

Climate Change, Livelihood Declining and Knowledge Management: A Case Study on Cyclone Sidr in Bangladesh

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Abstract: Climate change, global warming, natural disasters and poverty are the biggest challenges for the world today. Those challenges affect every person on the planet, but worst affected of all will be people living in the world's poorest countries. On 15 November 2007, Cyclone Sidr, a category 4 storm struck the coast of Bangladesh, and it was so devastating affected on people's livelihood. The objective of the study was to conduct a livelihood analysis of the people who had the self sufficiency before Cyclone Sidr in the study areas. The study was carried out in Mirzaganj sub district under Patuakhali district, which is purposely selected. A total of seventy primary data were collected by random sampling during April 2008. Five types of assets or capital (natural, physical, human, financial and social capital) were considered to analyze the livelihood. The study revealed that livelihood has been declined after Cyclone Sidr and sustainable development also hampered by Cyclone Sidr. All assets were shown the negative impact on livelihood except social capital. The assistance and support of different organizations were gradually helping to improve their livelihood through income generating activities such as, small business, livestock and poultry, fishery, crop farming, etc. The study also revealed that knowledge management and awareness on climate change would be key factors to minimize the loosing of human life and their assets.

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1. Introduction

Global Warming is defined as the increase of the average temperature on Earth. As the Earth is getting hotter, disasters like hurricanes, droughts and floods are getting more frequent (Allianz.com). A global rise in temperatures is undoubtedly real according to the Intergovernmental Panel on Climate Change (IPCC) (Macilwain, 2000; Nordell, 2003, Krishna, 2009). An increasing body of observations gives a collective picture of a warming world and other changes in the climate system (IPCC, 2001).

Water and agriculture sectors are likely to be most sensitive to climate change-induced impacts in Asia. Agricultural productivity in Asia is likely to suffer severe losses because of high temperature, severe drought, flood conditions, and soil degradation (IPCC, 2007). Anthropogenic climate change has the potential for slightly increasing the intensity of tropical cyclones through warming of sea surface temperature (Knutson and Tuleya, 2004). Recent publications linking an increase in cyclone intensity to increasing tropical sea surface temperatures (SSTs) (Webster et al., 2005; Trenberth, 2005; Emanuel, 2005; Landsea, 2005; Landsea et al., 2006) have fueled the debate on weather global warming is causing an increase in cyclone intensity (Pielke et al., 2005, Krishna, 2008). Flooding due to tropical cyclones is one of the most devastating natural hazards in Bangladesh. The

country is likely to be affected by more intense cyclonic events in the foreseeable future due to climate change and sea level rise (SLR). This is a grate concern, since the location and geography of Bangladesh makes it not only particularly susceptible to the effects of climate change, but also extremely hard to protect. The consequences of climate change lead to an increase in the cyclone-prone area and put a large number of people at risk (Karim and Mimura, 2008). Therefore, On 15 November 2007, Cyclone Sidr, a category 4 storm struck the coast of Bangladesh (Fig 1), maximum wind speed, total surge

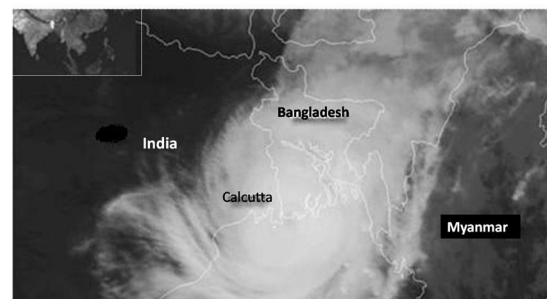


Fig. 1. Satellite image shows that Cyclone Sidr struck the coast of Bangladesh and its inland on 15th November 2007.

height and central pressure were 223kph, 15ft and 942 hpa respectively (BBS,2008). It might be an impact of climate change and global warming. A devastating loss has been occurred during the cyclone Sidr which is shown in table 1.

Table1. Effect of Cyclone Sidr in 2007 of Bangladesh

Item	Unit
1. Sidr affected districts	30
2. Affected sub-districts	200
3. Affected unions	1,950
4. Affected households (families)	20,64,026
5. Affected population	89,23,259
6. Reported deaths	3,363
7. People injured	55,282
8. People lost (missing)	871
9. Houses damaged (fully)	5,64,967
10. Houses damaged (partially)	9,57,110
11. Crops damaged (fully)	7,43,322 acres
12. Crops damaged (partially)	17,30,317
13. Livestock deaths	17,78,507
14. Roads damaged (fully)	1,714 km
15. Roads damaged (partially)	6,361 km
17. Educational institutions (fully)	4,231
18. Educational institutions (partially)	12,723
19. Embankment damaged	1,875 km
20. Damaged of trees	40,65,316

Source: Bangladesh Bureau Statistics, 2008, 20p

Livelihood has been hampered a lot through Cyclone Sidr not only landless and poor people but also medium and large scale farm owners. Different organizations (Government and NGOs) were disbursed emergency relief and aid right away and started distributing relief materials among the victims of the Cyclone Sidr. They are still working on Cyclone Sidr recovery program with an objective to assist the affected communities through a participatory approach to recover.

In developing countries like Tanzania major pressing issues like food security, poverty and water availability are all interconnected with climate change (Shemsanga et al., 2010). A very few study was done on impact of livelihood of climate change and disaster management and strategies ([Khan and Rahman, 2007](#); [Acock and Acock, 1993](#); [Gable and Aubrey, 1990](#); [Habibullah et al., 1998](#); [Karim et al., 1996](#); [Mahmood and Hayes, 1995](#); [Rotter and Ven De Geijn, 2000](#); [Haque, 1987](#); [Mahmood, 1993](#); [Mahmood, 1996](#); [Mahmood, 1997](#); [Motouq, 2008](#); [Amiri and Eslamian, 2010](#)). Hence, the broad objective of the study was to conduct a livelihood analysis of the people who had the self sufficiency before Cyclone Sidr in the study areas.

The hypothesis of the study is as followed
“Livelihood is declining by Cyclone Sidr and

general knowledge management and awareness on climate change would be minimized the losing of human life and their assets.”

2. Material and Methods

For fulfill the objective and prove the hypothesis, seventy primary data were collected from Mirzaganj town, Deuli Subidkhali and Amaragahha villages of Mirzaganj sub-district under Patuakhali district in Bangladesh during April 2008. Sampling areas were selected purposively. All respondents, before and after situations of Cyclone Sidr were considered for this study. According to the definition of Bangladesh Bureau of Statistics 2005, the concept of small, medium and large-scale of farm holding have been defined as follows: A small scale farm consists of an area of 0.02 to 1.01 hectares of land, medium farm consists of an area of 1.02 to 3.03 hectares of land and large farm consists of an area 3.04 hectares of land and above. The respondents (who have medium and large scale farm land, they had the self sufficiency and they didn't involve in micro credit before Cyclone Sidr) were selected for this study. Five types of assets (natural, physical, human, financial and social capital) were considered to analyze the livelihood and checked the primary knowledge on global warming, climate change and natural disaster in Bangladesh. The tabular technique of analysis was used and this technique was based on arithmetic mean, percentage ratio etc.

3. Results and Discussions:

In the study area, many sectors were affected by the Cyclone Sidr including water resources, agriculture and food security, ecosystems and biodiversity, human health and coastal zones. Five types of assets which the indicator of livelihood are as followed.

Human capital:

Human capital represents the skill, knowledge, education, ability to work and good health that together enable people to pursue their livelihood strategies (Tasnoova and Iwamoto, 2009). Here, respondents' family size, educational condition of spouses', health condition, experience of micro credit were considered which is shown in the table 2. In this table, the average family and educational condition of the spouses were declined because unexpected dead of some of family members during Cyclone Sidr. Health problems were increased because of diarrhea and skin diseases after Cyclone Sidr. Before Cyclone Sidr, none of respondents were involved in micro-credit. Therefore, human capital was shown the negative impact in their livelihood.

Table 2. Human capital of respondents

Items	Before cyclone Sidr	After cyclone Sidr
Family size (Average)	7.00	6.00
Illiterate (%)	32	33
Able to sign (%)	36	31
Primary level (%)	18	23
Secondary level & above (%)	14	13
Health condition	Good	Bad
Diarrhea (%)	9	91
Skin diseases (%)	15	85
Experience of micro-credit (%)	0	100%

Source: Field survey, 2008

Natural capital:

Natural capital of people represents the natural resources and services for livelihoods such as homestead land, cultivated land, fallow land pond area etc which is shown in table 3. In this table, average homestead land, cultivated land, fallow land and pond are were declined because of rising of sea level, soil erosion and after cyclone Sidr some of agricultural land were turn into salty soil land which was also difficult to grow any crop. Therefore, consideration of before and after situation, natural capital was shown the negative impact of livelihood analysis.

Table 3. Natural capital of respondents (Average)

Items	Before cyclone Sidr (ha)	After cyclone Sidr (ha)
Homestead land	0.50	0.31
Cultivated land	6.5	4.5
Fallow land	1.5	0
Pond area	0.73	0.55

Source: Field survey, 2008

Social Capital:

Training, network, social connection, group, trust, access to institution, technical assistances are the social capital for sustainable livelihood development. In this study, social capital were considered training specially small business, livestock and poultry farming, fish farming, vegetable and fruit farming, disaster knowledge management etc which is shown in the table 4. In this table, any of the respondents were involved in any NGOs activities before Cyclone Sidr because they had the self sufficiency. After Cyclone Sidr, 100 percent respondents were engaged in different NGOs especially BRAC, Grameen Bank, Proshika etc for receiving micro credit. They also took different training on their interest. Around 26% respondents were received training for small business. Around 50%, 15% and 9% respondents were received training for livestock and poultry, fish farming, and crop (including crops, fruits and vegetable) farming respectively.

Table 4. Social capital of respondents

Receiving training from NGOs	Before cyclone Sidr (%)	After cyclone Sidr (%)
Small business	0	26
Livestock and poultry	0	50
Fish farming	0	15
Crop farming	0	9
	9	36

Source: Field survey, 2008

Physical capital:

Around 36% respondents were received training for disaster knowledge management specially awareness of disaster, global warming, climate change and their impacts, are the physical capital which pursues the livelihood development which is shown in the table 5.

Table 5. Physical capital of respondents

Items	Before Cyclone Sidr (%)	After Cyclone Sidr (%)
Housing condition		
Building	7	7
Semi building	64	43
Wooden house with Tin shed	27	36
Mud house	2	0
Straw house	0	14
Treatment facilities	Good (hospital, clinic)	Good (hospital, NGOs treatments facilities etc),
Access of pure drinking water	100	50
Access of water supply for crops	100	30
Access of electricity	50	20
Sanitary facilities good	100	50
Involvement of relief & rehabilitation	0	100
Infrastructure	good	bad

Source: Field survey, 2008

In this table physical capital included housing conditions, treatment facilities, access of pure drinking water, access of water supply for crops, electricity, sanitary facilities, involvement of relief and rehabilitation, infrastructure etc. Before Cyclone Sidr none of the respondent's houses were made by straw. About 100% respondents had the access of pure drinking water, access of water supply for crops and good sanitary facilities. About 50% respondents had the access electricity and none of them had the involvement of relief and rehabilitation. The infrastructure was good. After Cyclone Sidr almost all facilities were declined. Therefore, physical capital was shown the negative impact of respondent's livelihood.

Financial capital:

Financial capital denotes the financial resources that people use to achieve their livelihood objectives. Financial capital represents the source of income, credit which are shown in the table 6 and table 7. Table 6 shows the sources of income. Main sources of income were agriculture, livestock and poultry, fish farming, business and services. Before Cyclone Sidr, most of the respondent's income was good. But after Cyclone Sidr, income has declined because of low productivity, soil erosion, biodiversity, land and water became salty etc.

Table 6. Sources of income of the respondents

Sources of income	Before cyclone Sidr (Average, TK)	After cyclone Sidr (Average, TK)
Agriculture	180,000	35,000
Livestock and poultry	60,000	0
Fish farming	80,000	15,000
Business	200,000	20,000
Service	85,000	85,000

Source: Field survey, 2008

Table 7 shows the sources of the credit of the respondents. Before Cyclone Sidr, 50% respondents received loan from banks especially on business and loan for fish farming. But after Cyclone Sidr, they tried to receive loan from different banks and NGOs such as small business, house hold consumption, livestock and poultry, fish and crop farming, children education etc which were easy to get from different NGOs as a micro credit. Therefore, both of the indicators (income and credit) were shown the negative impact of respondent livelihood.

Table 7. Sources of credit of the respondents

Sources of credit	Before cyclone Sidr (%)	After cyclone Sidr(%)
Banks	50	50
NGOs	0	100
Relatives & friends	10	0
Money lenders	0	10

Source: Field survey, 2008

Knowledge management on climate change:

Knowledge management is broad concept and it has numerous definitions. "Knowledge management

Table 8. Respondents' general knowledge on climate change

Items	Before Cyclone Sidr (%)		After Cyclone Sidr (%)	
	Yes	No	Yes	No
Did you have any idea on sea level rising before?	14	86	100	
Do you have any concept of global warming?		100	50	50
Do you have any idea of climate change?	9	91	64	36
Do you think natural disaster is an impact of climate change and global warming?	9	91	64	36
Would you like to know on general knowledge on climate change and global warming?		100	100	
Do you think, hearing the weather forecast is important for less lose of human life and assets?	50	50	100	
Before Cyclone Sidr, did you have any idea of social awareness of disaster and cyclone?	9	91	50	50
Do you think cyclone evacuate shelter is adequate to accommodate to all people in this region		100		100
Now, do you think all people (children to adult) should know about the impact of climate change? (Increasing droughts, floods cyclone, inundation, desertification, salination, diseases etc.)		100	64	36
Do you think water logging problem is created by the climate change?	15	85	100	
Do you think all people should have pre and post precautionary knowledge of impact of climate change, global warming and cyclonic storm?	50	50	100	
Do you think, pre and post precautionary knowledge and awareness on climate change would be key factors to minimize the losing of human life and their assets?	50	50	100	
Do you think knowledge management on climate change is important?		100	100	
Did you have the sustainability before Cyclone Sidr?	100			100
Does your sustainable development hamper and vulnerability increase by Cyclone Sidr		100	100	

Source: Field survey, 2008

will deliver outstanding collaboration and partnership working. It will ensure the region maximizes the value of its information and knowledge assets and it will help its citizens to use their creativity and skills better, leading to improved effectiveness and greater innovation" by West Midlands Regional Observatory, UK. It has big difference between developed and developing country. Climate change is a key priority for international development as its impact is likely to be disproportionately felt in developing countries. This is because developing countries are generally warmer, more prone to rainfall variability, more dependent on agriculture- the most climate-sensitive of economic sectors- and as a result of low income have limited risk mitigation infrastructure, both physical and financial (e.g. insurance) (Stern, 2007). Increased instances of drought, flooding and severe weather events as well as incremental environmental change through process such as inundation, desertification and salination are

likely to exacerbate existing problems related to agricultural production, communicable diseases, migration streams, poverty and conflict (Smith and Vivekananda, 2007; WHO, 2008; UNICEF UK, 2008). In Bangladesh poverty is still high and literacy level is low. For reducing the environmental problems as well as lose of human life and assets general knowledge on climate change is very important for Bangladesh which is shown in table 8. Before Cyclone Sidr people had hardly few idea and knowledge on climate change and impact of climate change.

Conclusions:

This study revealed that the livelihoods of the respondents were directly hampered by the Cyclone Sidr. Among the five types of assets or capital (Human capital, natural capital, social capital, physical and financial capital), four of them were shown the negative impact of livelihood. Only social capital was shown the positive impact of livelihood development.

All respondents had self sufficiency before cyclone Sidr and it had completely destroyed after cyclone Sidr which is same as the hypothesis. But, the assistance of the government of Bangladesh and support of micro credit of different NGOs, respondents are gradually improving their livelihood through income generating activities such as small business, livestock and poultry, fishery, crop farming etc. Different type of natural disasters have increased in Bangladesh in recent years such as floods, cyclones, storms etc. and this disasters have caused colossal humanitarian, economic and environmental impacts.

Livelihood of respondents was declined by Cyclone Sidr. People were hardly concerned about the devastation of cyclone. Support of organization had made significant contributions during and after disaster recovery. Respondents had hardly few knowledge on natural disasters, climate change and global warming and they felt importance on knowledge of those aspects and they were interested gathered knowledge on pre and post precautionary knowledge of impact of climate change, global warming and cyclonic storm. After Cyclone Sidr, all respondents were agreed that pre and post precautionary knowledge and awareness on climate change would be key factors to minimize the losing of human life and their asset. But, Bangladesh government, local communities, community based organization, non-government organizations, media, private sector, academia, neighboring countries and donor communities should work together to make concrete policy, strategy and plan which may prevent or decrease the loss of livelihood aspects. Therefore, all people (poor and rich, children and adult) must be motivated to aware of the natural disasters, climate change and global warming and can be concerned by group meeting, mass media, campaign, leaflets, posters, drama and other relevant activities.

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