

Achieving Community Resilience: Case Study of Cyclone Aila Affected Coastal Bangladesh

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Abstract This paper aimed to explore the causes of human casualty and property damage by cyclone Aila and associated storm surge in southwestern coastal Bangladesh as well as the mechanisms, which contribute towards the creation of resilient community in the aftermath of cyclones. This paper revealed that at risk people employed various coping and adaptive strategies with their level of exposure and abilities to keep themselves safe in the face of cyclones. Massive destruction occurred due to cyclone and associated storm surge that breached the earthen embankment as well as inundated agricultural land and households. However, early warning dissemination by the cyclone preparedness program volunteers significantly reduced unexpected human casualty. It is realized that climate change is not preventable, but it is possible to protect societies and economies from nature's vicissitudes to some extent by devising appropriate structural and non-structural measures such as providing better information, improved planning and more climate-resilient infrastructure. People from cyclone Aila affected area have been suffering due to livelihood damage and asset base that put community people into poverty trap even though disaster related deaths have been reduced significantly due to different types of structural and non-structural measures. However, people have resorted to different adaptation strategies to come out from the disaster situation and tried to make themselves resilient to disasters. The study clearly illustrates that hand in hand activities of members of the community is needed to develop their capacities to prevent, prepare for, cope with and respond to disasters.

Keywords Community Resilience, Disaster, Cyclone Aila, Vulnerability

associated storm surge (IPCC, 2012). Frequent cyclones (i.e., Gorky in April 29, 1991; Sidr in November 15, 2007; Aila in May 25, 2009; Mohasen in May16, 2013; Komen in July 31, 2015) gave an early indication of increasing natural calamities as well as support the latest observation of the Intergovernmental Panel on Climate Change (IPCC) that frequency of climate change induced extreme events like cyclone will increase in the future. Globally 606,000 lives have been lost and 4.1 billion people have been injured, left homeless or in need of emergency assistance as a result of Climate change induced disaster (CRED, 2015). According to a global report on "Disaster Risk Reduction: A challenge for development", Bangladesh ranked as the most disaster prone country in terms of the impacts of tropical cyclones. Cyclones related death rate was the highest in Bangladesh amongst other cyclone prone countries as 32.1 people per 100,000 have been over 100 years (UNDP, 2004). The magnitude of physical hazards, poor land-use decisions and unenforced public policy are the main causes of disaster related death and casualty (Paton and Johnston, 2006). Susceptibility of communities to loss from hazard consequences could be reduced by creating a community that is resilient (Johnston *et al.*, 2006). Bangladesh has demonstrated its ability to withstand disasters and climate risks by combining infrastructure development and community based coping practices. It is revealed that disasters are the first and foremost local phenomenon where local communities are on the frontlines of both the immediate impact of a disaster and the initial emergency response. In the face of hazard, learning from the previous disastrous events helps to create disaster resilient community through different disaster risk reduction mechanisms. More importantly, disaster risk reduction activities begin at home throughout the local communities. It was realized that combined efforts of GO, NGO and concerned community could save lives and livelihoods of the vulnerable people. The government, civil society organizations and development partners have come up with approaches to help the affected people adapt to climate change (Planning Commission Bangladesh, 2012). Preparedness is a

Introduction

Bangladesh has been identified as one of the most vulnerable countries (Huq, 2001) due to its exposure to frequent and extreme climatic events such as cyclones and

concomitant process requiring engagement of all sectors such as local administration, peoples' representatives, and members of civil society including NGO actors (O'Brien, 2006). It can be envisaged that systems including the human-environment are constantly adjusting its vulnerability to various forms of distress (O'Brien and O'Keefe, 2014). Though, it is no longer possible to prevent the climate change, it is possible to protect societies and economies from nature's vicissitudes to some extent by providing better information, improved planning and more climate-resilient infrastructures (Cabinet Office/HM Treasury, 2006).

This paper aims to explore the main causes of severe impacts of cyclone and the adaptation strategies, which create a disaster resilient community. To achieve these aims, this paper focuses on specific form of a community initiative called, Community Based Disaster Risk Management (CBDRM).

Concept of Resilience

Box 1. Mechanisms to achieving resilience

1. Hazard identification – Identification of potentially damaging physical events, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.
2. Adaptations (otherwise referred to as “hazard mitigation”) – Structural and non-structural measures undertaken to limit the adverse impact of hazards.
3. Preparedness planning – Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.
4. Recovery and rehabilitation – Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk. Rehabilitation and reconstruction afford an opportunity to develop and apply disaster risk reduction measures.

Source: UN (2004)

Resilience is conceptualized as a process that aims to reduce harm, both now and in the future. Resilience is about the ability to respond to change, which describes the capacity to anticipate and plan within human societies (O'Brien and O'Keefe, 2014). Janssen *et al.* (2006) described resilience as a function of human-environment interactions. Most definitions emphasize a capacity for successful adaptation in the face of disturbance, stress, or adversity. However,

resilience is better conceptualized as an ability or process rather than as an outcome (Brown and Kulig 1996/97; Pfefferbaum, 2005). In another vein, resilience is better conceptualized as adaptability than as stability (Handmer and Dovers 1996; Waller 2001). The UNISDR has adopted a concept of disaster risk management for resilience building through four different mechanisms (illustrated in box-1) UN (2004). It can be noted that the people living in poverty are more vulnerable to the risks and impact of natural disasters as compared to the people with affluence (Hossain *et al.*, 1992; Mathbor *et al.*, 1993 and UNICEF, 1991). This is happening because of less capacity, incapability and lack of preparedness of a person to hazards. The socio-economic, infrastructure and political aspects of vulnerability have to be addressed to create disaster resilient communities (Wisner *et al.* 2004; Heijmans, 2004).

Resilience building is required within the context of sustainable development so that it could develop the social and institutional capacity to respond to produced unknowns. Johnston *et al.*, (2006) stated that resilience of infrastructure to future cyclones could be enhanced with the preparation of cyclones contingency plans, community education about what to do in the face of cyclones and a general emphasis on appropriate measures such as 1. Policy and management measures: Reduce the likelihood of damage, 2. Engineering design measures: Reduce the vulnerability of the system and 3. Preparedness, response and recovery measures: To deal with the consequences of the event. Resilience could be achieved through active participation and meaningful cooperation of different stakeholders. It's not a matter of obligation. In resilience, it is necessary to consider and account for the robustness of community's infrastructure that provide services, utilities and linkages which allow society to function (Paton and Johnston, 2006). It is believed that institutional learning empowers the local community and strengthens governance as learning is the key to doing things differently for achieving resilient future (O'Brien, 2006). Along with institutional learning, people have learned from adverse experiences and used that learning throughout the history to better prepare for the future disaster (O'Brien and O'Keefe, 2014). Finally, it can be said that resilience is an on-going process of adaptive capacity that acts as an antidote to vulnerability.

Community Based Disaster Risk Management (CBDRM) Approach

Community based approaches are a fundamental form of participants' empowerment and a compelling mechanism for enforcing the transmission of ideas and claims from the grassroots level. Such approaches also raise local concerns more effectively with political representation. The goal of CBDRM is to reduce disaster risks and impacts through community participation (Urry, 2011). Community participation creates resilience and foster peoples'

participation in assessing the risk of disaster, reducing that risk, managing actual disasters and recovering after such event (Luna, 2014). Luna (2014) also stated that in facing natural hazards and disasters, the members of the local communities display different forms of skills, resources and knowledge. Historically, top-down, interventionist approaches have dominated the disaster management field. In 2005, the UNISDR introduced the Hyogo Framework for Action (HFA) 2005-2015 for building the resilience of nations and communities prone to disasters. HFA prioritizes Disaster Risk Reduction (DRR) at community level that offers a way of engaging with communities and making them self-reliant (UNISDR, 2007). In March 2015, UNISDR arranged a World Conference on DRR in Sendai, Japan to adopt Sendai Framework for Disaster Risk Reduction (SFDRR) 2015-2030, which is the first of the post 2015 international agreement to be adopted, for a risk informed resilient future (UNISDR, 2015). SFDRR outlines seven targets with thirteen guiding principles in four priority areas for action to prevent new and reduce existing risk. It addresses climate change by providing measures, guiding principles and means of implementation for disaster risk reduction as well as for a habitable earth. It is expected that SFDRR will be used as a significant milestone for substantial reduction of disaster risk as well as building resilience to climate related disaster. However, formal involvement of community people into the activities from planning to implementation can help to promote more effective civil society mobilization towards resilience building. Therefore, community participation in the development and implementation of plans ensures ownership that can enable communities to prevent, reduce and effectively respond to stress, shocks and potentially disastrous events (O'Brien and O'Keefe, 2014).

Increasing emphasis has been placed on the CBDRM that focuses on the root causes of vulnerability rather than isolated disaster events (Wisner *et al.*, 2004). It is assumed that community based approaches have the potential to make a significant and long-lasting contribution to reducing local vulnerability and strengthening adaptive capacities to disasters. According to Bankoff and Hilhorst (2004), CBDRM addresses the causes of vulnerability as well as provides sustainable solutions. The community people are the first victims and responders at the same time (Ritchie, 2003). However, it was observed that disaster mitigation is immensely effective at the community level (Murshed, 2003). As noted, people's participation in disaster management activities has the healing power as victims of disasters express themselves through their voices and actions that can be used to build resilience to disasters (Luna, 2014). The communities with above characteristics are organized in such a way that the effects of disasters are minimized and the recovery process is quicker (Tobbin, 1999). CBDRM approaches seek to strengthen and shape social capital, which potentially provides opportunities for low-income individuals and communities to access the resources they

need to improve their security and to reduce their vulnerability through coping and adaptive mechanisms (Pelling, 2002). In CBDRM, local people play a central role in the community activities; and priority is given to the most vulnerable people while focusing upon the Disaster Risk Reduction. Different perceptions of risks, vulnerabilities and capacities are recognized as well as multi-sectoral and multi-disciplinary approaches are applied here. Thus, the disaster risk management is integrated into the local development processes. CBDRM works on engineering and natural science based on local scale by focusing on event and exposure and on technological solutions through active participation of the community from planning to implementation for short term and increasingly longer term. However, assessment of risks, mitigation planning and capacity building are the main elements of CBDRM. It values the knowledge and capacities of the local people and considers local resources and social capital. The communities also develop monitoring system which ensures their stake. CBDRM therefore is an evolving and dynamic framework and it takes into account emerging issues, such as Climate Change and epidemics. Finally, awareness regarding climate change and active participation of the communities is a key pillar of community based disaster risk management that supports resilience building for the future with better infrastructure, income generation and diversified livelihoods.

Cyclone Aila and CBDRM in Bangladesh

The south-western coast of Bangladesh was heavily impacted by cyclone Aila, which struck on May 25, 2009. Even though Aila (2009) was a weak category cyclone by definition, its economic cost outweighed the impacts of Super cyclone Sidr (2007) and brought in long-term sufferings for the people of south-western Bangladesh. About 2.3 million people were affected by Aila and many of them were stranded in flooded villages as they had no alternative to save themselves (Mallick *et al.*, 2011). Most of the Aila affected people could not reach a safer place due to rush of sea water intrusion and also because the roads were inundated immediately. The effect of saline water intrusion inside embankment caused the destruction of houses, roads, and culverts. This added more obstacles for the post disaster activities and also increased the sufferings of the victims. During the landfall of Aila, the surge height was about 7 meters. One hundred and ninety human lives were lost and a large number of households as well as other resources (detailed in Table-1) were washed away due to the breach of protective embankment (Mallick *et al.*, 2011). The overwhelming majorities of coastal residents were impoverished and lived in poorly constructed houses, and the cyclone shelters were inadequate to protect them all (Paul and Dutt, 2010). The loss of lives was largely attributed to a

lack of adequate housing capable of providing shelter during the cyclone (Mathbor, 2007). Casualties were directly related to the types of housing and shelter seeking activities; no deaths occurred among individuals living in pucca houses (made of brick and concrete) and the ones who sought shelter in these buildings (Mathbor *et al.*, 1993). Unlimited excavation of tunnel throughout the embankment for saline water intrusion toward the shrimp farm was also an important cause of embankment damage. Height and magnitude of storm surge reduced the capacity of embankment. Some people lost their houses and livelihoods along with capital equipment (Mallick, *et al.*, 2011). These situations called for community capacity building that encompasses housing conditions, income generation activities and preparedness regarding cyclone’s consequences.

Table 1. Damage caused by Cyclone Aila

Sector	Damage	Quantity
Agriculture Crop (Acres)	Fully	77486
	Partially	245968
Bridges/Culverts (In Number)	Fully	157
Embankments (Kilometres)	Fully	237
	Partially	1557
Households (In Number)	Fully	243191
	Partially	370587
Institutions (In Number)	Fully	445
	Partially	4588
Roads (Kilometres)	Fully	2233
	Partially	6621

Source: DMB (2009)

The Table shows the type of devastation had occurred in the Aila affected area. Most of the affected people could not recover from the damages until very recently. Cyclone Aila devastated almost 90% of the livelihood of the people (Mallick *et al.*, 2011). Almost all the people were struggling to maintain a subsistence living after the event. Most of the farmers and fishermen were required to take up day labor job as they lost their livelihoods and had no other options to feed themselves and their family members. Such changes in livelihood activities (i.e. from farmers or fishermen to labor) are normal in the cyclone affected area. An example of an engaged wage labor activities offered by different GOs and NGOs include repair of roads and embankments (Dasgupta *et al.*, 2010). However, those activities run only for 40 days in a year (DMB, 2010). The earning source of the affected community members was uncertain after that. In such a situation, at least one member of the family was engaged for collection of relief aid and rehabilitation support provided by the government or development organizations (Mallick *et al.*, 2011). It is believed that existing socio-economic inequality in the community can make some people more vulnerable to disaster situation. For instance, it became evident that the cyclone shelter and the Pond Sand Filter (PSF)-drinkable water source were built near the houses of rich or dominant people (Mallick *et al.*, 2011). This occurred mainly for two reasons: economic solvency and political power exercise that

ensured the influential role of local power structure in the local level planning (Vogt *et al.*, 2009). Not only was the inadequacy of infrastructure the cause of increasing livelihood problems, but also the local social power system, which created more complications for the poor and disadvantaged local people. Besides, women and children were found to be experiencing the most inhuman situation since the male earning member of the family either died or migrated to manage family needs and to earn a living (Dasgupta *et al.*, 2010).

Local People’s Initiatives for Livelihood Recovery

It is found out that the people of the Aila affected area employed different strategies for their survival such as diversifying income sources by seeking second jobs, cultivating variety of crops including saline tolerant rice, vegetables on floating beds, poultry and livestock rearing. It was also observed that some people engaged in temporary migration; stocking up on various supplies; mortgaging or selling assets; borrowing and lending; and drawing upon common property resources. Sometimes, people depended on various forms of social and family relationships for survival (Davies 1996a). According to Chen (1989), livelihood diversification was normal for most of the people in rural areas and non-agricultural activities were critical components of the diversification process. It was revealed that people with better socio-economic circumstances were more likely to cope with impacts and were better prepared in responding to the aftermath of Aila. However, effective utilization of social capital such as social networks, social cohesion, social interaction and solidarity was crucial for the capacity building of the community (Mathbor *et al.*, 1993). In this regard, different community activities such as Community Risk Assessment (CRA), Risk Reduction Action Plan (RRAP) helped as a catalyst towards building a resilient community. Community people took part directly in the development process of disaster preparedness activities so that disaster risk could be reduced. It means community people were at the heart of decision making and implementation of Disaster Risk Management activities. People’s participation in the decision making process was a significant achievement here. It was noted that cyclone hazards generated socio-economic misery and caused damage to the environment, health and infrastructure. However, different types of coping mechanisms and adaptation strategies helped affected people to reduce their vulnerability significantly and make people resilient to disasters.

Government Initiatives towards Resilience to Disasters

Bangladesh has given priority on community participation

in disaster risk management inspired by community based approach where people's opinion and community participation played a vital role (Hossain, 2013). The Community Based Disaster Risk Management (CBDRM) is a process in which at risk communities are actively engaged in the identification, analysis, treatment of Disaster Risk in order to reduce vulnerability and enhance their capacities. CBDRM is given importance because it is promoting a culture of safety by reducing local vulnerabilities and building capacities of the at risk communities. Government has taken different structural and non-structural measures to reduce the vulnerability as well as increasing the resilience of at risk people. In line with this, in 1999, the Ministry of Food and Disaster Management issued the standing Order on Disaster (SOD) that described the roles and responsibilities of different Disaster Management Committee members (DMC). DMC members engaged themselves with disaster risk reduction and emergency management initiatives, which promote culture of safety by reducing local vulnerabilities and building capacities of the at risk communities in Bangladesh. In 2003, the government of Bangladesh implemented the Comprehensive Disaster Management Program (CDMP) in order to increase the capacities of at-risk communities by lowering their vulnerability to specific hazards. After Aila, CDMP had taken and completed a project on disaster resilient habitat at Bainpara, a small village at the bank of the river, Nalian in Khulna district. Under this program, 58 houses (cognizant of cyclone risks, storm surge so as to submerged with water) built and distributed to the most affected and destitute families (CDMP, 2015). The beneficiaries were selected by a local disaster management committee and the project was implemented with the combined effort of local public representatives, officials of government organizations and NGO, donor agencies as well as the active participation of the community members. The community was involved in the whole process, their perceived and real needs as well as resources were taken into consideration. The CBDRM creates the ability to make a difference and develops individuals as well as community ownership, which helps to create resilient society.

Bangladesh prepared the Bangladesh Climate Change Strategy and Action Plan (BCCSAP) in 2009 to achieve climate resilient future. Bangladesh adopted the draft National Plan for Disaster Management (NPDM) in 2007 and finalized this in 2010 for the period of 2010-2015 (DMB, 2010). In the upcoming plan for 2016-2020, priority was given to reduce the vulnerability of the people with disability, women, children and aged people of the society (MoDMR, 2016). The NPDM and BCCSAP are two instruments that jointly pursue and strengthen the comprehensive disaster management systems, improving the capacity of government, civil society partners and communities to manage natural disasters. Both of them ensure appropriate policies and regulations for community based adaptation programs in vulnerable areas of the country. Disaster risk reduction and

climate change adaptation initiatives have been strengthened among government and non-government actors in the areas of land use planning, emergency management, early warning dissemination, and community based disaster preparedness.

Bangladesh has prepared the National Adaption Plan of Action (NAPA) also for a pro-poor, climate resilient future that consists of different areas such as 1.Food security, social protection and health; 2.Comprehensive disaster management; 3.Infrastructure development; 4.Research and knowledge management; 5.Mitigation and low-carbon development; and 6.Capacity building and institutional development (MOEF, 2005). The above strategic national plans emphasize community participation in disaster management activities. The Government of Bangladesh was also determined to provide assistance and protection to all who suffer disproportionately from the consequences of natural disasters so that they can resume normal life in the quickest possible time (MOFDM, 2007). Finally, the Ministry of Disaster Management and Relief has changed paradigm from disaster response and recovery culture to disaster management where emphasis is given on awareness and preparedness activities for creating resilient community (MoDMR, 2016).

Early Warning System in Response to Cyclone

In 1970, cyclone Vola killed around 500,000 people in coastal Bangladesh. After that devastating cyclone, the International Federation of Red Cross (IFRC) started Cyclone Preparedness Program (CPP) through Bangladesh Red Crescent Society (BRCS) in coastal region of Bangladesh on early warning system, which is regarded as a significant instrument that saved many lives in recent disasters. The Ministry of Disaster Management and Relief (MoDMR) in behalf of the Government of Bangladesh had taken the charge of CPP on 1st July, 1973 when the IFRC had declared to leave the program. However, CPP activities were going on according to the direction of "Implementation Board" headed by Secretary of MoDMR. There was also a "Policy Committee" headed by the Minister of MoDMR to provide policy support for guidance and improvement of the program. However, at present, CPP has 55,260 volunteers (Male-36, 840 and female-18, 420) in 350 union areas across 40 Upazills (Sub district) and 7 zones under 13 districts of coastal Bangladesh (MoDMR, 2016). All the volunteers come and join CPP on a voluntary basis and worked in a group under a unit at village level. However, CPP working area is divided into 3,684 units and each unit consists of 15 members (10 male and 5 female) from the same community. Each unit divided into 5 groups. There is a group leader along with two other members. One unit constituted around 3,000 peoples. Training is given to the volunteers on early warning dissemination, first aid treatment, shelter management and different cross-cutting issues to improve

capability of the community for preparing themselves to face forthcoming cyclone hazard efficiently (MoDMR, 2016). Furthermore, transparency and information dissemination encourage peoples' participation. The communities prepare the risk reduction action plan with open consultation of the group members and implement the action plan accordingly. Volunteers are quite familiar with the local community and its resources, including the location of safe shelters and evacuation plans to be followed in the event of a disaster (CPP and BRCS, 2007). It is well recognized that CPP volunteers are engaged in cyclone early warning circulation after getting the information from the Storm Warning Centre (SWC) of the Bangladesh Meteorological Department (BMD), making people aware about the forthcoming hazard, guiding people to safe shelters, extending first aid, and assisting in the relief distributions activities. In this regard, different types of training on cyclone preparedness and rescue equipment is given to CPP volunteers throughout the year to make them prepare in the face of hazards so that they can extend their support in time of disaster situation.

The BMD issues a warning as soon a pressure system is visible in the Bay of Bengal. Meteorological forecasting, including cyclone prediction, involves round-the-clock observations of several weather parameters over a wide area. This prediction and warnings are transmitted through various media channels to assist government in planning and responding hazards as well as helping vulnerable inhabitants to prepare for the future hazard. The SWC of BMD issues a special weather bulletin soon after the formation of a tropical depression in the Bay of Bengal (Chowdhury, 2002; Haque, 1997). The mandate of CPP is to circulate cyclone warnings among community peoples via megaphones and house-to-house visits and to assist in their evacuation. Cyclone warning systems are an obvious precautionary measure, but their existence is not a sufficient criterion for reducing risk; general compliance with such warnings is also necessary (Haque, 1995). It was observed that the early warning dissemination and preparedness helped to reduce the human casualty during Aila, though financial loss was huge (Hossain, 2013). This reduction in human casualty was gained due to the active intervention of field administrators, initiatives of the representatives of local people and promptness of CPP volunteers. After getting the warning from BMD all the stakeholders of local DMCs called an urgent meeting to take decision on the course of action. According to the decision, dissemination of Aila warnings had been made immediately to at-risk communities through different mechanisms. Furthermore, CPP volunteers guided the community people to be evacuated in the cyclone shelter as well as other safe places in the area.

Social Safety Nets in Reducing Vulnerabilities

The country has implemented disaster risk reduction with its social safety nets (VGF, GR, TR and EGPP etc.), which

help people to cope with disasters and anticipated climate impacts so as to protect millions of its vulnerable women, children, and men (DMB, 2010). Following Aila, the government mobilizes resources through different social safety nets to reach out to those who had lost their habitat, personal belongings as well as livelihoods due to Aila and associated storm surge. This non-contributory transfer programs protected households from spiraling into deeper poverty and helped them to manage risk. This was done by supplying food, providing seasonal employment, and protecting, recovering, or expanding livelihood assets bases for at risk people. It was expected that the aforementioned social safety net programs would help to create resilient community. Moreover, the Ministry of Disaster Management and Relief implemented the disaster-related safety nets (illustrated in box-2) as part of initiative to make people resilient.

Box 2. Safety Nets in Bangladesh

The following safety nets are implementing by MoDMR in order to create resilience:

1. Vulnerable Group Feeding (VGF): This is a mechanism for mitigating the disaster consequences without pre-set criteria or conditionality for participation to help the poor cope during disasters.
2. Gratuitous Relief (GR): Food grains (rice and wheat) distribution as a wage payment to both male and female workers in labor-intensive public works program. Participants are generally self-targeting as the poor are typically the only ones willing to take on such jobs.
3. Test Relief (TR): This program is contributing to both the overall development of public welfare institutions and small infrastructure development.
4. Employment Generation Program for extreme Poor (EGPP): In 2008-2009 financial year, government introduced 100 days (now reduced at 40 days) employment generation for extreme poor that aimed to eliminate poverty through employment creation, and develop small scale infrastructure in rural areas. The program is designed for those marginalized people who have lost their livelihood around 5 months in a year.

Source: (MoDMR, 2016)

Reducing Risks and Building Resilience at the Community Level

People have to embrace worst situation during disaster due to lack of assets and capability. Dependence to nature forced many people to live in remote coastal areas and make them susceptible to recurring disaster (Hossain *et al.*, 1992). People of these vulnerable communities continue to lose their coping capacities with each disaster. Therefore, preparation is needed prior to occurrence of natural disaster

so that communities can respond and recover from disaster (Quarantelli, 1985). This requires addressing the causes of vulnerability and assisting the entire community to engage in comprehensive interventions that will not only ensure the protection of the settlement but also provide self-sustaining livelihoods and service delivery option for its population (Dasgupta *et al.*, 2010). Vulnerability can be reduced as well as more secured and dignified living can be maintained through community based disaster mitigation approach (Midgley, 1986). Structural and non-structural activities related to disaster risk reduction and adaptation interventions are needed for achieving the resilience.

Disaster and Climate change impacts are destroying infrastructures, creating challenges for livelihoods, increasing health risk and forcing thousands to leave their homes. The suffering mainly happened during hazardous event due to inadequate infrastructure supports (Mallick *et al.*, 2011). Disaster mitigation generally consists of action that can be categorized as: structural, local action, operational and risk transfer (Scawthorn, 2009). Structural actions consists of hardware fixes to physical facilities i.e. availability of cyclone shelter and road network; local actions consists of moving, dispersing or otherwise using distance as a protective measure; operational actions involve preparedness and response; and risk transfer includes the risk reduction through proper disaster mitigation work (Marsh, 2001). However, two methods are in use namely structural and non-structural to create a disaster resilient community. Both of them are needed to minimize vulnerabilities to natural hazards. After the devastation of Aila, CDMP implemented a project on disaster resilient habitat in Bainpara village under Khulna district where disaster education and sustainable houses were given to the community peoples for better preparedness for the future disasters. The construction or reconstruction of physical infrastructure is part of preparedness measures worldwide as the vulnerable populations can be evacuated to those infrastructures immediately after receiving the early warning (Hossain, 2013). Preparedness to disasters in community settings is the human dimension of response that shapes resilience (O'Brien, 2006). Strategies are essential for creating resilience that will produce a genuinely sustainable reduction in disaster risk and climate change adaptation (Fordham and Meyreles, 2014). However, community assistance is vital in time of disastrous event and lessons from the previous disaster intervention might help to build resilient communities that can withstand disasters.

Lessons Learned

The construction and maintenance of physical infrastructure has been a proven means of preparedness as the vulnerable populations could be saved as well as evacuated to those infrastructures immediately after receiving the early warning. Non-structural measures for raising awareness and behavioral change of the at-risk

community are considered necessary in response to cyclone hazards so as to create resilient society by making preparedness activities effective. Social safety net programs implemented by government of Bangladesh are helping community to cope with the impacts of cyclone as well as protecting the lives and livelihood of vulnerable people. Structural, Non-structural measures and social safety net programs for disaster preparedness are playing important role in creating resilient community. Non structural activities of CPP provides opportunities for the local communities to evaluate their own situation or share their own experience, facilitates community empowerment, which help to create resilient society. Local communities become part of the risk assessment, planning, decision making, implementation and monitoring with the end goal of achieving capacities and transfer of resource to the community. CPP is the best example of community based disaster management initiative. Community assistance is vital in time of disastrous event and lessons from the previous disaster intervention might help to build resilient communities that can withstand disasters. In addition, CPP initiatives help to build confidence in community through resource mobilization, cost-effective and sustainable solution with concerted actions for achieving enhanced capabilities to pursue disaster preparedness. It is expected that CPP intervention would act as catalyst to create resilient society.

Conclusions and Recommendations

In the context of frequent devastation from climate induced cyclone, it is strongly felt that along with disaster preparedness and response, structural and non-structural measures are considered necessary to mitigate impacts of disasters in Bangladesh. Disaster preparedness program focused on awareness and capacity building of the local people to increase their adaptive capacity that needs urgent collective action involving all actors in facing different natural calamities. In this regard, structural measures such as rural infrastructure and cyclone shelters need to be designed in a participatory and socially inclusive way from planning to implementation. This is needed so that basic needs of the vulnerable community can be fulfilled through the development activities. The community based approach provides an opportunity to understand and address a wide variety of local vulnerability through emphasis on disaster preparedness and vulnerability reduction in the context of climate change. However, the most important one is to improve the infrastructural conditions. Damaged embankments and communication system should be repaired, and where necessary reconstructed in priority basis to protect the area from further devastation. The height of the embankments should be increased and proper forestation must be implemented with suitable species at both sides of the embankments. Existing cyclone shelters are not enough to protect maximum number of people in the cyclone affected area. Therefore, sufficient number of cyclone

shelters should be constructed. In reality, life is full of uncertainty and we need to be ready to embrace changed situation with available resources. Finally, changes in personal behavior and actions are crucial to achieve resilience.

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