



The linkage between the economic status and the damage and recovery period: Evidence from the cyclone Mora in Teknaf Upazila, Bangladesh

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Abstract

The frequency of disasters is increasing in recent years due to climate change where the poor communities of the developing countries are the worst sufferer. The government along with the private agencies needs to understand the individual recovery approaches for the proper recovery and reconstruction strategies. To examine the relationship between an individual's damage (occurred) and recovery period (needed) with his economic status, a study has been conducted in the Teknaf Upazila for cyclone Mora in 2017. Individual questionnaire survey of 135 respondents were performed covering the most affected three sectors: the housing, commerce and transport sector. The study reveals that there is no relationship between the damage and the economic status of an individual but it disproportionately affect the recovery period (statistically significant). Excluding the ultra-poor, the recovery days will become less if the monthly income increases of an individual. This finding will help to design the recovery planning of developing countries like Bangladesh in the root level which will keep forward to effective disaster risk reduction measures.

1. Introduction

In recent years, climate change has been the major concern for all over the world [1, 2] which is increasing the vulnerability and worsening the situation of the poorer communities around the world [3]. Climate change is accountable for increasing temperature, sea level rise, and the increase of the frequency and intensity of different extreme events [2, 4]. Disasters created huge loss measured US\$ 2,908 billion during the time span of 1998-2017 around the world. In case of human death or affected people, it is evident that the poorer nations, explicitly the poorer communities are more likely to be exposed to disasters [5]. Even the human and economic developments of these poorer countries get largely affected than the high income countries through disasters [6, 7]. A study conducted in the Srilanka shows that the vulnerabilities and the post disaster effects are directly related to the poverty

since the poorer communities are more exposed to disasters and results huge negative impacts [8]. [9] also shows that the lower income people are the worst sufferer in a disaster and they are worried about the post disaster aid services more than other factors. The relationship between disaster vulnerability and the social classes, races and ethnicity were pictured out in the [9] where in Hurricane Katrina, though facing severe disruptions, the low-income African Americans were left behind even in the media coverage. It was not only bound to this but also the middle- and higher-income group of people were accessible to the easy recovery strategies than the lower income group of people in hurricane Katrina [10].

It is evident from different studies that the socio- economic condition and the vulnerability to disaster has a positive relationship with each other [11, 12, 13] as the vulnerability can lead to poverty, and even longer effects [14]. The low income households get affected inversely by the disaster worldwide and even they are less focused and get less assistance in the disaster recovery programs. Even whereas the economic growth accelerates around the world, the inequalities is increasing the disaster effects within the societies especially in the poorer countries [15]. However, the people with low incomes and low socio- economic status generally are less prepared to disasters to every conditions which result greater impact to them. They face huge damage of physical assets as well as different indirect losses [16]. This indirect and long term losses are necessary to calculate quantitatively along with the direct losses as they can surpass than the direct damage counts [17]. In terms of Ethiopian and Honduran communities, the poorer ones are the most struggler to the both short term and long term after- shocks of disasters [12].

In Bangladesh, both the economic recovery and the reconstruction processes need an integrated approach to secure the vulnerable communities [18]. Bangladesh Government have several post-disaster relief programs such as Gratiotous Relief (RF) [19]; due to the absence of proper and effective management planning, the relief distribution operations are not properly performed according to the situation of the affected ones in the community [20]. Moreover, the social capital development or community empowerment are complicated in the communities even for the private NGOs [21]. However, in the context of flood in Bangladesh, the households with similar income have better connection to help each other in coping strategies and receiving aid whereas the segregated ones having less income are the worst victims [22]. In case of SIDR, the damage and loss assessment were performed and the immediate and medium or long term recovery and reconstruction processes were discussed in the report on cyclone SIDR [23], but there were no planning procedures given on how to apply these among the affected ones depending on their capacities and situations. The damage and loss assessment (DaLA) is needed for the reconstruction and recovery strategies to understand each one's needs. As a consequence, in case of recovery strategies, that is the gap to understand if there is any relationship between the economic status and the recovery period of the affected ones.

The objective of this study is to explore the relationship between the economic condition with the recovery period needed and the damage occurred to the affected ones in the context of cyclone Mora in Bangladesh. Bangladesh is a high risk zone to different disasters especially to the cyclones. A field visit was performed to collect data in the upazila (sub- district) named Teknaf, Cox's bazar immediately after the occurrence of cyclone Mora. This area was the most affected especially in three sectors: housing, commerce and transport which were further get examined.

This paper is arranged in several sections: section 2 as the methodology, section 3 as the result and discussion and section 4 as the conclusion part.

2. Methodology

2.1 Study Area

According to the grey literature (reports, papers, news portals etc.), the Teknaf upazila (the small administrative boundary under the district) was affected the most by the cyclone Mora and that's why it was selected as the primary study area. Teknaf is located between 20°23' and 21°09' North latitudes and between 92°05' and 92°23' East longitudes. It is the southernmost part of Bangladesh and administrated under the Cox's bazar district, Chittagong division [24]. Teknaf is a peninsula as it is placed on the east bank of the Naf river and on the south and west of the Bay of Bengal [25]. It has a total number of 6 unions, 9 wards, 16 Mahallas, 12 Mauzas and 153 villages [24]. The total population of the Teknaf upazila is almost 264,389; among them male constitute 50.34% of the population, and female 49.66% [24]. The literacy rate of this area is 36.3%. Around 44.95% people of this upazila are occupied with agriculture and 21.88% are with commercial activities. Among the livelihood activities: the rice and betel leaf cultivation, fuel- wood collection from the forest, fishing, and day labor are the major ones [25]. The study area map (Figure 1) has been produced in ArcGIS 10.8 environment.

The key informants suggested the three unions (the smallest administrative boundary under Upazila) named: Sabrang and Baharchara to perform the study as they were the most affected in the upazila. The Teknaf pourashava (municipality administration) has been taken to examine the town area too.

2.2 Data collection

The research is focused on primary data. The primary data has been collected for the most affected three sectors: housing, commerce and transportation. The local people were interviewed through a structured questionnaire. A total number of 135 individuals have been surveyed (45 from each sector). Purposive sampling was followed as we have selected three unions depending on their severity on cyclone Mora found through KII. 12 KIIs (key informant information) were performed to select the micro study area and understand the overall scenario of the impact by cyclone Mora. Among these three unions, the town area was selected to compare the affected situation with the village areas. Moreover, stratified sampling was performed in three strata: the housing, commerce and transport sector. Sub- strata were followed in different types of housing (katcha, pucca, semi- pucca), commercial activities (fruits and vegetable shop, poultry farming, electronics store etc.), and transportation types (rickshaw, tom-tom, bus, truck etc.) to analyze the effects. The survey information has been shown in figure 2.

2.3 Methods

Different statistical analysis has been performed to understand the relationship between the economic status and the recovery period and occurred damage. The damage has been calculated following the ECLAC methodology which is the most comprehensive and consistent method for damage and loss assessment till date [26].

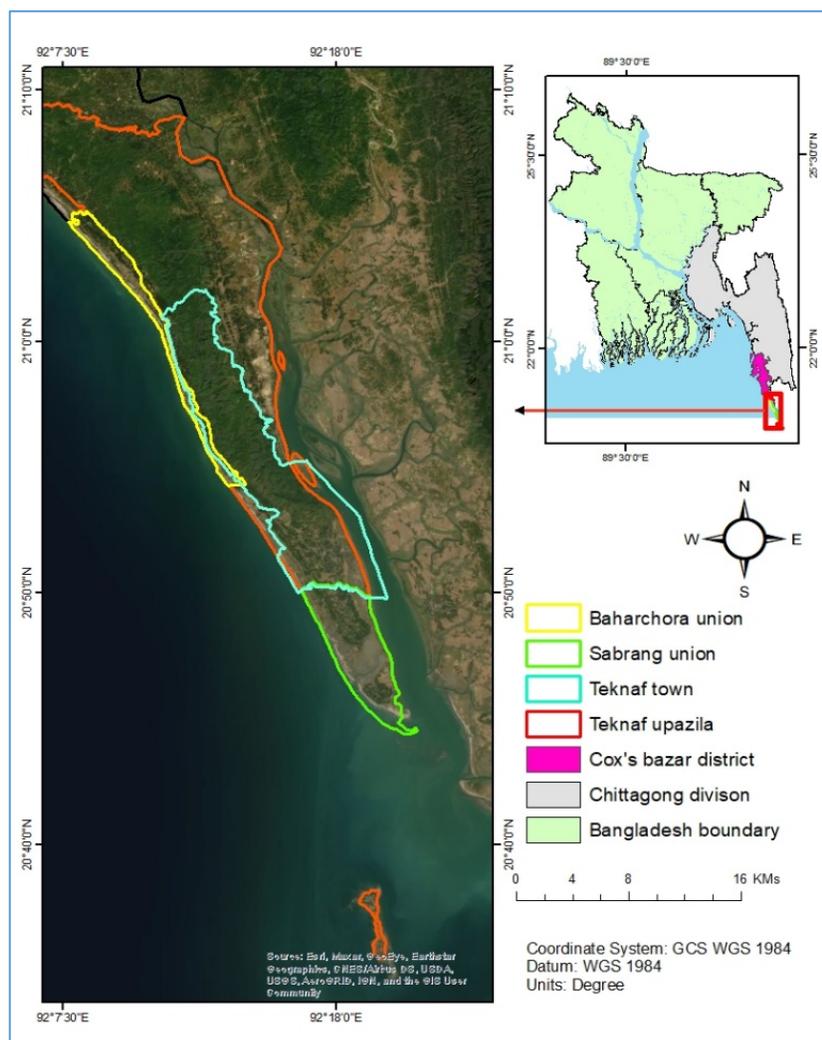


Figure 1. The study area location has been shown in Bangladesh including the study area Upazilas

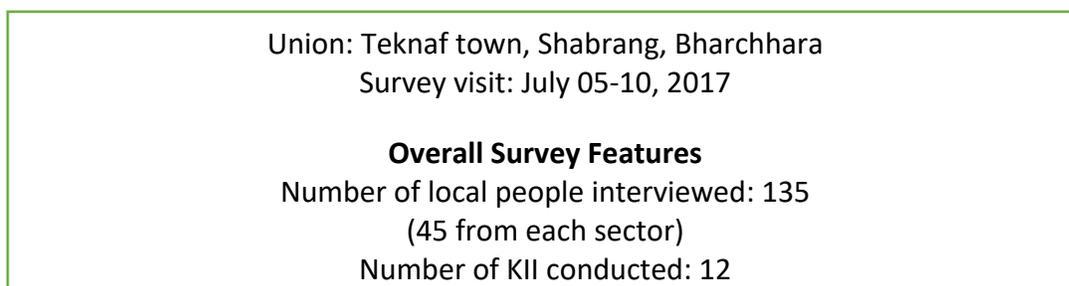


Figure 2. Survey information at a glance

SPSS and MS Excel were used during the analysis period. In this study, a linear regression model has been conducted to understand the correlation between the economic status and damage and the recovery period.

$$Y = a + bX,$$

where X is the independent variable (monthly income) and Y is the dependent one (recovery period and damage). The slope of the line is b , and a is the intercept (the value of y when $x = 0$). Since the

both of the independent and dependent data has linear and continuous value [27], that's why this regression model is appropriate for this analysis.

3. Result and Discussion

Since three different sectors have been covered, diverse economic groups were identified during field visit (table-1). The range varies from minimum monthly income of 1,800 BDT for a fisherman to 10, 50, 000 BDT for a truck company. But around 76.29% surveys fall into the 3001-45000 BDT range. It depicts that majority of the peoples' income lies within this range in this area. The following chart shows the number of surveys from the economic group covered in this study.

Table 1: Survey information according to monthly income

Monthly income range (BDT)	Number of surveys
1500-3000	9
3001-8000	25
8001-14000	41
15000-20000	24
20001-45000	13
45001-60000	7
60001-90000	4
90001-150000	8
150000+	4

The relationship between the economic range and the average economic status have been examined. As the economic status is the independent variable, it is placed in the X axis and the dependent variable, the recovery period is placed in Y. The relationship between the economic status and the recovery period shows that they are inversely correlated. It indicates that possessing a higher economy will lead to minimize the recovery days needed to bounce back to the previous situation. However, it is observed that the individuals who are extreme poor need less period to recover than the middle income individuals. It is because of their having little capital or asset to damage for their livelihoods. According to UN, the household having wages below \$ 1.9 USD per day are considered as extreme poor [28]. Converting this in USD to BDT (1\$= 85BDT on an average), the monthly income stands for 4,845 BDT for a month. Moreover in Bangladesh, the extreme poor get aid from both the government and non- governmental organizations to recover their damage easily and quickly [20]. In cyclone Mora, this relief was distributed including cash, pure drinking water, shelter toolkits, water storage items etc. [29]. It results that having less asset and receiving aid, the extreme poor need less time to recover to the disaster effects.

On the other hand, the individuals with middle economic status need more recovery days than the extreme poor ones (figure-3). This can be divided into two groups: ranging within 3001- 20000 BDT needs around 15 days for a disruption like cyclone Mora (category-1 moderate cyclone). Additionally, the second group within 20001-90000 BDT needs around 7 days to recover. Above these, the higher income group of 90001+ need on an average of two days only. This analysis depicts that excepting the extreme poor, the recovery days generally decrease with the economic status.

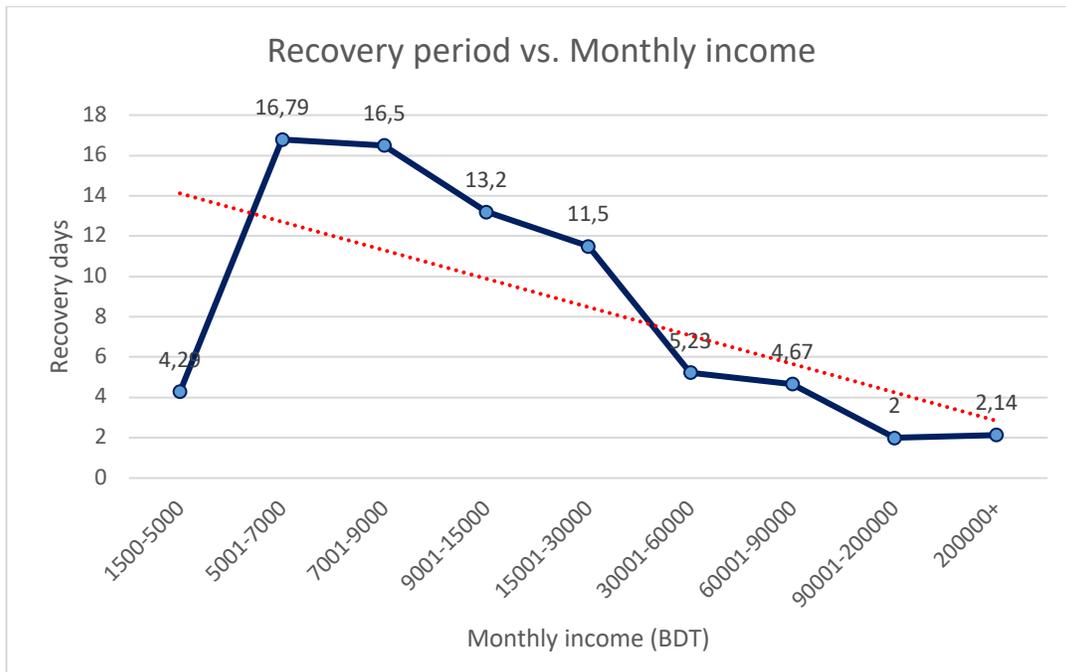


Figure 3. Relationship between monthly income and recovery period

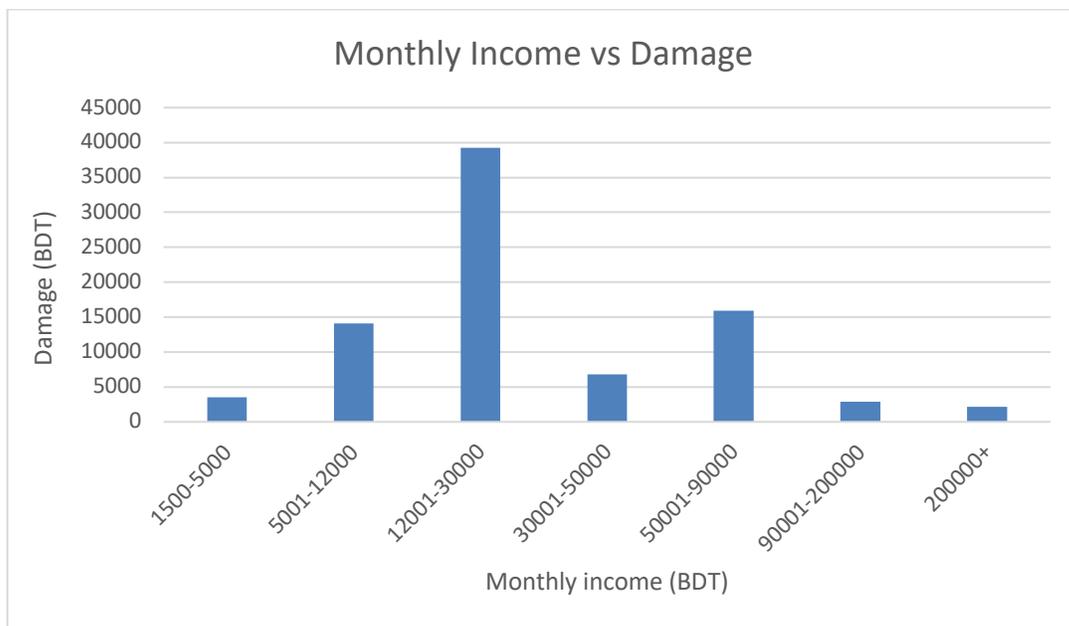


Figure 4. Relationship between monthly income and total damage

In case of inspecting the relationship between the economic status and the damage (figure-4), the middle-income group from 5001-30000 faced the highest damage whereas the extreme poor and the high-income groups face less damages. The key informant mentioned and it is also observed in the field visit that the high-income groups have resilient establishments which make it less vulnerable to disasters. It is evident that there is an inverse relationship between the recovery days and economic status (table-2). However, the damage and the economic status doesn't show any concrete relationship within them. The results of the linear regression between these are shown below here:

Table 2: Regression result

Dependent variable	Measurement	Significance
Recovery days	-0.00001677	0.008
Damage	-0.030	0.442

Source: Field survey 2017

It depicts that the analysis of the recovery days with the economic status is statistically significant with a 99% significance level ($p= 0.008$) and it holds 87% data ($R^2=0.87$). We can understand from table-2 that if the monthly income increases then the recovery period will be decreased by -0.00001677 units. However, the significance for the damage is not in acceptable rate. It means that the damage is independent depending on the type, severity and other factors of any individual. The Pearson's correlation between the damage quantity and the recovery days shows that they are moderately positively correlated with each other and the result is statistically significant (99%). It determines a positive association (.56) between them as one individual facing high damage will lead him to more recovery days.

$$r(135)= .56, p=0.0$$

There are different types of commercial establishments present in a society and the recovery time is somehow associated with its commercial type (Figure 5a). In case of different commercial activities, the grocery shop (16.5 days) such as the food store or small supermarket or the cereal seller (rice, wheat, corn etc.) (15 days) need longest time to bounce back to its normalcy. This is because of their need of connectivity between different types of production houses (from different areas) and them which was highly affected by the disruption of the transportation ways. Moreover, they face huge damage of diverse of products and need to recover this loss too. However, the restaurants (11.3 days) are the third type who need higher recovery days. As the restaurants of the study area were small, they faced huge damage of their stove/ oven, wooden table/ benches which were open to the environment, the cyclonic wind and rain damage their major furniture and machineries. All of these furniture and machineries were needed to buy or repair which need more time. The poultry farms (8.75 days) and the fish sellers (8.45 days) needed less time than the previous type. They lose their selling items such as: the poultry died, the supply of fishes were less, and the dry fish were damaged-which makes them to recover or restart their business. However, different types of establishments especially the green grocery and the fish-meat seller waited for their regular supplies to restart their business like before. Most of the poultry farms, fish sellers, or vegetable and fruit shops depended on the transport accessibility. However, the transport ways were open within 2-4 days (blockages due to destruction of structures and trees) which is a reflectance on their recovery days too. Lastly, the electronic and equipment shop were least affected as they had fine and concrete establishments and face minimal damage. Since there was little effect of damage in transport ways in cyclone Mora, the roadways were closed down for very few days due to the destruction of different houses, stores and the uprooted trees fallen on the roads in cyclonic wind. After the clearance of the roadways, they became open for the movement of the vehicles. However, several vehicles were found damaged of the individual owners and the company owners. From the figure- 5 (b), it is found that the charger

rickshaw and the tom-tom (local transportation type) needed highest days to recover. It is because they required electricity to charge their motors as the electricity of the studied area was disrupted and needed almost two weeks for re-functioning. During this period, these vehicles couldn't operate and that's why they faced massive loss. On the other hand, the remaining types of vehicles needed almost similar time to recover as after the reopening of the roads, they could move easily.

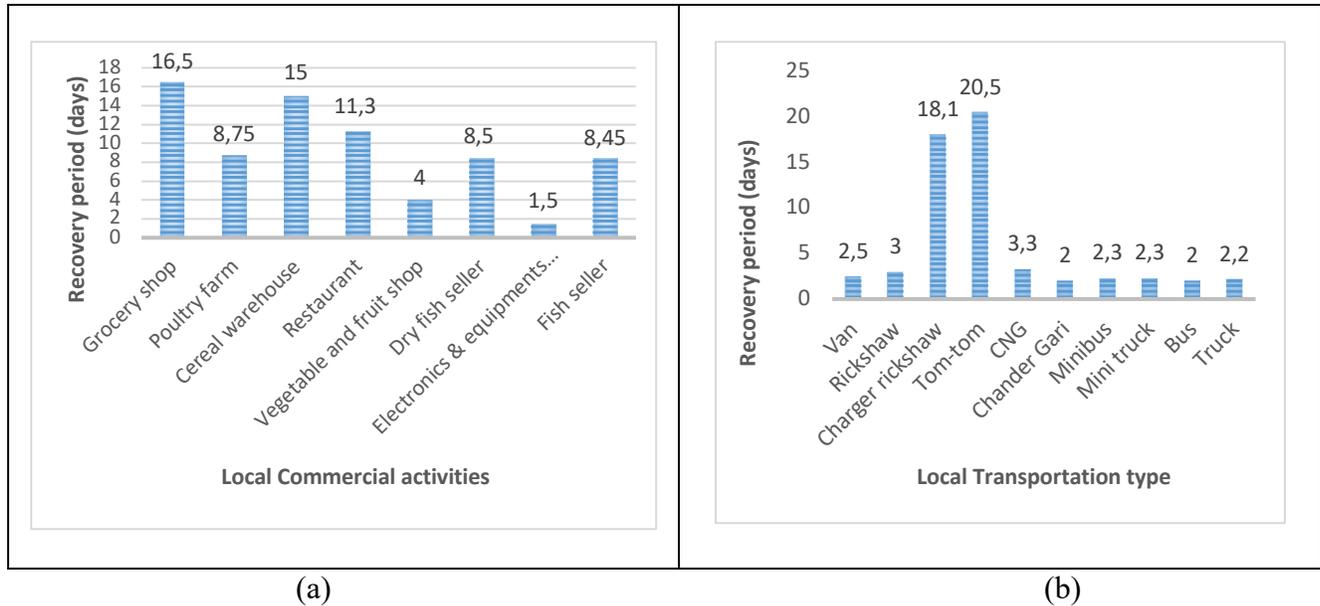


Figure-5. (a) Recovery period varying commercial activities; (b) Recovery period varying transportation types

The cyclone Mora was a category-1 cyclone which made its landfall in Kutubdia, Chittagong district, Bangladesh. It caused loss of 8 people along with many injuries and missing fisherman [30]. Bangladesh has a history of facing different large cyclones like cyclone SIDR -2007 (extremely severe cyclone of category 5) and Aila -2009 (severe cyclonic storm of category 1) with very high wind speed which created large disruption. Though the cyclone Mora was not that much destructive, it is shown that the affected need more recovery days excluding the relief advantages. Since this is the scenario of a less- destructive cyclone like Mora, then the situation could be more dangerous for the more devastating cyclones as well as other disasters.

A proper reconstruction and recovery planning is required after the occurrence of any disaster for any affected country. This planning should be inclusive of all categories of people of the community of different occupancies. It is also a complex question that how the resilient recovery can be planned of an individual through planning proper financial schemes [31]. In case of less developed areas, it is suggested to increase the post- disaster rescue fund for sustainable development which will help in smoothing the recovery measures and minimizing the adverse effects [32]. However, it is also evident that the middle income households have more access and ability to get financial help from various sources (including remittances and social capital) than the poorer communities [33] which is also needed to get considered during the recovery planning. It is obvious that understanding an individual's capacity to recover is necessary which is related directly to their economic status. Moreover, the social entrepreneurs can effectively play voluntary role in the community engagement

and post- disaster activities which will accelerate the recovery schemes [34]. This study will help the government organizations and also to the private agencies to plan a better relief distribution strategies and as well as the recovery planning.

4. Conclusion

Bangladesh has already been a great example in response and rapid recovery strategies to the whole world. However, in case of the recovery strategies, there is still a gap of proper planning. Since the damage and loss and the recovery strategies are directly linked with the economic status, there are needed to be a proper planning for the affected ones so that a quick recovery can be possible through the whole community. This systematic and quick approach to recovery planning will surely contribute to the disaster risk reduction (DRR) measures and will lead to a resilient community.

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