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Prospect of climate resilient livelihood activity in the south central coastal region of Bangladesh

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ABSTRACT

This study identifies the prospect of climate resilient alternative livelihood activities to reduce the effect of climate change. For this study five focus group discussion (FGD) and 120 questionnaire surveys were conducted and interpreted. Results show that housework and fishing are the most important income generating sectors in Sreepur, Char phenua, Char mahisha, Elisha koralia under Mehendiganj upazilla of Barisal district. Perceived impact of natural disasters on livelihood activities was calculated as more than medium-high effect, i.e. 3.1 in a scale of 5. Perceived resiliency of the livelihood is 36% for the traditional livelihood and the income loss due to the lack of climate resiliency of the livelihood estimates as 26000 BDT year^{-1}person^{-1}. Perceived livelihood loss due to the natural disaster was estimated at about 50000 BDT year^{1} person^{-1}. This study specifies the prospect of climate resilient alternative livelihood activities by measuring the perceived fiscal value of the livelihood loss due to lack of climate resiliency and loss due to natural disasters in the studied areas.

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I. Introduction

Bangladesh is one of the most climate vulnerable countries in the world. Population and large coastline increased the risk of natural disasters with climate change events like cyclone, tidal flood, storm surge, coastal erosion, salinity intrusion, water logging etc. (Awal et al. 2013; Castro-Ortiz, 1994; Ali and

Chowdhury, 1997; WB, 2000; Khan, 2008; GOB, 2010). Livelihood is vulnerable due to climate change in the south central coastal region of Bangladesh (Sarker et al. 2010). Coastal livelihoods are directly related to natural resources are affected by natural disasters (Sarker et al. 2010; Saroar et al. 2015). For this reason, climate resilient alternative livelihood is considered as one of the means to adapt with the natural disasters. Climate resiliency is the capacity for a social-ecological system to absorb stresses and maintain function that imposed by climate change. It reflects to adapt, reorganize and evolve that improve the sustainability of the system to leave it better prepared for future climate change impacts (Folke, 2006; Adger et al. 2001). Thus the climate resilient livelihood means the livelihood that can adapt, reorganize and evolve, that improve the sustainability of the system to leave it better prepared for future climate change impacts. Coastal people livelihood is very much affected by climate induced disasters. People generally migrate to the big cities (e.g. Dhaka, Chittagong, Khulna etc.) due to this climatic stress and for better livelihood (Saroar et al. 2015; Rashid, 2013; Khatun, 2013). The present condition of livelihood activities in coastal areas of Bangladesh illustrates that people are facing various stress due to climatic variability and these pressure increasing day by day (Awal et al. 2013; Sarker et al. 2010). The alternative livelihood activities that ensure resiliency might have the potentials to security against climate change induced disasters. Thus this study was conducted to find out the potential of alternative livelihood(s) to achieve resiliency against climate change induced disasters such as cyclone, flood, storm surges etc.

II. Materials and Methods

Study area

The study was conducted involving four villages, namely Sreepur, Char phenua, Char mahisha, Elisha koralia at Alimabad Union of Mehendiganj upazilla under Barisal district having 9,760.00 people (BBS, 2011). Mehendiganj Upazilla is very much vulnerable to natural disasters and climatic stress. People experienced devastating impact of river bank erosion, flood cyclone in this area. This natural disaster and climatic stress hampered people livelihood and daily life cycle greatly (Khatun, 2013).

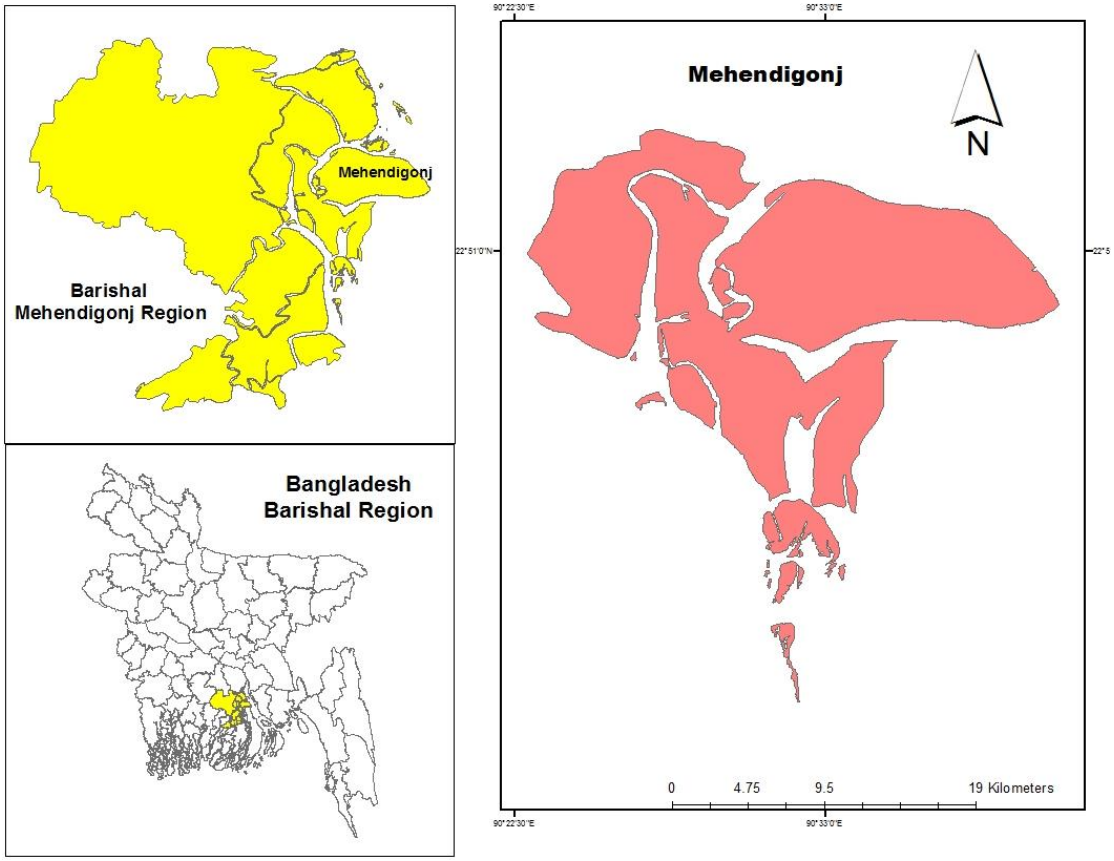

Figure 01. Map of Mehendiganj upazilla (i.e. Delineation of the administrative boundary from GADM, 2015).

Data collection and analysis

One hundred and twenty questionnaires survey were conducted randomly for the identification of general livelihood activities and alternative or disaster adaptive livelihood activities. The number of surveys in each of the villages was uniformly distributed, i.e. thirty household survey in each of the village. Moreover, perceptions on livelihood resiliency, natural disasters and its economic losses due to the absence of resiliency and willingness to pay for alternative resilient livelihoods were also investigated through this questionnaire. Five focus group discussions (FGD) and formal dialogue were conducted for validating the information in questionnaire's monetary estimates. Questionnaires and FGD were conducted during January to May, 2016. Monetary value estimate was predicted for the main livelihood activities, alternative livelihoods, loss for the absent of climate change induced livelihood resiliency, willingness to pay and financial loss for the natural disasters.

Prediction of the magnitude of impact

To identify the magnitude of impact on livelihood due to natural disasters graded matrix was used to do the analysis. We made assumptions to score the impact matrix according to the following scale:

> 0 – no observable effect; 1 – Low effect; 2– Tolerable effect; 3 – Medium high effect; 4 – High effect; 5 – Very high effect (devastation)

Here, low effect means lower loss due to the disasters that may not hamper the livelihood activity due to the disasters, tolerable effect means the effect of disaster is higher in consideration to livelihood impact but it is still manageable by the community. Medium high effect means livelihood effect due to the disaster needs some assistance to return to the previous state. High effect means the impact of disaster is not manageable and need high assistance. Very high effect assumed as unmanageable and impact that need reconstruction of most of the component of the livelihood.

We calculated the magnitude of impact by averaging all of the perceived impact (sectors vs disaster events) received in our schedule during the focus group discussion.

Estimating the priority index

Priority index is calculated for each facility by multiplying each priority with its relative weight. Here, (0) for not identified, (1) for high priority, (0.75) for medium high priority, (0.50) for medium priority and finally (0.25) for low priority.

Statistical analysis

Perceived resiliency of livelihood with climate change was analyzed by using binary logistic regression. This analysis was performed to test the respondent's perception about livelihood resiliency with climate change, any loss for the absent of climate change induced livelihood resiliency, desire to improve the climate resiliency of livelihoods in different risky situation and willing to pay to improve the livelihood means.

Monetary value estimation

Monetary value estimates of different parameters like main livelihood, alternative livelihood, loss due to lack of climate resiliency of the livelihood, damage due to natural disaster, willingness to pay for improving livelihood was done by multiplying the mean value of those (people perception) by the total number of respondents (Table 02). Negative responses were excluded from the calculations (people who responded 'NO' answer for those questions), i.e. the total of the monetary value of main livelihood, alternative livelihood, loss due to lack of climate resiliency of the livelihood, damage due to natural disaster and willingness to pay for improving livelihood were calculated excluding the percentages of negatives responses from the total population. For instance, total "no" response for willingness to pay for improving livelihood was 36%, therefore, total "no" response of loss for the absent of CC induced livelihood resiliency was 35%.

III. Results and Discussion

Demographic characteristics

Among the total hundred twenty respondents, half of them range from 26 to 55 years of age who are basically the working people in the locality. 50% of the respondent is not illiterate. Chi-square analysis verified that all socio-economic factors of the sample (respondents) were not significantly different from the whole population, which validated the representativeness of the randomly chosen sample. It would be statistically acceptable to aggregate estimates of mean willing to pay from the sample to the target population (Chen and Jim, 2008).

Livelihood activities

The most dominant occupation of the respondent was housework (32%) followed by fisherman (17%) farmer and day labor (12%). According to people perception, housework means homestead gardening, fishery and poultry farm. Other available occupations were employee, petty business, self-employed in agriculture/animal husbandry and motorbike driver. In reality, more or less every family was somehow engaged with natural resources based livelihood activities (e.g. fishery, agriculture etc.) which is might be vulnerable due to climatic disasters.

Around 40% respondent monthly income was 3000-6000 BDT, around 20% of the respondent monthly income ranges from 1500-3000 BDT and 6000-12000 BDT. About 10% respondent income was around 20000 BDT. The average income of the respondent was103812 BDT $year^{-1}$ $person^{-1}$.The average income was calculated assuming the average of each income ranges then adding all the averages and dividing the total average by the total respondent. For example, the average of the income range 3000-6000 BDT was assumed as 4500 BDT (mid-point of every range).

Alternative livelihood activities during disaster prone season

During disaster prone seasons (approximately April to mid-August) people accept alternative way for their livelihood activities and change the work with the seasonal variation. According to the respondent during the disaster prone seasons more than 30%respondent had no job, more than 20% involved in fishing related activity and less than 20% do housework. Rest of the, 20% respondent involved in handicraft, day labor, petty business and motor bike driver. Due to the effect of disaster the people were not involved with the outsides works and most of them work in their home. General livelihood activities and alternative livelihood activities during disaster prone seasons were more or less same because people change their occupation with the change of seasons. For example, when fishing opportunity is not available, the fishermen start doing housework. On the other hand, a farmer changes his/her livelihood with seasonal change (all seasons are not suitable for cropping). During disaster prone seasons, about 33% has no income. The total annual income from the alternative livelihood activities were more than 76 Million BDT. Thus, the annual income from alternative livelihood activities was78 thousand BDT $person^{-1}$.

Livelihood impact prediction

According to the impact matrix describe in the methodology section, the impact of different disasters on livelihood was calculated. The perception based calculated impact of the natural disasters is calculated higher for farmer (about 4.40 out of five). This is due to the nature dependent agriculture practices of Bangladesh. The lowest level of impact was perceived on motor bike driver and general employee. The cumulative impact of the natural disaster was calculated as 3.1. This value indicated medium high effects of climate induced natural disasters on the livelihood of the surveyed community. The most destructive value of the disastrous effect on livelihood was calculated for storm-surge and the perceived average impact value was calculated as 4.5. The other two high impact values were calculated for cyclone and riverbank erosion (Table 01).

Perceived priority of choosing the traditional and alternative livelihood

According to the people perception the highest priority for choosing the traditional livelihood was given for the availability of the services followed by high income possibilities (Figure 02).

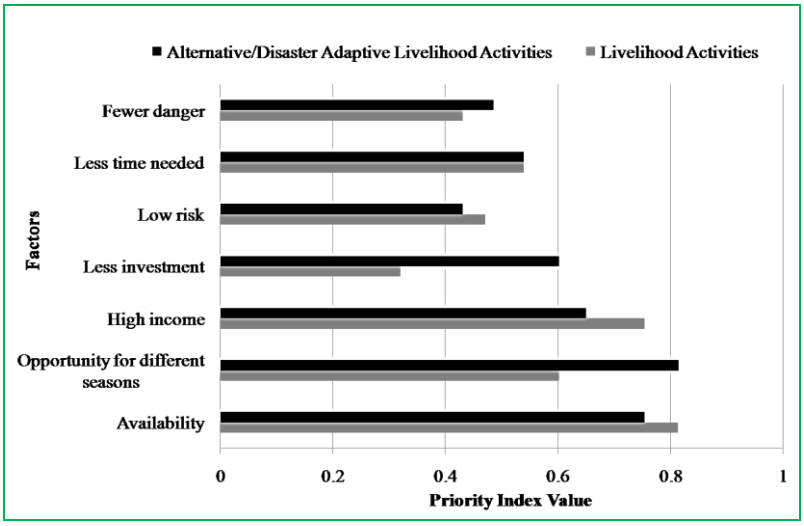

Figure 02. People's perceptions about the priority of choosing the traditional and alternative livelihood.

Table 01. Perceived impacts of natural disasters on livelihood activities

Livelihood Activities	Natural Disasters								Sum of Value	Avg.
	Flood	Cyclone	Storm Surge	River Bank Erosion	Tornado	Drought	Water Logging	Salinity		
Employee	2	3	4	3	2	0	2	0	16	2.00
Farmer	5	5	5	5	4	5	3	3	35	4.38
Fisherman	2	5	5	5	1	2	3	2	25	3.13
Day labor	5	5	4	5	4	4	2	1	30	3.75
Petty business	2	3	4	3	3	3	2	1	21	2.63
Self-employed in AG/AH	2	5	5	5	2	5	3	2	29	3.63
Motor-bike driver	1	3	4	4	0	2	2	0	16	2.00
Housework	2	4	5	4	2	3	3	3	26	3.25
Total	*21*	*33*	*36*	*34*	*18*	*24*	*20*	*12*		
Average	*2.63*	*4.13*	*4.50*	*4.25*	*2.25*	*3.00*	*2.50*	*1.50*		*3.1*

*AG=Agriculture and AH=Animal Husbandry

On the other hand, the priority for the alternative livelihood choice majorly influenced for its opportunities in different seasons followed by the availability of the job. This may be because of the vulnerability and accessibility in different seasons with less investment needs (Figure 02).

Perceived resiliency of livelihood

Binary logistic regression showed that respondents perceived significant influence on the livelihood resiliency issues due to the absence of the climate resilient livelihood (p=0.00).

From 120 respondents about 36% considered that their livelihoods activities were resilient with climate change whereas about 64% perceived their livelihoods were not resilient with climate change. According to the respondent fisherman and farmer occupations were not resilient with climate change.

According to Torrens Resilience Institute, the resiliency factors are managing risk, adapting to changes, gaining experience, positive outcomes, threats and events, being prepared, commitment to survive and easy to recovery etc. (Arbon et al. 2016). Among those factors of resiliency, the highest priority was found at managing risk (Figure 03). On the other hands, the lowest priority index value was calculated for threats and events (Figure 03).

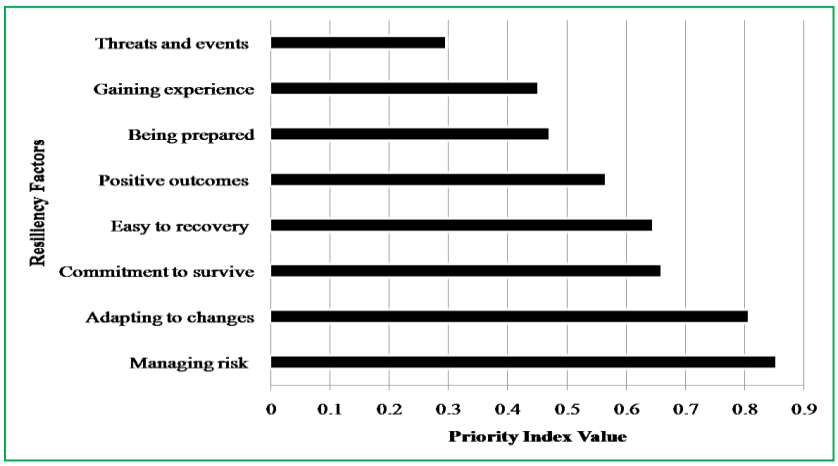

Figure 03. People understanding about the resiliency of the livelihood.

The perceived financial loss is 40000 BDT for around 30% respondents, 60000 BDT for 18% respondent, 20000 BDT for 11% respondents, 10000 BDT for 7% people and 50000 BDT for 3% respondent. The financial losses due to climate change induced livelihood resiliency calculated as 256202440 BDT year^{-1}. Thus financial losses due to climate change induced livelihood resiliency of per respondent was calculated as 26250 BDT year^{-1}person^{-1}.

Livelihood improvement potentials

About 85% of the total respondents were agreed for the improvement of their livelihood activities. On the other hands only about 15% of the total respondents were disagreed for their livelihood improvements. This may be because of they felt that their livelihoods were not influenced by climate change. Interestingly, the desire to improve the livelihood resiliency of the respondents was insignificant when willingness to pay is considered. For ensuring climate resiliency and improvement of livelihood activities, about 45% respondents were agreed for willingness to pay financially whereas about 55% were disagreed for willingness to pay financially. Annually willingness to pay for increasing the for climate change-induced livelihood resiliency was calculated as 1261692 BDT. Thus the willingness to pay was calculated as 129 BDT person^{-1} year^{-1}.

Natural disasters

The study also examined the information about the perceived natural effect of the common natural disaster livelihood activities. The highest priority index value was calculated for river bank erosion whereas the lowest priority index values were calculated for salinity (Figure 04). According to the respondents, loss was calculated as 60000 BDT year^{-1} (52%), 40000 BDT year^{-1} (26%) and 20000 BDT year^{-1} (18%). The total annual financial losses due to natural disasters were 444568000 BDT. So per respondent annual financial loss due to natural disasters was calculated as more than 45 thousand BDT year^{-1}.

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Comparison of the perceived fiscal value of the livelihood activities

The perceived average of annual income was calculated as 103812 BDT from livelihood activities. On the other hand, from alternative livelihood the averages annual income was calculated as 78180 BDT. The annual loss due to the absences of climate resiliency of livelihoods was calculated as annually 256202440 BDT and due to natural disasters, the annually financial loss was calculated 444568000 BDT (Table 02). People willingness to pay for ensuring livelihood resiliency was calculated as 129 BDT year^{-1}. This summary of fiscal value clearly showed the potential of alternative livelihood activities. This perception revealed that the communities might reduce their extra economic loss by adopting these alternatives means of income during the adverse climatic period of the year.

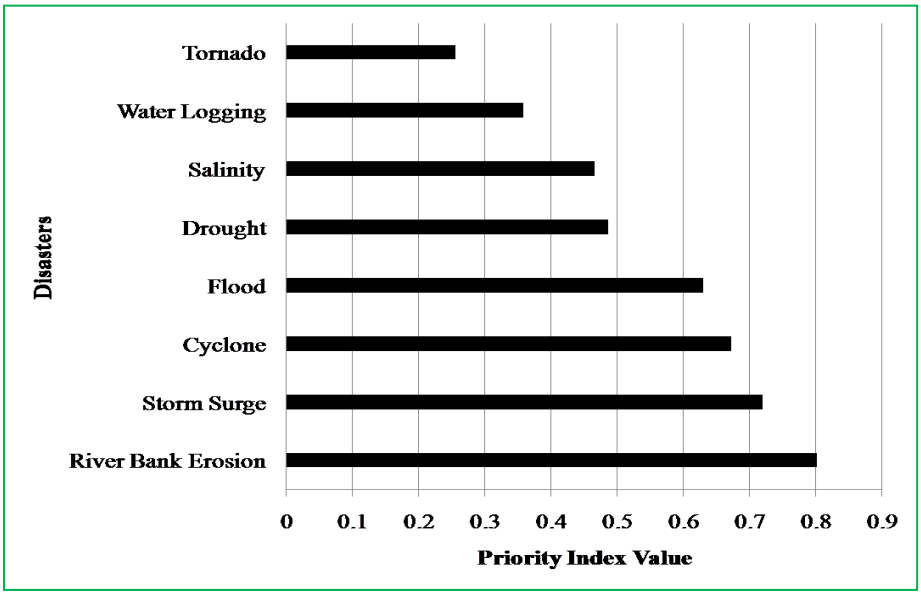

Figure 04. Respondent perceptions about the priority of impact on livelihood activities by natural disasters.

Table 02. Perceived fiscal statue of livelihoods, alternative livelihoods, climate change induced livelihood resiliency, willingness to pay for ensuring climate resilient livelihood and loss from natural disasters

Perception points	Perceived fiscal value (million BDT year^{-1})	Perceived fiscal value (per person)
Livelihoods activities	101 (100%)	103812 BDT year^{-1}
Alternative livelihoods activities	76 (67%)	78180 BDT year^{-1}
Loss for the absent of CC induced livelihood resiliency	25 (65%)	26250 BDT year^{-1}
Willing to pay for ensuring livelihood resiliency	0.1 (64%)	129 BDT year^{-1}
Financial loss due to natural disasters	4 (100%)	45550 BDT year^{-1}

*CC=Climate Change

IV. Summary and concluding remarks

Livelihood resiliency is an enveloping phenomenon for the coastal livelihood protection in Bangladesh which is similar for many of the developing countries (Ellis, 2000; Ellis and Freeman, 2004; Pritchard et al. 2015; Armahet al. 2010; Vailta et al. 2012; Tanner et al. 2015). We showed that the resilience of livelihood activities was hampered significantly due to the absence of climate resilient livelihood. This may be because of climatic disastrous events that were increasing day by day. Several studies estimated that the resiliency of livelihood activities in the cost line were not a good range and normally resiliency percentages is small numbers near fifty percent (Armah et al. 2010; Jayaweera, 2010; Pritchard et al. 2015; Vailta et al. 2012; Tanner et al. 2015). Perceived resiliency percentage was 36 for the traditional livelihood. We estimated that the loss due to the lack of livelihood resiliency was more than 26000 BDT year^{-1}person^{-1}. Moreover, we estimated that perceived loss due to the natural disasters was around 50,000 BDT year^{-1}person^{-1-}.

Studies determined the resiliency of livelihood activities of the coastal area were decreasing day by day; these may be because of local and global climate change and human influences. Thus, coastal areas of Bangladesh have a great potentiality of the climate resilient alternative and disaster adaptive livelihood activities (Pouliotte et al. 2009; Rawlani and Sovacool, 2011). This survey was conducted among the respondent who are not highly educated in most of the cases. The measurement of the wiliness to pay was simpler in this study. If the bidding card approach was used, the calculation of willingness to pay might be more statistically specific than it is now. However, we believe that these respondents have high experience of the frequent disaster adaptations in consideration to replying the questions. The prospect of climate resilient livelihood at the community level revealed by this study. The study suggested that the alternative livelihood activities were more economic and resilient with climate change; people took alternative livelihood as their earning means with the main occupation. Though people were interested to alternative livelihood activities because of more financial benefits, introducing resilient measure with this livelihood may ensure more sustainable climate variability adaptation of the coastal community in Bangladesh.

Alternative livelihood has the potentials to increase resilience to livelihood development. The cumulative risk factor of climatic events on different livelihood activities was calculated as 3.1 (in a scale of 5) which was moderately high. Perceived resiliency of the livelihood is 36% for the traditional livelihood and the income loss due to the lack of climate resiliency of the livelihood was estimated as than 26000 BDT year^{-1}person^{-1}. In addition the perceived livelihood loss due to the natural disaster was estimated as about 50000 BDT year^{-1} person^{-1}. Other 64% of the respondent perceived the lack of climate adaptive resiliency of their livelihood. According to the respondents the livelihood resiliency varied significantly due absences of it climate variability adaptive mechanism. The willingness to pay for the improving the livelihood was not significant, however, the amount they wanted to pay was impressive and it was about 130 BDT year^{-1} person^{-1}. The highest priority for managing the risk was perceived due to the lack of opportunity or options to them for managing the risk exerted from the climate event (e.g. disease outbreak, drought etc.).Findings revealed that climate resiliency of livelihood and resiliency factors related to main and alternative livelihood in the studied coastal area. This study also draws an attention to economic opportunities to facilitate people's wellbeing to cope with climate variability and climate induces disasters.

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APA (American Psychological Association)

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