Economics Of Climate Resiliency: A Case Of The Small-Scale Industrial Sector In Jamuna River Basin Of Bangladesh

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Abstract: The climate resilient cluster village with handlooms was established by an NGO named "ActionAid Bangladesh" with the objective of ensuring secure living and productive service for sustained livelihood in the Jamuna river basin of Bangladesh. The experience was that the poor people had their handloom factories and dwellings devastated by flood almost every year with consequential threat to livelihood and dignity of the women. It was therefore felt essential to facilitate them in building multi-hazard resilient handloom factories so as to make them self-protective from windy storm, foggy weather, monsoon flooding theft etc. The program started with a threadbare discussion with the vulnerable communities in a participatory manner where the program staffs has sat with the community groups, especially the poor, to generate the basic analysis of vulnerabilities, the community is facing and its link to climate change. The community itself did the analysis and analyzed the vulnerability faced by them. The result is building of climate resilient handloom industry for 10 families whose industrial unit and dwellings were devastated almost annually by flood. A variant of a social and economic analysis is carried out to determine scaling up of these types of adaptations to similar ecological zones of the country and elsewhere.

Keywords: Community based, Participatory, Livelihood sustenance. flood resilient handllom industry, Jamuna river basin, Social and economic analysis, Bangladesh

1. INTRODUCTION

1.1 Background of the Projects

Community-based adaptation (CBA) to climate change focuses on empowering communities to use their own knowledge and decision-making processes to take action. Actionaid Bangladesh (AAB) has been experimenting with CBAs on climate resilient handloom industry in one village of Sirajganj belonging to their project areas. This project is studied to examine its social and economic viability and therefore of scaling up to other ecological zones both inside and outside Bangladesh.

1.2 Rationale of the Projects

CBA still remains a relatively new concept that is continually evolving. The understanding of engaging with and incorporating the scientific climate community in project design was not as prominent when AAB's CBA interventions were designed in 2007 as today (AAB et.al [1]). Similarly, as the project is now functioning, there was felt need of knowing the viability of the scheme for replication. Also, knowledge on the technique of social-cost benefit analysis involving judicial quantification of subjective elements is essential for effective training programs for prospective project participants and local partner staff. Moreover, the analysis of the project is important in view of the high importance to women's rights at the centre of its work amidst patriarchal Bangladeshi context.

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1.3 Objective of the Study

The main objective of this study is to assess the social and economic viability of community based climate resilient adaptation schemes. In this regard, a case study site of AAB as reported above is examined so as to judge social and economic viability of climate resilient adaptation schemes. Three layers of output will be generated from this study: Firstly, the viability of the community based adaptation will be established. Secondly, the knowledge generated under this study will be used for effective and applicable adaptation options for minimizing uncertainties on replication elsewhere. Thirdly, the case study on flood resilient housing project will facilitate capacity building needed in NGOs and CBOs for climate resilient rural economy, one of the pillars of Bangladesh Climate Change Strategy and Action Plan (BCCSAP). (Please see BCCSAP [2])

2 DESCRIPTION OF THE PROJECT

2.1 Climate Resilient Cluster Village: Sirajganj

Sirajganj district is one of the most flood-prone areas of the river Jamuna- the most unpredictable river basin of the climate vulnerable country Bangladesh. The fate of the people living in the area is orchestrated by frequent flooding, precipitation, fog and siltation, manifested through inundation, land erosion, high temperature and drought – like situation during some months, lack of production, migration and marginalization from fundamental requirement of life like shelter, water sanitation and food. Considering this multi-hazard perspective of climate change, a comprehensive effort was initially planned by AAB at around 2007 in building resilience of the community to different vulnerabilities. The activities were intended for household–level coping/adaptation against flood. But, it has also been envisaged that vulnerabilities are linked to poverty and unequal access to resources. Later on, after threadbare situation analysis, AAB identified following components of a programmatic approach to reduce the vulnerabilities and risks to disasters of the community:

- Strengthening capacity of the community through activities like awareness building, skill training, asset base creating etc.
- Developing adaptation innovations and practices and
- Ensuring poor peoples' access to different social and natural resources so that livelihood can be sustained in disaster periods.

2.2 Vulnerability Analysis and Adaptations:

Climate resilient handloom factory was a joint effort of ActionAid Bangladesh and Embassy of Denmark in Bangladesh under the project "Assistance to the Establishment of Handloom Factory at Koijuri on Climate Change Adaptation and Disaster Risk Reduction in Bangladesh (CCA-DRR)" started in January, 2008. Flood prone district of Sirajganj is famous for handloom textile factories since long in the past. In the locality, handloom textiles were run as family businesses where all adult family members like father, sons, and daughters participate in one handloom activity or another's. As mentioned earlier, Sirajganj is also one of the most flood prone areas of Bangladesh. The handloom factories of the locality remained operative for nearly 8 months in a year and remained suspended for climatic reasons like inundation of flood water to their factory premises, fogy winter weather affecting sunlight in the factory premise and damp monsoon weather making yarn highly moisturous and unsuitable for weaving cloths. Most of the poor people work in the handloom factories as day laborers. As such the weavers do not have any other livelihood options for at least 4 months in a year due to climatic hazards. Moreover, Governmental intervention in safeguarding handloom laborers was too little. As a result, along with owners who are losing profit, laborers were compelled to remain idle or migrate to other places both within and outside the country in the face of disastrous situation. In such circumstances, AAB planned to establish a premise that could house the handloom weaving activities in an uninterrupted way so that the incumbents could maintain their livelihood sustainably throughout the year. Following table summarizes the difficulty of handloom weavers due to climate change.

TABLE 1

Climate change impact on handloom factories

Hazard	Duration	Vulnerability
Flood, River erosion and erratic Monsoon rain	August - October	Water logging and submergence of factory; Sticky yarn due to damp and extra moisture; Skin diseases of the operators.
High temperature and drought like situation	March- May	Dehydration of the workers due to excessive sweating; Dry yarn due to insufficient moisture.
Cold wave and deep fog	December-February	Physical numbness due to cold and sticky yarn .

In view of the mentioned problems, AAB searched for ways of providing continuous livelihood throughout the years. One alternative envisaged was of establishing of climate resilient handloom factory model. There was perceived need for constructing a factory which could ensure uninterrupted production during flood, fog and drought – like the one with "damp proof" raised plinth for keeping the factory from inundation, protection from fog for ensuring transparent production, moisture control mechanism for drought etc. The design also included ergonomic working environment with the provision of proper lighting, seating arrangement and ventilation for the workers for ensuring labor productivity. There were also mini-lab facilities for conducting research and quality control based on the climatic parameters observed in the locality. AAB in line with its mission and objectives, dedicated to confer ownership in favor of a cooperative of women yarn processors from weaver families. The owners, e.g., women, though will not do the weaving, but their husbands and sons could be involved as weavers. The management of the factory was guided by a constitution which was developed by the owners in consultation with the concerned Gono Gobeshana Dal (People's Research Team). GGD itself has selected the weavers cum owners by following criteria like hardcore poor, poor weaving professionals, handloom wage laborers etc. It has also been considered that the selected weavers will be able to pay back the capital and be physically able to work. The project has been implemented through a comprehensive methodology where community participation has been given the top priority. The project implementation followed both "top down' and "bottom up" approaches and blended the local experience-based coping practices with scientific knowledge.

3. CONCEPTUAL FRAMEWORK FOR SOCIAL AND ECONOMIC ASSESSMENT OF ADAPTATIONS

3.3.1 Conceptual Framework

Following the approach of Stern (2007), benefit to adaptation of en-suite project is the sum total of "Avoided Loss" and "Additional benefit due to efficient adaptation". However, since in the present case, project is built in a newer location away from their original location, "total social and economic benefit" is compared with "total social and economic cost" to examine comprehensive viability of this Climate resilient project of AAB. Based on above conceptual framework, a 4- step methodology was used for data collection. The various steps followed are firstly, relevant data was as collected from AAB, the executing agency responsible for planning and implementing the project; secondly, relevant literatures on community based adaptations were reviewed. The main inquiry was on understanding factors responsible for successful community approaches, type of interventions required, the local power factors that jeopardize otherwise successful innovations, tools for assessment of socio-economic viability etc. Thirdly, data on the various aspects of benefit and cost of climate resilient handloom factory was collected through FGDs. Lastly; brainstorming session was arranged in the handloom factory for incorporating community basis of social costing and benefits. The important costing features were that for community service, wage rate was valued at "opportunity cost" foregone. The initial cost (sunk cost) which is usually left out was considered vital for realizing this innovative climate resilient projects and therefore was used as "social cost". The limitations of the present approach were that all the social and economic benefits and costs (externalities) could not be measured for lack of comprehension and time availability. Some of the past data had to be collected by

"recall" methods that might somewhat depart from reality.

3.3.1 Conceptual Framework

2 Project Interventions

The project interventions by AAB included adaptations in infrastructure designing and construction to tackle the adversities of climate change as detailed below:

TABLE 2

Planning.Designing and Costing of Adaptive Measures

Adaptive Measures	Planning/Designing and Costing	Output	Impact
Raised and damp- proof plinth; Transparent canopy and roof (partial), ceiling fan, exhaust fan	Technical designs for plinth, wall and roof; Planning ergonomic working condition	Damp free working environment	Uninterrupted production
Enough ventilation; Ceiling fan, exhaust fan; Moisture control spray etc.	Design of roof and materials; Mechanisms for moisture control	Cool and humid working environment	Uninterrupted production
Transparent canopy roof (partial) to protect from cold wave and fog; Wide glass windows for Sunlight	Designing transparent canopy roof and wide glass windows keeping security issues in consideration	Cold wave and fog intrusion blocked	Uninterrupted production

Table 3 shows the break-down of expenditure of the project interventions

TABLE 3

Expenditure heads of the project

Expenditure Head	Amount (Tk)
Land purchase and earth work cost	1,552,157.00
Infrastructure (factory building, office, different sheds, bathroom and fittings) construction cost	943,212.00
Capital Machinery	405,198.00
Working Capital	721,392.00
Furniture and Others	170,455.00
Skill development training	72,468.00
TOTAL	**3,864,882.00**

4. SOCIAL AND ECONOMIC ASSESSMENT OF CLIMATE RESILIENCY

4.1 Basis of Social and Economic Benefit and Cost Calculation

"Social cost and benefits study" was carried out by calculating Socio-Economic Internal Rate of Return (SEIRR) of the project. The basis of calculation of social and economic benefit and costs is shown in the table below:

TABLE 4.1

Basis of Social Benefit and Cost Calculation

Social and Economic Benefit	Techniques of Measurement
Economic Benefits	
Fabric Production	Money values multiplied by respective Shadow Exchange Rate Factor (SERF)
Yarn production, Dyeing and return to Cooperative owners	Money values multiplied by respective Shadow Exchange Rate Factor (SERF)
Mango and timber production (annualized)	Money values multiplied by respective Shadow Exchange Rate Factor (SERF)
Social benefit Benefit of 2 neighboring factories fully copying and 1 factory partly (60%) copying the design of the project.	For 3 factories, (20% +20% +12%) = 52% additional revenue multiplied by respective Shadow Exchange Rate Factor (SERF).
Additional 50 days of production days possible due to mitigation of flood, temperature, foggy weather and high temperatures etc.	Wage rate x 50 days multiplied by respective Shadow Exchange Rate Factor (SERF) for wage rate
Social Benefit in terms of reduced pressure on the government for humanitarian assistance and relief. for the affected households/factories.	Relief/humanitarian assistance received calculated at Tk 64,752 for the group.
Social and Economic Cost	
Economic Cost	
Fixed and Recurrent Costs	Fixed and recurrent costs multiplied by respective Shadow Exchange Rate Factor (SERF) of fixed and recurrent inputs.
Social Cost	
Social jealousy	Impact of social jealousy (mainly by the community members left out of the project benefits) was measured by "willingness to forego community ownership" multiplied by number of actual and potential contenders and was found to be Tk 3,600 annually.

Following above methods and techniques, item-wise cost and benefit calculations are done. These data are then used in the benefit/cost model to generate results as shown in the Table below:.

TABLE 4.2
Calculations of social and economic benefits and costs per annum

BENEFITS	Tk (,000)
Economic	
Fabric Production	3840.0
Additional wage Income	10.0
Mango and timber production (annualized)	5.5
Social	
Neighboring Factories copying the improved designs	718.8
Reduced relief and humanitarian support from government	64.7
Total	4639
COSTS	
Variable cost	
Cost of yarn	1152.0
Cost of dye, chemicals	240.0
Labor wage for weavers	0
Cost of extra yarn, dye etc of neighbor factories	337
Social jealously cost of the have-nots	3.6
Total Variable Cost	1732.6
Fixed cost	
Union Parishad Tax	0.01
Investment costs (economic)	
Land area (35 decimal) w. registration	1200.0
Factory structure inc. tube well, latrine	450.0
Extra cost for Climate Resilient	0
Plinth raising	150.0
Tin+ Grill Adjust fan etc	65.0
Extra wall and Generator	120.0
Looms and installation	405.0
Training cost	72.0
Working capital	721.0
Community Labor Cost	23.4
Other cost	161.0
Total	3367.4
Social Cost	
Social jealously cost of the have-nots	3.6
AAB/MMS initial cost/HH	79.00
Total Social and economic costs	3450

5: RESULT

Results of social and economic analyses are shown in table below:

TABLE 5
Climate Resilient Handloom Factory

Social and economic Internal Rate of Return %	21%
Social and economic B/C Ratio	1.07
Social and economic NPV (in ,000 Tk)	2,866
Sensitivity Analysis	
Social and economic Benefit streams declines by 5% and its impact of Social and economic IRR	10%
Cost of factory rises by 5% and its impact of Social and economic IRR	18%

Table 5 above show that social and economic IRR in case of climate resilient handloom factory is 21% which is higher than the social discount rate used in the country. The values of B/C ratios and NPV also reinforce confidence on viability. The sensitivity analyses show that the social and economic viability is more sensitive to decrease in benefits than an increase in costs. Therefore the entrepreneurs of the climate resilient handloom project should be careful about declining benefits..

6: CONCLUSIONS

After the project, factory was found to be kept operated even in the event of erratic and extreme climatic events like flood, foggy weather, severe cold wave, winter rain, high temperature etc. In contrast, all the other factories not adapting in the manner of the project were found to be closed during most of the time of the climate change adversities. Thus the concept of climate resilient small business in “handloom Factory” presented in the study is socially and economically viable option and could be disseminated to other agro-ecological zones of the country.

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