

## **Local Adaptation Strategies of a Coastal Community during Cyclone Sidr and Their Vulnerability Analysis for Sustainable Disaster Mitigation Planning in Bangladesh**

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### **Abstract**

Social vulnerability to disasters refers to the inability of a society and its people to withstand adverse impacts from multiple stresses to which they are exposed. Using a combination of geographical and social research methods, this paper examines the people's (re)action and responses during cyclone Sidr 2007 at Baniasanta union of Dacope Upazila in Bangladesh. Finding shows that their adopted strategies to cope with cyclone address their vulnerability and it is necessary to integrate their local wisdom of living with unnatural situation into the future planning and development process of the coastal belt. Accordingly, the plans and development should not only be necessity, but also be accepted by the local community.

### **Introduction**

There is probably a little scope to live in a risk-free society as in every moment, anywhere in the world, natural or man-made problems may result in humanitarian crises. Disaster whether natural or man made are very common in Bangladesh. Almost every year, the country faces floods, cyclones, storms, tornadoes, drought, river erosion, earthquakes, arsenic contamination of ground water sources and environmental pollution (Chowdhury, 1998: 203). The situation hinders the development of the nation.

People of coastal areas are more vulnerable, because they live in an extremely dynamic estuarine environment facing many natural threats. Besides, there are threats of climate change and upstream land and water uses. These threats affect almost every aspect of life and limit livelihood choices of the people. The coastal zone of Bangladesh, an area covering 47,211 km<sup>2</sup> facing the Bay of Bengal or having proximity to the Bay, and the exclusive economic zone in the Bay (PDO-ICZMP, 2004:13), is generally perceived to be a zone of multiple vulnerabilities. Records of last 200 years show that at least 70 major cyclones hit the coastal belt of Bangladesh and during the last 35 years nearly 900,000 people died due to catastrophic cyclones (PDO-ICZMP, 2004:14). The Government of Bangladesh (GoB) has already identified the zone as vulnerable to adverse ecological process (MOF, 2003: 25). The opportunities and potentials of the zone have not received much attention, and also the disaster mitigation approaches are seen as curative measure rather than protective, which raise questions regarding sustainable coastal belt planning and development. What is needed now is a multidisciplinary approach to tackle the complexity of social systems, and patterns of vulnerability in those systems.

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In terms of coastal hazards, there are mainly four parts of vulnerability, the economical, ecological, infrastructural and social. In vulnerability assessment, the analysis of social system resilience is crucial as it reduces vulnerability. Risk is often overestimated due to the disregard of the peoples and the systems ability to cope and adapt. Thus, strengthening of resilience is an effective strategy to reduce vulnerability. The individual or collective perception or awareness of risk plays a vital role in the whole concept of vulnerability.

An attempt has been made in this research to understand those challenges in the context of cyclone Sidr 2007 in Bangladesh. It is intended to analyze the households' situation of a union (local administrative unit) in order to delve into a common view on coastal conditions during cyclone Sidr, especially challenges being faced and or to be faced by the coastal communities. This study provides a synthesized picture of the study area during cyclone Sidr and hints at issues and areas that need to be addressed for the sustainable well being of the coastal communities in Bangladesh.

### Theoretical Debate

“Fighting climate change: Human solidarity in a divided world”, the Human Development Report 2007 from the UN, argues that the world is drifting towards a “tipping point”. It could lock the world's poorest countries in a downward spiral, leaving hundreds of millions facing malnutrition, water scarcity, ecological threats, and a loss of livelihoods (DFID, 2008:30). Accordingly, the poor always faces the immediate and most severe human costs due to their inability of coping with any disasters or crisis.

The modern integrative approach to vulnerability is set out in the Hyogo Framework 2005-2015 adopted by the UN in 2005. Vulnerability is defined here as ‘the conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards’ (Yamin, et. al. 2005:2). Although vulnerability is not defined as poverty, however, today's poverty is yesterday's unaddressed vulnerability (Chambers, 1989:1; Yamin, et al. 2005:2). Vulnerability here refers to exposure to contingencies and stress, and identify in coping with them. It has thus two sides: an external side of risks, shocks, and stress to which an individual or household is subject; and an internal side which is defenselessness, meaning a lack of means to cope. It is shorthand for factors that drive people into poverty, keep them in poverty and block their existing route from poverty (ActionAid 2005:7) and finally introduces the ‘social vulnerability’ (Cutter, et al., 2003:242-261, Cannon, et al. 2004:4; Braun and Shoeb, 2008:381-394) which emergence the need of ‘social protection’ (Devereux and Sabates-Wheeler, 2004:3). In the same way, understanding vulnerability should spread out the know-how on climatic, economical, generational, geographical, political and social process of the society, particularly the poverty traps (Chambers, 1989:2; Barrett and McPeak, 2004:3). Procedural and institutional frameworks are also important because they help to define actors, funding flows and types of policies that must be linked to support successful community-led adaptation strategies (Yamin, et.al. 2005:1).

Disasters are the situations that really require mobilization of capabilities and capacities of local resources. Local determination of needs is important because adaptation is highly context specific, and standard policies for successful adaptation are difficult to define (Yamin, F. et al. 2005:3). A disaster is commonly defined as a singular, large, non-routine event that crushes the local capacity to respond adequately (NRC, 2006:12-17). It generates collective stress and serious disruptions of activities of the global economy. It, either natural or manmade slows down the development process of the nation (Tierney, et. al. 2001:318). Again, numerous researches on natural hazards and disasters in recent years focus increasingly on the society (Wisner and Blaikie, 2004:464; Dikau and Weichselgartner, 2005:17; Müller-Mahn, 2007:4-11), which interpret the so called ‘social disaster’ as a result of natural disasters. The effects of such natural disaster can also be determined on the social situation and adaptation capability of the affected people. Getting affected by disasters and increasing vulnerability, individual or even collective groups can become

aware about their adaptation strategies to reduce risks and to respond to a disaster (Callon and Law, 1989:57-83; Hilhorst and Bankoff, 2004:1-10). Thus empowering them and making them able to identify problems and needs to plan, manage, control and assess the collective action. Nevertheless, disasters need not lead unavoidably to costly disasters or not in the process in increasing social vulnerability (Cannon, 2004:4-7). Hence the community people stricken by a disaster should be considered as taking action for itself not as having action taken for it. This presupposes the fundamental change compared to the usual notion that the responsibility of caring of disaster stricken community should be entirely taken over by outside assistance and the government.

The most decisive factor in any disaster is its disruptive impact that creates pervasive uncertainty, suffering and trauma. Furthermore, the strain on emergency response and reserve diverts personnel's time and resources from other critical obligations, making the communities more vulnerable to the threats. The coping mechanisms of a community are often undervalued and at time ignored too (Lindell and Prater, 2003:117-122; Chakraborty, et. al. 2005:23-33). However it should be the responsibility of the community and local government in any disaster to assume primary roles in managing recovery, setting goals, establishing programs, developing priorities and distributing resources before and after disasters. Accordingly, risk management and planning activities cannot be sustainably and efficiently implemented unless being based on a participative approach resulting from the problem consciousness and perception of local inhabitants (Teka and Vogt, 2009). In view of this community led efforts or local level strategies to cope with cyclone Sidr are considered as the center statement of this paper.

### **Importance of the Study**

Coasts and islands are highly exposed to a variety of climate hazards (Westmacott, S. 2002:67). The increasing use and activity within the coastal zone has led to a series of environmental issues that require to be addressed. Typical issues found in tropical coastal zones have been described by many authors (Wilkinson, 1992:11-12; Ehler and Basta, 1993:6-13; World Bank, 1995:20-25; Cicin-Sainand Knecht, 1998:12-27, Leary, et al., 2009:13) as: rapidly growing population, deteriorating environmental quality, loss of critical habitats, diminishing levels of fish and shellfish, reduced biodiversity and increasing vulnerability to natural hazards. Consequently, as Bangladesh's infrastructure, health and education systems lag far behind, people who live in the natural hazard's path, especially in the coastal areas had their homes and livelihoods destroyed in the past, with no safety net that could help them recover. Effective disaster risk management in such vulnerable coastal areas of the country relies on a strong legal policy, inter-institutional coordination mechanism and of course community participation (IISD, 2003:3-7). However, there is no universal model of disaster risk management in the world. It varies from country to country, region to region, community to community and even individual to individual.

Differences are also seen in forecasting, detection, communications and public awareness everywhere in the world. As for example, a shift from the traditional 'top-down' approach (Victoria, 2002:3; Morshed and Huda, 2002:3) is emphasized by the Bangladesh Urban Disaster Mitigation Project (2002). In addition, up to \$2.2 trillion of the U.S. economy are believed to be affected annually by weather and climate events (Dutton, 2001). Though the cyclones or tornadoes are more common in the U.S than anywhere else in the world (in an average 1000 tornadoes per year reported nationwide in US), the amount of damage and losses (70 deaths and 1500 injuries per year) compared with Bangladesh (death of 3406 human lives in cyclone Sidr 2007) is insignificant. Conversely the paid out amount for the recovery in Bangladesh is very little with respect to the investment of the Federal Emergency Management Assistance of US government. During last decades, for a total of 102 tornados, US disbursed \$1.72 billion (SDR, 2003:6), whereas Bangladesh spent \$1 billion emergency help during cyclone Sidr 2007. It is also noticeable that Joint Damage Loss and Needs Assessment (JDLNA) Mission of 11 donors in Bangladesh proposed \$4 billion to mitigate natural disasters like cyclone Sidr is to be

implemented in the next 15 years. This states the intra-dependency of disaster preparedness between rich and poor countries and leads the rich to spend for the problems of the poor (Turner, et. al., 2003:8074-8079; Pettit and Wheeler, 2005:1-8). Thus makes the poor countries more dependable and redundant upon rich countries and indirectly more vulnerable to natural calamities. Therefore, it is urgent to develop strategies that will be originated from the community itself and will be sustainable in the long run. This point led the expert community to enlarge the 'risk-hazard model' to a 'vulnerability model' (Wisner, and Blaikie, 2004:464; Cutter, et. al., 2003: 242-261; Wood, et al., 2002; Cutter, 1996:529-539, Chambers, 1989:1-7), ultimately adding the environment itself to population and place in order to determine resilience (Adger et al., 2005:1036; Turner, et. al., 2003:8075). Accordingly during any disaster, people at the community level should try to cope with their own survival strategies long before outside help from NGOs or the government arrives.

The degree of international assistance generally depends on the national capacity of the country to cope with disaster. In this view, the focus on crisis response is time sensitive, data for long-term disaster recovery, mitigation and prevention are also important. The approach to response natural calamities differs vastly between developed and developing countries. Most of the industrialized countries possess both technology and economic solvency; on the other hand, the third world countries are generally vulnerable to any calamities as they do not have technological efficiencies and as well as economic strength. So it is important for a developing country, like Bangladesh to develop and start planning with locally organized sustainable strategies for disaster mitigation.

### **Methodology**

Various coastal vulnerability assessment methods and tools have been developed and applied in many coastal settings worldwide, encompassing a broad range of application from cross-cutting methods to specific sectoral methods and from local to global scale. Nevertheless, while today there are great achievements in the quality of data, there is still a deficit of integrated assessment methods. So far most methodologies were designed according to morphological or economic terms, whereas social and ecological vulnerability criteria as well as the systems resilience have been widely neglected. This study thus considers that knowledge of the local people and their perceptions (Nyong, et al., 2009: 11; Blakie, 2000: 1033-1050; Chambers, 1999:15) for assessing the vulnerability of the study area is important. A field survey was conducted in Baniasanta union of Dacope Upazila in Khulna district, is a union of around 29 km<sup>2</sup> area with a population of 17300 and a total of 3331 households (BBS, 2001). The quantitative data i.e. household survey constituted with a sample of 124 households. The questionnaire concentrated on the respondents' immediate initiatives for survival, success or failure, relief and rehabilitation opportunities, housing conditions, institutional and community involvement. A total of 10 case studies were conducted regarding their life experiences on disastrous situation.

To operationalise vulnerability and resilience and to create vulnerability profiles of the study area the identification and quantification of a variety of indicators on different scales has been further developed. The social vulnerability is defined by the group of indicators of individual perceptions and assessment of cyclone Sidr, responses during and after Sidr, their education, occupation, and housing conditions. Infrastructural vulnerability is measured here by using the temporal and spatial distance of cyclone center from the respondents' house.

### **Analysis of Findings: Response and Resilience**

This study focuses on an indicator based qualitative and quantitative description of social, economic and infrastructural vulnerability and resilience of household level, community level and institutional level in order to derive a generic instrument that assists risk mitigation, adaptation and management.

### Household Level

Every population at risks design and plan their own strategies to cope, to response and finally to overcome the difficulties of a disaster. Every steps of managing risk is introduced by the earliest way as having information. Radio frequency is available all over Bangladesh, thus radio (50 percent) was the main sources of having information regarding Sidr, following with the information from relatives or neighbors (29 percent), community volunteer (17 percent) and television (4 percent). It seems that the information flow by the neighbors, relatives and community volunteer is mostly sustainable for a poor country like Bangladesh, where the poor people are not capable to buy a radio or a television. They (73 percent) took decision alone immediately after having the information, whereas 25 percent discussed with their neighbors regarding the problems and tried to repair their own houses and made own residence safer. Around 86 percent decided to stay at own house to protect their own family. Only 11 percent planned to take their old members and children to other safer places, like neighbors' or relatives' houses; and only 3 percent had plan to take their family in cyclone center. However, during Sidr, around 80 percent of them tried to stay in their own houses, whereas only 15 percent had left their own houses and took shelter in cyclone centers or neighbors' houses, amongst them only 5 percent took shelter in cyclone center and the rest 95 percent were in neighbors' house. It was easy to reach to their neighbors' houses, when they felt insecure in own houses, as because they tried to stay in their own houses as long as they could.

On the other hand, one can reach to the cyclone center during the normal period by an average time of 15 minutes from any corner of the village. Thus one can reach in cyclone center at least before cyclone starts, if he/she receives early warning in time and also has the intention to take shelter in a cyclone center. It mostly depends on their motivation and knowledge to handle the crisis and also on their culture, norms, religion and social strata. As per the field data, it is seen that 63 percent of the respondents who left their houses (15 percent of total respondents) during Sidr, constructed their houses with the amount of less than 10000 Taka as because they are the poorer segment of the society. The middle income group always tried to preserve their resources, re(de)construct or repair their own shelter (16 percent), as reported here that 16 percent tied down the roof of houses with the rope and bamboo into the ground, 31 percent tried to preserve food like fried rice, chira, sweet using mud-pot or poly-packet under the ground. Interestingly those people who preserved food (31 percent respondents) had also collected relief foods (74 percent of who preserved food). Thus in one hand, it raises the issues of "dependency on relief works" and on the other hand, accuses them of not mentioning the sources of income.

It shows that mostly day laborer (96 percent), fishermen (69 percent), jobless or those who have no specific jobs (100 percent) were dependent on relief foods. Moreover, 53 percent reported that they had faced food shortages during Sidr, but 14 percent of them didn't receive any relief. However, 84 percent of them, who didn't face any food shortages, had received relief foods. This shows misappropriation of relief works which weakens the community resilience to risks management; increases corrupt acts, favoritism, conflicts and let the poor be deprived. And it indicates the sign of individuality and individual strategies to cope with risks, which in total can strengthen the community resilience to the risk, if it can be well managed. Otherwise in the long run it increases the poverty ratio and pressurizes them into vulnerability of any calamities.

### Community Level

In Bangladesh, the Cyclone Preparedness Program (CPP) set up by the Red Cross Society is charged to spread the message through the community via hand-held microphones. In 1991, though there were ample warnings that a cyclone might strike, few people were convinced of the imminent danger until they saw the embankment overtopped or the wave advancing. Analysts of the '91 cyclone event concluded that the warning system in place was not really designed to convey information to local people. Further investigations showed that many people did not

believe the warning in 1991 because the number 10 warning (which means “Great Danger”) had been issued on several occasions prior to this event, with no cyclone occurring. In 1991, the “Great Danger” warning was broadcast well in advance of the cyclone, but when it increased in intensity and a new, more urgent warning needed to be broadcast, the imminent arrival of the storm could not be communicated to the public. This experience of 1991 helped make people aware of cyclone during Sidr. Our field study shows that the community level efforts were not too satisfactory as the respondents waited for more initiatives from the community volunteers. The messengers, local volunteers, were shouting through loud speakers or megaphones to warn the people about the impending cyclone and let them to bring people to cyclone shelters. Many of the affected people, who had mobile phones, maintained contact with the rest of the country. About 25 percent of the respondents replied that they received support from their community initiative, in information distribution, rescue and relief work. However, there were few rooms in the cyclone shelter and were hardly accessible for all the people and as a result, a majority of people didn’t leave their own houses. It was very common in the coastal belt that people did not want to leave their houses. They tried to reconstruct their houses or shelter and wanted to preserve their food and other resources; but most of them never wanted to take shelter in a cyclone center. One of the problems was a scarcity of resources and the other was the lack of coordination, favoritism, nepotism by the local chairmen and ward commissioners. The women and children were somewhat lagging behind in securing relief materials. Although the government of Bangladesh with Red Cross Society (RCS) had implemented the project “Cyclone Preparedness Program” to reduce the communication problem, there also existed the problems with social status and relationship, which explored that middle-class farmers and fishermen in the cyclone-prone areas, suffered the most.

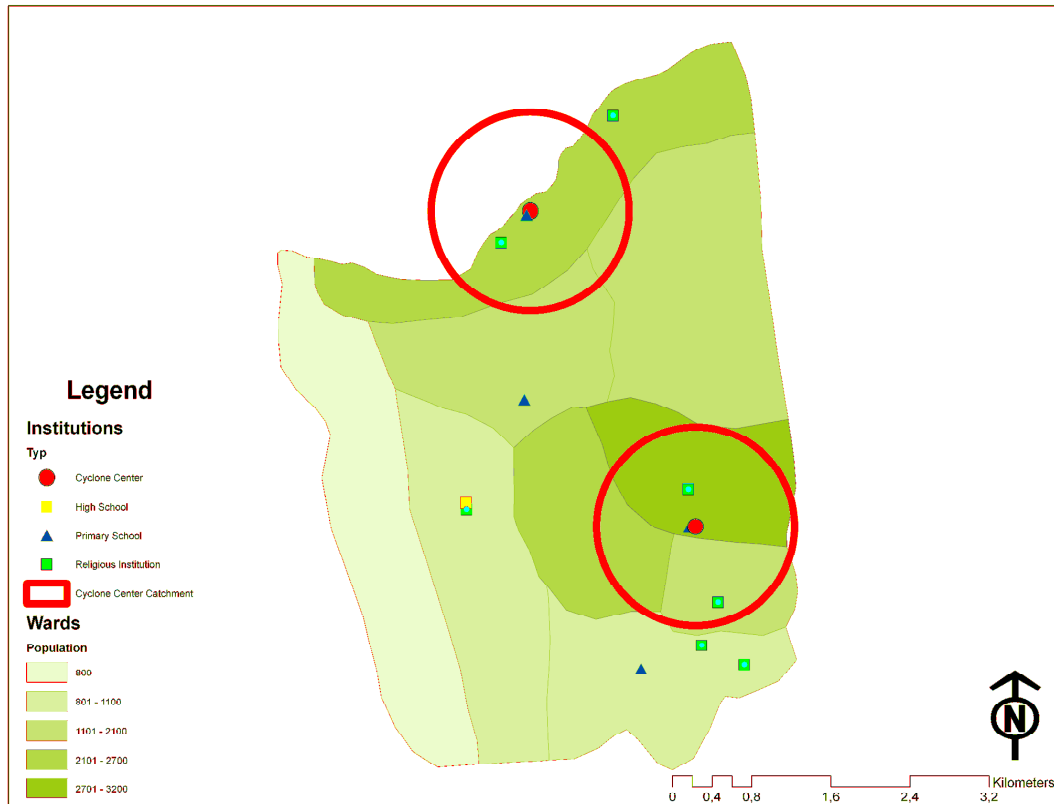
#### **Institutional Level**

Preconditions are the first stage when the planning process begins. The government of Bangladesh provides a primary school for a population of ten thousand or for a minimum of two villages. Other institutions like cyclone centers, high schools, and religious places, where people can take shelter in case of emergency should also maintain some basic preconditions before being established. Accordingly after the 1991 cyclone, the government had planned to develop multipurpose cyclone centers in the coastal belt. During a normal period, these cyclone centers are used as primary schools. In our study area, we found that two cyclone centers are constructed near to the existing primary schools, without improving the conditions of those schools (Figure 1). The primary school has not yet moved into this cyclone center, although the condition of the primary school buildings was very vulnerable and it still couldn’t support to take shelter during Sidr. Figure 1 shows the catchments areas of the cyclone centers, and shows the lack of support for all the inhabitants in the study area.

The religious places like the mosques, temple, and churches have very little capacity of accommodating people during a disaster and most of them are not well constructed. We took the religious places, where the people had taken shelter during Sidr and as an average of 80-100 people can take shelter during any emergencies. In this respect, it is very difficult to estimate whether the present institutional support is effective for the local population or if more support is needed there.

However, from our household survey, we found that only 19 per cent of the total respondents had left their houses and taken shelter in safer places, like cyclone centers (only 16 percent of the 19 percent). This result raises not only the question of providing adequate institutional support, but also the question of their socio-cultural motivation to leave their houses in an emergency. Why didn’t they like to leave their own houses, as it was risky to remain in their houses during any natural calamities? Why didn’t they like to improve their housing conditions, as they frequently face such natural disasters? Are these problems really related to their lack of knowledge or

motivation? Or there might be some other indigenous strategies, knowledge, norms or customs, which influence their lifestyles, their communication, behavior and their ways of thinking. Our analysis cannot reply to all of these questions. It requires further field based intensive analysis, especially with the methods of endogenous and exogenous approaches of fact findings that may help to design or plan a sustainable resilience for community based disaster mitigation.



Source: Field survey, 2008

Fig. 1: Catchments areas of available cyclone centers

### Discussion

The complex interactions between social, economic and environmental factors and the underlying causes of vulnerability have not been sufficiently captured yet. Thus rather than focusing solely on hazards and their magnitude, future concepts of human security to climate change also need to address the vulnerabilities of people, economic sectors, environmental goods and critical infrastructures as their starting point is social vulnerability (Birkmann, 2006: 25; Bogardi and Brauch, 2005: 85-109 and Bohle, 2001:).

### Addressing social vulnerability

The heterogeneous characteristic of the community shows that the impact of disasters varies from individual to individual, group to group and community to community. Communities are differentiated in terms of access to resources and factors such as gender, age, class and ethnicity and these differences are highly significant to the vulnerability and adaptive capacity of particular individuals (Yamin et al. 2005:5). Our study replied with the similar understanding amongst the

respondents with respect to their mitigating approach and response to cyclone Sidr. We found that more educated people (although only 1.6 percent of the respondents) invested more capital in constructing their houses, as they regularly face different types of natural calamities. The poor segment or the illiterate (47 percent of the respondent) group did not invest much money to construct their residences, as they knew that after every disaster, somebody would come to rehabilitate their settlements with housing materials. It is also seen that more than 85 percent of the respondents had received relief during Sidr, amongst them 91 percent had below secondary level educational qualifications. Though the education qualification helps to expand the income opportunities and changes the perception of the person, it is found in this study that 50 percent of the higher secondary education group had taken the chance to collect relief although most of them have regular income sources. Such dependency nature of the local community illustrates the chance of increasing social incapacities to cope with unnatural situations.

Results showed that 81 percent did not want to leave their houses during Sidr, though most of their houses were damaged severely. This convergence interprets the issue of self resilience, religion and cultural belief. Usually the Muslims' female do not like to take a sit in common place because of their religious beliefs and norms, whereas other religions are relatively flexible. Although 76 percent of the respondents were Hindus, the rate of taking shelters in a cyclone center was also very minimal (4 percent of the total). It raises the questions of not only the social beliefs but also the personal habits and customs or particular issues of social segregation due to local political power exercises may prohibit them to take shelter in cyclone center or any other common places. For example, it is reported that the middle-income group did not receive enough relief as they felt shy to collect relief standing behind the poor people in a queue. It led them to sell their own property or to take credit from other sources. Such continuous trend of taking loan from different sources due to natural disasters makes them more susceptible to poverty traps. And in the long run, it may introduce a community without middle income-group, thus in general can hinder the capacity building of the community to respond to disasters as well as the development of the country.

### Conclusion

To mitigate unavoidable natural disasters, it is now needed to draw up a sound plan for the people. Community Based Disaster Management (CBDM) requires the importance of people's participation (ADPC, 2006; Pandey and Okazaki, 2005; ISDR, 2000) and technical improvement which can provide an early warning for the successful evacuation of people from vulnerable areas prior to cyclones. Thus it results in fewer casualties, but it could not protect the damages done to houses, crops and trees', proving it is imperative that measures should be planned to curb the possibility of such damage. With risk embedded in the vulnerability concept, a more vulnerable population is one that is frequently exposed to, is easily harmed by, and has low levels of recovery, buffering, and an adaptation to a hazard (NRC, 2007:17). Many cost-effective planning, location, design and maintenance measures can be implemented and it may reduce the risk and vulnerability of roads and infrastructure also (Keller and MAsce, 2002). Therefore, it is rather better to introduce the approach of "acceptance" rather than "necessity" (Pandey and Okazaki, 2005, Mallick and Vogt, 2008) in future disaster mitigation planning. Equally, consideration of communication-rationalities of the social actors should be taken into consideration (Steins, 2001:19). After all, human beings will not be considered as mere organisms but as people (as social actors) because they have material properties and a history of social relations over which they may have some control but on which they equally depend (Law, 1992:379-93). Accordingly, it is here proposed to undertake a research to know the methods and strategies already exist within the coastal communities in Bangladesh so that GoB can build the capacity of the common people to cope with future disasters. This research should be aimed at strengthening the local government's institutions, and above all on enhancing the government's capacity for negotiation with the developed countries that had pledged assistance for developing nations. It must be asked whether the individual and collective learning processes inhibit and how they are sustained after a disaster, and in particular whether the provision for the next disaster victims reaches the typical pattern of individual or collective displacement processes.



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