

Some Observations and Lessons Learned: Cyclone 'Mora' and 'Landslide Of Chittagong', Bangladesh

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Abstract: In the last few years, several devastating disasters have occurred in a different part Of the world. Cyclone and landslide arc common disasters in Bangladesh. The cyclone is the natural disaster Where a landslide is the man-made disaster. Cyclone "Moran devastated the coast Of south-western Bangladesh on May 30, 2017, and 'landslide Of Chittagong' districts has occurred on Junc 12, 2017, and caused various socioeconomic impacts including loss of lives, damages to infrastructures and loss Of coastal resources. Based on data the study sought to understand the losses due to mora and landslide Of Chittagong districts consequences on the environment Of the southwest part Of Bangladesh. The authors rely on personal observation Of activities and documentation for which they Were responsible for those disaster or to which they contributed to minimizing the loss. The paper provides the causes, impacts and some technical and managerial techniques Of restoration and reconstruction Of the affected area. Finally, results drawn from this research Will bc useful for project manager, planners as well as people Of Bangladesh for future disaster mitigation, restoration, reconstruction and planning in the studied area and this papers methodology can also bc applied in the similar geographic area.

Keywords: Mora; Landslide; Disasters; Restoration; Reconstruction; Mitigation

Introduction: The landmass of Bangladesh is connected to the Indian Ocean through a coastline of 700 km to the north and north-eastem part of the Bay of Bengal [ll. So, Bangladesh owns a huge coastal region which consists of 19 districts with a total area of 47,203 km2 and a population of 35 million, which is 28% of the country's total population Since distant past, people have been settling in the coastal belt of Bangladesh though they remain in a precarious situation of becoming hit by a natural disaster at any time. Historical statistics demonstrate that since 1970, Bangladesh has experienced 36 cyclonic storm surges bringing about more than 450,000 passing and immense financial misfortunes [10]. But still, thley have been taking risks to live here in the coastal legion of Bangladesh has one of the world's largest resources and opportunities as well. Severe cyclonic storm mora made landfall in Bangladesh on 30 may 2017. Mostly 200 people were dead and over half a million people were affected by the floods and landslides in Sri-Lanka, and 18 000 families were moved to 366 temporary safe locations [13]. In Bangladesh, six lives lost, as well as 136 people injured and local administration in 16 coastal districts evacuated almost half a million people to about 3000 cyclone shelters [11. These cyclones and surges resulted in the loss of lives and damages to properties thus rendering millions of people homeless. Government sources have evaluated that roughly 52,000 houses were harmed or devastated, leaving 260,000 people in possible need of shelter. Then again, landslides happen hilly area in every year (13). The June landslides were the most exceedingly bad landslides related disaster in Bangladesh since

2007. Starting 13 June, the landslide brought about the deaths of 160 individuals, hanned 187



individuals, and destroys 6,000 homes, in spite of being restricted in effect. It affected about 80,000 people across five districts: Bandarban, Chittagong, Cox's Bazar, Khagrachari and Rangamati [14]. Although some researchers have been conducted on the cyclone and landslide risk mitigation in Bangladesh; however, there is no effective approach to mitigate the risk. That's why the amount of loss is so much higher than developed countries in the world.so the main objectives of this paper are to find out the way by which we can mitigate the losses rapidly for further disaster.

# Research Methodology

Study Area: Our study area is Parbotto Chottogram (Khagrachari District, Rangamati Hill District, and Bandarban District), Chittagong and Cox's Bazar district. This area is within southeastern Bangladesh, bordering India, the Bay of Bengal, Myanmar (Burma). The area lies at 22020'18" N latitude and 9.1049'54" E longitude. It covers a total land area 33,771.18 square kilometers. Before 1984, Parbotto Chottogram was a single district, after that was divided into three districts: Khagrachari District, Rangamati Hill District, and Bandarban District. Topographically, those districts are the hilly area. This area receives a very high annual rainfall amounting to more than 100 inches (2,540 mm). The study area has been situated in humid zone 1 which soil is podzolic type including alluvial [51. The population of the three districts (zilas) totaled 1,587,000, the population density is 120 km2. About 34% of the population are tribal peoples and mainly followers of Theravada Buddhism; 65% of the inhabitants are Bengali (Muslims and Hindus); and 1 % Christians or animists [l l.

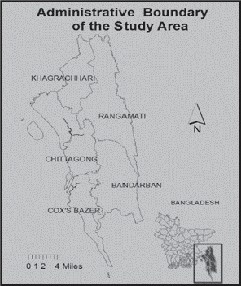


Fig.

1:

Study

area

map

Data collection:

Primary data: Primary data were collected through interviews with people were conducted by authors. All those data are recorded and analyzed in SPSS software. About 200 household surveys were canied out for this present study to find an adverse impact of MORA and landslide as well as peoples responses in our study area.

Secondary data: Secondary data were collected through several field communications to relevant organizations with the study. Damage and compensation information was collected from Ministry Disaster Management and Relief-Government of Bangladesh, Ministry of Chittagong Hill Tracts Affairs, Bangladesh Bureau of Statistics, UNDP, UN CR. Data on general cause of landslide were collected through interviews with local people from Chittagong hilly area.

Table 1. Secondary Data and Their Source

|  |  |  |  |
| --- | --- | --- | --- |
| Landslide | Data |  |  |
| Cause Of LandSlide | | www.infokosh. .bd |
| Historical Information on Landslide | | The Daily star, Date:13 June 2017 |
| Losses of Landslide | | The Daily Star, Date:13 June 2017 |
| Cyclone | History of natural disaster | | Iivesci |

ofDifferent c lone

# Result and discussion

Losses: About 200 households were surveyed to see the adverse impact of landslide and mora in a study area. According to survey result, here seen that most of the community people were falling in the adverse impact of this disaster. For this, these impacts are classified into three categories Economic loss is high and loss of life is low. Below the table -2 and figure -2 which indicate the losses of mora and landslide according to field survey

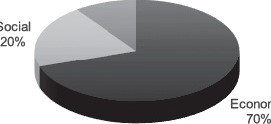
Table 2. Losses of mora and landslide

|  |  |
| --- | --- |
| Economic losses | Losses Of home  Losses of land  Loss of income  Loss Of working place  Loss of asset  Damage to crops  Damage ofdomestic cattle  Health losses  Losses of infrastructure. |
| Loss oflives | Loss of man, woman and child life |
| Social losses | LOSS of social network.  Damage oftransportation network  Loss Of social inclusion |

Losses Of MORAand landslide

Lives

10%



Social

Economic

Economic Lives

Fig. 2: Losses of mora and landslide

Loss of ecosystem services: It is known that a large number of trees were uprooted, and logs of trees were swept away by the storm surge [31. A significant decrease in regeneration and growth of mangrove forests was seen in the Sundarbans after mora. Infrastmctures like forest camps were severely damaged. Floral and faunal decent variety alongside numerous seaside individuals' livelihood was additionally seriously hamed. Local people infomed that many dead frogs, snakes, etc., were seen floating in the water aner mora. Due to long-term waterlogging, many trees died due to anoxic conditions [13]. Below the table 3 which indicates the historical information of landslide in study area.

Table 3. Historical information of landslide in study area at a glance [71

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Date | Reason | | | Losses |
| 1968 | Tree cuttin | |  | Tran ortation and infrastructure Iosses |
| 1970 | Tree cuttin | | | Losses oflives and asset |
|  | Hea |  | itation | Insses of lives and asset |
|  | Hea |  | itation | About 90 000 . Km area was affected |
| 1999 | E uake | | | Losses of 19 lives and economic losses |
| 2003 | Tree cu | | | Losses Of6 lives |
| 2007 | Hea | Cl Itatlon | | Kusumba ladies club of senanibash and losses of around 127 lives |
| 2008 | Heavy precipitation | | | Losses Of6 lives |
| 2010 | E uake | | | Losses of 53 lives and economic losses |
| 2011 | Tree cu | | | Losses Of 17 lives in a s' famil and economic losses |
| 2012 | Hea | ci itation | | Losses Of 94 lives and economic, social losses |
| 2015 | Heavy precipitation | | | Losses of 19 lives and economic losses |

Aforesaid information of landslides is alarming issues for Bangladesh as well as in study area [4]. A number of the devastating landslides is occurred frequently and resulting a lot of damage of social and economic, even loss of lives also. If we are not conscious of this disaster and there is no mitigation approach against the landslide and different types of a disaster than our lives will remain at stake. Below the table 4 which indicates the major cyclones losses in Bangladesh. Here we can see that the rate of losses is decreasing day by day in our country.

Table 4. Major cyclone occurrence in Bangladesh [7]

|  |  |  |
| --- | --- | --- |
| Date | Name | Losses |
| 1991 (29 April) |  | The loss of property was estimated at about the 60 billion. The death toll was estimated at 150,000; cattle head killed 70,000. |
| 1994 (29 April 3 may) |  | People killed about cattle lost about 8,000. |
| 1995 (21-25 November) |  | About 650 people killed, 17,OOO cattle head perished. |
| 1997 (16-19 may) | Hurricane | Only 126 people killed because of better disaster managcment |
| 2007 (15-17 November) | Sidr | About 3000 persons killed |
| 2009 (27-29 may) |  | About 150 persons killed, 2 lac houses and 3 lac acres Of cultivated land and crops losses. |
| May 30, 2017 | Mora | Fatalities 40 total, 81 missing  Damage 5297.8 million (2017 USD) |

The above table concerns us that a number of cyclones hit our study area in different time and bring a miserable condition for the community people. We can't remove the impact of these natural calamities, but we have to take an effective initiative to reduce the fine negative impact ofcyclone and landslide [5].

Personal opinion of respondent: While surveying some respondent objection that they dorfi get any logistics or training facilities like information about the disaster, precaution, alarm, fast aid and recovery to face any natural disasters like mora and landslide. Those preparation offices specified above ought to be given by nearby government experts like union board part or administrator, school teacher, NGOs.

# The main reasons of those landslides are (According to field survey)

1. Tree cutting: Trees of the hilly areas are improved with different species and exceptionally demandable for the medicines, fumiture, log pit, been and from different essential viewpoints [61. In this way, different illicit gatherings are constantly engaged with the accumulation of those trees by cutting indiscriminately considering they're high economic and market values [3]. So, the soil of the hilly areas become uncovered and loses their bonding strength quickly. That causes serious landslides every now and again mainly during rainy seasons. The tree is cut down by a vast amount in our study area (as a table:2) and is the striking reason for the landslide.
2. Heavy Precipitation: Due to the geographical position of the area, the area is enriched with various types of hills-large or tinny [7]. Besides, due to enrich of high vegetation and trees transpiration, evaporation occurs here highly. This vapor goes high and floating, and then creates heavy rainfall. From the figure of annual precipitation, it has been seen that every year a huge amount of precipitation may occur in study area and it leads to landslide
3. Earthquake: Here the study is being fall in earthquake zone 2 and zone 3the earthquake is one of the major causes of the landslide. Vibration power is forced the soli structure to collapse their natural bonding and leads to slide (101.

|  |
| --- |
| Earthquake Zanie in EArc1ad2Sh |

Fig. 3: Earthquake zone in study area

1. Human modifications of slopes such as cuts pits, and canals.
2. Removal ofvegetation

Mitigation: From the above information, it was seen that heavy precipitation is one of the prime reason for the landslide in the study area[8]. Due to heavy rainfalls, the soil structure of the hilly area is collapse and resulting destruction of a various asset as well as human lives. if there was a system in the hilly area to instant drain out the participation than the rainwater cannot percolate into the soil structure at a large quantity. Consequently, the falling of soil stmcture is minimized and its lead to minimize landslide [14].

Indiscriminate tree cutting is another reason for a landslide. but we need tree cutting for our essential. For doing this a specific rule is prepared to cut down a tree for hilly reason [8].

Hill land cutting major issues resulting from unplanned urbanization. Due to this land cutting in the hilly area, a number of devastation landslide occurred in the study area. To regulate the land cutting process and achieved a balanced landscape planning there must need some plan and policy as well as the relevant authority (cda) must be a concern to implement and monitoring this policy

Marginal people can be found in the venerable hilly region.in this case, to reduce the number of losses, we need to restate them to another place[8].

In case Of emergency situation, we need cyclone shelter, nearby information center, and Other logistics need to reduce the adverse impact of the disaster. By providing various training facilities like information about disaster, precautions, alarm, fast aid and recovery on the disaster to the community people we can strengthen them to face natural calamities. Finally, mutual coordination of authority and community people can help to reduce the losses of mora and landslide [8J.common engineering techniques for landslide prevention include provision for surface and subsurface drainage, removal Of unstable slope materials, constmction of retaining walls, or some combination of these. Many of them are currently used in Bangladesh To mitigate the damage of a disaster, some adapting effectively need to change through strong communication via electronic mail, ndio, television. That decision will be sudden and totally unexpected. Good communication and accurate exchange of information of the affected area are the main key point for restoration of any disasters like cyclone, landslides [9]. Accurate building and facility triage must be required. To recover a disaster or mitigate loss the role of logistics is very high.to control the project after disaster some policy should be required for human resources to schedule the activities to mitigate stress. Follow this procedure especially those who have little experience in major disaster recovery efforts [151 prevention is the better option than protection to mitigate the damages of cyclone or landslide in Bangladesh. For that reason, the united states has conducted experiments in the Atlantic by spraying silver iodide in the region of the maximum wind speed to minimize the wind speed. These experiments, though very promising, have remained inconclusive. Moreover, there is a chance that these cyclones could change their track and move towards another direction. The cyclone is a natural phenomenon like an earthquake or a volcanic ejection [111. Nations like Bangladesh need to figure out how to live with it. Nowadays the disaster management system has improved. In the event of a cyclone, the whole of the army, navy, air force and related ministries and agencies perform their duties properly. Below a chart which is shown a disaster restoration professional body and disaster restoration manager should go through it to mitigate damages of a disaster[12]. Authority should know and follow this chart.

This foms a good basis for what disaster restoration managers should know. It consists of the managerial and technical knowledge that helps to restore a disaster-prone area[10]. The managerial part describes project control, project administmtion, and marketing. The technical part indicates material science and contents restoration, structural restoration process and peripheral restoration concerns[14]. It will be helpful for making a sustainable built environment to restore the area after a disaster. Below the figure 4 of a disaster restoration professional body [9].

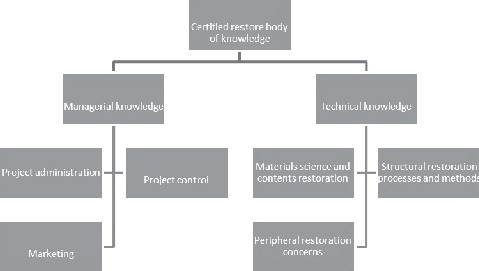


Fig. 4: Chart of a body of knowledge for the cellified rest01er1 credential

Conclusions: The above lessons in disaster recovery management are among those that had a substantial impact on projects in which the lead author observed recently. Findings of this research are 70% of economic losses, 20% social losses and 1 ()0/0 losses of lives according to data analysis. While surveying some respondent complaint that they do not get any logistic or training facilities like information about disaster, precaution, alarm, fast aid and recovery to face any natural disasters like mora and landslide. There is no effective system for providing an early precaution as well as no system for emergency response. Those training facilities mentioned above should be provided by local government authorities like union council member or chairman, primary school teacher, NGOs through oral or sometimes workshop. The distinguished difficulties, including; insufficient financial and human resources, political interference, abuse of assets, constrained participation by the nearby group and lack of supporting laws and directions are an indication of high institutional vulnerability and ought to be addressed. Instructive and examine associations ought to be bolstered consistently. In the region of disaster management, Bangladesh is not bad in front of numerous nations. This is the reason the nation will be viewed as a good example of overseeing catastrophic events. To fulfill this expectation, future research should concentrate on evaluating the effectiveness of early warning frameworks for landslide and cyclone disaster risk reduction in Bangladesh.

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