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Studies on the Causes and Impacts of Landslide: A Comparative Study of Rangamati and Bandarban Hilly District, Bangladesh

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Abstract

The landslide is becoming a regular hazard in the hilly areas of Bangladesh. Generally, the hills consist of unconsolidated sedimentary rocks such as sandstone, siltstone, shale and conglomerate. Both qualitative and quantative data were applied. The qualitative data were obtain through Key Informant Interview (KIIs), Focus Group Discussion (FGDs). Beside, the quantative data were collected through questionnaira survey. A total 270 questionnaira have been conducted on landslide affected household head. Sample rendom sampling were applied. The study indicates that landslide largely affects the poor people living on the slope in hilly areas. The main natural reasons identified for landslide were heavy rainfall, earthquakes, unstable soil, and thunderstorm. Along with the main man-made reasons were deforested, hill cutting, road construction and over population. Conscquently, the local people faces economical, health, sanitation, agricultural and communication problems.

Keywords: *Hill cutting, Landslide, Vulnerability and Settlement.*

Introduction

The landslide is becoming a concern of great priority because of its devastating nature worldwide (Evans *et al*., 2007; Havenith *et al*., 2007).

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In Bangladesh, the hilly areas are vulnerable to landslide as with the other hilly regions of the world. In the last one and half decades, landslide becomes an inveterate problem for south eastern part of the country and Chittagong division is highly vulnerable to this hazard, with an increasing trend of frequency and damage (Ahmed et al., 2014).Rapid urbanization and human development activities such as, building and road construction through deforestation and excavation of hill slopes have increased landslide in densely populated cities located in mountainous areas (Galli and Guzzeti, 2007; Schuster and Highland, 2007).

Physiographically, most of the areas of Bangladesh is floodplain and only 18% is hilly and tract area (Islam and Uddin, 2002) where considerable proportion of people are living due to growing urbanization. Rangamati and Bandarban city has already been recognized as the most vulnerable cities to landslide. The city dwellers of Rangamati and Bandarban have experienced a number of devastating landslides. Since 2017, landslides have caused the death of nearly 219 people in various informal settlements within Rangamati and Bandarban city and adjacent small urban centers (Prothom Alo). A variety of natural and human induced reasons have contributed to accelerating landslide events in the recent past. These include: excessive and prolong rainfall in a short period; unplanned hill cutting problems; loose soil structure in hilly areas; deforestation in the hilly areas; seismic activity and abnormal tidal How (Ahmed *et al*., 2016; Christie *et al*., 2014; Sarwar, 2008).Considering above facts, the present study was carried out to assess socioeconomic condition of the people living in the landslide prone area, causes of landslide, impacts of landslide on local communities in the study area of Bangladesh.

Objective of the Research

The objective of this paper is to investigate the causes and impacts of landslide addressing on Rangamati and Bandarban hilly district, Bangladesh. The specific objectives are as follows,

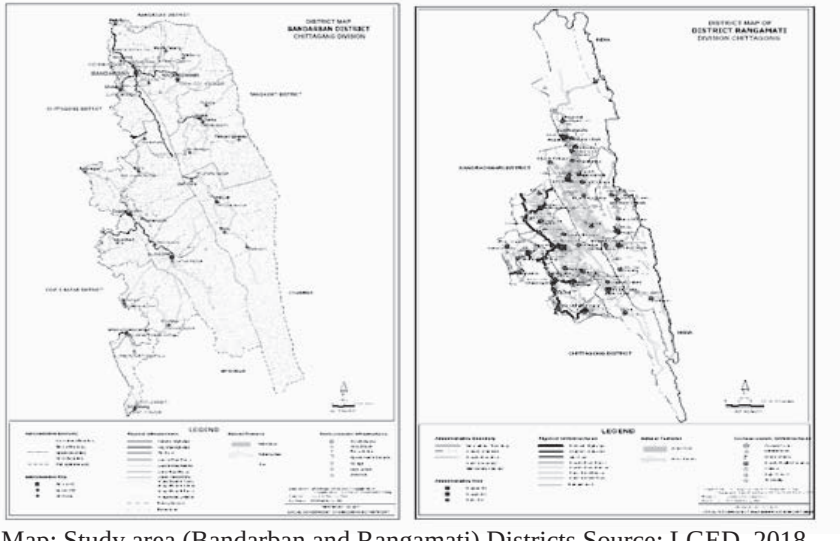
To know about the causes of landslide in the study area; and

To determine the problems associated with landslides of the study area.

Materials and Methods

Study Area

To conduct the study, authors have been selected hilly area of Bangladesh, particularly two districts namely Rangamati and Bandarban. Landslide, land Subduction has been considered during the selected for the study. Rangamati District (Chittagong Division) area 6116.13 sq km, located in between 22°27' and 23°44' northern latitudes and in between 91°56' and 92°33' east longitudes.It is bounded by the Tripura state of India on the north, Bandarban district on the south, Mizoram state of India and Chinpradesh of Mayanmar on the east, Khagrachhari and Chittagong districts on the west. From Chittagong a 77 km road leads to Rangamati, and Bandarban District (Chittagong division) area 4479.03 sq km, located in between 21°11' and 22°22' northern latitudes and in between 92°04' and 92°41' east longitudes.It is bounded by rangamati district on the north, Arakan (Myanmar) on the south, Chin Province (Myanmar) and Rangamati district on the east, Chittagong and cox's bazaar district on the west.



Map: Study area (Bandarban and Rangamati) Districts.Source: LGED, 2018

Data Collection

Basically, the study was primary or field data based but some of secondary data have been used. Primary and secondary data sources were used for doing the study. Primary data were collected through participant observation, Key Informant Interview (KII), Focus Group Discussion (FGD) and questionnaire methods. Besides, total 270 numbers of questions were operated in two study areas.

Focus Group Discussion (FGD)

The focus group consisted of 10-12 people from the study site. The participants were selected based on their experiences with landslides of 2017. Four individuals were selected from household level as families that were affected by landslides. One person was selected who has experienced with temporary relocation.The community leader was selected as he dealt with law matters on claiming land tenure on hills. One home owner was selected who owns some risky houses along the hill slopes for rent to low income people. Two small sellers from the area have been selected as landslide has damaged their business property. Two volunteers were selected from the community who rescued a number of people in landslide incidence of 2017. In the focus group, the participants were asked to gather data on what institutional arrangements were available before and after the landslides in 2017 of them. The group answered certain questions and the participants were also allowed to discuss and determine the key gaps between them and formal organizations regarding vulnerability reduction to landslides.

Secondary Sources

Secondary sources of information are an integral part of this research. When a project involves original (case study) research, secondary data can play an important role in providing a context for the primary data (Clark, 2005). There fore, the basic aim of collecting secondary essentials for the research was to have an in-

depth background as well as an overview. Various governmental and non-governmental organizations such as the Department of Environment (DoE) Chittagong Division, Bangladesh Bureau of Statistics (BBS), and the Centre for Urban Studies (CUS), Dhaka were the most significant sources of secondary information. To some extent, individual people proved a fruitful source of gathering secondary records too. On-line information on contemporary urban landslide issues was also used to enrich the literature review and analysis sections.

Data Analysis

After the collections of both qualitative and quantitative data from primary and secondary sources, these data were edited, coded, classified and tabulated the sequential manner. Qualitative data were examined with the help of Narrative Analysis. Quantitative data were interpreted with the help of two analysis procedure such as- statistical and analytical analysis. Statistical and analytical analysis were done by the help of Statistical Package for The Social Science (SPSS: version-16) and various statistical techniques such as tables and figure.

Result and Discussion

Causes of landslide

Landslides occur as a result of changes on a slope, sudden or gradual, either in its composition, structure or in its hydrology, vegetation. The change can be due to geology, climate, weathering, land use and earthquakes (Sahni *et al*, 2001). There are two types of factors of landslide occurrence in the study area. One is natural factors and another is man-made.

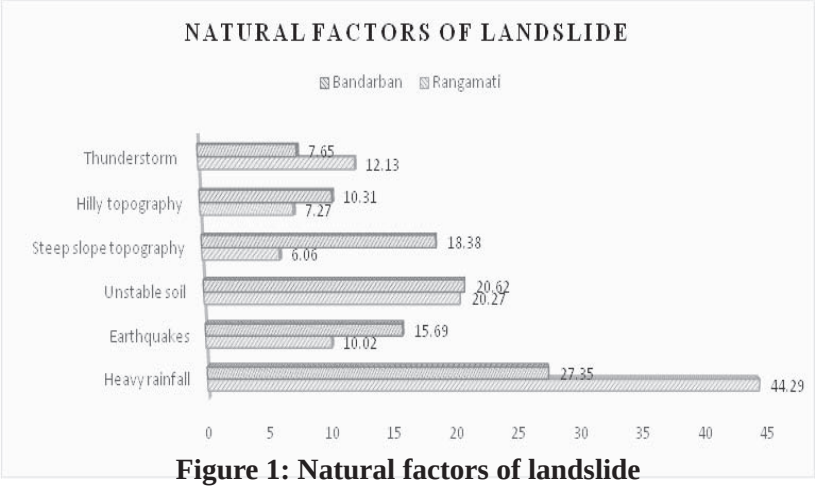


Figure 1: Natural factors of landslide

Figure 1 shows the natural factors of landslide in study area. Heavy rainfall is prime factors in two (Rangamati 44.29%, Bandarban 27.35%) study area. The second main factor is Unstable soil of the hill (Rangamati 20.27%, Bandarban 20.62%). Respondents also amnestied some natural factors, such as Earthquakes, Steep slope topography, Hilly topographic, Thunderstorms.

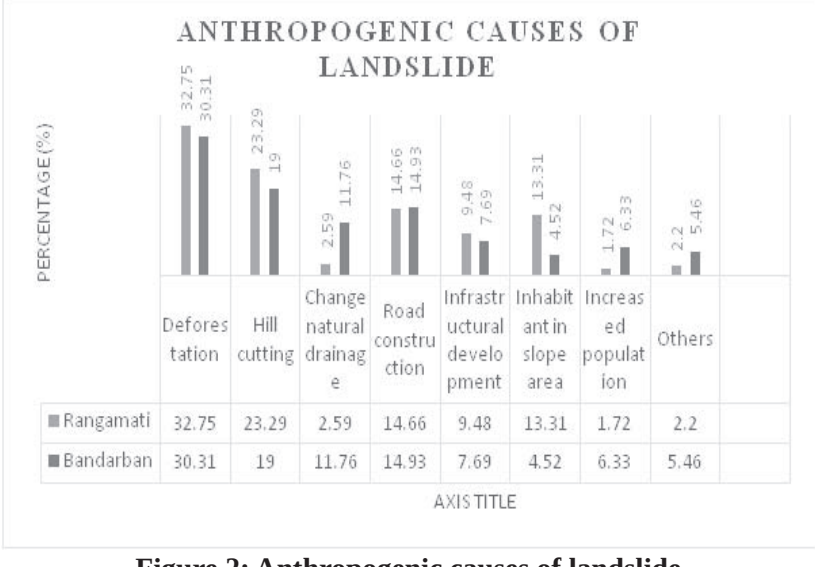


Figure 2: Anthropogenic causes of landslide

On the above figure 2 shows the anthropogenic causes of landslide in the study area. Deforestation is prime man-made factors in two (Rangamati 32.75%, Bandarban 30.31%) study area. The second main factor is the Hill cutest (Rangamati 23.29%, Bandarban 19%). Respondents also amnestied some Anthropogenic factors such as Change natural drainage, Road construction, Infrastructural development, Inhabitant in slope area and Increased population.

Problems are associated with landslides

Types of impact	Rangamati	Bandarban
Loss of human life	35.77	48.10
Scarcity of safe water	25.76	20.35
Mental disorder	16.74	10.12
Spreading of disorder	12.55	8.02
Lack of food	7.43	11.81
Others	1.75	1.60
Total	**100**	**100**

Figure 3: Problems are associated with landslides

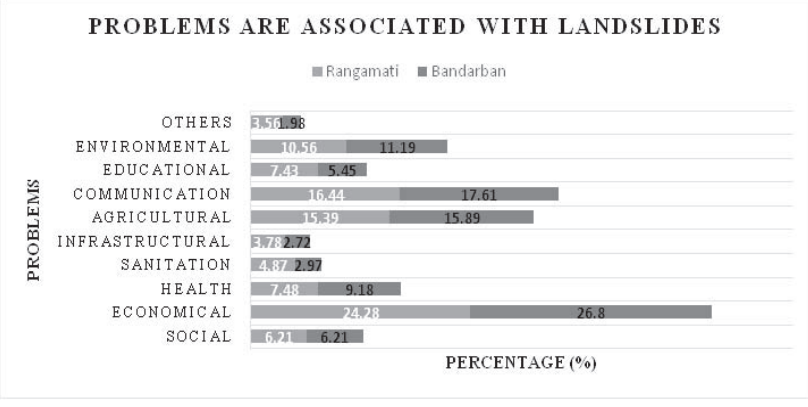
There are various problems created for landslides. This figure shows the landslide related problems. Maximum respondents (Rangamati 24.28%, Bandarban 26.8%) told that, economical problems associated with landslides. There are many types natural resource are found in the study area. Second maximum respondents (Rangamati 16.44%, Bandarban 17.61%) communication problems create for a landslide. Other problems create for landslide such as Social, Health, Sanitation, Infrastructural, Agricultural, Educational and environmental related problems.

Impacts of landslide on the people's lives in the study area

The landslide is occurring frequently in the hilly regions of the country (Alam *et al*., 2005) especially in Rangamati and Bandarban. A landslide has huge impacts on the human being and their environment, including effects on people, their homes and possessions, farms and livestock, industrial establishments and other

structures. According to the survey, the major impact was related to the loss of human life, scarcity of safe water, mental disorder and loss, spreading of disorder and lack of food.

Table-1: Major impacts of landslides on human life



This table 1 shows the impacts of landslides on human life. Most of the respondents (Rangamati 35.77%, Bandarban 48.10%) told that, the major impact of landslides on the loss of human life. Second maximum respondents (Rangamati 25.76%, Bandarban 20.35%) told the Major impacts of landslides are being scarcity of safe water. And also various problems create by landslides such as; Mental disorder (Rangamati 16.74%, Bandarban 10.12%), Spreading of disorder (Rangamati 12.55%, Bandarban 8.02%) Lack of food (Rangamati 7.43%, Bandarban 11.81%).

Conclusion

Landslide vulnerability is an important issue for people living in the hilly areas of Rangamati and Bandarban. In the recent years, the landslide is occurring regularly. In the study area, the vulnerability of landslide is mentionable than other landslide vulnerable areas in Rangamati and Bandarban city. The present study indicates that landslide affects the poor people living on the slope in hilly areas.The main reasons identified for landslide where deforestation, hill cutting, and road construction. The major impacts of landslides on the local communities were destruction of natural scenic beauty,

economic loss, destruction of lives and environmental problems. The main mitigation strategies suggested by the respondents were stopping of hill cutting, resettlement of the affected people, vegetation and development of robust policy.

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