

Surviving Cyclones:

The Indigenous Wisdom



Surviving Cyclones: Voices from *Kuakata* Coast

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Executive Summary

Cyclones are intense low-pressure systems that form over tropical oceans with sustained winds exceeding 63 km/hr surrounding the center. Bangladesh, due to its conical shape and location on the tip of the Bay of Bengal, is vulnerable to periodic natural disasters especially cyclones. Cyclone “Sidr” ravaged the coastal belt of Bangladesh on 15th November, 2007. The present study was conducted at ‘*Kuakata*’, a coastal area of southern Bangladesh in November 2008. The focus was to reveal the disaster management skills of the indigenous people who are living in this coastal area for centuries.

Indigenous communities living in the coastal areas for centuries with a unique cultural identity have close contact with nature. It is assumed that they have developed an indigenous perception and prediction strategy for cyclones and, thereby possess effective survival strategies. They have inherited the time-tested experiences of generations, internalized through a process of socialization. Originated within communities, based on local needs and specific to the local culture and context, this vast knowledge capital has helped in building community resilience and enhancing their coping mechanisms to natural disasters (cyclones).

Based on three main predefined priorities - indigenous ethnic communities, coastal region, and the impact of “Sidr” - the Rakhain (the only ethnic minority community of considerable number living on the coastal belt for centuries with a unique cultural identity) of the Patuakhali district were selected for intensive in-depth investigation. The study, at large, aimed at exploring the indigenous disaster management of the Rakhains *before, during* and *post* cyclone, with special interest on the impact of “Sidr” on the Rakhains. Using in-depth interviewing of key informants, group discussion with community members and associated case studies, the study tried to identify: indigenous perception of cyclones, predicting indicators used by the local people to determine the occurrences and intensity of cyclone, and their survival strategies prior to institutional help arriving.

Disaster management involves preparing for disasters before it occurs and disaster response as well as supporting and rebuilding society. The Rakhains were found to have different adaptive strategies for *Pre, during,* and *Post* disaster periods of a cyclone. The people ignored the formal preventive and survival strategies and relied upon cumulative experience of the earlier generations. The evidences of their community level preparedness include: structural adjustment to reduce cyclone damage, specific forms of housing, prediction of cyclones using the state and level of the sea-water, wind direction, weather, and behavior of some living organisms. Their capacity to survive before any institutional help arrives after the cyclone hit demonstrate the effectiveness of their survival strategies. After the devastating cyclone “Sidr”, Rakhains are facing problem regarding their livelihood strategies due to saline water intrusion. On the other hand, due to the unplanned rehabilitation process their unique cultural heritage is also under threat.

Since Bangladesh is a disaster prone country, the ecological knowledge of the Rakhains may have some applicability in other coastal areas vulnerable to periodic cyclones. Thus, there remains the necessity of further research in this subject of indigenous disaster management.

Section 01

1.1 Introduction

As the natural disasters make people vulnerable, every society perceives the natural disastrous events with its capacity to cope and peoples' interaction with their surroundings is important for their living in a particular area. Every social system responds in the crisis situation and that temporary adaptive process may transfer to the permanent pattern for that society if there is recurrence. Ethnic communities living in the coastal areas for centuries with a unique cultural identity maintain a close connection with nature; it is assumed that they have developed an indigenous perception and prediction strategy for cyclones and, thereby possess effective survival strategies (Hassan, 2000; Hossain, 2001).

Cyclone 'Sidr' devastated the coastal region of Bangladesh on 15th November 2007. The cyclone battered vast areas of Khulna, Barishal, and Chittagong divisions with a wind speed of almost 250 km per hour with giant waves up to 30ft high (MoFDM, 2008). Various reports of the local journalists and volunteers working in relief and rescue operations reported that seriously affected people were from all walks of life.

Almost every year, small to medium range cyclones form in the Bay of Bengal to hit the landmass, causing moderate damage. However, periodically strong cyclones associated with high tidal surges engulf the entire coastline and sometimes even approach further north. Thus, property and lives are lost beyond belief. Given the periodic catastrophes affecting the Bay of Bengal coast, there is a serious need for an effective disaster management plan to minimize the loss of lives and property. Unfortunately, the present cyclone warning system is ineffective and sometimes, also confusing (Hassan, 2000). Moreover, we lack a comprehensive disaster management strategy. Some of the local NGOs, in collaboration with government agencies, undertake some activities but those too have been limited mostly to relief and rehabilitation activities. A cyclone preparedness plan is hardly found among these agencies. People living in the coast apply their own weather reading skills and take necessary precautions. In view of this the present study has two distinct purposes to serve:

1. Revealing the indigenous disaster strategy and coping mechanism.
2. The academics, particularly engaged in disaster anthropology, are likely to be benefited for practical reasons.

Therefore, the research is expected to provide planning and programming input and enhance human knowledge.

While it is impossible to prevent natural disasters, protective measures to reduce the vagaries of disasters can be evolved. For these reasons, this research aims to analyze the Rakhains' (the only ethnic minority community with a considerable number, living in the coastal belt for centuries with a unique cultural identity) indigenous perception of cyclone and risk situation, predicting indicators of cyclone, coping mechanism and impact of "Sidr" on the Rakhains. The Rakhains, living in the coastal areas of Bangladesh since 1789 (Khan, A. M, 1999:50) and have faced numerous cyclones, possess extended knowledge about cyclone prediction and survival strategies.

1.2 Objectives of the Study

Given the magnitude of the adverse impacts of tropical cyclones; community perception, prediction and survival strategies to combat cyclonic disaster are matters of utmost importance, especially in the context of the indigenous communities who have been living in the extremely vulnerable zones for a long time and surviving mostly without outside support. The present research intends to compile environmental concerns and traditional environmental knowledge of an indigenous community, namely, the Rakhain; living in the coastal area for centuries. The specific objectives are:

- a) to reveal the perception and prediction indicators used by the Rakhains during cyclones;
- b) to examine their survival strategies at the face and pace of cyclones;
- c) to assess the impact of “Sidr” on the Rakhains;
- d) to highlight important findings which can be used by the disaster management programmers/planners of NGOs and GOs.

Section 02

2.1 Indigenous Perception of Cyclone

The Rakhains use the word *Lemungrai* to denote any natural calamity. But they the terms *tulong*, *mundai* and *le mundai* are commonly used to describe cyclone, tidal surge, and cyclone without tidal surge respectively. Wind is described by the Rakhain term *li-thare*; wind blowing with a high intensity is denoted by *li-ben-thare*. And flood due to excessive rain is denoted by *mouri prera*.

According to the Rakhains, cyclones of the late rainy season (*ni-radi*) and the early winter season (*mo-radi*) are most devastating because of higher intensity and bigger tidal surge but during dry season there are frequent cyclones of low intensity in terms of tidal surge. Rakhains explain this difference due to swollen rivers of the rainy season (*penle*) and sea (*mraima*) have more water than in dry season. However, prefixes are also used to classify the intensity of cyclone. For examples, cyclones with low intensity and high intensity are called *leingri* and *laeingshi* respectively. Similarly the people of Maheskhalī classify cyclones on the basis of intensity as “*choto tufan*” (small cyclone) and “*boro tufan*” (big cyclone) (Hassan, 2000). This type of distinction between cyclones is common in cyclone prone areas of Japan too, as *large*, *medium* and *small* cyclones (Hassan, 2000).

When the Rakhains in the study area were asked if they know the causes of formation of cyclones they replied that as cyclone are created in the deep sea and they have not seen the creation of cyclone they do not know the actual cause. But they believe: *Its all because of will of the God*. Mostly all over Bangladesh cyclones/natural disasters are also traditionally seen as Punishment from Allah (Howell, 2001 and 2003; Schmuck, 2000) or Domsday or Curses of God (Hassan, 2000).

The Rakhains also do believe that cyclones are inevitable in the coastal region due to natural causes; they have seen water level of the sea rise about 3 ft. in the last 30 years, and sea is coming nearer to human settlements due to land erosion. Few also look at the pollution of the sea as a cause of cyclone formation.

“The sea is coming nearer so where will the waves of the sea go; it will come and hit the shore in the form of cyclones”, male: 76

One more aspect of their belief about cyclones is that they believe that a mighty cyclone will hit the coast every five years. This belief came to exist because of the periodical cyclone hits of 1960, 1963, 1965, and 1970.

Some also indicated to the geographical position, the sea is directly to the west, as a cause of frequent cyclone hits.

After 1970, the study area has not been attacked by any big cyclones, but in 2007 the mighty cyclone “Sidr” hit the area of the Rakhains. It hit the coast on 15th November, 2007 which is in the winter season (*Mo-radi*). According to the Rakhain calendar, it should not be a time for cyclone creation. Because of these two reasons Rakhains believe the Cyclone “Sidr” was a result of previous sins. A resident of Patuakhali district describes his perception about extreme weather events such as big cyclones:

“People are dishonest these days; they don’t have any religion. For this reasons there is drought, flood, excessive rains and at last this “Sidr”. If people do not become ‘good’ these will not end and we will have to suffer”, Male: 65

Before the cyclone “Sidr” hit the coast, it was raining all day and the wind was blowing from the south-east. However, this happens every year and they did not pay much attention to it and never thought the situation could be the way it turned out eventually.

The reason why cyclone “Sidr” did not hit the *Kuakata* coast directly, according to some locals is ‘land mitigation’ (*cho*) (width about .5 kilometer and length about 4.5 km) into the deep sea of the Bay of Bengal. This is located, according to a Rakhain respondent, about 1 km deep into the sea (south to north) from the coast in an east-west direction. They believe the cyclone traveled through the deep sea and went to Khulna and Sundarban through the deep sea. They have seen in last few years that cyclones avoid the *kuakata* coast most of the time.

2.2 Indigenous Predicting Indicators

When the Rakhains were asked whether they can anticipate and predict occurrences of cyclones, most of them replied positively. It is perceived that older members of the community are most knowledgeable about history and development of a particular system of knowledge, including past successes and failures (Mustafa, 2000). Thus, most of the responses came from the older generation, that is, 50 years and above but for comparative analysis people of different ages and sexes were also approached. Respondents were asked if they could anticipate and predict occurrences of cyclones. The responses are compiled in Table 2.2 according to age and gender of the respondents:

Table 2.2: Age and Gender based list of the respondents and their ability to anticipate and predict cyclones

| Age (years) | Male | | Female | | Total | |
|-------------|------|----|--------|----|-------|----|
| | Yes | No | Yes | No | Yes | No |
| Below 20 | - | 2 | - | 1 | - | 3 |
| 21-30 | - | 2 | - | 3 | - | 5 |
| 31-40 | 2 | 3 | 1 | 1 | 3 | 4 |
| 41-50 | 9 | 1 | 2 | 4 | 10 | 6 |
| 51-60 | 11 | 1 | 3 | 5 | 15 | 6 |
| Above 60 | 7 | - | 2 | - | 9 | - |
| Total | 29 | 9 | 8 | 14 | 36 | 24 |

Fieldwork, 2008

It can be seen from the above table that 60 percent of the respondents (36 out of 60) responded positively when they were asked if they could anticipate and predict occurrences of cyclones. It was further observed that almost all of the positive response belonged to age groups above 40 (34 out of 36 i.e. almost 95%) and there was no one in the age groups below 30 who could anticipate or predict cyclones. Looking from a gender perspective, only 36.6 percent of the females answered affirmatively, i.e. 8 out of 22; and they too belong to the mid-aged and older age group. But among the men, the percentage of positive responses was much higher i.e. 76.4% or 29 out of 38 respondents.

Predicting indicators of cyclone depends on several factors. People do not take a single indicator to predict the cyclone. All the indicators as a whole give the definite direction. The indicators that are operative in their process of anticipation and prediction of a cyclone are indexed in the Figure 2.2:

Box 1
Women are mostly ignorant of predicting indicators of cyclones

Maten Ae, Female: 35, is a housewife of the Kerani Para, *Kuakata*. According to her, cyclone “Sidr” was the first mighty cyclone she experienced. Although it was raining all day before the cyclone hit, with winds blowing from the east, she did not perceive a mighty cyclone. The reluctance, she says, was due to lack of experience and though she knew wind blowing from east side is more likely to create a cyclone, she did not perceive it as a signal for cyclone because of experience of the last few years. She came to know about the formation of the cyclone “Sidr” from radio broadcasting and announcements on the microphones but did not pay attention to them. She was also sure about a cyclone when her father-in-law said a mighty cyclone is coming and asked her to finish all her work before sunset. She could not mention any other predicting indicators and she says that she has not got the ability because she is always busy with household works and does not have time and necessity to pay attention to identify indicators related to cyclone formation. When she was talking about the cautionary measures taken during the cyclone “Sidr” she said most women and children were sent to the nearest cyclone shelters or other safer places while a male member remained at home in every household.

Source: Case Study in *Kuakata*, 2008

Figure 2.2: Predicting Indicators of Cyclones

| | |
|-------------------------------------|---|
| <i>Perception</i> | <p><i>Tulong</i> (cyclone)</p> <p><i>leingri</i> (cyclone with high intensity of tidal surge)</p> <p><i>laeingshi</i> (cyclone with lesser intensity of tidal surge)</p> <p><i>le mundai</i> (cyclone with tidal surge)</p> |
| <i>Prediction</i> | <p><i>Kachong/ Naeung</i>(April/May) and</p> <p><i>Tachong mong/ Na-ddo</i> (Oct/ Nov)</p> |
| <i>Wind Direction</i> | <p><i>acche tong da-ong</i> (South east) : High intensity</p> <p><i>mrao acche da-ong</i> (North east) : Low intensity</p> |
| <i>Warmth of Wind</i> | <p><i>Hot during cold season</i></p> <p><i>Cold during hot season</i></p> |
| <i>Weather condition</i> | <p>Drizzling and gloomy sky with wind blowing from south east</p> |
| <i>Sound</i> | <p>Huge roar of the sea is heard</p> <p>No sound of thunder storm</p> |
| <i>Appearance of cyclone</i> | <p>Wind blowing in circle can be seen in the deep sea from the coast</p> |
| <i>Water</i> | <p>Abnormally Hot</p> <p>Dark color</p> <p>Bitter taste of rain water/ salinity of rain water</p> <p>Water increases in the river if cyclone is heading towards the shore</p> |
| <i>Availability of fish</i> | <p>increased</p> |
| <i>Cloud</i> | <p>Rainbow color</p> <p>Rainbow shape</p> |
| <i>Living Barometer</i> | <p>Human with special type of disease (sufferings of the people having skin problems and breathing problems are increased)</p> <p>Insects (moving out of their nests and move to higher places)</p> <p>Fish (jumping of a certain kind of fish in the ocean, locally called “cheowa”)</p> |

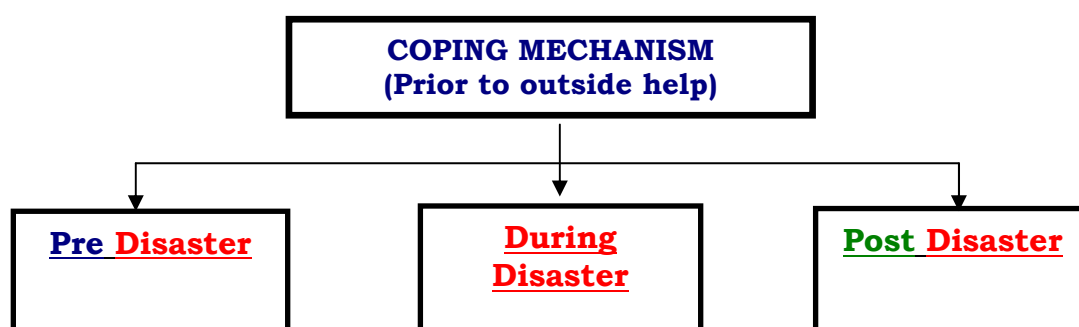
(Fieldwork, 2008)

2.3 Indigenous Survival Strategies at the Pace and Face of Cyclones

The Rakhains lived in the coastal area of Bangladesh for years and faced numerous mighty cyclones. Cyclones in different times killed many Rakhains but many survived and are still living. Through the experience of facing many cyclones, the Rakhains of the coastal area have developed various strategies to survive and face cyclones: to save life, to protect their houses, cattle, grains, valuable items and live the post disaster period when there is no food, no water, no medicine for the injured.

Hassan (2000) has developed a framework to analyze survival strategies of people to face cyclones:

Figure 2.3.1. Pre-cyclone Adaptation



LONG-TERM ADAPTATION

Structural Preparedness: *Eing*: A structural Protection

Almost all indigenous people around the world have their own distinctive housing pattern which protects them from all types of natural and environmental hazards. The eco-friendly house (*eing*) of the Rakhains helps them to sustain against major damages during cyclones. The Seminoles of the North America also have a special housing structure (*Chickee*) that protects them from hurricanes (Hassan, 2004).

The Rakhains have their own system of building and constructing houses which is environmentally and ecologically safe and sound. For several hundreds of years, the Rakhains are strictly following their indigenous prescription of house constructions.

Rakhain houses are constructed at 65 inches above the base platform. This was primarily because Rakhains had to face various wild animals and snakes when they first settled in the coastal areas. These types of houses on higher platforms helped them to keep themselves off the ground and wild animals.

As time passed, the Rakhains observed that this housing pattern is very well adapted to the local environment to sustain against such geo-climatic factors as flood, cyclones and tidal surge. As the Rakhains living in the coastal belt are familiar with recurrent cyclones, the Rakhain houses are constructed in a way that allows the strong wind to freely pass across and ventilate out with few obstructions. The Rakhains of the study area are very aware of the fact that if the wind flows easily without any obstruction, there is less chance of house damage and the house platform being higher than the ground helps them survive

during tidal surges. They can hold on to the logs and tie their children with the logs; and during higher tidal surges, they can dismantle some parts of the roof and take shelter over the roof to survive. This is evident from the following comments:

”When cyclone “Sidr” attacked we all went to the second floor and opened all the windows so that winds can easily pass through”, Male: 70.

“During the cyclone of 1965, my father tied me with a log on the first floor of the house and I survived the tidal surge”, Male: 56

From the above statements, it is evident that the traditional Rakhain houses give the Rakhains a structural advantage when facing cyclones. This knowledge passed on from one generation to another and they are very inclined towards such houses.

Rakhain houses are mostly two-storied. However, some houses are three storied (houses of the wealthy) and there are also a few one storied houses like traditional Bengali houses and the Rakhain people who build such houses said that they are not making traditional houses because it is very expensive to build such houses. Another reason is that the traditional materials such as “loha” (Prain) or “Shal” (Dosti) which were used to build houses, are not easily available these days.

Photo 2.3.1 (a): A Three storied Rakhain House



Photo 2.3.1(b): Rakhain House constructed like Bengali Houses



In the study area, one more type of Rakhain houses (government sanctioned) were found which are structurally like the traditional Rakhain houses but not in terms of material of the house (photo: 2.3.1 (c)). These houses are made of concrete, steel and wood. This new type of house gave some structural advantages like their traditional houses but the space utilization is not the same as the traditional houses. For example, previously they had a cooking place at the first floor of their house, but in this new house they have attached toilet in the first floor now.

Photo 2.3.1 (c): New style of Govt. Sanctioned Rakhain House



The Scientific validity of traditional Rakhain housing technology is evidenced by certain similarities with the cyclone shelters in the coastal area of Bangladesh. The following two photos illustrate them.

Photo 2.3.1(d): Traditional Rakhain House



Photo 2.3.1(e): A Cyclone Center in Kuakata



An accurate perception and prediction of a cyclone always reduces the extent of loss, particularly human lives, allows escape from huge loss due to cyclones. The Rakhains are prepared structurally.

***Aepong Re*: Trees around Rakhain houses**

Traditional Rakhain houses help them to survive cyclones but the trees (*Aepong Re*) (Photo: 2.3.1 (f)) around their houses gives the following advantages:

Photo 2.3.1 (f): *Aepong Re*: Trees around Rakhain Houses



Photo 2.3.1 (g): Trees around Human Settlements in Coastal Areas



- Trees around the houses reduce the speed with which the wind hits the house.
- It prevents the water from hitting directly during tidal surge.
- Sometimes when people fall into the water during a huge tidal surge, these trees help them to survive if someone can hold on to the trees.
- Trees, especially coconut trees, help them with drinkable water during water crisis after cyclones.

The Rakhains’ knowledge about the advantages of planting trees around houses is evident from the following comment:

“I was in water when the first wave hit our house and I saved myself by holding onto a coconut tree”, Male: 76

“If someone falls into the water during a tidal surge, there is no way to survive if someone cannot find any tree or any other material to float or just to hold on to” ,Male: 74

“During the cyclones of ‘60 and ‘65 lots of people died, but during Sidr of 2007 lesser number of people died. One of the reasons of this is the trees around the whole village which were not present earlier”, Male: 65

The validity of this knowledge is supported by the tree plantation around coastal region by the Forestry Department of Bangladesh Government (Photo 2.3.1 (g)). The practical use of such trees around houses and villages was exemplified in 2007 during cyclone “Sidr” when the mangrove forest, the Sundarbans, reduced the intensity of the cyclone and helped on a large scale to reduce human causality and other damage when it reached human settlements.

SHORT-TERM ADAPTATION

Traditionally, Rakhains have used traditional knowledge to understand weather and climate patterns, in order to make decisions on survival in the face of cyclones. But with the development of communication systems, spreading government safety nets and other socio-economic factors, they have evolved some of their coping strategies.

Survival strategies taken in pre cyclonic periods are to minimize loss and to ensure that they could survive the *during* and the *post* disaster phases well. The problems and their strategies can be seen in Figure 2.3.1 and a detailed description is provided in the following sections.

Figure 2.3.1: Pre Cyclone Adaptation

| | |
|-----------------|--|
| <i>Problem</i> | Valuable items, domestic animals, food, women and children, crop in the fields |
| <i>Strategy</i> | Hiding valuable items under earth, letting the domestic animal free, keeping food in higher places of house, harvesting crops, moving women and children to safer places |

Source: Fieldwork, 2008.

2.3.2 Coping with *During* Disaster Period

The Rakhains have strong group cohesiveness and when a cyclone strikes, they not only think about personal safety but also try to protect family and sometimes give shelter to community members. But when in disastrous situations, for example: when the tidal surge hits them and sucks them into the water, personal survival strategy dominates because according to them if personal safety is not ensured they cannot help others. But sometimes, although they are in trouble themselves, they tend to try to save their children. These findings are somewhat consistent with the people of Maheskhali, who themselves face numerous cyclones themselves (Hassan, 2000). The mixture of their egoistic and altruistic behavior will be more evident from the sections below.

Figure 2.3.2: Coping With *During* Disaster Period

| | |
|-----------------|---|
| <i>Strategy</i> | Self-protection, or, protection of own family, gives shelter to others, mostly relatives |
| <i>Shelter</i> | Higher places, strong traditional houses, trying to leave for safe places at inner & higher part of land, roof of the houses, cyclone centers |
| <i>Problems</i> | In accuracy of warning signals, dress/hair, swimming, huge tidal surge, different types of material coming with great speed with the water, problem of robbery. |

Source: Fieldwork, 2008.

2.3.3 Coping with *Post* Disaster Period

After a cyclone, normally the whole area is destroyed. At this stage, the strategies are more concerned with surviving. These strategies are qualitatively different than the *pre* and *during* disaster periods. Whereas in *during* disaster phase self protection instinct dominates, in this stage one can see their group cohesiveness.

Figure 2.3.3 gives an idea of the problems in this period and how the Rakhains resolve them. A detailed description also follows.

Figure 2.3.3: Coping *Post* Disaster Period

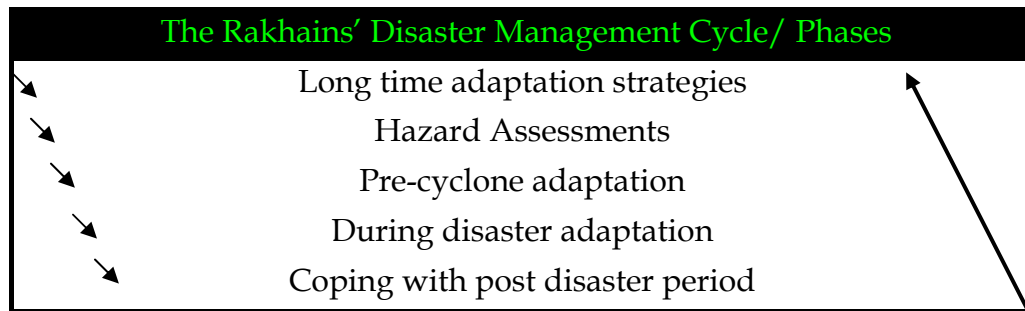
| | |
|-----------------|--|
| <i>Problems</i> | Lost relatives Water crisis Disease/Injury/Food/Shelter |
| <i>Resolve</i> | Looking for kins Coconut, Banana tree, tubewell, river water, collecting water from distant places, water by digging sandy sea beach. Home made medicine/Medicinal plants/fruits/ till outside help All problems are solved by the community together |

Source: Fieldwork, 2008.

2.4 Disaster Management Cycle

The Rakhains in the study area possess and follow a disaster management cycle which can be defined as:

Figure 2.4 (d): Rakhains' Disaster Management cycle/phases



(Fieldwork, 2008)

In the study area, among the Rakhains a well-developed disaster management strategy is identifiable. They make hazard assessments and adapt with the pre-cyclone period accordingly. During the disaster phase, the Rakhains with their traditional indigenous knowledge are more apt to survive and have some distinctive advantages over others to survive. Their adapting strategies with the post disaster situation are also very useful which has been proved by their survival of many mighty cyclones and their long time adapting strategies have some scientific validity also.

Box 2

Surviving a Cyclone

Aung La Chin, Male: 76, He has memories of previous cyclones like those of 1960, 1965 and 1970. During 1960s there was no embankment around the area where he lives, so any cyclone and tidal surge badly affected the area. During the cyclone of 1960 he says first two waves of tidal surge dismantled his house and with the third wave he was into the water and to survive he put off his clothes early before the tidal waves hit the area. When he was in the water, he said he had to be attentive to miss all the material that was coming with the water, as any of those could kill him if he got hit. He finally survived holding onto a coconut tree. When the cyclone was over, he says what he wanted most was drinking water and as saline water contaminated all the available water sources, he had to chew on the branch of a banana tree to get the liquid and survive.

Source: Case Study in *Kuakata*, 2008

Figure 2.4 (e): A detail of Rakhains' Disaster Management Cycle/ Phases is presented in the following:

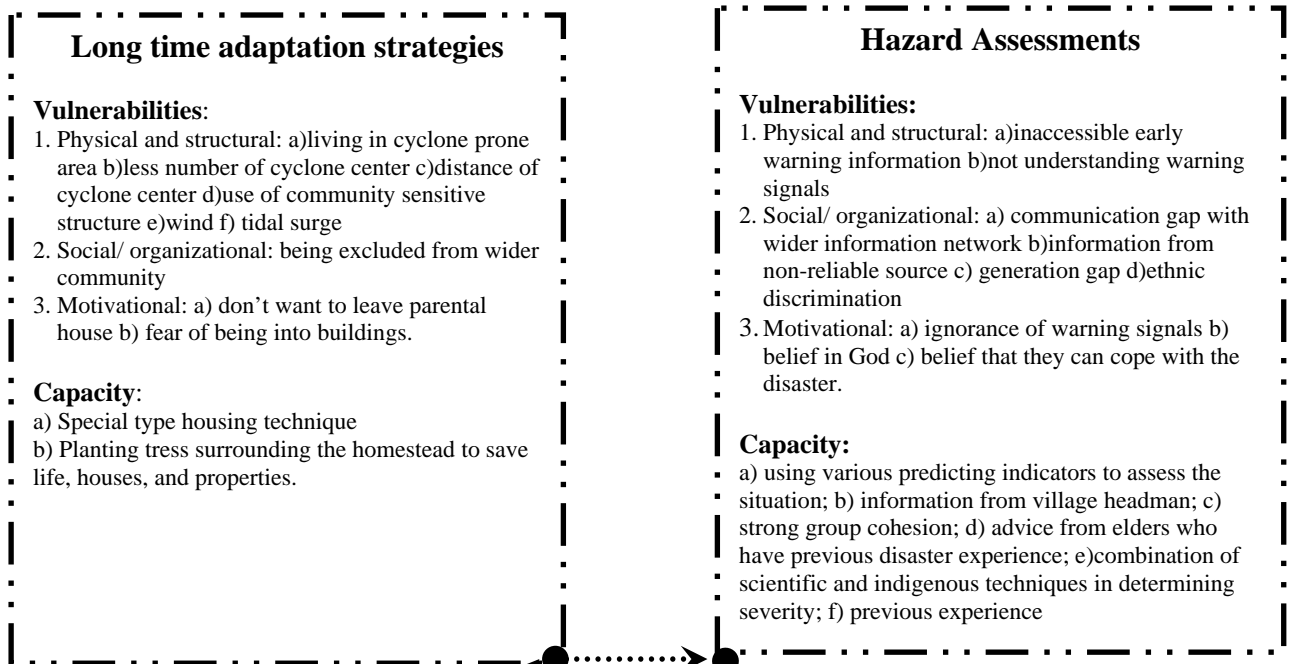
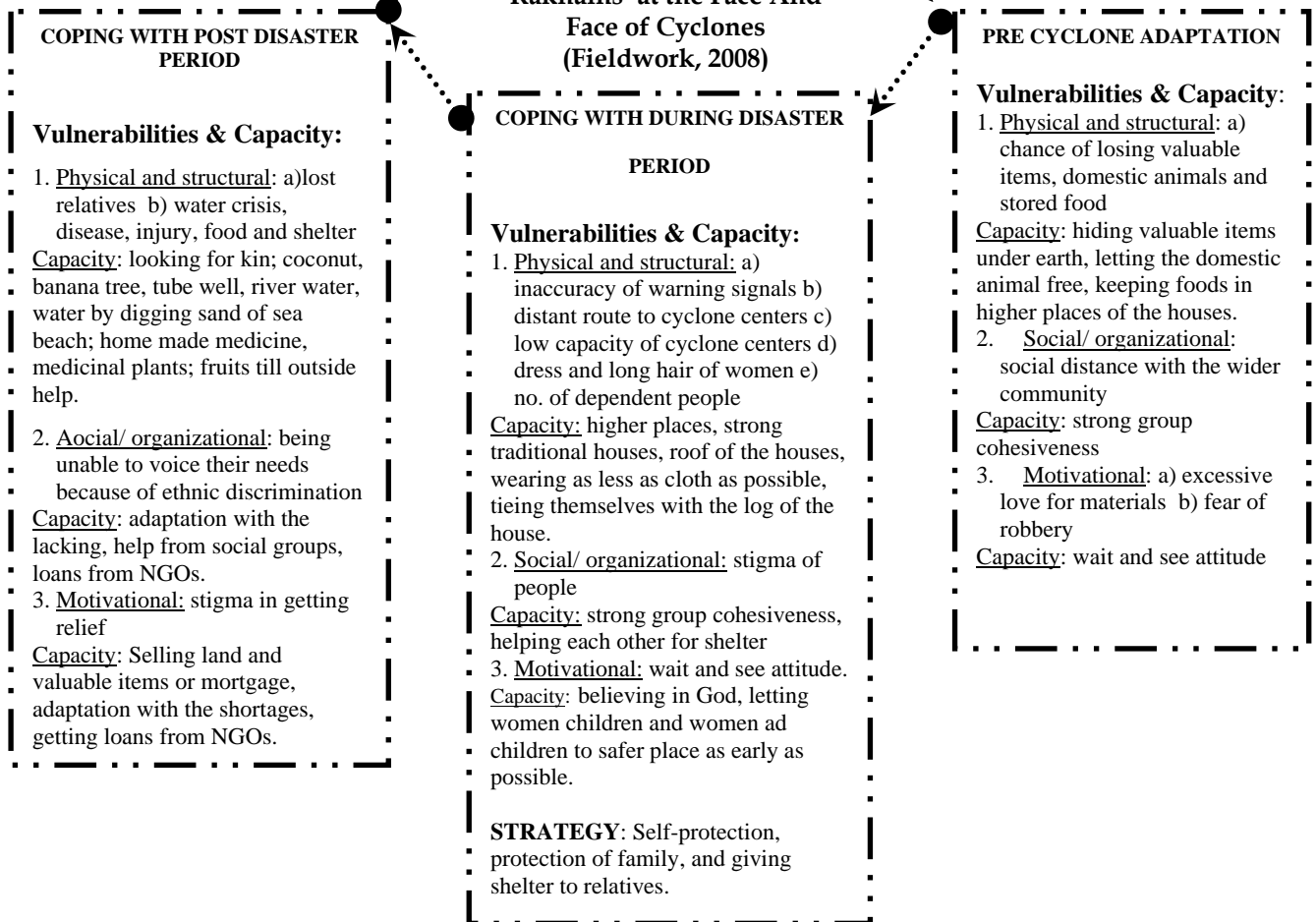


Figure 5.5 (e): A Detail of the Disaster Management Phases/Cycle of the Rakhains' at the Face And Face of Cyclones (Fieldwork, 2008)



2.5 Rakhains' Knowledge about Cyclone and Transfer of Indigenous knowledge to the Following Generations

The Rakhains are the early settlers of the coastal areas of Bangladesh (Khan, 1999). They started living in this area when there were no modern technologies available. Living in a cyclone prone area gifted them with a unique knowledge to read weather. These traditional skills have been acquired by later generations from distant ancestors and are being transmitted from generations to the next through oral tradition.

"This is the age of machines, people have different machines to read weather but we have learnt through experiences when to get ready for cyclones", Male: 54

"When cyclones occur, wind starts from north east and gradually turns towards the South East, I have learnt this from my grandfather", Male: 65.

2.6 Generation Gap in Perceiving Cyclone

Almost everyone can anticipate cyclones when there is wind blowing from the east regardless of age and sex but in Maheshkhali this knowledge was possessed only by the males (Hassan, 2000). There are a lot of other indicators which are used by the Rakhains to predict cyclones which are not familiar to women and to young males. Women depend on male members of the family for decisions.

"We are always busy with work so only can anticipate cyclone if wind blows from east": Female: 35

"We did not know how a cyclone looks before Sidr": Female: 32

"No cyclone occurred for many years so people could not imagine something like "Sidr" could happen": Male: 25

"On the day "Sidr" attacked my husband said: today a cyclone may hit do your work quickly and go to cyclone center": Female: 60

"Young people have not seen cyclones of 1960, 1962, 1965, they don't know what happens during cyclones, only we elders know": Male: 74

As there were no big cyclones in *Kuakata* in the recent past, people are becoming ignorant about the various indicators used by previous generations to predict cyclones. Also, many young people have not seen any big cyclone before the "Sidr" as they do not usually have any regard for other indicators of cyclones forming other than the wind from the east. They generally see this during the smaller storms and learn from elders. But there is little evidence that it is being passed on to younger people, who have not had experienced a really serious disaster before cyclone "Sidr".

The indigenous techniques which the Rakhains used during cyclones in the early years of their settlements and afterwards, when the communication system was not as good and relief did not appear long after the cyclone hit are perceived as obsolete by others nowadays. This type of indigenous predicting indicators and their uses are regarded as 'old- fashioned' and are being superseded by newer scientific systems in other coastal chars of Bangladesh too (Howell, 2003). But the validity of their weather predicting

knowledge and survival strategies is evident in their everyday lives in a place where cyclone hits have been common for many centuries.

2.7 Rakhains' Belief in their knowledge and Perception about Warning Signals

Rakhains are living in this cyclone prone area for centuries (Khan, 1999) and this has enabled them to predict cyclones. They have learnt from the ancestors and they believe in their knowledge. However, because cyclone "Sidr" crossed the coast after many years since the last big cyclone hit, they did not observe the weather change that closely. Only later did they realize all the changes in the environment taking place.

Older people in the study area did not believe, in general, the cautionary warning signals because there were some signals in the past which did not come out to be true. So although various organizations like Red Crescent and Heed Bangladesh were disseminating warning signals and pursuing people to go to cyclone centers, they were reluctant to go as they believed it will be like numerous other cautionary signals. Only when the sea water was about to cross the "wapda" embankment did they hurry to safety.

Young people on the other hand, although dependant on cautionary signals to know about the condition of weather, also did not have high regard because of the poor accuracy in predicting cyclone hits.

On the other hand, women of all ages did not bother at all about warning signals whether they hear the cautionary signals or not. They depend on the male members for decisions on safety, whether to go to cyclone centers, or to other big strong house or to remain at home.

Section 3

3.1 Impacts of Cyclone "Sidr"

Cyclone "Sidr" inflicted heavy damage on property and infrastructure in up to 30 districts in Bangladesh on 15 November 2007. The destruction affected approximately 8.9 million people, resulting in large-scale humanitarian needs in the country (MoFDM, 2008).

Hazardous process of all types can have primary, secondary, and tertiary effects (Nelson, Stephen A., 2007).

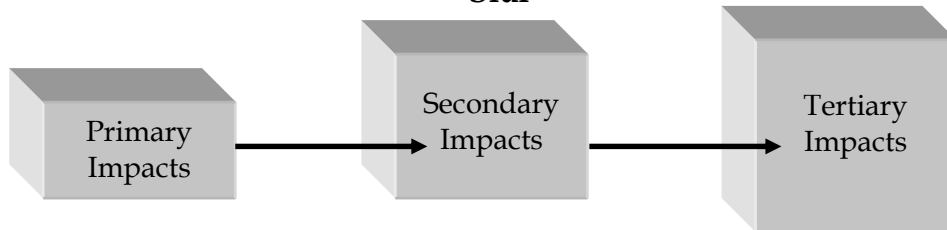
Primary Effects occur as a result of the process itself. For example water damage due to a tidal surge, and collapse of houses due to a cyclone, earthquake, landslide, hurricane, or tornado.

Secondary Effects occur only because a primary effect has caused them. For example, damaged infrastructures and other facilities due to cyclone and tidal surge, fires ignited by earthquakes or volcanic eruptions; disruption of electrical power and water services as a result of an earthquake or flood, and flooding caused by a landslide moving into a lake or river.

Tertiary Effects are long-term effects that are set off as a result of a primary event. These include things like loss of houses caused by a cyclone, and permanent changes in the occupation.

Effects of the “Sidr” will be described following the framework below:

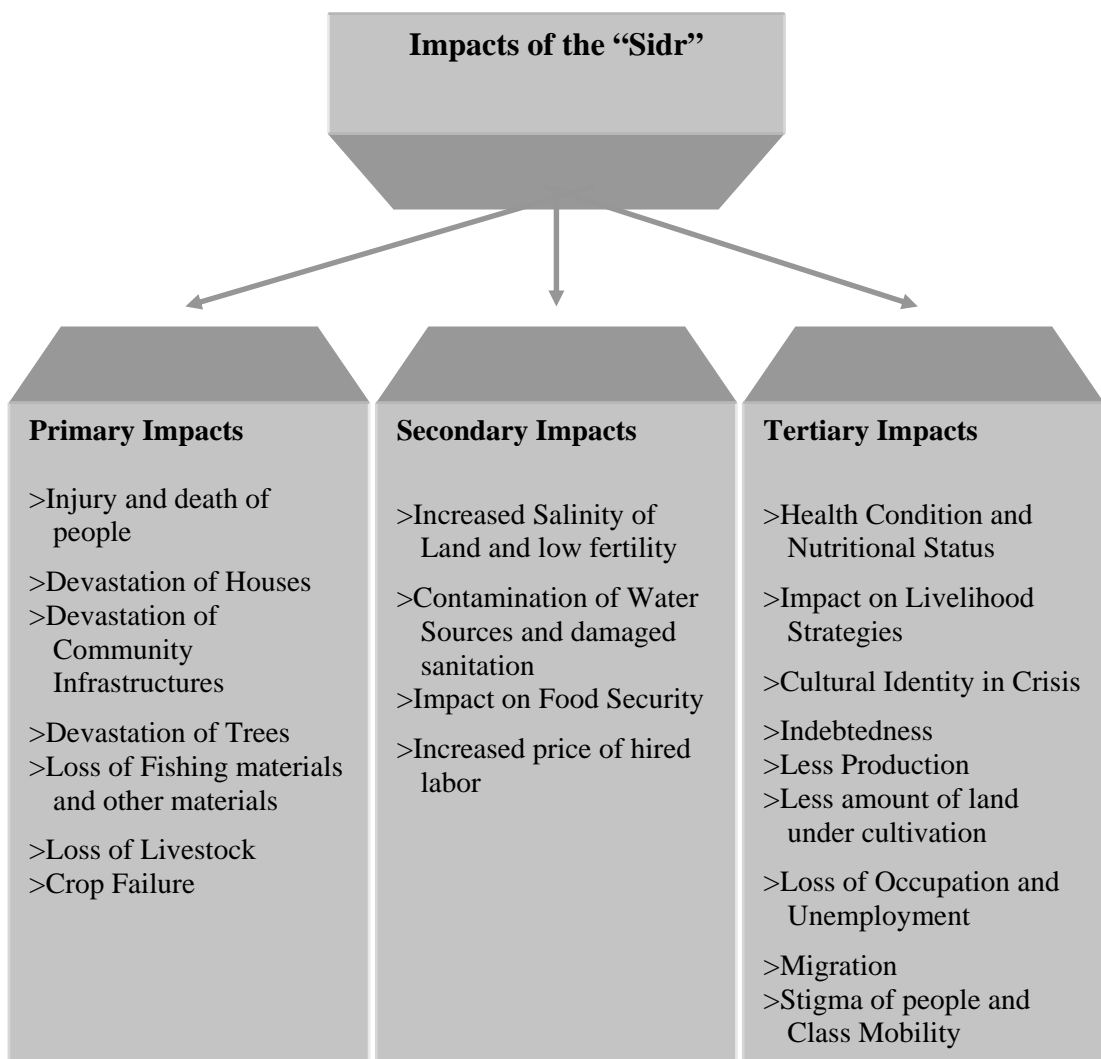
Figure 3.1 (a): Impacts of the “Sidr”



The following figure 3.1 (b) gives a detail of the primary, secondary, and tertiary impacts of the “Sidr” on the Rakhains:

Figure: 3.1 (b): Primary, Secondary and Tertiary Impacts of the “Sidr”

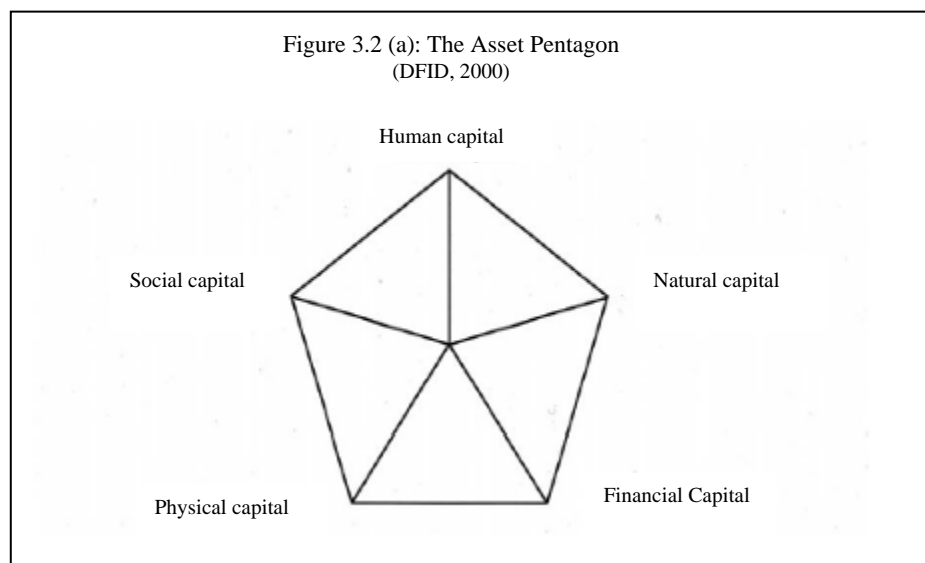
(Fieldwork, 2008)



3.2 Impacts on Livelihood Strategies

A livelihood comprises of the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resources base (DFID, 2000).

The livelihood assets can be visually expressed as an asset ‘pentagon’ showing the different types of assets and important interrelationships between them. The cyclone “Sidr” had a direct impact upon Rakhains’ assets and livelihood options that are open to them.



Cyclone “Sidr” had directly affected natural, physical, and financial assets of the Rakhains’:

Mostly Rakhains are agriculturalist and fishermen. Cyclone “Sidr” directly affected both. Firstly due to the wind and water surge many fishing boats were destroyed and fishing nets were lost. When cyclone “Sidr” attacked saline water and sand with the surge came and damaged the agricultural fields. And they did not get the only crop of the year (Damage of natural assets). Financial assets were damaged because of damage of houses, lost crop and had to buy food to feed themselves (despite relief). Crop failure resulted in loss of investments made in the production process. Physical assets were also directly affected by the cyclone as loss of livestock, equipment such as tractors, other infrastructures like damaged embankments and roads.

Figure 3.2 (b) will illustrate the impacts of the “Sidr” on Rakhains’ livelihood assets:

Figure 3.2 (b): Damage to Livelihood assets

| Capital | Impact of the “Sidr” |
|------------------|--|
| <i>Human</i> | <ul style="list-style-type: none"> • Injury • Weak physical state • Mental stress |
| <i>Social</i> | <ul style="list-style-type: none"> • Everyone is affected so none is there to help |
| <i>Physical</i> | <ul style="list-style-type: none"> • Loss of fishing boats, nets and other materials • Damaged crop land due sand which comes with storm water • Loss of standing crop • Damage of agricultural tools and livestock |
| <i>Natural</i> | <ul style="list-style-type: none"> • Contamination of water resources • Damage to trees • Loss of soil fertility due to water surge |
| <i>Financial</i> | <ul style="list-style-type: none"> • Damage of houses, and other materials • Had to spend money on treatment • To payback loan • To buy foods • Loss of investment in agriculture, fishing, and other livelihood strategies |

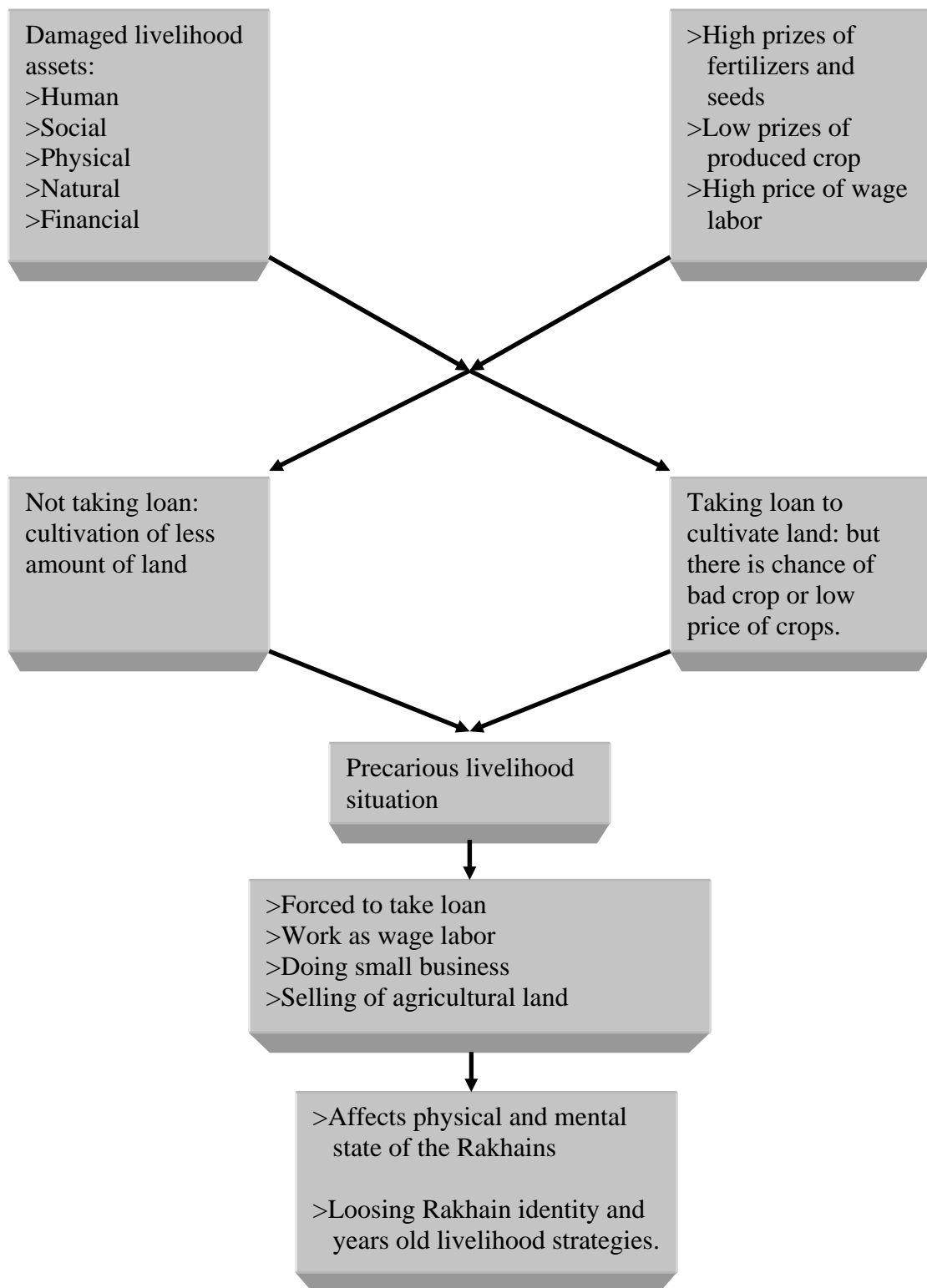
(Fieldwork, 2008)

But this damage is not separate. It is interrelated and making the Rakhains more vulnerable in terms of their livelihoods day by day; for example, at first due to the “Sidr” they lost their crop and fertility of land (natural assets), also physical equipments for production, and were in financial crisis due to severe loss of properties. This was the immediate situation but after more than one year this situation is becoming worse instead of improving.

Firstly due to saline water, the next crop was not good. The rate of fertilizers and other important materials for production were costly but the yield of rice fell, so their financial assets were damaged further. After cyclone “Sidr”, human labor for cultivation becomes expensive because due to relief the poor people started to raise their daily wage rate but the Rakhain farmers needed human labor for cultivation. They are now short of both financial and human capital and there was damaged natural capital already. Their social capital was also damaged because of the cyclone “Sidr” because everyone was affected by the cyclone. They can get loan from various NGOs which started micro credit programs after the cyclone. But they do not want to get loans because due to the higher wage rate of the laborer and fertilizers and lack of good seeds (due to the cyclone) they feel it is risky to cultivate and so they might not get their investment back. They are reluctant to cultivate lands.

The people are also in danger of losing lands as they took loans through mortgages. They will start losing lands as a result of not being able to return installments in due time. After the cyclone “Sidr”, there remains a precarious situation which is affecting Rakhains’ livelihoods severely. The whole process is described in the Figure 3.2 (c):

Figure: 3.2 (c): Process of Change among the Rakhains' in livelihood Strategies and Identity after the "Sidr"



(Fieldwork, 2008)

Box 3
Precarious livelihood

Chan Than, Male: 40; lives in the *Monu khe para* of Taltali. He did not witness any big cyclones before the “Sidr”. He reported that the cyclone had devastating effect on his livelihood. He is an agriculturist and also does some fish farming. He said the cyclone “Sidr” pushed him into a downward spiral of poverty. Firstly, when the cyclone “Sidr” attacked, saline water and sand with the tidal surge damaged the agricultural fields. He did not get the only crop of the year. Financial assets were damaged because of damage of houses, lost crop and therefore had to buy food to feed his family. Crop failure resulted in loss of investment made in the production process. But this damage is not separate. It is interrelated and making him more vulnerable in terms of his livelihood day by day. First, due to the cyclone “Sidr” he lost the crop and fertility of land, also physical equipments for production, and was in a financial crisis due to severe loss of properties. This was the immediate situation but after more than one year, this situation is becoming worse instead of improving. Saline water ensured that the next crop was not good. The price of fertilizers and other important materials for production was dear, but the yield of rice was low so his financial assets were damaged further. After the cyclone “Sidr” human labor for cultivation became expensive. Due to relief, the poor people started to raise their daily wage rate but the Rakhain farmers like him needed human labor for cultivation. Now, he is in short of both financial and human capital and there was damaged natural capital already. His social capital was also damaged because of the cyclone “Sidr” as everyone was affected by the cyclone. He, like many others, can get a loan from various NGOs which started micro credit programs after the cyclone. But he does not want to get loan because of the higher wage rate of the laborer and fertilizers and lack of good seeds (due to the cyclone). He feels it is risky to cultivate. He might not get his investment back and so he is reluctant to cultivate the lands. And now he is also in danger of losing lands as he took loans through mortgages and will start losing lands as a result of not being able to return installments in due time. He says after the cyclone “Sidr”, there remains a precarious situation which is affecting Rakhain livelihoods severely.

Source: Case Study in *Kuakata*, 2008

3.3 Cultural Identity Crisis

Traditionally Rakhains have their own distinctive housing pattern which protects them from all types of natural and environmental hazards. Their special type of housing structure helps them when faced with floods and cyclones and also performing economic and professional activities. But after cyclone “Sidr”, which damaged most of the houses. They were provided houses by different NGOs. The NGOs did not consider their traditional housing tradition while constructing new houses for them. The houses that were provided are mostly like Bengali traditional houses.

The Rakhain houses constitute four principal clusters with three sub-clusters. The four principal clusters, ordering from entrance to kitchen, are:

1. *chowa*: drawing room
2. *produng*: prayer room
3. *angthay*: bed room only for young girl or newly married couple
4. *negphoi*: master bed where generally parents of the family live.

The other clusters of Rakhain house are:

1. *Khuikkadon*: A little place for keeping shoes.
2. *Berenda*: a room for drying cloths and gossiping place for leisure time which is connected with the *chowa*.
3. *taamusake*: kitchen that is usually connected with the *nagphoi*.

Generally, the toilets are kept outside the main premise, which is called *Chepontha*.

But the newly built Rakhain houses do not possess these special features. The new houses are built on a mud base not on a high platform of wooden logs. The interior also has no such distinction between different parts. The houses have got two parts and a dining place.

According to Rakhain tradition, all children have equal right to their parents’ wealth and assets. But after cyclone “Sidr” mostly the houses were sanctioned in women’s names.

Photo 6.1.3.3: Traditional Rakhain house on the right and newly built house on the left



3.4 Rakhains’ Struggle to Cope with the Vulnerabilities Created by “Sidr”

The vulnerabilities and capacities of the Rakhains to cope with the existing vulnerabilities after the Sidr are shown in Figure 3.4:

Figure 3.4: Vulnerabilities of the Rakhains Due to Cyclone “Sidr”

| | Vulnerabilities | Capacities |
|----------------------------------|---|--|
| Physical/material | Damaged embankments | Govt. started to rebuild in some areas |
| | Damaged infrastructures | Govt. started to rebuild in some areas |
| | Land Erosion | No specific measures taken yet |
| | Uprooted Trees | Planting new trees |
| | Salinity of land | Specific varieties of crop cultivation |
| | High rate of hired labor | Working on land by themselves, less amount of land under production |
| | Crop failure | Loan from various NGOs, land mortgage, land selling |
| | Indebtedness | Selling land or taking more loans from various NGOs |
| | Unemployment | No specific capacities |
| | New type of housing | Adjusting to the new type, losing their own cultural identity |
| Social/ organizational | Ethnic discrimination | Strong group cohesiveness |
| Motivational/ attitudinal | The thinking that cyclone will strike again | Building cyclone resistant houses and belief in their ability to survive cyclones in the future. |

(Fieldwork, 2008)

Section 04

4.1 Recommendation

To reduce the damages from cyclone, counter measures are in practice. The interrelationships of all the problems related to cyclone disaster mitigation are so complex that they need an integrated approach. One of the objectives of this paper is to make suggestions to increase the effectiveness of the counter measures in the future, incorporating the indigenous knowledge of cyclone prediction and disaster management.

To mitigate the sufferings of the people from the devastation of cyclones and tidal surges, several approaches such as: (a) Cyclone Forecasting and Warning, (b) Cyclone Shelters, (c) Post Cyclone Relief and Rehabilitation are currently in practice in Bangladesh.

On the basis of the findings of this research the following recommendations for taking structural and non-structural measures are made, which can be utilized to reduce cyclone damage:

Forecasting and Warning System

One of the most effective countermeasures for the reducing damage caused by cyclones is the establishment of an early warning system. By predicting the possible occurrence of cyclones, its destructiveness may be minimized. In Bangladesh the cyclone forecast is generally the responsibility of the Meteorological Department. The forecast is transmitted to the radio and television station and the Warning is disseminated through a Comprehensive Cyclone Preparedness (CPP) programme. This programme is jointly operated by the Bangladesh Red Crescent Society and the Ministry of Relief and Rehabilitation.

The cyclone warning system, which is prevailing in Bangladesh, based on signal numbers up to 10. This system is cumbersome. It has been found that nearly all the Rakhain people in the study area had heard the cyclone warning at least 8-10 hours before the cyclone of November 15, 2007 struck. But, very few responded in any way, before escaping was difficult because of cyclonic winds or the water was upon them. People had no clear idea of the meaning of the signals. For those who have experienced previous cyclones in the area, previous signal 10 storm warnings were associated with some flooding at a level not much above normal so special behavior was not required. The ability to motivate people to respond to a once in a decade event is a major challenge. The group who decided to stay at home was at the highest risk of deaths and injuries from the cyclone, the factors responsible are: no information or late information regarding the impending cyclone, relative distance of the shelters from home and lack of cyclone experience. More research is needed to establish all the reasons for ignoring warning, which may relate to religious and traditional beliefs but sometimes are for practical reasons such as fear of robbery.

The warning system on the basis of forecast should be disseminated in a language that can be easily understood by the general people. Because it is commonly believed that public in general does not respond to warning signals during cyclones and do little to prepare in advance. If experts want to change the way people prepare for natural hazards, they must make a greater effort to understand community perceptions and expectations, to be able to target different sectors of the community with appropriate information.

Cyclone Shelters

To prevent or mitigate the loss of human lives and to livestock and poultry, the cyclone shelters can play the most vital role. After the cyclone of 1971, a number of cyclone shelters were constructed in the coastal areas. These are not sufficient in number and are not properly designed and located (although nowadays the situation is improving). But many people could not use these shelters because the access roads were flooded.

In the study area along with usual cyclone centers, many other pueblo buildings (e.g. schools, clinics, mosques) and private brick built homes served to shelter people during

the cyclone. But the Rakhain people face problems in these too as for ethnic discrimination they could not take shelter along with the Bengali Muslims in many cyclone centers, private cyclone resistant houses and mosques. It has always been a problem for the Rakhains and because of these they sometimes exclude cyclone centers as an option for safety.

Drinking Water and Sanitation

Similar to other infrastructures the cyclone normally causes serious damages to the water supply and sanitation system. The tube-wells are broken or partially damaged and become unusable due to submergence. Ponds are contaminated by the onrush of saline water and sludge. The Rakhains traditionally use pond water for drinking. Therefore, after the cyclone there is a serious crisis of drinking water and an outbreak of waterborne diseases is very common. People in the affected areas use water from this contaminated pond indiscriminately. As a result, they have become vulnerable to diarrhoea and other water borne diseases. Therefore, post cyclone diarrhoea and other common water borne diseases are the major causes of death and casualties associated with the cyclone.

A large number of casualties occur from the post cyclone water borne diseases. To mitigate the post cyclone sufferings and loss of lives, the water and sanitation sector should be given proper care. The tube-well installation should be made in such a place and elevation that these will not go underwater during the cyclone and can be recovered immediately after the cyclone. A provision should be made to store the drinking water on the basis of early cyclone forecasting and warning for use during *post* cyclone period. Ponds should be protected by raising the embankment of the ponds above the level of storm surge.

Relief and Rehabilitation

Extensive relief and rehabilitation programmes from the Government, NGO's and International Organizations have been launched after the November 15, 2007 cyclone. But initially the programmes suffered from poor transport and communication due to severe damage to roads and the telecommunication system. The transport system in the coastal areas should be planned in such a way that during the storm surge, the system faces minimum damage and can help in breaking the impact of water flow during the tidal surge.

Sufficient amount of relief material came into the locality from various government and non-government organizations. But there were shortcomings in the distribution processes. For instance, all the rehabilitation programs were launched to help the extreme poor but the people (most of the Rakhains are agriculturalists and some are involved in other activities) who lost the most, were out of focus. If said in their voice it goes like: *the people who can ask for help got help, those who had nothing gained more, those who did not lose anything but gain everything want more and more cyclones. On the contrary the people who had something, lost everything and got nothing and now have nothing to live upon and they are always out of focus.* Thus, Bangladesh needs a better plan to incorporate all the sufferers from cyclones under a well managed relief and rehabilitation programme. And the higher level officials should take into account two more facts in relief distribution and programming: (a) when there is a lot to give through relief to the sufferers it has to be properly monitored as it was found that local NGOs were accused of

taking bribes in distributing relief products especially in case of house construction because the houses cost around 50-60 thousand taka. They took some money in return of sanctioning the houses; (b) also to be taken into account is that all the ethnic communities have their traditional cultural heritage and this can be evident from the special structure of houses but after the cyclone hit November 15, 2007 the Rakhains were provided with houses which are not like their traditional houses and were more like the Bengali Muslim houses. To keep protecting the cultural tradition of the Rakhain the government needs to take proper initiative.

4.2 Concluding Remarks

The Rakhains' perception, prediction and survival strategies are an area of interest in this paper. The ways in which the natural disasters (cyclones) are perceived, predicted and responded are part of their unique social, economic and cultural situations in which the Rakhains find themselves. Rakhains take all aspects of their social, cultural and environmental circumstances into account as well as a series of risk-related factors in responding to cyclones. And their perceptions have geographical, social, economic, cultural and factors such as the magnitude of the consequences of the hazardous events, the cost and availability of alternatives, the degree of the perceived control over the consequences, the degree of personal exposure and other social costs and benefits. Thus it is important to explore the rationale of their actions for effective disaster management planning and programming input at the local and national level.

Annex - 1

Selection of the Study Area

There were three main predefined priorities: (a) indigenous ethnic communities; (b) coastal region; and (c) impact of the “Sidr”. Keeping these in context, on the basis of secondary information, Rakhains of the Patuakhali district were selected for intensive in-depth investigation. The selection of the study was done following the information below:

- a. This area was having the experiences of cyclones repeatedly for long time. Almost every cyclone that passes Bangladesh damages the selected area.
- b. Among the indigenous ethnic communities of Bangladesh only the Rakhains live in the coastal region in a considerable number.
- c. The Rakhains lived in the selected area since 1789 (Khan, A. M, 1999:50) and thus have faced numerous cyclones and possess extended knowledge about cyclone prediction and survival strategies.
- d. The selected study site was almost on the coast, which made it vulnerable for living and the Rakhains maintain their unique lifestyle to cope with cyclones and determine indigenous survival strategies.
- e. The Rakhains were also dependent on the sea for their living, being fishermen for long and this made them more experienced in reading sea behavior before and during cyclones.

Method of data collection

The study mostly relied upon qualitative data and information. In order to achieve the objectives of the study, data have been collected from both primary and secondary sources. Primary data have been collected through field visits which are mostly qualitative. Secondary data are obtained from reports, journals, research papers, and books. Information on relevant issues is collected from websites available on the internet.

Relevant information on the concerned issue has been collected through in-depth, key informant interviews and group discussions with the local people were also carried out. Primary data and information collected through questionnaire have been summarized and analyzed for the purpose of the study.

Method of data processing

Qualitative data collected from in-depth interviews have been analyzed to identify the indigenous knowledge used by the Rakhains in predicting the occurrences of cyclone and also to survive the post disaster phase before any institutional help arrives. Associated case studies were incorporated to describe survival strategies and the impact of cyclone “Sidr”.

Annex –2

Interview Schedule

- ❖ Socio-economic condition of the Rakhains
- ❖ Rakhains perception of cyclone
- ❖ Perception about the causes of the cyclone “Sidr”
- ❖ Predicting indicators used by the Rakhains to predict cyclone formation
- ❖ Indicators used by the Rakhains to predict the formation of the cyclone “Sidr”
- ❖ Survival Strategies at the pace and face of a cyclone
 - Strategies to protect life
 - Strategies to protect assets
 - Strategies to survive the impact of cyclones
- ❖ Sectoral impact of “Sidr” on the Rakhains
- ❖ Vulnerabilities created due to cyclone “Sidr”
- ❖ Rakhains’ perception of warning signals

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