Journal of Biodiversity and Environmental Sciences (JBES)
ISSN: 2220-6663 (Print) 2222-3045 (Online)
Vol. 3, No. 8, p. 16-28, 2013
http://www.innspub.net

RESEARCH PAPER OPEN ACCESS

Community resilience in recurring disaster events

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Article published on August 24, 2013

Key words: Adaptation, resilience, climate change, disaster, remote island.

Abstract

The increasing vulnerabilities and exposures to the negative consequences of climate change are inevitable especially facing recurring natural hazards and extreme weather events, social and economic disruptions, and physiological instability. People base local knowledge for copping to survive in this changing climate without proper adaptation to such changes. The uniqueness of this research is to reveals a correlation between different coping practices with socio-economic and mental instability. In previous studies researchers emphasized on the current coping mechanisms rather than concentrating the criteria that influence the coping capacities. Methodology comprises numerous questionnaire surveys and uses of different tools of Vulnerability and Capacity Assessment techniques with selective households. Study area concentrated among the inhabitants of the char land and remote island of Bangladesh. General coping includes; eat fewer meals, borrowing money or take loan and sell labour in cheap at advance. People use major portion of their income for food and repairing houses as both are often destroyed by recurring disasters. Medical and educational expenses are just aggravating their burdens whereas savings are delusion. Malnutrition, economic imbalance, and domestic hostility along with mental instability are the common phenomena. All these sufferings contribute in lack of people's ability to take proper decision in time of risk or affect current coping ability with recurring events or the vice versa

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Introduction

The increased intensity and frequency of natural disasters and extreme weather events throughout the world is the inevitable truth of Climate change impact. Along with increased casualties, all these extreme weather events and disasters impede the typical socio-economic and technological advancement and increased people's vulnerabilities especially in the developing countries. Associated with other factors, rural and agricultural populations such as poor population living in the semi-arid areas in Africa, Asia and Latin America or in low-lying coastal and riverine areas, especially in Asia would bear the cost of climate change impact in terms of food and water scarcity (World Bank, 2006). Similar scenario is observing in Bangladesh as it is one of the most vulnerable countries to climate change. Researchers have recognized Bangladesh, as the first in terms of flood and second in terms of storms/cyclone from the 12 lower income countries at severe risk to the five climate threats (Boko et. al., 2007, McKinnon et. al., 2009). Changes in rainfall patterns, droughts in rainy seasons, early and late monsoon, recurring floods, cyclones cold wave and warm winters are all obvious signs of these changes. Bangladesh faces at least one major disaster a year; it has lost on average 3.02 % of its GDP every year during the last 10 years and holds the highest disaster mortality rate in the world (UN/ISDR, 2004). These changes are deteriorating our social and economic structure in a significant way. The changes of climate is mostly affecting major portion of our population living in the remote Islands and char lands. Though people exposed to the climate change negative effect seem to be less prepared to deal with adverse situation, they base indigenous, traditional knowledge and access to technology in coping with the changing climate. According to disaster statistics in Bangladesh for the last 30 years, the average flood events per year is 2.19 and storm per year is 3.48 and associated economic damage per year for flood is 165,129.41 US$ and for storm 49,478.70 US$ (EM-DAT: Database, 2008). Last three decades, the GoB with its development partners has invested over $10 billion to make the country more resilient against climate induced natural disasters. A key focus of these measures is to build community resilience to respond, withstand, and recover from adverse situation. However, most of these initiatives are concentrated in areas susceptible for catastrophic natural hazards which quite often turned into disasters (e.g. cyclones, floods) which are in severity level but occur less frequently. In contrast, a larger part of the country often faces recurring natural phenomenon (e.g. flood, river erosion, cyclone) every year albeit less severe. The costs associated with these recurring events might be higher when aggregated than a major event. The flood of 1998 caused damage of US$ 2.5 billion which equivalent to the proposed Padma Bridge. All these social and economic disruptions are making poor people to poorer, reducing their coping capacities and putting huge stress on their decision making process and therefore, increasing future risks. This research aims to contribute indicating these interrelationships between people's coping capacities, their socio-economic differences and mental ability for copping to the recurring extreme weather events. It will provide information in the knowledge gap for taking initiatives to enhance resiliency of the community of Bangladesh.

Resilience, Adaptation and Coping

In this study resilience is known as the adaptive capacity of a system, community or society potentially exposed to hazards and has the strength to resist or maintain the minimum functioning as like it was before whereas adaptive capacity is the ability to adjust to climate change or extreme events, to moderate potential damages, or to cope with the consequences. Adaptive measures and coping is synonymous, according to International Strategy for Disaster Reduction (ISDR), coping is defined the ways people using their available resources and their abilities to face and manage adverse circumstance.

However, 'the capacity to adapt to stress and change' left behind. Adaptation practices are required to address the impact of global warming and can lessen the risk and vulnerabilities associated with negative consequences of climate change. Therefore, strengthen coping capacities can enhance resilience of

a community to withstand the effects of hazards (UN/ISDR, 2004).

Economic and Psychological Instability to Coping

After any disaster strike, the total population does not undergo equal aftermath, it depend on the socio-economic imbalance as well as demographic differences. Researchers signify the fact that the poor communities need the incorporation of resilience and sustainability more in the planning process than the economically stable community (Tobin, 1999). Gradual increases in economic loss during flood events certainly posing threats to vulnerable communities and ensured they are more likely to experience further economic loss. The UK government estimated that climate change could lead to a loss of at least 5% of global GDP each year and could rise to 20% if a wider range of risks and impacts is taken account (Stern, 2006). The United Nations Framework Convention on Climate Change (UNFCCC, 2010) warns that developing countries will bear the brunt of climate change through economic shrinkage and therefore, in uncertainty to reaching the Millennium Development Goals (MDG). Vulnerability and risk exposure also depends on income inequality and access to natural resources: higher exposure levels are associated with higher inequality and less access to land. Inequality also results in higher flood damage, confirming the hypothesis found in the literature that an unequal income distribution contributes to socioeconomic vulnerability. The relationship between poverty and damage costs appears to be more complex. The poorer households are more sufferer and less capacity to cope rather than wealthier households. Approximately one-third of their annual household income is lost due to flooding (Brouwer et. al., 2007).

Displaced people have their own stress leaving their birthplace due to affected by natural hazards and forced to settle down in places which are already exposed to risk. In Psychology it is termed as stress due to cataclysmic events. Depression and Post Traumatic Stress Disorder (PTSD) are the consequences of this stress. In a study researchers reviewed 52 studies examining the impact of world disaster events upon subsequent psychopathology and they found these two syndromes as result (Rubonis & Bickman, 1991). Furthermore, there are possibilities of increased risk of other musculoskeletal complaints, as manifested by escalating work-related injuries, work absence, and lost productivity in a distressed population (Wesley et. al., 2000). Based on the findings of previous studies of 34 epidemiological cases of the mental health consequences of flooding in developing countries and illustrated the fact that, there are serious mental health problems following flooding events. Reviewer suggested to include mental health issues in disaster response and also mentioned that this burden would increase as the impact of climate change (Crabtree, 2012). Resilience is depend upon individual, communities, government and NGOs collective initiatives with diverse value and it affects the decision making process (Hay & Mimura, 2006, Paavola & Adger, 2006). Mentally instable community could not able to make proper decision in time of danger and thus increased their vulnerabilities.

Bangladesh: adaptation and coping

In Bangladesh, researchers emphasized on adaptation to flooding (Rashid, 2000, Del Ninno & Dorosh, 2003, Rashid & Haider, 2003); adjustment strategies to agricultural cropping patterns (Islam, 1991, Rashid & Mallik, 1995) and; coping with riverbank erosion (Haque & Zaman, 1989, Hutton & Haque, 2004), some have focused on adaptation measures for climate change induced sea level rise, cyclones, flash floods and storm surges (Choudhury et. al., 2004, Karim & Mimura, 2008); Eighty percent of the country consists of floodplains of the Ganges, Brahmaputra, Meghna, and several other minor rivers and poor rural inhabitants of the 75% of the total populations of 132 million people (in 2001) earning on average US$325 per capita per year (Bangladesh Bureau of Statistics, 2005). These populations have their own coping mechanisms and yet very little had been discovered. This study will look into the current capacities and coping of the inhabitants of small Island and char land who are

constantly facing natural disasters and living in the utmost risk areas of Bangladesh.

Bangladesh is highly appreciated for its numerous improvements in disaster management especially for the national level preparedness. The GoB has taken several initiatives with support of international agencies which include; Climate-Resilient Ecosystems and Livelihoods (CREL) program in March 2013, Bangladesh Climate Change Resilience Fund (BCCRF) in May 2010, National Disaster Risk Reduction platform with key ministries, department and civil society organizations in 2010, the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), 2009 and The National Adaptation Programme of Action (NAPA) in 2005.

Different coping mechanisms identified all over the globe depending upon people's cultural and socio-economic context rather than the vulnerability severity or risks. It also varies within the same geographical boundaries. Every community practices their own knowledge that has developed over the years. In the coastal region of Bangladesh for cyclones, half of people go to the shelters after they heard early warnings and one third of the people prepared themselves with their traditional approaches such as they tied their house with strong rope or wire to tie four sides to a large trees in a secure and balanced way. In the flooded areas people made their beds or boxes with long legs to keep their valuables in time of floods. They also build extra ceilings underneath the main ones to store crops, food and fuel to protect from inundation (Parvin et. al., 2008, Paul & Routray, 2011). The popular strategies for preparedness especially for cyclone and storm surge people of Bangladesh build indigenous structures made of bamboo called Machan and Pataton to protect household items, foods and goods. In addition, to protect households, people used to build their dwelling unit or courtyard on a raised earth platform. For reducing the impact of strong winds people make their roof with gentle slope towards the south-east. Most preferred saved food items were rice, flattened rice, fried rice, chili, onion, gur, potato, pulses, oil, biscuits, dry fish etc. They keep these in polythene bag, jute bag, plastic container and aluminium pots and store in above the Machan or a shallow pond or tie them to strong trees with cloth or rope in the hope of retrieving these after the disaster (Paul & Routray, 2011). The char land people generally cope by moving housing structures, livestock, and family members to safer areas during flooded season (Haque & Zaman, 1994). Similarly cyclone affected people also move their valuables and family to a relative house or nearby lower risky areas peoples' house, sometimes in the road, embankments or elevated areas. Store drinking water and sometime keep water purifying tablets. After the disaster strike people tried to cope with their savings if they have any or sell their property, jewelries', small poultry and valuable things or took loan from relatives or money lenders (Parvin et. al., 2008, Del Ninno & Dorosh, 2003, Paul & Routray, 2011). Most commonly post disaster coping involve survive with foods and shelters. For that people involved themselves in government or NGO sponsored 'food for work' or 'cash for work' programs, a few involved in rickshaw-van pulling, fuel wood collection, repairing houses, boats and nets, and a few instances of begging. Many villagers could not get employment and relied on savings for food and other emergency purposes, gathering of wild foods, fuel woods, and extra income by temporary migration, etc (Paul & Routray, 2011). According to the previous studies, borrowing of money is a common coping measure (Del Ninno, 2003.). More than 80% of the people depend on loan on mahajans/arotdars or any other institutions that offer loan. People borrowed money after a cyclone (79%) to rebuild livelihoods, meet food consumption needs and emergencies (Paul & Routray, 2011).

Data and methods

Selection of case study areas

Two geographically distinct areas were selected to study. Bandartila is an offshore village of the Nijhumdwip island most southern tip in the Bay of Bengal, under Hatiya upazila in Noakhali District surrounded by Meghna River to the west and the Bay of Bengal to the south with some fertile highlands.

Nijhumdwip island is a cluster of islands emerged in the early 1950s as an alluvium in the shallow estuary of the Bay of Bengal on to the south of Noakhali now considered as sanctuary for deer, and the Keora plant. There are total nine words/villages in this island. Bandartilla is a low lying village made up of alluvial soil and the total area of agricultural land in the village is 25 acres (source: Upazila Agriculture Office). This village is highly vulnerable to disaster specially cyclone and storm surge due to its geographical location and currently very much expose to salinity intrusion as there is no embankment around the village. There is riverbank erosion in some parts and as most of the land area is depressed, it is prone to flooding especially the banks of rivers. Sand deposition from the floods, damages the cultivable lands around the river banks while salinity from the tides often hampers crop production. NAPA initiated by the Ministry of Environment and Forest of Bangladesh government has identified that other than population living in the coastal belt is more vulnerable than other areas of the country and about 88% of the people of Hatiya upazilla live below the poverty line in respect of income and calorie intake. Patgram is relatively new char land (mid-river island) situated in Manikganj zila, during the 1980s people started establishing habitats there. It has no land connection or road connectivity with the mainland and is entirely surrounded by the large river Padma. Patgram is known in local language duba-char and characterized by as the central part being relatively higher than the fringes. The deposits in the centre are usually randy and the peripheral areas are made up with silt. Only the larger duba-char is suitable for human habitation and smaller duba-chars with catkin grass and other primary vegetation are used only for cattle grazing. Patgram is a large duba-char and is about 6kms away from the Harirampur upazila. Most of the land is fertile and rabi crops grows here well. Because of its geographical position, it faces multiple disasters throughout the year such as riverbank erosion, floods, cyclones, cold waves. These two different areas have been selected based on their vulnerabilities and exposure to two different major natural hazards of Bangladesh. Patgram is surrounded by the mighty Padma River and affected by recurring flood associated with river erosion, on the other hand Bandartilla is a part of island in Bay of Bengal and affected by recurring cyclones associated with storm surge and salinity intrusion. Almost every year the inhabitants of these areas face natural catastrophes which cause economic and social damage and they have to pay persistently. There are similarities in these two areas such as the inhabitants are mostly migrated population due to affected by natural calamities, living in disaster prone areas and surrounded by water, affected by recurring natural hazards, limited opportunity of work, trying hard to survive in the new evolved ecosystem with new adjustments, social differences is very obvious and poor are sufferer by the rich. The baseline of socio-economic condition is already low which is compounded by increased salinity intrusion challenging crops production.

Data collection

Primary data collection and analysis

A household questionnaire survey was conducted in these two case study areas in 2012 (source: Bangladesh Red Crescent Society, Climate Change Adaptation project) and a total of 900 questionnaires were collected. Under this survey 82 items of socio-economic, disaster coping and climate change adaptation questionnaire were included. Data was quantitative some of them are with multiple choice question and some are open ended. Selected skilled volunteers interviewed all the respondents by door to door visit at their convenient time over eight weeks. Individual interviews covered general profile of the house head, family composition, education, previous disaster experience, disaster preparedness, copping and perceptions of the climate change, response, mental imbalance and stress.

In addition to the questionnaire survey, some Vulnerability and Capacity assessment (VCA) tools had been used, such as Transect Walk, Social and Institutional Network Analysis, Direct Observation Key Informant Interview (KII), Social and Risk

Mapping, Focus Group Discussion (FGD), Livelihood Analysis and Historical Profile.

Secondary data collection

Secondary information was collected from several upazila and union level government departments and agencies. Other than that relevant information was collected from sources such as research studies and documents, scholarly journals, information from specialized websites, and government and non-government research and policy documents, published books, websites, national and international organizations, Government Offices like Bangladesh Bureau of Statistics (BBS), Bangladesh Water Development Board (BWDB), Disaster Management Bureau and Ministry of Food and Disaster Management.

Limitation of the study

This study conducted with large data set. Individual households were covered through interview to get a clear understanding of the community vulnerabilities and exposures with their coping capacities. Therefore, it was not possible to capture all the preparedness and coping mechanisms rather searched for broader aspects. Both the study areas are is in a remote place and the communication system is very poor, so volunteers faced problems of conducting the survey.

Results

Under this research vulnerability and coping capacity of the Bandartilla and Patgram community identified in terms of geographic and socio-economic aspects. Living in the disaster prone areas for the long period community people enhanced their own coping mechanisms by using their experiences and indigenous knowledge. Both the communities have migrated from their birthplace due to natural hazards built their perception and strengthened capacity than other communities. From the study it has been found that more than 92% people perceived that the intensity and frequency of the hazards and vulnerabilities of the people have increased over the last few decades. Slight difference is found in char land than the coastal area as coastal people's perception to experience the trend of the hazards is very long. Previous studies show more or less similar (Parvin et. al., 2008). According to many researchers, climate change impact has aggravated the social and economic difficulties to the communities with vulnerability and exposures to risk (Adger et. al., 2005) and it is evident from the African farmers that though they have improved in adaptation to climate change impact, there are plenty others in extreme risk because of socio-economic and technological reasons.

Socio-economic differences

There are total 400 families live in Bandartilla village and around 500 families in Patgram. A majority (80%) of people living in Bandartilla were fishermen and rest of them were farmers and day labourers whereas farming was the main (85%) profession of people living in Patgram and also with other professions such as boatmen, fishermen, blacksmiths, small businessmen, barber, goldsmiths, bull-cart pullers, etc. (source: Upazila Agriculture Office). Similar to the other areas of Bangladesh more than half of the population (62%-Bandartilla and 56%-Patgram) is dependent population in both the areas. The main cash crop is rice and they also produce small amounts of saline tolerant varieties, other than rice, the Bandartilla people also cultivate small amounts of fruits such as guava, mango, coconut, boroi, bananas, papaya and vegetables like chili, eggplant, tomatoes, betel nuts, etc. The production of crops decreased drastically because of the increased salinity in the soil. Also, deer is a pest for the villagers, as they come into their agricultural lands and eat their crops, because of food shortages in the forest. This has in turn caused food insecurity amongst the villagers. Most of the people of the village are deep sea fishermen and have to venture out to the Bay of Bengal for catch. Often, when darkness falls, the islet cannot be identified and it becomes difficult for these fishermen to return home. Because of its location in the heart of the Bay, cyclones and storm surges regularly attack the village. The big cyclones and SIDR that hit this area were during 1970, 1985, 1987, 1991 and 2007 and cyclone Aila in recent years that took a lot of lives in the village. On the other hand,

Patgram is newly emerged char land and very fertile; various crops such as rice (Boro), mung beans, corn, mashkalai dal (lentil), sesame seeds, mustard, kheshari dal (lentil), peanuts and jute grows here. In the FGDs, farmers of Patgram complained about lost of some of the varieties those are cultivated in most of their land 25 years ago due to intense raining in rainy season and no rain at all in dry season. Such varieties include Aus and Aman rice, different varieties of jute, rai mustard, white mustard, black seeds (spices), sugarcane and sunflowers. As Patgram is disconnected from the mainland, river transportation system is the only means of communication and for the inland movement there are some horse carts and a few motor bikes whereas in Bandartilla village small sea track and other riverine transport is available and for inland movement there are rickshaws, cycle and motor bikes are available. Bandartilla people possess limited source of safe drinking water supply. In both the dry and wet seasons, the villagers have to travel up to one kilometre for collecting water. Only a small fraction of the villagers have tube-wells or water sources in their households. On contrary this situation is better in Patgram as most of the households (63%) have their own deep tube-well for drinking purpose. Regarding sanitation facilities, both areas are more or less similar conditions. Majority of the people have latrines beside their homes and most cases, the latrines are common and many users go to the same toilet. Almost all the roads in both areas are kacha (not concrete) and very narrow. Most of the houses (74%) in Bandartilla village are made of thatched roofs and are highly vulnerable to cyclonic winds, storm surges and other disasters such as floods and water logging. Similar scenario in Patgram, houses are either tin shade (58%) or thatched (41%) that are very vulnerable to natural events like norwester and flood. There is only one primary school in Patgram and literacy rates are higher amongst men than women and a handful of the people continue with further education and in Bandartilla villages, there are two non-formal primary schools but classes are not held regularly. Education and literacy rates are low in both the village, both for men and women. Most of the men and women complete only primary education and even here there are noticeable gender differences. A small fraction of the population barely manages to finish primary school and also the schools and teachers are not equipped. Means of communication channels mostly occupied by the mobile phone (71%) in Patgram as like Bandartilla (99%) other than television or radio. The major concern among the people of Bandartilla is the land ownership from the government as almost all the families are migrants from other areas and they are the victim of river erosion. People in the village do not have proper land ownership documents and are regularly harassed by land grabbers and goons with political clout. In Patgram the major concern is the safety issue as the inhabitants are mostly the victims of the river erosion from the other side of the river and most of them are single families, they are often attack by river dacoit. In both areas things are very expensive due to the limited connectivity of the village to mainland and very limited bazaar for trading basic commodities. In addition, there are very limited medical facilities and no hospitals or clinics available and that effect a lot to the maternity health care of the pregnant women mostly and the fatality rate is very high during childbirth. Water borne and skin diseases are common because of lack of proper sanitation facilities, and awareness regarding health. People are superstition and black magic is practiced widely. Dowry and early marriage are main social problems. There is only one police station in Nijhum Dweep, which is understaffed and so they cannot really address the problems of this village whereas there are no police station in Patgram. Agriculture and other extension services have pretty good outreach amongst the people of Bandartila, on the other hand, almost nil in Patgram. There are only one cyclone shelter for the entire Nijhumdwip people and not possible to accommodate the entire population of the village whereas in Patgram there are no shelters for the people. During the SIDR and AILA cyclones, the people of the Bandartilla village did not receive any prior warning. Although Bangladesh Red Crescent Society's climate change adaptation programme is there and the island falls under the Cyclone

Preparedness programme (CPP), there are almost no other development partners that have programme in Patgram and in Bandartilla. There are also no weather and climate forecast centres or information services available in these areas.

Coping mechanisms: pre-disaster

People of the both places have their own preparedness strategy for coping with the disaster. This study only looks through the immediate preparedness of disaster in broader aspect. More or less 17%-18% people in both the areas take some precaution for their houses; such as, raise their house plinth to avoid flood water, wealthier people build their houses with brick and CI (Corrugated Iron sheet) to save their houses from storm or cyclone and some people made a second ceiling under their main ceiling called Pataton. They keep valuable thing on there to save household belongings from the tidal surge. Similar structures found mostly in other flood affected areas in Bangladesh. In Bandartilla, people made Machan and Pataton to keep their things in the time of storm surge. (Machan and Pataton are the indigenous structures made of bamboo or wood. It is raised platform to keep valuable things). People (11-14%) store their food grains, such as seed, rice, puffed rice, flattened rice, potato, dry fish for disaster recoveries digging hole in their yard covered with polythene bags or sometimes they store in a clay pots and tied it to the tree top or in their roof top. Earlier studies show some similarities only for coastal areas (literature).

In our study, char land people less likely to move their things rather than keeping things to their second roof top or tree top. As people living in the remote island face cyclones or storm surges frequently while the people of Patgram encounter seasonal flooding associated with river bank erosion, they are more conscious for their livestock and take appropriate measures for their safety, After the receiving early warning they take their animals to the shelter or to the other safer places in any neighbour's house. Bandartilla people have indigenous knowledge of disaster than patgram people. During last disaster 10% more people got the flood early warning in Patgram than Bandartila. Although early warning dissemination system improved a lot in recent years, most of people of Bandartilla did not receive the early warnings because of their poor communication system and the remoteness. Conventional Radio is not very popular in selected areas as a mode of information, acquiring so early warning through Radio proven not very effective for these areas whereas local warning dissemination through miking is more effective. Unfortunately, it also varies reaching to the women and children than men. There are three cyclone shelters in Nijhumdwip for the entire inhabitant and it is not enough for accommodating and providing facilities for all the vulnerable people in disaster events. Earlier research showed that the capacity of the cyclone shelters in coastal areas is insufficient for the number of vulnerable people. For the last cyclone early warning more than 52% people of Bandartilla took the shelter and rest of the people cope with their own knowledge such as tie four sides their houses with strong trees so that it might not fall under any strong wind. Similar coping was observed in other areas of coastal region (Parvin et. al., 2008).

Coping mechanisms: post-disaster

The most popular coping in both areas is borrowing money or food from the rich or money lender. This is very much similar to the previous findings (literature). Sometime they have to offer their precious things for lending and later, they lose to pay the interest. This percentage is higher in Patgram (31%) from Bandartilla (28%) as the social difference is higher because of some land bandits, who have the power to grab most of the land of char although they possess enough properties in mainland and become influential person of that area. There are numerous records of blooded conflict regarding this matter in Bangladesh. Because of remoteness and limited options for work approximately 20% of island people cope by reducing their number of meals whereas this percentage is half in Patgram due to available working opportunities and better connectivity than remote island with the mainland. This coping is very

popular in any disaster event in the vulnerable countries of Africa continent where food shortage is a common problem. As for example in Kenya similar coping illustrated by researcher such as households in Lower Keiyo (22.5%) and Aldai (22.2%) go an entire day without a meal during times of acute food shortage, and more than 30% of households limit/reduce the portion of meals taken. Another effective coping is working for money or food. After disaster strike the Government and other development agencies offer some development works for repairing/restoring of rural infrastructure, key installations public services and shelter instead of food or money, this is known as Food for Work (FFW) or Cash for Work (CFW). This is higher in Bandartilla (25%) than Patgram (11%) as cyclone/storms is responsible for bigger mess than flood.

In Bangladesh, the vulnerabilities and coping capacities are influenced by the social imbalance depending on their economic conditions. The major portion of these vulnerable poor people most of time especially in any disaster period depends on wealthy landed families for their survival. Many researchers estimated that more than half of our rural households are landless marginal farmers and mostly depend on selling their labours in cheap to work on others land (Rogge & Haque, 1987).

No difference in our study area; selling labour in advance with cheaper price is found 22% in Patgram and 16% in Bandartilla. Another study in Okavango Delta of Botswana of Africa continent indicated that people intentionally trying to diversifying their livelihoods for quick returns to survive all the year round (Bendseb & Meyer, 2003). In Africa, almost half of the households were found engaged in two livelihood activities and after that they have to rely on the governmental assistance of help from relatives due to severe drought condition (Wilk & Kgathi, 2007).

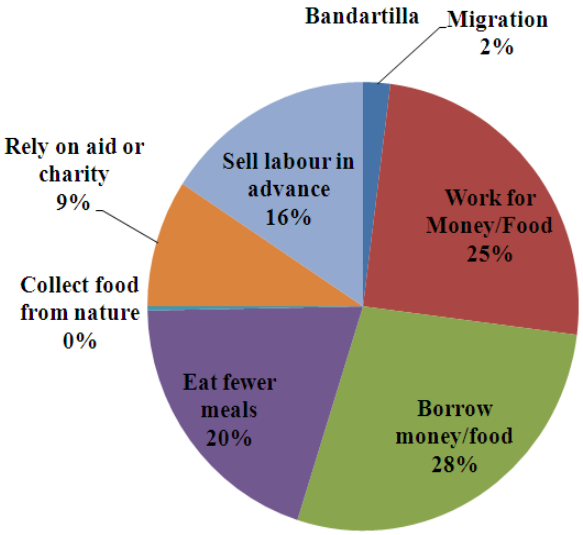

Fig. 1(a). Bandartilla coping strategies.

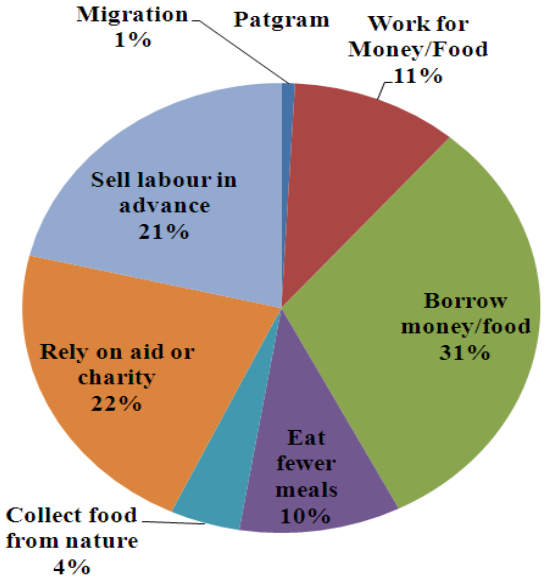

Fig. 1(b). Patgram coping strategies.

Similarly in our study areas people already engaged in two activities and also rely on other external assistance. Patgram produce rabi crops and most of the people has animal farm so working opportunity is more than Bandartilla. The percentage of people (22%) rely on charity or humanitarian aid is also higher in Patgram as the better communication and social differences, people can come easily with aid and charity and also this area is nearer to capital city so relief can come very quick after any disaster strikes. In Bandartilla only 9% of people rely on the charity or aid because of its remoteness. Migration rate is very insignificant and more or less similar in

both areas as those people have already migrated from other places and they understand the miseries of migration well and do not want to repeat. Collection of food from nature is nil in Bandartilla as nature is very hostile here and saline water impedes various naturally available foods to grow. However, in Patgram char land is very fertile for natural vegetables to grow and people can easily collect them and prepare food from them. Around 4% of people rely on the naturally available vegetables here.

Coping through expenditure distribution

People of the Bandartila and Patgram had been affected by various disasters in past and very prone to recurring natural events every so often. People are aware of their vulnerabilities and they had to compromise whether they wish to or not. These people already have migrated from other places and striving to fit in the new ecology with practicing more diversified livelihood options. They are stressed people loaded with numerous burdens on their head; people are spending more just to survive rather to meet their actual needs. The uniqueness of this study is that it has looked through people expense distribution to infer their actual vulnerabilities and exposures. Previous study in Hatiya upzilla of Noakhali district calculated that the average income of 2/3 respondent of their study population is 5000BDT per month and that is below poverty line (Parvin et. al., 2008). In this study it has been divided into two segments to get the clear understanding. The income ranges for daily labour from BDT 200/day as there are very limited opportunities of work all the year round and for the farmers BDT 120,000/year from the sale of crops/agricultural production, in both areas. In Patgram only 61% people's source of income from daily wages and only 19% people depend on selling their crops while in Bandartilla 41% of the people depend on their daily wages and only 11% from fishing. Similar to the earlier findings more than 50% people live below the poverty line in the study areas. They spend major portion of their income for food and repairing houses and little for medical and education. They could not afford any savings for their family; moreover, they are burdened with loan and other added responsibilities they could not bear (Table 1). Addition to that researchers has pointed out that major portion of the rural populations are forced to acquire the opportunities in front of them as agricultural laborers in cheap only to survive without any savings or assets that might help them against natural calamities. Usually after disasters strike, the poor usually survive by selling off land, livestock, housing materials, and personal belongings (Haque, 1997).

Table 1. Expenditure distribution.

Expenditure items	Bandartilla (%)	Patgram (%)
Food	60	40
Medical Care	10	9
Clothes	6	10
Entertainment	3	-
Communication	-	5
Education	4	12
Household repair	11	9
Savings	0	0
Animal husbandry	-	8
Loan	6	7

Discussion and conclusions

The negative consequence of climate change especially the increased intensity and frequency of the natural hazards and extreme weather events has triggered the vulnerabilities of the Bangladeshi people with other associated factors, such as spatial characteristic, socio-economic imbalance and political unrest. In this research it has been revealed that the inhabitants, who are mostly disaster migrants; have to compromise with their basic needs just to survive due to coping with the vulnerabilities and being exposure at risks. They are already striving to survive in new ecology with traditional and modern diversified options. Climate change impact has worsened their current situation whether they are prepared to cope or not. People's income is not stable along with the limited working opportunity. They have to spend maximum portion of their income for food and repairing houses that are often destroyed by recurring disasters. Savings are almost nil in among the people of both places. Medical and education expenses are just amplifying their burden. Loan is

very common in people to survive in the disaster events and aftermath. In this situation coping option has becoming narrower day by day. The most suitable options for coping includes; eat fewer meals, borrowing money or take loan and sell labour in cheap at advance. Although they could not afford any savings for their family, they are imposed with loan and other added responsibilities they could not bear. All these copings are leading people to malnutrition and imbalance mental health and people are forced to migrate or to change their profession or girls in early marriage, domestic violence, conflicts and so on. By observing people's current situation they might be the victim of stress of cataclysmic events and in addition, current vulnerabilities and huge mental instability along with other pressure might lead them to post traumatic stress disorder (PTSD). This situation will worsen gradually if not consider proper intervention that will justify people's need at grass root levels. Malnutrition, economic imbalance, domestic hostility along with mental instability would hinder people's ability to take proper decision in time of risk or affect current coping options. Effective household level coping depend upon the allocation of resources by a household to overcome the crisis without compromising of livelihood security in the long run. Therefore, economic and mental instability will lessen their ability to cope with recurring events or vice versa.

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