



12-29-2017

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Recommended Citation

Ahmed, Chowdhury (2017). Community participation in building climate change resilient rural housing: examining the socio-economic viability of case In the Jamuna River Basin of Bangladesh. *ASEAN Journal of Community Engagement*, 1(2).

Available at: <https://doi.org/10.7454/ajce.v1i2.94>

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Community Participation in Building Climate Change Resilient Rural Housing: Examining the Socio-Economic Viability of a Case in the Jamuna River Basin of Bangladesh

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Received: November 4th, 2017 || Revised: November 11th & November 28th, 2017 || Accepted: December 12th, 2017

Abstract

The climate resilient community cluster village was established by a Non-Government Organization named "ActionAid Bangladesh" to ensure safe community living for the inhabitants of a vulnerable ecological zone of Bangladesh situated in the Jamuna river basin of Bangladesh. The experience was that local people had their houses destroyed by a flood almost every year with a far-reaching threat to livelihood and solemnity of women. It was, therefore, essential to facilitate the community in building multi-hazard resilient houses to make them self-protective from climatic hazards like a windy storm, flooding etc. Moreover, as the poor usually had no savings or insurance, there was additional need to make provision for livelihood sustenance. Therefore, it is important to provide for some flood free land, for instance, to grow vegetables and fruits or pond for fish culture, both self-consumption and selling in the market. The program started with a threadbare discussion with the vulnerable communities in a participatory manner where the program staffs had discussed with the community groups, to generate the basic analysis of vulnerabilities and its link to climate change. The community itself analysed the vulnerability faced by them. The result was building of climate resilient community cluster village housing for ten families whose dwellings were devastated almost annually by the flood. A social and economic feasibility analysis was carried out to determine to scale up of these types of adaptations to similar ecological zones of the country and elsewhere.

Keywords: Community based; Livelihood sustenance; flood resilient cluster village; Social and economic analysis; Bangladesh

1. Introduction

Community-based adaptation (CBA) in climate change adaptations is a tool of empowering communities to use their own generated knowledge and decision-making power in taking adaptive actions. A Non-Government Organization called ActionAid Bangladesh has long been conducting experiments with community-based adaptations in their project locations. Climate-resilient community cluster village of Sirajganj was one of the project interventions of ActionAid Bangladesh. The result was the building of climate resilient community cluster village housing for ten families whose dwellings were devastated almost annually by the flood. The project activities were analysed using recall method to examine its social and economic viability and replicability to similar climate vulnerable areas within and outside Bangladesh.

Community-based adaptation is in a formative stage and is continuously refined for tackling adversities of climate change. In the initial stage, as has been mentioned in (ActionAid Bangladesh, un-dated), there was a limited scope of incorporating up-to-date knowledge in project design like earth-compaction required, the strength of pillars necessary to stand wind, etcetera. Nevertheless, as the project was found to be impactful, there was a need to examine the socio-economic viability of the scheme for scaling up in other locations. Besides, disseminating the knowledge of social and economic cost-benefit technique to local partner organizations was one of the reasons for carrying out the study. Lastly, as the poor women folk would be its major

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beneficiary, the analysis of the ActionAid Bangladesh's interventions was crucial given the patronization of women's rights amidst the patriarchal Bangladeshi society.

Four layers of output were expected to 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 cost and uncertainties on replication elsewhere. Thirdly, the case study on flood resilient housing project will facilitate capacity building needed in Non-Government Organizations and Community Based Organizations for climate resilient rural economy, one of the pillars of Bangladesh Climate Change Strategy and Action Plan (BCCSAP, 2009) of the government of Bangladesh. Lastly, the project output was expected to contribute to gender development and was a priority area of research as mentioned in (CDMP, 2009), UNEP (2013) and other government publications on climate change.

The project area is in one of the most climate vulnerable areas of Bangladesh. The marginalized population of the locality lived near floodplains which were inundated every year during the monsoon. These people were mainly unskilled and belonged to the category of "day labourers". They lived in thatched houses of which the roof and side-wall materials were made of straw of paddy/bamboo. Their houses were destroyed almost every year, and the intensity of damage depended on the severity of the flood, water surge and associated wind flow. The affected people included elderly parents, widowed women, housewives and children, and their meagre productive assets. The main concern of the working members of the families in those critical days was to arrange alternative make-shift accommodation for the family members and to supply food. However, the working men were constrained by the lack of any savings and loss of productive assets by the flood. This was the general picture for the marginalized people living in the Jamuna river basin before the start of the project interventions.

2. Theoretical Background

Climate change is inevitable, and the vulnerability of people and economic sectors to climate variability and subsequently to climate change varies across the Bangladeshi societies because of differing capacities to cope, recover, and to take adaptive measures. In Bangladesh, two of the major barriers for implementing climate change adaptation are (i) prevailing weak socioeconomic conditions and (ii) cross-cutting issues such as the availability of capacity (resources – human, financial, and technical) and the absence of good governance, especially at the local level development planning. Rural communities are often the most vulnerable to climate variability because of the above mentioned and other factors such as land tenure and cultural practices. Nonetheless, the call for planned adaptation is pertinent, and this needs to be internalized within their local community level planning processes. Moreover, climate vulnerabilities add to existing stresses caused by non-climatic factors like the marginalization of the poor people, environmental pollution, deforestation, etc. Therefore, this crisis needed to be dealt with prudently. It was felt that increasing adaptive capacity of communities will substantially decrease vulnerabilities and risks of those communities from negative impacts of climate change and the resultant aftermath. It was important to involve local communities in the formulating process as they could give practical and relevant data on their particular situation as has been emphasized in (Kevan et al 2012), the author's recent publications. In line with the theory of empowerment, the bottom-up approach was supposed to empower poor communities in awareness building, conscience-raising,

self-conceptualization of adaptations, planning and implementing adaptations and ensuring its sustainability as mentioned in literature (BDRRC,2008), USA Environmental Agency (2016) and BCAS (2012), among others.

As the fate of the people living in the area is orchestrated by frequent flooding, precipitation, fog and siltation, manifested through inundation, land erosion, lack of production, migration and marginalization from fundamental requirement of life like shelter, water sanitation and food, a comprehensive effort was planned by ActionAid Bangladesh in 2007 to build resilience within the community. The activities were initially intended for household-level coping/adaptation against the flood. Later, it was envisaged that vulnerabilities are linked to poverty and unequal access to resources. Therefore, after threadbare situation analysis, ActionAid Bangladesh identified the following components: (i) Strengthening capacity of the community through activates like awareness building, skill training, asset base creating etc. (ii) Developing adaptation innovations and practices as mentioned in (Wong 2015) and (iii) Ensuring poor peoples' access to different social and natural resources of a programmatic approach to reduce the vulnerabilities and risks to disasters of the community.

The programme started with a threadbare discussion with the vulnerable communities in a participatory manner to generate the basic analysis of vulnerabilities due to climate changes in line with guidelines provided in government documents of (DOE, 2005), (DOE,2009) and (GED, 2011) which had wide circulation.

3. Methods

3.1. Approach and Methodology

A 4- step approach was used and is discussed below:

- a. All relevant data and information were collected from ActionAid Bangladesh. This involved visiting ActionAid Bangladesh head-office in Dhaka and project site in Sirajganj. Intensive discussions were held with ActionAid Bangladesh officials, Government officials (mainly those posted in the local Upazila) who were involved with the project intervention, fully or partially.
- b. Literature was reviewed to understand the current frontier of knowledge (DOE, 2009) and (EEPSEA, 2016) on Community-based adaptation. The thrust was on understanding community mobilization, involvement in the decision-making process, type of interventions required, local power conflicts (CDMP, 2009) that endanger otherwise successful innovations. Additionally, the literature on social and economic evaluations of climate change adaptations was reviewed. During the literature review, it was found that usual cost-benefit of climate change adaptation, as conducted in (Stern, 2007) and (San Fankhauser 2016) starts with an intend of calculating "total cost of adaptation" and comparing it with "avoided loss" considered to be the "benefit" of climate change adaptation. However, in the present case, the houses where the poor people lived were sometimes completely devastated or lost in the river bed. Therefore, the entire costing of the community cluster village needed to be compared to entire benefits arising from community housing.
- c. Thirdly, Focused Group Discussions were organized with relatively homogenous groups to get data and information on the various aspects of benefit and cost of community cluster villages. In these discussions, the participation of people falling either in the Patron-Client or owner farmer- share-tenant farmers were avoided to control of suppression of facts.

- (i) From Focused Group Discussions, it is found that both voluntary and paid labours were used in the construction of the community cluster village. However, during construction of the community cluster village, the paid labourers were paid the market wage rate, and the community labourers were not paid any wage. However, in a community-based adaptation model, the assumption of free labour service was untenable. It was therefore decided that when the provision of community labour service conflicted with their market-labour service, labourers were charged a price equal to the wage rate. This basis of costing is well established in “opportunity cost” concept.
- (ii) ActionAid Bangladesh incurred some initial cost in organizing the group, conscience-raising and in awareness-building and in forming “groups” that lead to the implementation of the project. Usually, these types of expenditures are not considered in social and economic cost-benefit analysis. However, in the present analysis, this was treated as “social cost”.
- (iii) Community living itself provided some “happiness” in the sense of collective security against social jealousy and enmity, protection from thefts and dacoity and loss of women dignity. On the other hand, some families were discontented for benefitting from the project. Family members who could not be immediately provided with community housing needed to contend. The social cost was termed as “discontentment cost” and was estimated using the standard methodology. The estimation procedure involved asking the benefiting households about their “willingness to pay for the community living” or “willingness to forego the service of community living”.

3.2. Data Analysis

A 30-year life-span of the community cluster village was considered. Social cost and benefit streams were spread over the entire length of the project. Appropriate adjustments were made for the residual life of the machinery and equipment's where applicable. In the social and economic analysis, a shadow exchange rate factor (SERF) of 1.11 has been used to convert non-tradable values to this numeraire. A conversion factor (CF) of 0.88 has been used to adjust salaries and wages to economic values. An exchange rate of Taka 70 = \$1.00 has been used to convert constant dollar values in their local currency equivalent. Sensitivity analysis was conducted to test the robustness of the calculations.

3.3. Techniques Used in Data Analysis

Table 1 shows the measurement techniques used for social and economic cost and benefits.

Table 1. Description of Social and Economic Benefit and Cost and Techniques of Measurement

Social and Economic Benefit and Cost per Household	Techniques of Measurement
Economic Benefit	
House Rent of "Cluster Village"	Annual rent, net income for the kitchen, and net income from fishing were multiplied by Shadow Exchange Rate Factor (SERF) of non-tradable.
Social Benefit	
Schooling of children	Estimated by "money value of average rice" received per household as a subsidy from the government per children per year for attending local schools.
Community Living	Estimated by "money value of extra labour service" provided per adult in the household per year due to their living in the community cluster village free from the flood adversities.
Economic Cost	
Fixed and Recurrent Costs	Money values multiplied by respective Shadow Exchange Rate Factor (SERF) of fixed and recurrent inputs
Social Cost	
Discontentment cost	"Discontentment cost" of those needy families were measured indirectly through "willingness to pay" by the benefitting households (similar as a willingness to forego by the non-benefitting households).
Fixed Costs/ Initial cost	The initial cost was treated as essential "social" cost.

Source: Study Findings

4. Results and Discussion

Table 2 provides a description of resulting vulnerability and adaptation measures to climate factors experienced by the people of the vulnerable people of the Brahmaputra river basin.

Table 2. Description Vulnerability and Adaptation Measures to Climatic Factor: Inundation to Flooding

Type of vulnerability	Adaptation Measure
Households submerged	Raising of plinth area, Building Flood / multi-hazard resistant houses
Livelihood affected and Migratory displacements	Provision of flood free area in the neighbourhood, Growing of vegetables and fruits
Insecurity of family members	The safety and security shortcomings of the existing

	<p>houses were attempted to be solved with following modifications as learned by ActionAid Bangladesh from previous experiences:</p> <ul style="list-style-type: none"> • Using of green and upper part of bamboo (locally called <i>nail</i>) for fencing to ensure the durability of the house. • Four more bamboo pillars for making it more resilient to strong wind. • Wooden door (previously door was made from bamboo) and wooden frame for the roof to make it stronger.
<p>Shortage of income, food and drinking water in critical period of vulnerability</p>	<p>This plinth-raising for individual houses allowed some extra spaces to the households due to its slopes. The top soils of these lands were quite fertile and were used for kitchen gardening and growing of fruit-bearing plants contributing to nutrition standards of family members and income from selling vegetables to the nearby market.</p> <p>Tube wells were installed in raised-platform so as remain above flood level. Similarly, latrines were established to be used in times of inundation. They were installed after checking water quality to prevent contamination from arsenic or others. The availability of tube well water reduced women's effort in fetching water from distant locations and reduced risks of abuses and violence against women. Thus, this project also contributed to the empowerment of women.</p>
<p>Lack of community sense of belonging and empowerment</p>	<p>An empowerment theory requires a convincing integration of the micro and macro levels to make clear the interrelations among individual, community, and professional empowerment as has been shown in CARE INTERNATIONAL (2015) and Islam (2016). In this case, the community system has brought in additional qualitative benefits in the sense of generating a sense of belonging which was a pre-requisite for the empowerment of community itself.</p> <p>Community cluster village hall fitted with solar electricity system and television for recreation were considered.</p>
<p>Lack of capacity building</p>	<p>Training was initially provided for various income generating activities like fish pond preparation, fish culture, kitchen gardening, repair and maintenance</p>

	of the houses which were common to everyone in the cluster village. Specific training was arranged on emerging areas related to sustainable livelihoods like (i) preparing snack foods for captive local markets requiring low capital (ii) mechanics training for local rickshaws, vans and cycles.
Lack of ownership perception	Lack of Ownership in community asset impedes spontaneous participation. Therefore, ActionAid Bangladesh decided to transfer ownership of the land and house to a woman member of the household. It was made clear to them from the beginning. This move empowered the women folk and contributed to mainstreaming of women in the development process.

Source: Study Findings

Table 3 shows benefit and cost values for the flood resilient housing scheme. The values are derived from applications of the techniques mentioned in Table 2.

Table 3. Description of Benefit and Costs for Community Cluster Village per Household

BENEFIT	Tk (,000)
Economic Benefit	
Rental income of the Cluster Village Houses	8.40
Net Income from Kitchen Garden	8.00
Net Income from Fishing Pond	4.25
Social Benefit	
Community Living/Schooling of Children (Tk 1k x 6 months)	6.00
Community Living/ Extra Labour income (60 days x 150)	9.00
Sub-Total of Benefit per year	35.65
Economic Costs	
Investment Costs:	
Land Development and Pond Construction cost	52.80
House Construction cost	37.40
Tube well/ Latrine	2.10
Social Cost	
Present Value of "Discontentment cost" /household	1.8
AAB initial cost	77.70
Sub-Total of Investment and Social Cost	173.30
Variable Costs per year:	
Maintenance cost of Land, House, Pond etc.	3.60
Repair cost of Tube well, latrine etc.	1.45
Fixed Costs per year:	
Land tax	0.01
Sub-Total of Variable and Fixed Cost	5.06

Source: ActionAid Bangladesh

Table 3 shows that the community cluster village yields an annual benefit of Tk 6 thousand per family because of sending their children to schools, which was not possible in their earlier housing conditions in the edge of the river. Similarly, the annual benefit per household due to higher labour-days possible in community cluster village (because flood-free housing) is valued at Tk 9 thousand per year. The sub-total of benefit comprising of economic and social benefit per household per year in the cluster village is Tk 35.65 thousand. The sub-total of investment and the Social cost is Tk 173.3 thousand per household. The fixed and variable cost per household per year is Tk 5.06 thousand. Assuming community cluster houses would be built for all the “discontented households” within a time-span for five years, “discontentment cost” per household (using standard method of quantifying subjective values through normative demand curve estimation) became Tk1.8 thousand per household.

Finally, Table 4 shows the results of social and economic feasibility analyses.

Table 4. Description of Results

Indicators Used	Results
Social and Economic Benefit/Cost ratio (B/C Ratio)	1.71
Social and Economic Net present value (NPV) (Tk,000)	139.4
Social and Economic Internal Rate of Return (IRR %)	13.0
Sensitivity Analysis for Internal Rate of Return (IRR)	
	Results
Benefit streams decline by 5%	10.0%
Cost of Cluster Village rises by 5%	12.0%
Benefit streams decline by 5% and Cost increase by 5%- <u>worst case</u>	9.0%
Cost of Cluster Village declines by 5% and benefits increase by 5%- <u>best case</u>	15.0%

Source: Study Findings

The results on Table 4 signify that social and economic benefit and cost analysis of a resilient climate house in the Cluster village passed the social and economic viabilities test. The Social and Economic Internal rate of return is 13.0% which is higher than the discount rate of 12% used in Bangladesh. This 12% rate as used by the Planning Commission of Bangladesh captures both the inter-generational time value of money, costs of natural depletion, and environmental costs, in addition to the opportunity cost of alternative investments. The study reveals that the social and economic benefit of the project is over 70% higher than the concomitant social and economic cost. The value of social and economic “net present value” is Tk139.4 thousand, implying that over the project life; projected social and economic benefit will surpass antecedent costs by that amount.

The above viability of the climate change adaptation intervention in the community cluster housing sector corroborates practicability of combating entire domain of climatic and social vulnerability-matrix of floods comprising of (i) disruption to Income and food (due to remaining pre-occupied with urgent repairing of their house damaged by flood), (ii) flood-damage to tools and kits used in providing daily-labour service, (iii) security-threat of women and children in flood damaged houses, (iv) inability to seek

social or public assistance due to lack of empowerment (tackled by community interaction), and (v) discontentment of left-out community members etc.

The outcomes of the sensitivity analysis reinforce confidence in the results. The impact of 5% decrease in social and economic benefits is found to be more damaging than 5% increase in social and economic costs. The Internal rate of return drops to 10% in case of 5% benefit decline compared to dropping to 12% in case of 5% costs increase from the base case (13%). In the worst scenario of 5% decrease in benefit coupled with 5% increase in cost, internal rate of return drops to the lowest position of 9%. On the other hand, in the best scenario comprising of 5% increase in benefit combined with 5% decrease in cost, internal rate of return rises to the highest position of 15%.

Considering the overall situation, the above results reveal social and economic viability of the climate resilient community cluster village being experimented upon by ActionAid Bangladesh. The viability points out that project components envisaged such as awareness building, group organization, capacity building, infrastructure design, livelihood style, security and safety of women and children considered, greater competence in wage-income due to secure housing, risk-mitigation measures in times of calamities, system of neutralizing “discontentment”, and payment of community-labour service is therefore feasible.

The results lend support to various theories which are common in the community-based adaptation literature. Theory of ownership element is vital to the success of a community intervention. According to the (Rudmin et al., 1987), it is the “living definitions” of ownership that affect beneficiaries’ perceptions of the plan and their roles. Since these perceptions are the raw material of group behaviour, leaders or agents of change must work with and, where necessary, stand for such interpretations of ownership. The theory of change which is often referred to as the engine of change, project conceptualization, log-frame etc. has been an essential part of a successful transformation effort in the Action-aid case. Without such a theory of change, the community would have wandered in situations of multiple vulnerabilities. The theory of opportunity cost was used in valuing community labour when community service conflicted with their usual labour-market service. Otherwise, it would not have been possible to measure the true economic cost of the community cluster village. In the line of the theory of empowerment, the bottom-up approach was used to empower poor communities in awareness building, conscience-raising, self-conceptualization of adaptations, planning and implementing adaptations and ensuring its sustainability as mentioned in the literature (BDRRC,2008) and BCAS (2012), among others. Adaptation theory was aptly used by ActionAid Bangladesh when it used a participatory approach to tackle the various elements of vulnerabilities, like combating the surge of flood water, wind speed, security from theft, provision of emergency income generation etc. However, exposure units, operators and receptors of adaptation may not be identical, and hence adaptations may fail in obtaining the desired benefits. Therefore, ActionAid Bangladesh always guarded against such miss-directions by interested quarters. Theory of behaviour change was instrumental in bringing out the potential of each capability taking into consideration a wider range of social, cultural and economic factors that influence behaviour.

5. Conclusion

The study was carried out to examine the social and economic viability of the climate resilient community cluster village of Action-aid Bangladesh for possible replication to

similar ecological zones both within and outside Bangladesh. To achieve this objective, a social and economic cost and benefit analysis of the project was carried out using appropriately developed techniques and methods involving both quantitative and qualitative elements. Major findings and policy recommendations are described below:

- a. The concept of climate resilient “Cluster Village” is a viable option. The benefits of this climate resilient project are manifold and more than the social and economic cost incurred. In the study, the social and economic benefit was found to be 70% higher than social and economic cost.
- b. The main benefit of the cluster village project was in providing a safe and secure housing service. This community living has provided a peace of mind free from fear of vulnerability and the associated risk of destruction and consequent migration. The sustainability has facilitated practising vegetable gardening and fish culture in the secure vicinity of their houses.
- c. The cluster village has given additional benefit in the form of allowing the inhabitants to enjoy the advantages of “community living” such as freedom from the fear of conflicts and crimes in the far-flung area where the project is located. This has also empowered women in giving a contribution to the society.
- d. The knowledge generated in this study can be used for effective adaptation options for minimizing cost and uncertainties on replication elsewhere. The methodology and approach used can be used in the capacity building of similar NGOs working in the field.

Acknowledgements

The author wishes to acknowledge assistance received from Sajit Raihan of ActionAid Bangladesh and Khandaker Mainuddin of Bangladesh Centre for Advanced Studies, Dhaka. The inhabitants of the Climate Resilient Community Cluster Village of Sirajganj deserve special mentioning for freely providing necessary data and information. Funding for the project was received from UKAid through Action Research for Community Adaptation Project (ARCAB). The usual caveat applies; the author is responsible for the findings and conclusions. Lastly, the author would like to acknowledge two anonymous reviewers of the paper.

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