Advancing Capacity for Climate Change Adaptation (ACCCA)
Analysis and Evaluation of the Pilot Action

Project Report

Project Title	Participatory Climate Risk Assessment and Development of Local Adaptation Action Plan
Country	Bangladesh
Project site(s)	1) Protapnagar and Bardal Union of Assasuni Upazila (Sub-district), Satkhira, 2) Sufalakathi and Panjia Union of Keshobpur Upazila, Jessore, & 3) Nitpur and Tentulia Union of Porsha Upazila, Naogaon The project sites represent three vulnerable eco-systems: - coastal ecosystem (Assasuni) exposed to salinity and cyclone, - brackish eco-system (Keshobpur) exposed to waterlogging and flooding; and - Barind Tract (Semi-arid highland; Porsha) exposed to extreme droughts.
Project Leader(s)	Dr. Mizan R Khan
Monitoring Team(s)	Suppakorn Chinvanno
Project Objectives	1. Increase capacity and motivation of communities and Local Government Entities' to assess community risks to climate change and variability following a participatory process. 2. Build confidence of Local Government Entities and enhance skills of community people in developing stakeholder-inclusive climate risk reduction (adaptation) plans of action at community and local government levels. 3. Increase awareness of multi-level stakeholders on livelihood risks to climate change and variability and adaptation options to facilitate government and development agencies' buy-in and mainstreaming climate change issues. 4. Increase confidence of the multi-level stakeholders on replicability of the identified local level livelihood adaptation strategies.

I. Activities:

A. Project Activities Planned

A. Community Risk Assessment
- A1. Develop a participatory climate risk assessment guideline
- A2. Conduct participatory climate change risk (vulnerability) assessment
- A3. Document and disseminate risk assessment findings and results.

B. Develop Climate Risk Reduction Plan
- B1. Workshops with 6 Union and 3 Upazila (sub-district) Disaster Management Committee
- B2. Development of Participatory Risk Reduction (Adaptation) Plans of Action
- B3. Sharing and Dissemination of Action Plans with Government, NGOs and Development Partners

C. Mainstreaming Climate Change Issues
- C1. Development of Communication Strategy
- C2. Development of Communication Materials (Field Test, Finalization and Printing of school book and posters)
- C3. Dissemination of Communication Materials (Women Groups, Farmer Groups, Fishermen Groups, Indigenous People, Union Parishad, Upazila Parishad, Govt. Departments, NGOs, Development Partners, Universities)
- C4. Develop an Advocacy Strategy for Mainstreaming adaptation strategies into development business.
- C5. School Awareness Programme in 12 secondary schools

D. Implementation and assessment of adaptation options for sharing lessons learned
- D1. Selection of six possible adaptation options from action plan
- D2. Test of selected adaptation options and assessment of efficacy of the option(s).
- D3. Sharing of lessons learned with local, national and international stakeholders.

E. One article in peer reviewed journal and 1 book (Bangla and English) is published
- E1. Preparation of manuscript to publish 1 article in peer reviewed international journal
- E2. Preparation of manuscript to publish 1 Book (Bengali and English) documenting the methodology and results

B. Implementation of the activities Planned

A. Community Risk Assessment

A1. Develop a participatory climate risk assessment guideline

The project personnel have developed a guideline to conduct participatory climate risk assessment in July 2008.

A2. Conduct participatory climate change risk (vulnerability) assessment

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The project has selected the most vulnerable 6 unions based on the workshop findings conducted in June 2007 (2 June at Assasuni, 10 June at Porsha and 12 June at Keshobpur), these are Bardal and Protapnagar in Assasuni, Sufalakathi and Panjia in Keshobpur and Nithpur and Tentulia in Porsha. The project has conducted climate change risk (vulnerability) assessment in the selected 6 unions by the month 4 of the project.

A3. Document and disseminate risk assessment findings and results

The project has produced 6 separate reports that were disseminated among the disaster management committees and relevant government departments to bring consensus among the local community, local government and different service providers of the government for developing a common action plan at local level. The findings also were disseminated to Comprehensive Disaster Management Program (CDMP) of the Ministry of Food and Disaster Management and Climate Change Cell of Department of Environment (DoE) by August 2008.

B. Develop Climate Risk Reduction Plan

B1. Workshops with 6 Union and 3 Upazila (sub-district) Disaster Management Committees

Considering the risk assessment results of the 6 union, 6 workshops at union level have been conducted by the month 6 of the project to develop an action plan at union level. Similarly, 3 Upazila level workshops has conducted to develop action plans at Upazila level and to find out the roles and responsibilities of different agencies and stakeholders to implement the action plans at both Upazila and Union level by August 2008.

B2. Development of Participatory Risk Reduction (Adaptation) Plans of Action

Following the workshops, 6 action plans have been developed in 6 unions, which were validated by upazila disaster management committees. The action plans were developed developed by August 2008.

B3. Sharing and Dissemination of Action Plans with Government, NGOs and Development Partners

The action plans were shared and disseminated to government (DoE, MoFDM, CDMP, Agriculture Department, Fisheries Department, Livestock Department, Women Affairs Department, Youth Development Department, Water Resources Ministry, Public Health Department, and others), NGOs (PKSF, BRAC, PADAKHEP, ASA, BCAS, BUP, Action Aid, Oxfam, CARE, Concern, World Fish, Arannayak Foundation, Water Aid, NGO Forum for Drinking Water and Sanitation and other local NGOs) and Development Partners (DFID, EC, NORAD, DANIDA, UNEP, UNDP, GEF, CIDA, FAO, and others) from August 2008 to May 2009. This will continue beyond the project period.

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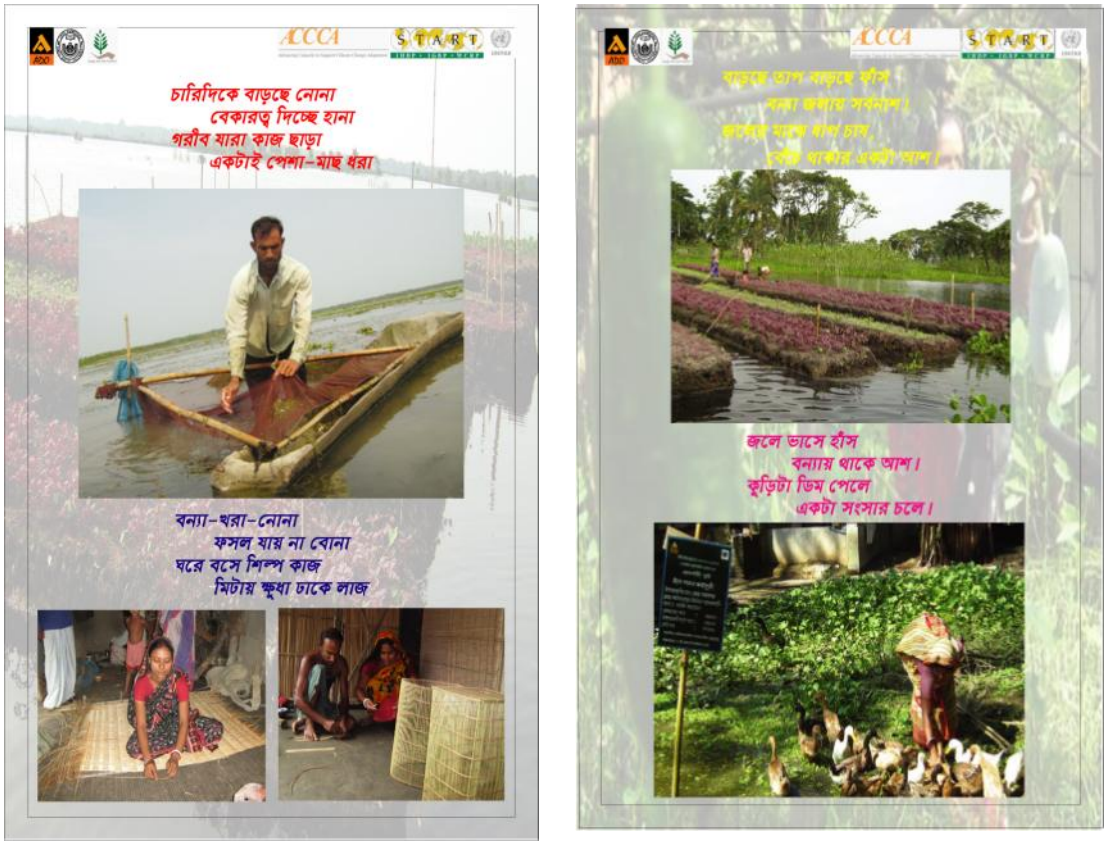
C. Mainstreaming Climate Change Issues

C1. Development of Communication Strategy

A communication was developed by PI and KI in November 2008, which identified communication targets, messages and media for project period and beyond project period to communicate with different stakeholders.

C2. Development of Communication Materials (Field Test, Finalization and Printing of school book and posters)

Following the communication strategy, materials have been developed by month 10 of the project. The materials were developed through field testing of communication message and media. School Students' A Handbook on Climate Change was developed and field tested as it was over emphasized in the project design workshops. Other materials, such as poster was determined after field testing of the communication materials.



Picture: Posters developed and disseminated in the villages of 3 project sites

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C3. Dissemination of Communication Materials (Women Groups, Farmers Fishermen Groups, Indigenous People, Union Parishad, Upazila Parishad, Govt. Departments, NGOs, Development Partners, Universities)

All the communication materials have been disseminated in various channels since October 2008. The posters were disseminated in 3 project sites in different publicized places. The brochure was distributed in regional and national workshops and in COP 14 events to the wider stakeholders.

C4. Develop an Advocacy Strategy for Mainstreaming adaptation strategies into development business

PI and KI also developed an advocacy strategy in December 2008 to advocate with different policy stakeholders and to communicate with them through various means to influence the decision making process in favor of the highly vulnerable people in relation to climate change impacts.

C5. School Awareness Programme in 12 secondary schools

Following the development of school materials from November 2008 to December 2008, there was school awareness programme to educate students of secondary schools on climate change adaptation, so that they could spread the message to the community for having a long run effect for the vulnerable people.

D. Implementation and assessment of adaptation options for sharing lessons learned

D1. Selection of six possible adaptation options from action plan

The project has selected the most appropriate and visible nine adaptation strategies from the action plans developed to test the efficacy of adaptation options before recommending them to the policy stakeholders. The selection was done in September 2008 of the project.

D2. Test of selected adaptation options and assessment of efficacy of the option(s)

9 adaptation strategies have been tested at household level in 120 highly vulnerable households (40 poor and marginal farmers, 20 agri-labourers, 20 landless women, 20 Indigenous people and 20 small traders). The adaptation options have been implemented from September 2008 to January 2009 of the project. At the same time there was ongoing assessment of efficacy of the options by the project Monitor, KI and PI regularly in the implementation phase as well as post-implementation phase. The assessment has been done in May 2009.

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D.2 Pilot Adaptation Actions

Community based pilot adaptation actions have been selected from the climate change risk assessment and local adaptation action plans for implementation at household level among the 120 highly vulnerable households (40 Poor and Marginal Farmers, 20 agri-labourers, 20 Landless Women, 20 Indigenous People and 20 Small Traders).The adaptation processes in water logged area were hydroponics, duck rearing, ring-based vegetable cultivation and charu (fish trapper) making and in saline prone area, adaptation processes were mat weaving by reed, reed cultivation, crab cultivation, sheep rearing and kewara cultivation. For Charu making, roots of some trees, soil and soil nutrients for ring based vegetable cultivation and hyacinth for hydroponics are all collected from the natural sources. So the level of pollution is low here and the amounts of these natural elements are not very high.

Hydroponics

In water logging area, hydroponics is a sustainable agriculture that increases the capacity of the poor and marginal peasants. A total of 10 project participants are now able to cultivate eco-friendly vegetables and other crops round the year to enhance family income and nutrition. Apart from the above, a total of 40 project participants received hands-on skill training on summer and winter vegetable cultivation techniques, inter-culture operation of fruit trees, and vegetable seed preservation techniques. Ladies finger, Spinach (*Lalshak & Palang shak*) and seedling of Cabbage, Kohlrabi, Tomato Chili, and Cauliflower were cultivated in floating bed. Every beneficiary was provided some adaptation inputs like 2 beds costs 1800 Taka, seeds per beneficiary is 700 Taka, net per beneficiary 1500 Taka, and Bamboo 1000 Taka. Per household costs was 5,000 Taka. The cost for 10 households was Tk. 50000. To support the hydroponics beneficiaries 2 small boats were supplied to the 10 households.

Top: Beneficiaries are harvesting crop from floating bed of hydroponics cultivation.
Below: Mr. Suppakorn Chinvanno from the monitoring team visiting hydroponics sites of the project

Table 1: Cost for Hydroponics for 10 beneficiaries (Source: Field survey, 2008)

Items	Quantity	Costs (BDT)	Total (BDT)	Total Cost (BDT)
Cost details per beneficiary				**For 10 beneficiaries**
Bed	2 no.	900 (per bed)	1800	50000
Seed	1 pot	700	700	
Net	5 pcs	300 (per bed)	1500	
Bamboo	5 pcs	200	1000	
Total	per beneficiary		**5000**	

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Charu-making (Fish Trapper)

The beneficiaries of charu (fish trapper) are ten in number. The project has distributed Taka 2000 to each small trader for charu making. The budget is for knife, strings, bamboo etc. by which they can make baskets or other structures for catching fish.

Dr. Mizan R Khan, principal investigator and Mr. Suppakorn from MT visiting beneficiary house adopted alternative livelihoods (making fish trapper) to climate change impacts (water logging)

Table 2: Cost for Charu as an Adaptation Option

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 10	Total Cost (BDT)
Knife, Bamboo, String, Root of different trees etc	1 fold	2000	2000		
Total	per beneficiary		**2000**		20000

Source: Field survey, 2008

Ring-based vegetable cultivation

Ring-based vegetable cultivation in water logged area is a new concept, where vegetables are cultivated round the year. Concrete rings are placed in a relatively higher land around the homesteads and soils are filled up, then seeds are sown. When they grow, branches are put on structures made of sticks or bamboo poles, or they are put on tin/leaf roofs. Pumpkin, Gourd, Spinach, Chili, Balsam Apple, and other vegetables are cultivated in the ring-based system. The beneficiaries of ring based culture are ten in number. Each family was provided twenty rings at a cost of 2,000 Taka (100 Taka per ring), 100 Taka for conveyance, 100 Taka for seed. That is, each family is provided 3200 Taka in a total.

Table 3: Cost for Ring-based Adaptation

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 10	Total Cost (BDT)
Ring	20 no.	100 per ring	2000		
Conveyance	1 fold	100 per beneficiary	100		
Seed and Net	1 fold	100 per beneficiary	100		22000
Total	Per family		**2200**		

Source: Field survey, 2008

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Duck rearing

Duck is a livestock bird animal. It inhabits on both land and water. The suitable areas for duck rearing are water logged areas and in open/closed water bodies. Duck rearing was the source of income in poor community for meeting their nutritional requirements specially proteins. The variety of duck is *kambel, indigenous and Runner*. The beneficiaries of duck rearing are 10 in number. Each family was provided 25 pieces of ducks which cost Taka 150 per duck. Each family was also provided 20kg duck feed which cost Taka 400 and also the medical support if it is needed to anywhere (Taka 5000 for the whole).
In Bangladesh, there is lots of scope to increase duck rearing, because huge areas in this country remain under water or water logged. On the other hand, due to climate change, sea level will rise so there is a need to adapt this condition by shifting or modifying current coping mechanisms.

Table 4: Cost for Duck rearing

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 10	Total Cost (BDT)
Duck	25 no.	150 per duck	3750		
Food	20 Kgs	20 per family	400		
Total	Per Beneficiary		**4150**		10×4150+5000 (medicine) = 46500

Source: Field survey, 2008.

Reed cultivation

The prawn cultivation is a traditional practice in the coastal region of Bangladesh. But the landless poor have no option to cultivate prawn. In addition, water logging and salinity, swampy lands are available in the project area. These kinds of lands are not suitable for normal cultivation practice. In these circumstances, reed cultivation practice was introduced in the saline-prone area as an alternative livelihood for the poor. The beneficiaries of reed cultivation are 10 in number. Each family is provided 5,000 Taka/acre by the project budget.

Table 5: Cost for Reed cultivation (Field survey, 2008)

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 10	Total Cost (BDT)
argil input (Seedling, fertilizer, herbicide)	1	3000 per acre	3000		
Labour cost	10 no.	150	1500		
others (convince)	10	50	500		
Total	Per Beneficiary		**4500**		**45000**

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Mat weaving by reed

Reed cultivation and weaving of mat is a non-traditional product and is very significant for the livelihood of the poor today. During the project period one skill development training on mat weaving was conducted among the vulnerable women. Later, the project supported 10 beneficiaries for mat weaving. Each family is provided Taka 3,000 by the project budget. A suitable place measuring about 5 cubits x 2.5 cubits in the dwelling house is selected for weaving the mat.

Table 6: Cost for mat weaving

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 10	Total Cost (BDT)
Raw materials (reed)	1	2000	2000		
others (Knife, Bamboo)	1	1000	1000		
Total	Per Beneficiary		**3,000**		**30,000**

Source: Field survey, 2008

Kewra tree plantation

The Kewra (*Sonneratia apetala*) plants are usually cultivated on saline soil or around the ridges of a prawn culture area or in the premises of homesteads. In the project, Kewra plants were cultivated near the river beach. The Kewra is used for multiple purposes. Its fruit is edible by humans and can be converted to various food items. It has an economic importance for additional income to the poor. Side by side, it acts as an environmental protector, such as wind-breaks and soil protector against erosion in the coastal region. In addition, tree roots and shell of the fruits are used as fuel and its wood makes good furniture. There are three demonstrations of Kewra cultivation, implemented in Protapnagar Union.

Table 7: Cost for Kewra cultivation

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 3	Total Cost (BDT)
Plant	300	20 per bed	6000		
Labour	3	200	6 00		
Net	1 fold	500	400		24000
Bamboo	1 fold	1000	1000		
Total	Per Beneficiary		**8000**		

Source: Field survey, 2008

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Crab cultivation

The pattern of the land use is changing in the coastal areas gradually. The causes are sea level rise and decrease of fresh water flow from the upstream at dry season. So it is necessary to find out options for changes. At the same time, some adaptive measures should be evolved to increase the resilience to withstand disaster and climate change impacts of the community. During the project period, another skill development training on crab fattening was conducted. The project budget allocated Tk. 50,000 for this purpose (three demonstrations). The trained-up beneficiaries successfully completed crab fattening in six cycles totaling 9,000 crabs and earned a net profit of Tk. 300,000 in a year. A production cycle requires a full lunar period (12-15 days). The production has inspired other vulnerable peasants in the community.

Table 8: Cost for Crab cultivation

Items	Quantity	Costs (BDT)	Total (BDT)	Total Beneficiary 5	Total Cost (BDT)
Pata	18	200	3600		
Threads	15 kg	100	1500		
Net	3 kg	500	1500		50000
seed	5 kg	500	2500		
Bamboo			400		
Total	Per Beneficiary		**10000**		

Source: Field survey, 2008

Sheep rearing

Sheep rearing is importance as source of income as well as meeting the nutritional requirements specially proteins. In drought prone area, sheep rearing is suitable for the landless women and indigenous people. Sheep rearing is an alternative source to increase family income. Each family was provided two sheep's by the project which cost Taka 2400 per sheep. Each family is also provided the medical support when needed (Taka 2500 for the whole).

Table 9: Cost for sheep rearing (Field survey, 2008)

Items	Quantity	Costs (BDT)	Total (BDT)	20 beneficiaries	Total Cost (BDT)
Sheep	2	1200 per	2400		
Medicine	2	50	100		**50000**
Total	Per Beneficiary		**2500**		

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5.1.2 Economic Benefits of the Poor from the project

The project pilots were ways of adapting to extreme climatic conditions. So these new means of adaptations have become the livelihood option of the poor communities at the changed climatic conditions. The cost estimate does include the household labor.

5.1.2.1 Measuring Tools or Methodology

- Input and Output analysis at present / Confidence Level 100
- Projected input and output in 1 year / Confidence Level 90
- Project input and output in 3 years / Confidence Level 70

The study covered all direct beneficiaries of the project, who implemented the options during the project period. Therefore the confidence level of cost-benefits analysis during project period is 100%. But the project cost benefits in 1 and 3 years are based on likely impacts, which beneficiaries projected during the study. The confidence level of the cost-benefit analysis is 90% for 1 year, but 70% for 3 years as the possibility of uncertainties are higher.

Table 10: Immediate outputs of the adaptation interventions

Adaptations	Amount	Total Duration	Total
Hydroponics	Average 1000 Taka/ bed/season	2 months	5,000
Ring Based Culture	Average 370 Taka/week/beneficiary (after 1st 1 month)	3 months	5,600
Duck Rearing (only eggs)	Average 1000 Taka/beneficiary/month (after 1st 2 months)	5 months	3,000
Charu Making	Average 600 Taka/week/beneficiary	2 months	4800
Mat weaving	Average 800 Taka/week/beneficiary	2 months	6400
Reed cultivation	Average 12000 tk/acre/ beneficiary	6 month	12000
Kewra Cultivation	Average 7000 Taka/acre/ beneficiary(after 3 years)	6 month	0
Crab fattening	Average 5000 Tk/month/Beneficiaries	3 months	15,000
Sheep rearing	Average 2400 Taka/year/beneficiary (after1 year)	5 month	0

Source: Field Survey, 2008.

In the calculations, the labor-cost was not included. So the costs of the different adaptations without labor cost are given in the Table 6 below.

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Table 11: Cost without labor-cost

Adaptations	Cost without labor input monetization(BDT)
Hydroponics	5000
Ring Based Culture	2200
Duck Rearing	4650
Charu Making	2000
Mat weaving	3000
Reed cultivation	3500
Kewra Cultivation	7500
Crab fattening	10000
Sheep rearing	2500

Source: Field Survey, 2008

The comparisons between the costs and outputs of the project are given in the Figure 1 below.

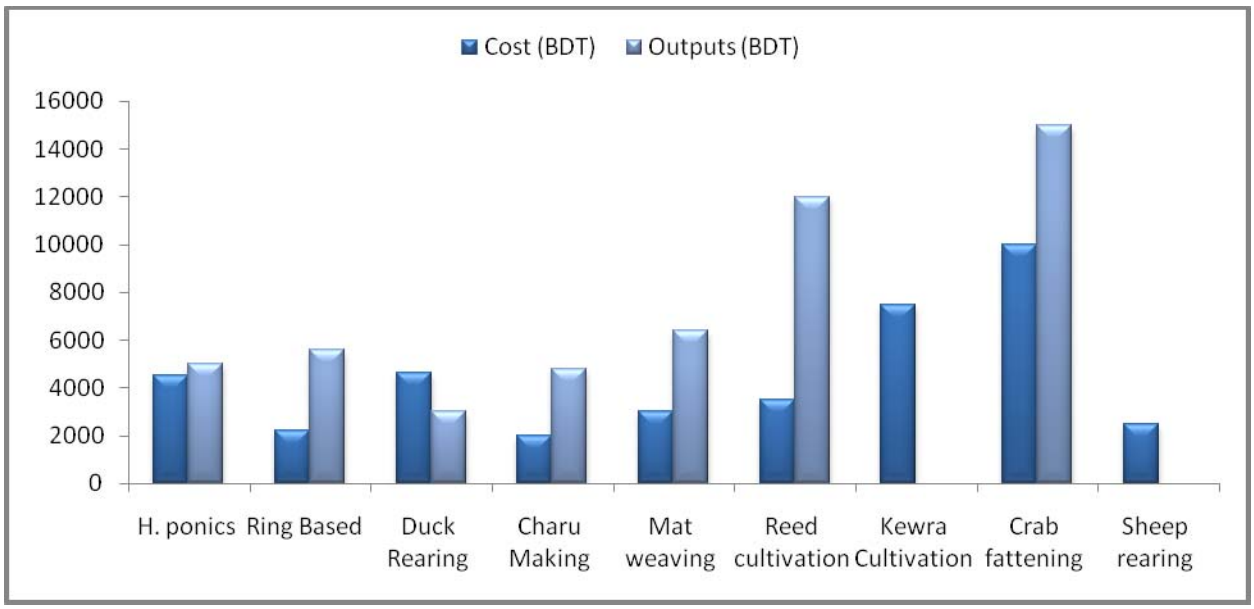

Figure 1: Comparison between the costs and outputs of the project

Depending on the continuation of some adaptation options for different times of the year, based sometimes on seasonality, the assumed outputs are given below. The figure shows that benefit from hydroponic is Taka 500, ring-based vegetable is Taka 3400, charu making is Taka 2800, mat weaving is Taka 3400, reed cultivation is Taka 8500, crab cultivation is Taka 5000. The initial cost for Kewra plantation and sheep rearing was Taka 7500 and Taka 2500 respectively but the benefits from this activities accrue will take time from 1 to 5 years.

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Table 12: Outputs from the project after one year and three years

Adaptations	Quantity	Duration (BDT)	
		1 Year	3 Year
Hydroponics	Average 100 Taka/ bed/season	30,000*	30,000*
Ring Based Culture	Average 70 Taka/week/beneficiary (after 1st 1 month)	22,400	67,200
Duck Rearing (only eggs)	Average 1000 Taka/beneficiary/month (after 1st 2 months)	36,000	1,08,000**
Charu Making	Average 600 Taka/month/beneficiary	28,800***	66,400
Mat weaving	Average 800 Taka/month/beneficiary	38400***	1,05,200
Reed cultivation	Average 12000 tk/acre/ beneficiary	24000	72000
Kewra Cultivation	Average 7000 Taka/acre/ beneficiary(after 3 years	0	7000
Crab fattening	Average 5000 Tk/month/Beneficiaries	60,000	1,80,000
Sheep rearing	Average 2400 Taka/year/beneficiary	2400	12,000

Source: Field Survey, 2008

* Hydroponics will not be sustained after four months if the height is not be raised, so the value of four months has been calculated.

** The ducks lay eggs for one and half year, so the value of first sixteen months are considered.

*** Sale of Charu depends on the seasons like rainy season, so the total sells are assumed equal to the regular sells of four months.

According to the methodology of the analysis for one year projection the confidence level is 90% of the projected value can be accepted and for three years projection the confidence level is 70% of the projected value is taken. These values are given in the table below.

Table 13: Outputs from the project after one year and three years according to the methodology

Adaptations	Duration (BDT)	
	After 1 Year	After 3 Year
Hydroponics	27000	21000
Ring Based Culture	20160	47040
Duck Rearing (only eggs)	32400	75600
Charu Making	25920	46480
Mat weaving	26800	73640
Reed cultivation	16800	50400
Kewra Cultivation	0	4900
Crab fattening	54000	126000
Sheep rearing	2100	8400

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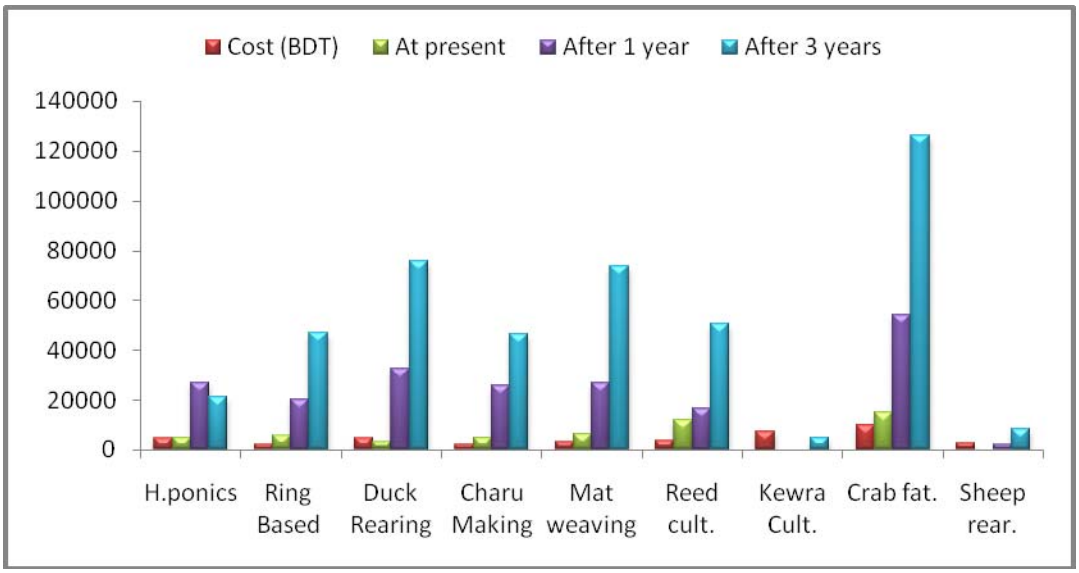
The comparison between the costs and outputs of the project at present, after one year and after three years are given in the figure below.



***At present refers in this table a period of 2 months after initial adaptation intervention.**

Figure 2: Comparison between the costs and outputs of the project at present, after one year and after three years

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5.2 Empowerment of the Beneficiaries

Empowerment of the poor most vulnerable to climate change impact is one of the major issues for the success of any adaptation project. The people have become more interested to new adaptation ways and means, if they bring in more income and if their social status becomes higher. In most of the cases, it was found that beneficiaries become empowered after executing the project. Now non-beneficiaries are very eager to be the beneficiaries of the project and in some cases they become jealous of it. Mr. Sanjit Sarker is one of the beneficiaries of the hydroponics. He told that most of the villagers were eager to be the beneficiary of the project. As he got some income from the hydroponics, it has increased his buying power and his family becomes happier than before with the extra income source. He also wants to continue the culture on his own after the project is over.

Women empowerment is another important factor for the success of any project. The survey result portraits that the female beneficiaries are now more empowered in their family and in the society as well.

5.3 Social Inequity

In the study areas, it was found that people had vast disparity in their income and social status in very much inequitable condition. After executing the project, the beneficiaries were able a bit to reduce the situation by earning extra money. Social harmony also enhanced in the areas. The beneficiaries are now invited in some social programs where they were not invited before. They can now ensure the education of their children also. So the social inequity is being reduced now to some extent.

5.4 Technical Analysis

There are nine pilot adaptation of the project. Except hydroponics, the rest of them are easily adaptable. The beneficiaries have some observations on the hydroponics culture. The technical staff of the field also said the same thing about it. The first one is the height of the bed. As the bed is made of biodegradable materials, it degrades day by day. So the height of the beds is reduced and plants do not have enough depth for their stand. Moreover the duration of these beds is only 3 to 4 months. Now the thickness oh the beds are 3 feet. Local technical hands suggest doing it at least 6 to 7 feet thick. So the longevity will increase. Culture on the beds then can continue for 6 months or more and it becomes more cost effective.

Another problem is the attack of the pests on the bed. Most extreme problem is the rat attacks in the cultured beds. Some other pesticides are also affecting the system. But the problem is that there is a provision of not using the pesticide on the beds. So the productivity may not be that high. So the beneficiaries suggest using some pesticides on the beds to get better production. This issue needs to be further studied.

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5.5 Environmental Analysis

There are some benefits and harms to the environment out of the project activities. The duck rearing and ring based culture are kind of innocuous to the environment. They are natural processes. However, the other two adaptation options in the water-logged area have some negative impact. To make charu, roots of the tree are needed. So when they collect roots they make the tree weak. They also need bamboo, so harvesting may take place more than planting. The most striking is the hydroponics. Another benefit is - after the full degradation, the beds can be used as compost for agriculture.

But the problem is that the beds made of water hyacinth degrade gradually. As a result, water becomes polluted and organic load increases in the water body. Dissolved oxygen level becomes lower and affects other species of flora and fauna of the water body. The fish species is already reduced beside the bed areas. The people who live on fishing from the beel area are not happy with it. It is a matter of further analysis.

Another effect is found on the people who work in the beds. Skin inflammation and irritation is become common because of polluted water. The people need medication which incurs further cost to them.

I. Multi Criteria Analysis of Climate Change Adaptation Options

For multi criteria analysis of climate change adaptation options some indicators may be used. All the selected criteria become weighted here so that decision making becomes easier. The selected criteria and their indicators are given here below.

- **Economic Cost-benefit indicators**
  Cost/Benefit Ratio = 1:2 = 30
  Cost/Benefit Ratio = 1:1.5 = 15
  Cost/Benefit Ratio = 1:1 = 0
  Cost/Benefit Ratio = 1:0.5 = -15
  Cost/Benefit Ratio = 1 : <0.5 = -30

- **Social Impact Indicators**
  Accepted without any objection and high increase in literacy and living standard = 10
  Accepted with small change and small increase of literacy and living standard = 5
  Not accepted and no increase in literacy and living standard = 0

- **Culture Sensitivity Indicators**
  Culturally indifferent = 10
  Culturally small different but adaptable = 5

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Culturally different	= 0
Change local culture	= -5
Bad impact on the local culture	= -10

- **Gender Sensitivity Indicators**

Is sensitive to gender needs	= 10
Is relatively gender sensitive	= 5
Is gender neutral	= 0
Is gender insensitive	_= -5
Is harmful for gender balance	= -10

- **Empowerment Sensitivity Indicators**

Make local people highly empowered	= 10
Make local people moderately empowered	= 5
Empowerment neutral	= 0
Make local people slightly disempowered	= -5
Make local people highly disempowered	= -10

- **Environmental Indicators**

Non-polluting and large scale improvement of the environment	= 15
Non-polluting and small scale improvement of the environment	= 7.5
Non-polluting and no improvement of the environment	= 0
Small scale polluting and degrade environment partially	= -7.5
Polluting and degrade environment	= -15

- **Labor and technological indicators**

Need less labor and technology is transferable and sustainable	= 15
Need less labor and technology is transferable but unsustainable	= 10
Need less labor and technology is non-transferable and unsustainable	= 5
Need labor and technology is nontransferable	= 0

The multi criteria analysis of climate change adaptation options according to the attributed value are shown in the table below here.

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Table 14: Multi criteria analysis of climate change adaptation options after 3 months of the interventions

Criteria	Adaptation Option								
	H.ponics	Ring based Cultiv.	Duck Rearing	Charu Making	Mat weaving	Reed cultiv.	Kewra Cultiv.	Crab fattening	Sheep rearing
Economic Cost-benefit indicators (30)	0	-30	-15	30	15	30	-30	30	-30
Social Impact Indicators (10)	5	5	5	5	10	5	10	10	10
Culture Sensitivity Indicators (10)	5	10	10	10	10	5	10	0	5
Gender Sensitivity Indicators (10)	5	10	5	10	10	0	5	0	5
Empowerment Sensitivity Indicators (10)	5	5	5	5	10	0	0	5	10
Environmental Indicators (15)	-7.5	7.5	7.5	-7.5	0	0	15	-7.5	0
Labor and technological indicators (15)	10	15	15	10	10	10	15	5	15
Total Weighted Value	22.5	22.5	32.5	62.5	65	50	25	42.5	15

Table 15: Multi criteria analysis of climate change adaptation options at after 1 year

Criteria	Adaptation Option								
	H.ponics	Ring based Cultiv.	Duck Rearing	Charu Making	Mat weaving	Reed cultiv.	Kewra cultiv.	Crab fattening	Sheep rearing
Economic Cost-benefit indicators (30)	30	0	30	30	15	30	-30	30	15
Social Impact Indicators (10)	5	5	5	5	10	5	10	10	10
Culture Sensitivity Indicators (10)	5	10	10	10	10	5	10	0	5
Gender Sensitivity Indicators (10)	5	10	5	10	10	0	5	0	5
Empowerment Sensitivity Indicators (10)	5	5	5	5	10	0	0	5	10
Environmental Indicators (15)	-7.5	7.5	7.5	-7.5	0	0	15	-7.5	0
Labor and technological indicators (15)	10	15	15	10	10	10	15	5	15
Total Weighted Value	52.5	52.5	77.5	62.5	65	50	25	42.5	60

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Table 16: Multi criteria analysis of climate change adaptation options at after 3 year

Criteria	Adaptation Option								
	H.ponics	Ring based Cultiv.	Duck Rearing	Charu Making	Mat weaving	Reed cultiv.	Kewra cultiv.	Crab fattening	Sheep rearing
Economic Cost-benefit indicators (30)	15	30	30	30	30	30	-30	30	30
Social Impact Indicators (10)	5	5	5	5	10	5	10	10	10
Culture Sensitivity Indicators (10)	5	10	10	10	10	5	10	0	5
Gender Sensitivity Indicators (10)	5	10	5	10	10	0	5	0	5
Empowerment Sensitivity Indicators (10)	5	5	5	5	10	0	0	5	10
Environmental Indicators (15)	-7.5	7.5	7.5	-7.5	0	0	15	-7.5	0
Labor and technological indicators (15)	10	15	15	10	10	10	15	5	15
Total Weighted Value	37.5	82.5	77.5	62.5	80	50	25	42.5	75

Table 17: Feasibility of the climate change adaptations according to the attributed weight

Time Period	Adaptation Option								
	H.ponics	Ring based Cultiv.	Duck Rearing	Charu Making	Mat weaving	Reed cultiv.	Kewra cultiv.	Crab fattening	Sheep rearing
At Present	(10) 7th	(10)7th	(20)5th	(35)2nd	(40)1st	(30)3rd	(15)6th	(25)4th	(5)8th
After 1 Year	(20) 5th	(20)5th	(40)1st	(30)3rd	(35)2nd	(15)6th	(5)8th	(10)7th	(25)4th
After 3 Years	(5) 8th	(40)1st	(30)3th	(20)5th	(35)2nd	(15)6th	(0)9th	(10)7th	(25)4th
In Total	(35) 8th	(70) 4th	(90) 2nd	(85) 3rd	(110)1st	(60) 5th	(20) 9th	(45) 7th	(55) 6th

Here, 1st = 40, 2nd = 35, 3rd = 30, 4th = 25, 5th =20, 6th =15
7th =10, 8th =5, 9th =0

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D3. Sharing of lessons learned with local, national and international stakeholders.

Following the result of field test of adaptation options and assessment of efficacy of the options, a document on lessons learned has been prepared for sharing it with different local and national stakeholders. The lessons learned document has been shared from December 2008 to March 2009.

Picture: PI Dr. Mizan R Khan is sharing project lessons and validating the results with regional workshop held in Keshobpur.

E. One article in peer reviewed journal and 1 book (Bangla and English) is to be published

E1. Preparation of manuscript to publish 1 article in peer reviewed international journal
The PI and KIs have preparing the manuscript of an article, taking the lessons learned of the project, to publish in peer reviewed international journal..

E2. Preparation of manuscript to publish 1 Book (Bengali and English) documenting the methodology and results
The PI, KIs and Project staff have documented the methodology of the whole project and PI is preparing the manuscript of a book in English and Bangla for publication.

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C. Self evaluation relative to activities executed

The Strengths:

- Good guideline
- Good facilitators
- Good support from community
- Ownership of the Local Government
- Support from CDMP
- Good Team and some important volunteers from CDMP and University of Manitova

The Weaknesses:

- Too little effort in adaptation
- The scale of adaptation was very little
- It grows hope among the community but fail to continue support to scale up adaptation
- Very little attention at national level
- Too many focuses and interfaces
- Very low inputs for awareness and advocacy

The Opportunities:

- Good organizational learning can be utilized in future projects
- The beneficiaries motivation to successful adaptation options
- Action Plans are ready for further implementation and scale up
- Good working relationship with Local Government might be beneficial for poor people
- Good scope of access to trust fund in Bangladesh and other international resources
- Visibility of the project to international and national stakeholders

The Threats:

- If not continued, pilot actions will not sustain and lose its potentiality for scale up and large scale demonstration effect
- If action plans are not implemented, partnership with local government and community might turn to cold status
- Community people and students might forget the issues and thus new investments will be required and the current investment will not be maximized.
- Poor people remain vulnerable and exposed to climate change impacts

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D. Challenges encountered

1. Delayed start of the project due to lengthy approval process of NGO affairs bureau.

2. Political Strife, State of Emergencies and National Elections delayed the completion of the project activities.

3. Very high expectations of the vulnerable people from the project activities.

4. Communities, Local Govt. and Government demands for up scaling of the pilot livelihood options and fuller implementation of action plans developed.

How these challenges were resolved

1& 2 Lengthy bureaucratic processes were out of control of the project staff & only option was to wait.

3 & 4 The beneficiaries were motivated to give training to those left out of the project activities, and the project staff gave assurance that they would try to mobilize funds from local and international sources for fuller implementation of the adaptation plans.

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II. Outputs

A. Project goals and objectives

	Narrative Summary	Objectively verifiable indicators	Achievements
Goal/ Purpose	Facilitate mainstreaming of livelihood adaptation strategies in the development planning process through piloting participatory and community driven adaptation plans in three rural areas of Bangladesh, which are highly susceptible to climate change and variability.	◆ Importance of Participatory Community Risk Assessment process is recognized by National Agencies in designing the development programmes by month 18 of the project. ◆ At least 3 livelihood adaptation strategies are recognized and adopted by Department of Environment and other relevant national stakeholders for implementation by month 18 of the project.	◆ Importance of participatory community risk assessment process is being established in the CDMP programme, and they have utilized the guideline developed by the project in revising an existing manual for participatory planning. ◆ 4 livelihood strategies are recognized by DoE and its climate change cell
Specific Objectives	1) Increase capacity and motivation of communities and Local Government Entities' to assess community risks to climate change and variability following a participatory process by month 9 of the project.	◆ Participation and motivation of Local Government Entities' increased in assessing livelihood risks of poor and marginal people to climate change and variability ◆ A community level climate risk assessment guideline developed by month 2 of the project and 6 community risk assessment reports produced by the month 7 of the project. ◆ Livelihood risk profile of 6 communities endorsed by the Local Government Entities by the month 9 of the project.	◆ 84 Local Government Representatives, 90 Local Govt. officials participated in the project and demonstrated proactive role in assessing the livelihood risk induced by climate change. ◆ Risk Assessment guideline is developed and implemented ◆ Livelihood risks identified in CRA process is validated by the local government entities.
	2) Build confidence of Local Government Entities and enhance skills of community people in developing stakeholder-inclusive climate risk reduction (adaptation) plans of action at community and local government levels by month 14 of the project.	◆ Community people provided inputs into the Local Governments' planning process during and beyond project period ◆ Local Government Entities' acknowledged and incorporated adaptation strategies into their regular business plans by the month 14 of the project ◆ 6 Local level Risk Reduction Plans of Action developed; and at least 6 gender and ethnicity based disaggregated potential adaptation strategies identified and prioritized in each Union.	◆ 384 community people along with 84 local government representatives involved in risk assessment process, which helped the community and local government in further planning engagements in LGSP and other development projects. ◆ Out of 6 UP, 4 has incorporated adaptation plan in their development plan. ◆ 6 adaptation plans are developed in 6 union and segregated adaptation options are identified.

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	Narrative Summary	Objectively verifiable indicators	Achievements
	3) Increase awareness of multi-level stakeholders on livelihood risks to climate change and variability and adaptation options to facilitate government and development agencies' buy-in and mainstreaming climate change issues by month 17 of the project.	◆ Different stakeholders from public, private, civil society and donor agencies well aware about effects of climate change and variability on livelihoods of the rural poor by month 17 of the project; ◆ Stakeholders internalize the participatory risk assessment issues in the national and organizational policies by month 17 of the project. ◆ Communication Strategy, Risk Communication Materials and an advocacy strategy available by month 15 of the project;	◆ The risk assessment reports are shared with local and national level stakeholders and they are aware about the livelihood risks. This awareness is taken by CDMP programme of MoFDM in designing their second phase as priority area. ◆ Participatory risk assessment is valued by CDMP, DFID, EC, UNDP, LGSP and World Bank Trust Fund secretariat in Bangladesh as a key strategy for community based climate change adaptation. ◆ Communication strategy and subsequent communication materials are developed and disseminated among the vulnerable people living in project sites for greater awareness. An advocacy strategy is ready for launching a national wide advocacy by the ADO in conjunction with CDMP and other alliance in Bangladesh.
	4) Increase confidence of the multi-level stakeholders on replicability of the identified local level livelihood adaptation strategies by month 18 of the project	◆ At least 6 prioritized adaptation strategies piloted by Local Government Entities during month 12 to 18 of the project. ◆ Vulnerabilities of 120 households to climate change impacts have significantly reduced by month 18 of the project. ◆ Lessons of the 6 pilot adaptation strategies documented by the month 17 of the project; ◆ Manuscripts of one article in peer reviewed journal and 1 book (Bangla and English) are ready by month 18 of the project and published after project period.	◆ 09 prioritized adaptation strategies are piloted by the UDMC in their respective areas. ◆ 120 households piloted different livelihood adaptation strategies in reducing their vulnerability to climate change. ◆ A multi-criteria analysis and lessons of 120 households regarding different adaptation strategies are documented for future programme design with local government. ◆ Table of content of the book is developed. Article draft is ready for review among the team members.

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B. Important accomplishments of the project

The following significant achievements as of completion date of the project.

1. A participatory climate risk assessment guideline, which is utilized by CDMP as a good practice.

2. A revision of existing school text books incorporating climate change issues. This is submitted to the national textbook curriculum board and CDMP. National Textbook Curriculum Board agreed to review the texts for incorporation in education session 2010.

3. 120 households tested adaptation options and a multi-criteria analysis shows at least 6 options are viable for scale up at local and national level.

4. 6 local level climate adaptation action plans are developed and 4 of these plans are incorporated into the local development plan.

5. Knowledge about climate risk and adaptation increased among the students and vulnerable people in project sites.

6. Better understanding developed between scientific knowledge and indigenous knowledge on climate change.

7. Environmental sustainability is ensured because of use of natural inputs

C. Key outputs of the projects and how these outputs were used or will be used.

- A climate risk assessment guideline developed and community level risk assessment reports produced. This report is used by local government and some academicians from UK Hazard Research Center, UK
- 6 Local level Risk Reduction (Adaptation) Plans of Action developed. These plans are being considered by the local government, CDMP and some other grants programme.
- Communication Strategy, Risk Communication Materials and an advocacy strategy developed. The communication strategy and advocacy strategy will be used further for mass awareness and long term advocacy. Some communication materials are used for awareness raising among local people and school students.
- A revision of school text books done and 5000 students are taught of climate change risks and adaptation issues;
- 9 adaptation strategies tested in field and lessons learned documented. This lessons learned will be used for further scale up of the adaptation programme; and
- One article in peer reviewed journal and 1 book (Bangla and English) are planned to be published.

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