the day that the rice was harvested, farmer groups, representatives of BRRRI, Research Assistants and directors of concerned NGOs were present and BRRRI recorded the farmers' perception on the 10 varieties of rice grown. During the growing season, information was recorded for such parameters as seedling height, number of days to flowering, panicle length, days to maturity, yield, etc.

In order to improve performance of the research in the coming season, BRRRI has undertaken several activities. It was decided that since suitable rice varieties do not seem to be available in Khulna, varieties from other parts of the country would be introduced in the trials. Twenty new varieties were collected and will be tested in the upcoming season. As well, six of the varieties that performed comparatively well in fast season's trials will be retested in the coming season. The final selection of varieties to be tested was based on the final results of last year's trials and the preference of participating farmers.

3.8 Description of some successful adaptation Practice in the Southwest coastal region of Bangladesh.

Some strategies implemented by the project and practiced by the indigenous people to improve adaptive capacity and reduce vulnerability, are suitable for some environmental condition. Here we highlight four such implementing activities.

1) Vegetable gardening on floating bed (hydroponics)

Vegetable gardening on floating beds (or *hydroponics*) is subject to traditional agricultural practices in some portion of the southwest coastal region where water logging is a regular phenomenon. A floating garden based market chain has developed in Barishal (Adjacent to the southwest region) and Gopalganj districts. This indigenous technology is being disseminated by the project in other waterlogged areas of southwest coastal region.



Figure: Vegetable cultivation on floating bed

Hydroponics is an agricultural system where traditional crops are grown on beds floating on water rather than soils. The floating bed used by the farmers are usually made of water hyacinth and straw of *aman* paddy along with duckweed, Dulali lata (*Potamogeton alpinus*), *Salvinia* (water fern), water lettuce and other aquatic plants. Main crops of floating bed cultivation are Ladyfingers, Cucumber, Bitter Gourd, Lal sak (*Amaranthus gangeticus*), Kohlrabi (*Brassica oleracea L. var. gangyloides*), palang sak (*Spinacea oleracea*), Panikachu (*Colsacea esculenta*), egg plant, Chili, turmeric, cabbage, cauliflower, pumpkin, potato, tomato etc.

The traditions behind this floating bed agriculture in southwest zone of Bangladesh are:

- This zone is characterized by several ditches, canals and water logged areas and thus cultivable areas are low. So farmers use to cultivate crops on floating beds along with soil cropping.
- Floating bed agriculture is more productive than traditional soil agriculture as shown in table-

Table 3.5.1: comparative yields per acre in soil based and floating bed agriculture

Crop	Soil-based	Soil-less
Beans	5 tons	21 tons
Beets	4 tons	12 tons
Potatoes	8 tons	70 tons
Cabbage	13000 lb	18000 lb
Cucumbers	7000 lb	28000 lb
Tomatoes	5-10 tons	60-300 tons

Source: Haq, Rezaul, A.H.M. etal, 2002, *Soil less agriculture in Bangladesh*, Grameen Trust, Dhaka Bangladesh.

The *dhaps* or beds float on water and stay for at least 10 to 12 months. After harvesting crops, the beds are used as organic manure instead of chemical fertilizer in the fields. The nutrient-rich floating media promotes crop growth intensity as well as lessens the increasing threat of water logging.

2) Mele (reed) cultivation

Mele (reed) is a moderate saline tolerant plant that can grow in high water levels. Depending on species variety *mele* can grow in saline, brackish and fresh water, so species selection is a crucial

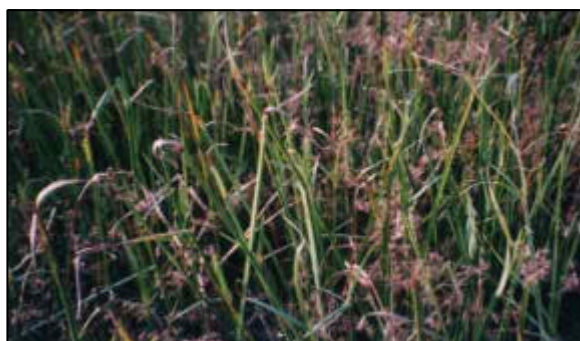


Figure: Standing *Mele* in field



Figure: Drying *Mele* to prepare Mat



Figure: Mat production from *Mele*



Figure: Carrying Mat to Local Market for selling

factor in *mele* cultivation. *Mele* cultivation is economically viable for the local communities but there are some local problems in this sector like lack of capital, lack of water availability, lack of seeds etc. But people are encouraged to overcome these problems and disseminate widely to reduce vulnerability to climate change.

3) Cage aquaculture

Cage aquaculture is a recently adopted strategy of fish culture in the S-W coastal region of Bangladesh. In this process, fish are cultured in an open aquatic body like river, canals or wetlands in cages by individuals or community. The cages are made of metal nets and sunk in water bodies. Then fish are cultured in it, which are either fed manually or by simply leaving it to nature. In this process fish can use its own natural environment and feeding to grow and further more, the right of a human being or community on public properties like fishes of open water are preserved.



Cage aquaculture is adopted in the SW zone of Bangladesh to reduce vulnerability to climate change because six of the PNGOs (see table 3.4.1) are promoting small-scale fish farming in cages, which can be implemented in household ponds, common water bodies, or water logged areas. Fish can be consumed or sold at markets to increase income stability. Cage aquaculture primarily addresses the water logging context and has several benefits:

- Access of local people to common water bodies can be established. They used to have access to common water bodies, but since commercial shrimp cultivation developed in the 1980's on a large scale, much of the land has been enclosed by the shrimp farmers, and entry of outsiders is not permitted. Now the local people can use household ponds and water logged areas.
- Cage culture of fish requires less capital than conventional aquaculture, even if one is the owner of the land.
- Local people can use their own rights on these natural resources.
- In this process water logged areas can be used efficiently
- The secondary impact of reduced juvenile fish from the wild:
During the rainy season, when much of the land area is flooded, fish enter into the flooded agricultural lands. After the rains, when the water drains off, some water remains in the low-lying pockets where some of the fish, and most of the juvenile fry take refuge. These are often collected for food by poor families.

4) Saline tolerant non-rice crop cultivation

Saline tolerant non-rice crops like maize, grass as fodder etc are specially being promoted to cultivate among local communities in Southwest Bangladesh to increase crop rotation along with retention of Nitrogen and other nutrients in soil for a longer time than usual. This enhances rice production by supplying necessary nutrients to soil. Traditionally in the monsoon season when salinity is low, one cycle of paddy cultivation is possible for people. Rest of the year due to salinity the land is left fallow. In this period cultivation of saline tolerant non-rice crops like maize, grass etc. can provide fodder for cattle that encourages local people to raise livestock along with other benefits. Ultimately the livelihood options increase, a sign of reducing vulnerability of climate change.



5.Improve food availability/Storage, safe water supply, health and safety, better housing and reduction of threat via community-based Initiative

Improvement of food availability and storage, safe water supply techniques, health and safety system, better housing techniques regarding resistant to natural disasters, community approaches etc are considered for better adaptation. Indigenous techniques of safe water production by filtering system are encouraged in this area. Further improved system of safe water techniques are also especially encouraged. Safe sanitation techniques are being introduced in the area which areas are low cost and easy to handle. More over, sanitation materials are also being supplied in low price among the people. Storm and flood resistance housing techniques are part of the indigenous knowledge in the area.

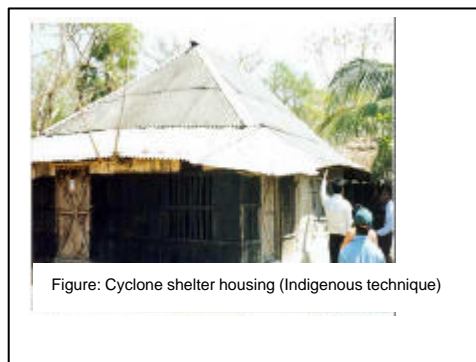


Figure: Cyclone shelter housing (Indigenous technique)

Improved housing techniques are encouraged among them to achieve more stability against natural disaster. Community based initiatives are also encouraged especially for strengthening adaptive responses.

3.9 Current and expected challenges

The challenges are identified by CARE -RVCC project as follows

1. Working with union parishads/Local Government (Last tier of the local govt. which is least empowered and not able to provide proper services in the community, so by this project it is also an important task to build up their capacity and promote community level adaptation.)
2. Including materials on climate change issues into the School Curricula, which is an innovative initiative for Bangladesh.
3. Increasing income and food through alternative livelihood for vulnerable people
4. Developing knowledge and skills of beneficiaries
5. Ensuring food security to vulnerable groups
6. Improving access to safe, water and sanitation
7. Overcoming the political influence at local level (e.g. large areas of state owned land and water bodies are leased out for the dominant shrimp cultivation. Moreover, many locally powerful and influential individuals engage labourers to fish in rivers and other state-owned water bodies without paying any gear fees. The Fourth Fisheries Project (FFP) has reduced this risk in some areas, as the project has introduced Community management of fisheries. This project has developed community organizations and trained them in fishery management. Unfortunately the project only covers a few small pockets.

3.10 Stake holders

Rural male and female who are vulnerable to climate change. especially day labourers, fishermen of South-West Region, Partner organizations of RVCC Project, Local NGOs, CBOs, Community leaders and Civil Society members such as students, Teachers, Lawyers, Doctors etc and other projects working in the southwest region, National Organization (both GOs and NGOs), International Organizations, various institutions etc. all are stake holders of this project.

3.11 Opportunities to replicate the activities

The adaptation strategies of RVCC Project have been collected from different places which local people used as indigenous ways. In the Southwest Coastal region of Bangladesh. One such strategy is to use the slightly saline low lands to cultivate Mele (reed) a sedge-like grass used for weaving mats where rice cannot be produced. This provides an alternative source of livelihood mainly for poor and marginal farmers. In waterlogged areas, hydroponics or cultivating vegetables on floating beds, is both income generating as well as assuring nutrition. Both have been found successful adaptation practices in the Southwest Coastal Region. These processes are replicated easily and are gaining popularity among the beneficiaries. They can be replicated in similar conditions anywhere.

4. Linkages of the activities with UNFCCC, CBD and UNCCD

4.1 Contribution to the UNFCCC

The RVCC project goal is: to increase the capacity of Bangladeshi communities in the southwest to adapt with the adverse effects of climate change. The project has been designed to assist Bangladesh, a non-Annex 1 country, to adapt with the impacts of adverse climate change via promotion of sustainable development and local level capacity through advocacy initiatives on climate change issues and to focus on the real vulnerabilities of households and communities, rather than emphasizing on long-term climate models. The activities address issues applicable to beneficiaries, as well as reducing vulnerability to long-term environmental changes.

The project is working with communities and institutions to raise awareness on climate change, promoting livelihood standards to adapt with environmental changes that could be exacerbated by climate change and influencing policies related to climate change and livelihood.

4.2 Contribution to CBD and UNCCD

Reducing Vulnerability to Climate Change (RVCC) Project has also working on reducing vulnerability to other environmental stresses such as land degradation, loss of biodiversity as well as promoting sustainable development.

Table 4.2.1: Activities on vulnerability and climate change related to combat of Land degradation and enhance conservation of biodiversity

Measures	Land degradation combat status (Prevention, rehabilitation and reclamation are three basic combat desertification status set by UNCCD)	Biodiversity conservation status ("+ " indicates having relation; "0" indicates no relation with CBD)	Explanation (# Contribution to UNCCD and * Contribution to CBD)
Vegetable gardening on floating bed in water logged area	Prevention	+	#Decrease pressure on land use in purpose of agriculture * Induce culture of vegetation of indigenous variety
Saline tolerant non-rice crop cultivation	Prevention and reclamation	+	# Increase possibility of rotation of crops with rice thus increases soil organic matter, moisture and stability of soil texture. * Introduction of resistant species to local scale biodiversity
Drought resistant crop cultivation	Prevention	+	# Increase stability of soil texture under draught conditions * Small-scale biodiversity conservation and protection of local species along with increased water availability in root level soils.
Homestead gardening	Rehabilitation and reclamation	+	# Increase stability of soil texture in house hold areas * Strengthening local biodiversity status to adverse conditions
Saline tolerant Tree (Mainly Mangrove species having Market Value) Plantation	Prevention, reclamation and rehabilitation	+	

Forestry (nursery and homestead aforestation)	Prevention, reclamation and rehabilitation	+	
Embankment Cropping	Prevention	+	# Decrease of soil loss from high erosion prone areas * Strengthening local biodiversity status to adverse conditions
Mele (Reed) cultivation	Rehabilitation	+	# Increase of soil organic matter, prevent land degradation *Decrease extraction pressure on other species as resources
Carp-Fish Poly culture	Prevention	+	# Decrease pressure on land agriculture * Protection and increase of local scale biodiversity
Cage-Aquaculture	Prevention	+	
Crab Fattening	Prevention	+	
Poultry and Duck rearing	Prevention	+	
Livestock (goat, cow, pig etc.) rearing	0	+	*Protection and increase of local scale biodiversity
Apiculture and Honey Processing	0	+	
Improvement of food storage system	0	+	* Increased availability of food will reduce pressure on local resources thus conserve local scale biodiversity
Introduction of improved cooking stoves	0	+	* Improved stove will consume less fuel woods to reduce pressure on local woods
Rain Water Harvesting and storage	0	0	-
Small Pond Protection at household level	+	+	# Increase of water recharge in ground water table and thus increase of soil stability * Availability of fresh water in saline area enhances conservation of biodiversity
Community based Pond sand filter	0	0	-
Indigenous methods for safe water production	0	0	-
Community based deep tube well	0	0	-
Storm resistant housing and Flood resistant housing	0	+	* Less affected households will be more efficient to conserve biodiversity. Decreased damage reduces pressure on local housing materials like <i>Golpata (Nypa)</i> , Bamboo, local woody shrubs etc.
Creating Wind breaks for cyclone protection	Prevention	+	# Increased plantation enlighten soil structure and decrease land erosion * Plantation around house holds acting as wind breaker enhance local scale floral biodiversity
Improvement of hygiene and sanitation	0	0	-
Awareness Campaign	0	0	-Long term effect
Research Initiatives	0	0	- Long term effect but not directly.

4.3 Synergy of activities between biodiversity, desertification and climate change

Vegetable gardening on floating beds in waterlogged area is a low cost indigenous method to cope with water logging. Cage-aquaculture, Carp-fish poly culture, crab fattening increases livelihood security of local inhabitants as well as reduces dependency on natural resources. Water logged area is utilized efficiently without any intervention to limited land of the region. Floral biodiversity in the southwestern region of Bangladesh is in vulnerable condition due to the expansion of shrimp farming as most profitable culture. As a result, a broader region is without trees and other floral diversity. These also increase land degradation as soil loses its quality. The situation is much more vulnerable to local people as they have no alternative livelihood options. Reintroduction of saline tolerant trees with food value such as *Kewra* (a mangrove species), saline tolerant non-rice crops such as grass, *Mele* (Reed) cultivation, saline tolerant rice cultivation, homestead gardening etc. make local people livelihoods more secure while also reducing pressure on the Sundarbans, the world heritage mangrove forest that is being degraded through over exploitation. Diversified cultivation practice conserves biodiversity and quality of soil to combat land degradation.

5. Conclusion

Reducing Vulnerability to Climate Change (RVCC) is working on developing strategies to adapt with the adverse effects of climate change in local level through implementation of an advocacy plan which include an awareness campaign, information collection and dissemination system and community level participation. This is because a true and sound adaptation plan is closely linked with environmental, social and economic components defining the status of each community. However, a criticism of the RVCC can be made as, there is not enough assessment of identified risks or vulnerability to climate change information available nor a good view of social assessment as mobilization, instant reaction to hazards, peoples capacity to adapt, strength of infrastructure is present. As complex and interdependent interactions among environmental, social and economic changes exist, therefore none of the adaptation measures promoted by the RVCC can be applied appropriately without a good socio-economic assessment. A long-term assessment on the geo-physical and socio-economic changes and vulnerabilities can promote the adaptation initiatives in more proper way by forming an integrated policy. In the developing countries like Bangladesh, mainstreaming climate policies into non-climate objectives of the national policy can facilitate and steer adaptation processes in broader perspective, so that the whole communities can be benefited.

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