Influence of Natural System and Development Features on Cyclone Aila's Impact in the South-west Coastal Region of Bangladesh

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Abstract

This paper aims to examine the extent of destruction caused by Cyclone Aila in south-west coastal zone of Bangladesh, as well as to identify the role of natural system and development features in determining the nature of the impact. The study is purely based on the opinions of those affected by the Cyclone Aila. A questionnaire survey was being conducted in 13 villages of Khulna, one of the severely affected district of Aila. The study reveals that, the presence of Sundarban forest, sea grass and convex coast are assumed to top the list of natural system responsible for minimizing both the death toll and house damages. On the contrary, rivers and concave coast are thought to exacerbate these affects.
None of the development features has been presumed to enhance the death toll or house damage, however, roads, polders/embankments and housing are perceived to have significantly lessen the destruction.

Keywords: Natural System, Development Features, Perception, Cyclone

Introduction

On 25th May, 2009 a disastrous cyclone, Aila, swept through the south west coastal region of Bangladesh taking away lives of 111 people, injuring 6,600 and making 500,000 million people homeless (United Press International, 2009; Telegraph, 2009). The aftermath of the disaster was massive. Several villages were inundated by a storm surge of 3m, houses and infrastructures were wrecked and an outbreak of water borne diseases occurred, infecting thousands of people. The calamity brought long term distress to the indigent people of the affected area.

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For a disaster-prone country, like Bangladesh, the situation is not new. Almost 26.7% (BBS, 2011) of the country's population resides in the coastal zone and they are accustomed to facing the harsh consequences of natural disasters like cyclone, flood and heavy storms frequently. However, the rural subsistence community of coastal Bangladesh are well known for their fearless capability to fight against these disasters and thrive in such vulnerable situation. Thus their perception on the environment they live in and the disasters they confront can be an important means to assess many aspects of a disaster.

Many researches has stressed on the importance of using community's knowledge along with scientific approaches to assess the risk factors of a disaster. Practical approaches in risk management should build on both the technical knowhow of professionally-trained people and the knowledge and perceptions of those at risk (Young, 1998). The analysis of the traditional ecological knowledge possessed by the inhabitants helps policy makers to get a better insight into the situation thus allowing production of an integrated approach to disaster management. Taking this into account, the current paper focuses on the impacts of cyclone Aila, and the role of natural system and development infrastructure on the nature of impacts, from the people centered perspective, i.e, from the knowledge of the victims.

Certain elements of nature has been seen on many occasions to withstand the stress of a disaster, protecting lives and belongings of the people. Studies have shown, presence of thick coastal forest as a pre-requisite to abate dreadful impacts of storm surges and wind (Fritz and Blount, 2007; Wolanski, 2007) Mangrove forest, in particular, provides shelter against the fury of cyclone (Dash, 2007; McIvor et al., 2012). Presence of coral reefs, coastal sand dunes, grasses are also likely to influence impact of a cyclone. Moreover, the shape of the coast matters, in determining the degree of losses from a cyclone. This study papers aims to find them out in the light of opinion of the sufferers of a cyclone.

However at the present century, the role of natural system is not just to judge the risk factors of a disaster's impact. The growth of infrastructures especially, roads, houses, bridges as well as structural approaches like, embankments built to control flooding also influences the nature of impact from cyclone.

Objective of the Study

The major aim of the current study is to assess the impact of Cyclone and to identify the risk factors of cyclone's impact based on the opinion of the sufferers of a cyclone. The specific objectives of the study are:

i)   to evaluate the impact of cyclone Aila on the people of coastal zone and on their livelihoods

ii)   to ascertain the degree to which various natural systems and development features influence the impact of cyclone Aila

Methods

Study Area Selection

Fourteen, out of nineteen, coastal districts of Bangladesh were hit by cyclone Aila (Anwar, 2009). The current study focuses on the south west coastal zone of Bangladesh, which comprises of 9 Aila impacted districts. Among them Khulna and Shathkhira, lying in the westernmost part, were most severely affected (Kumar et al., 2010).

Respondents of the study comes from 13 villages of 3 upazila of Khulna district, namely: Hariharpur, Dakshin Bedkashi, Jorsing, Golkhali, Purbo Motbari and Maheswaripur of Koyra Upazila; Purbo Gonariya, Gonariya and Kaminibashiya of Dacope Upazila and Garuikhali, Bethbunia, Laskar and Tharia of Paikgachha upazila.

Data Acquisition

Yamane Strategy has been followed for the purpose of determining the sample size. Yamane (1967:886) provides a simplified formula to calculate sample sizes, which has been used to calculate the sample sizes with 95% confidence level and P = .10 percent.
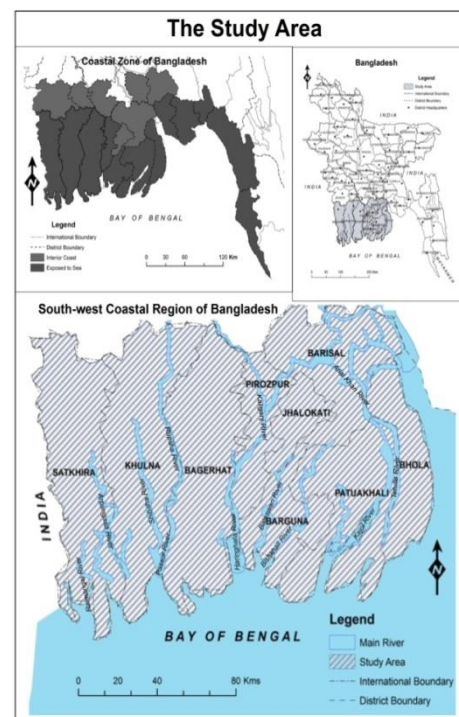
$$n = \frac{N}{1 + N(e)^2}$$

Where, n = sample size;

N = population size; and

e = level of precision.

Applying the formula sample size has been determined as follows:

$$n = \frac{10,000,000}{1+10,000,000\,(0.1)^2}$$

$$n = 100.$$

To collect data from these 100 people a standardized, structural questionnaire was prepared. With the help of it face-to-face interview were conducted. The 100 respondents were chosen randomly from the houses along the bank of the river of the selected villages.

Data Analysis

After accumulation of data from the field and various other sources the next step was to manipulate and analyze them. Data from the questionnaire were manipulated through SPSS 17.0 software.

Results

Impacts of Cyclone Aila

Each and every respondents of the present survey resides within 100m from the shoreline and were directly influenced by the cyclone Aila. They reported to have confronted wide range of impacts. Damage to agriculture land, loss of valuable assets and injury of family member are the most common impacts, as reported by almost all of the respondents (Figure 1). 72% of them experienced complete destruction of their houses while the houses of the rest of them were partially damaged (Figure 1).

Figure 1: Impacts of Cyclone Aila
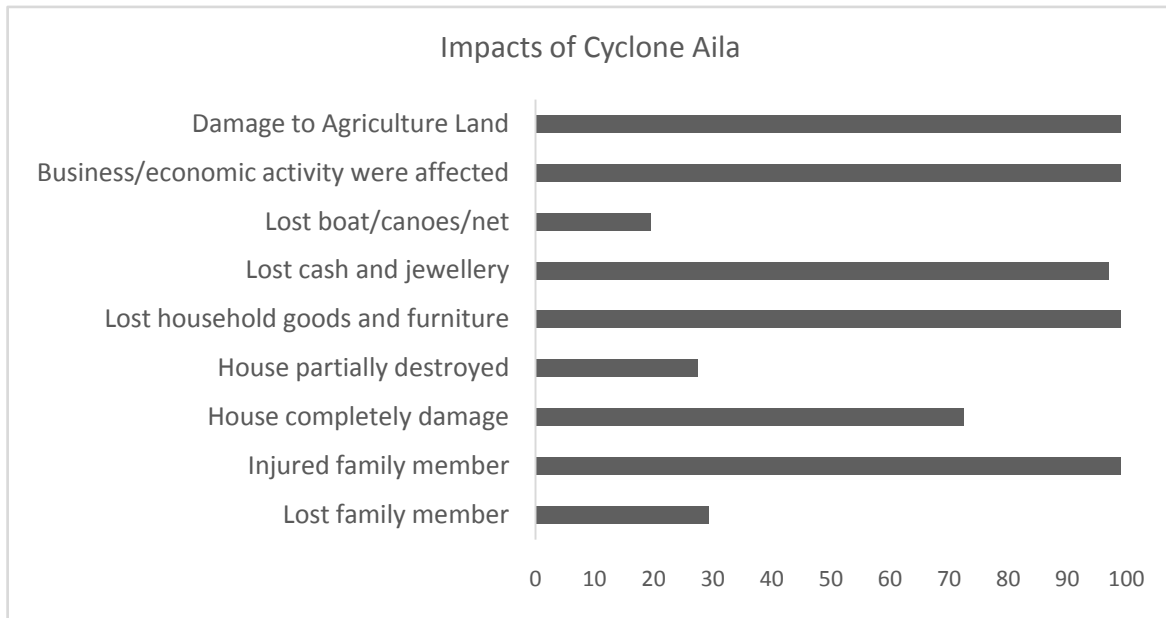
Source: Field Survey, 2015

More than two-third (78.4%) of them assume the death toll to range from 1to 10 persons, whereas, almost 10% believe that 11 to 20 persons died in their area and according to the remaining, 11.6%, the death toll might be greater than 20 persons. However, the occurrence of injury is perceived to be much higher. Majority of the respondents presumes that over 1000 people were injured by the calamity.

Table 1: Changes in Economic Status of the Respondents due to Cyclone Aila

Economic Status	Before Cyclone Aila		After Cyclone Aila	
	Frequency (f)	Percentage (%)	Frequency (f)	Percentage (%)
Good	20	19.6	2	2.0
Medium	68	66.7	7	6.9
Bad	14	13.7	20	19.6
Vary Bad	0	0.0	73	71.6

Source: Field Survey, 2015

Apart from killing and injuring people, Aila made vast majority of the affected region economically crippled. Whereas 66.7% of the respondents

had medium economic status before, 71.6% of them reported having very bad economic status after the occurrence of Aila (Table 1).

Risk Factors of Cyclone

Natural Systems

Ninety nine percentage of the respondents believe, natural systems influence the nature of impact of cyclone. Among them, 100% agrees that the existence of Sunderban forest has played the major role in declining death toll, followed by sea grass and convex coast as presumed by 93.1% and 88.2% respondents respectively (Figure 2.a). Similarly, housing damage is also perceived to be reduced by Sunderban, Sea grass and convex coast by 100%, 96.1% and 88.2% of them respectively (Figure 2.b). On the other hand rivers/ estuaries and concave coast increase both the death toll and housing damage, according to the opinion of 100% and 89.2% of the respondents. The impact of sand dune could not be judged by this survey, since maximum (46.1%) responded to be unsure of its effect and about 36.3% reported that sand dunes are absent in the study area. Nonetheless, 17% people believes it has no impact on cyclone.

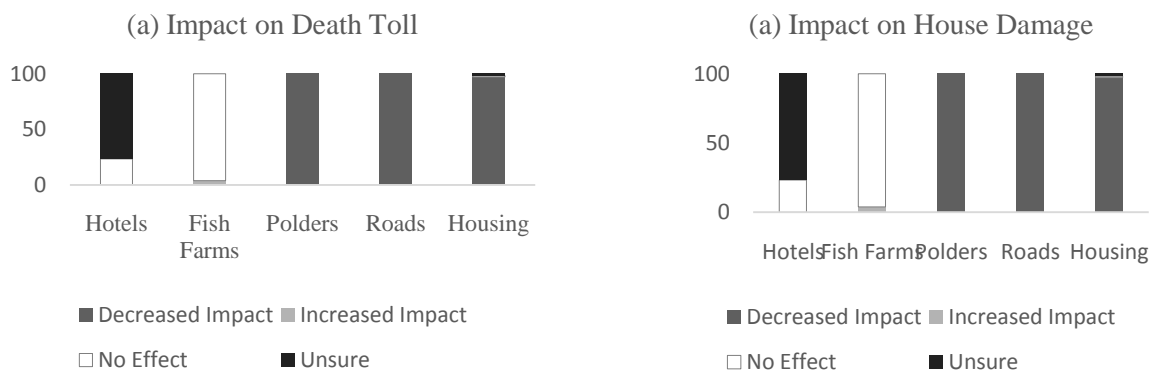Figure 2. Natural System's Influence on (a) Death Toll. (b) House Damage
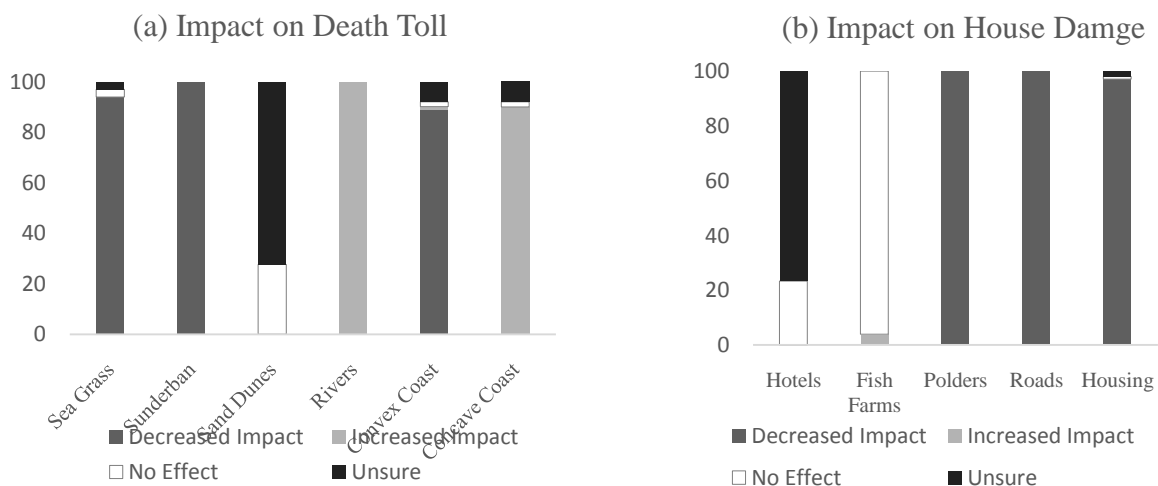
Source:Field_Survey, 2015

Development Features

According to 100% of the respondents, both polders/embankments and road simultaneously top the list of development features involved in reducing human death and household damages, from Cyclone Aila. Housing comes next in the list, as viewed by 97.1% respondents. Fish/ Shrimp farms, however, are thought to have no influence on any of the impacts, by 96.1% people. Perception varies about the role of hotels, while maximum (almost 57%) are unsure of its influence, some17%

thinks it had no impact. Except, for a very small proportion of respondents' assumption of fish farms increasing the impact of cyclone, none of the development features are viewed to exacerbate the impact of the cyclone.

Figure 3. Development Features's Influence on (a) Death Toll (b) House Damage

(a) Impact on Death Toll

(a) Impact on House Damage

■ Decreased Impact ■ Increased Impact
□ No Effect ■ Unsure

Source: Field_Survey, 2015

Conclusion & Recommendations

Evaluation of the extent of damage caused by cyclone Aila and identifying the potential risk factors of its impact are the major aims of this research paper. The findings are based on perception of those affected by that deadly hazard. An innumerable writings has supported views from the local residents as valuable supplement to scientific survey (Pauly, 1995; Price and Firaq, 1996; Saˊ enz-Arroyo et al., 2005a,b cited in Venkatachalam et al, 2004)

The range of destructions, as perceived by the respondents, is high. Cyclone Aila not only killed or injured people it has cause   long-term impact on life of many, as their houses, valuable possessions were destroyed and their earning opportunities declined.

The respondents perceive, existence of Sunderban Mangrove forest, unanimously as the protector from such dreadful hazards. Moreover, sea grass and convex coast are also assumed to reduce impact of cyclone. This finding is congruent with a study conducted on fishers affected by Tsunami in Srilanka (Venkatachalam et al 2008), who also identified these three elements of nature to provide protection against tsunami. Indeed, various scientific surveys support such views, particularly for mangroves. On the other hand the current research discern, concave coast

and rivers/estuaries playing negative role towards life and possessions by exacerbating impact of cyclone. Similar views has also been obtained from fisher's about the impact of Tsunami in the study mentioned before.

In respondent' eyes none of the development features intensifies cyclone's impact. In fact, they believe presence of polders/ embankments; housing and the road has protected them from more damage. This view also matches with fishers of Sri Lanka affected by Tsunami (Venkatachalam et al, 2008).

Perception of the locals, who actually survives by fighting with natural hazards, can be very useful for disaster preparedness planning and disaster management. The current research highlights the importance of conserving Sunderban Forest for disaster risk reduction. It suggests that disaster preparedness planning should involve local community. The knowledge of the locals can be integrated with scientific surveys to improve resilience against disaster.

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