

# Analyzing Issues Of Housing For Post Disaster Rehabilitation: A Study Of Land Slide Rehabilitation At Chittagong, Bangladesh

Kanu Kumar Das, Mainak Ghosh, Shajib Paul

**Abstract:** Housing is one of the basic human needs. Landslide is one of the natural disasters which directly and indirectly impacts on housing every year. For several natural causes and strong human impact on highly fragile and sensitive hill ecological landscape in form of deforestation, constructions the natural stability are accelerated out. Natural factors like rainstorms, earthquake can trigger landslides. Chittagong the second largest city and industrial and commercial hub with the largest seaport of Bangladesh has undergone steady and rapid unplanned urbanization since independence. Chittagong urban area is facing landslide disaster in rainy season. On the other hand, the City is facing housing shortage and the number shortage of housing increases day by day. In this thesis paper, it is an attempt to find out the way and proposal of a selection of a site for rehabilitation housing scheme which is economically viable for that affected people in Chittagong City.

**Index Terms:** Housing, Natural Disaster, Environment, Landslide, Rehabilitation, Economical Feasibility, Urban Development, .

## 1. INTRODUCTION

Natural disasters are the complex dynamics of unfavorable events that occur completely beyond the human control and human interventions often indirectly make it worse. Some hazards are known to be more prevalent such as windstorms, floods, earthquakes, volcano, droughts and extreme temperature; however, landslides are the 7th largest destroyer among all natural disasters [1]. Landslide is a natural disaster which has been causing a large number of deaths, injuries and damages to human settlements or housing and infrastructure in an urban area CRED statistics show that landslides are responsible for at least 17% of all fatalities from natural hazards worldwide. Petley reported that regarding the occurrence of landslide fatalities in the year 2007 by nation, the most seriously affected country was China with 695 landslides induced death followed by Indonesia (465), India (352), Nepal (168), Bangladesh (150) & Vietnam (130). Regarding trigger, 89.6% worldwide fatalities were a result of landslides caused by intense and prolonged precipitation [2]. On the other hand, SAARC reported that there are various types of landslide hazards that happened in almost all the countries of South Asia [3]. According to Geographical Survey of Austria, 2012, Landslide is a mass movement of rock, soil or debris materials forming slope towards the lower and external part of the slope, along with sliding surface. When a part of a natural slope is not able to sustain its weight, a landslide hazard occurs causing the destruction of property, shelter, infrastructure and death of people and livestock[4]. Landslides are widespread phenomena and unpredictable in nature. Landslide are major hydrogeological and anthropogenic hazards that can affect not only mountains areas rather it can found in mining areas, plateau river terrains, coastal areas and offshore too.

The importance of housing is universally accepted from the dawn of history. Since past few decades the poverty of urban dwellers has been increasing, mostly in low and middle-income nations and for that the housing of those countries is of poor quality, overcrowded and has a lack of provision for the basic infrastructure and services which should protect them from environmental health hazards and prevent disasters [5]. Substandard housing is more vulnerable to disasters and during landslides these substandard houses are easily damaged aggravating the problem of housing in those areas. So now to live a safe life it is necessary to provide a safe house for landslide affected zone. Bangladesh is an overpopulated, developing country where housing is an important factor in its development, and still the country is facing housing shortage due to different reasons [6]. People are not getting proper shelter, and most of the poor and economically disadvantaged/deprived people have to face this housing problem severely [7]. The country is vulnerable to various disasters and environmental hazards because of its physiographic, morphology and other natural conditions. Natural and human-induced hazards such as floods, cyclones, droughts, tidal surges, tornadoes, earthquakes, river erosion, fire, infrastructure collapse, high arsenic contents of ground water, water logging, water and soil salinity, epidemic, and various forms of pollution are frequent occurrences [8]. In Bangladesh, almost 70000 people are living at vulnerable housing in landslide disaster prone area [9]. Landslide is an incurable problem for southeastern part of Bangladesh, and Chittagong city is particularly highly vulnerable to this hazard with an increasing trend of frequency and demand. Since Chittagong is the Port City and the Commercial Capital, people from the surrounding regions are migrating into the city areas for better Income Opportunities as well as attractive Urban Facilities [10]. The Hill area of Chittagong Metropolitan Area (CMA) is highly vulnerable to landslide hazard with the increasing trend of frequency and damage [11]. The landslide of 11 June 2007 in Chittagong is the most devastating case of landfall in the history of a landslide of Bangladesh [9]. The direct loss due to that disaster of Chittagong estimated as US\$ 13.2 million [12]. The Daily Observer reported that almost 10000 people living in hill area in Chittagong city are most vulnerable due to landslide disaster [13]. The Daily Star (Local

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News Paper) editorial report stated that 127 people died due to a landslide in Chittagong in June 2007. According to committee who worked on a landslide in Chittagong city identified the 30 most vulnerable areas and 666 families living in this area [13]. The landslide happened in Chittagong city every rainy season, and recently three people died due to this disaster in Bajjed Bostami and Lalkhan Bazaar area [14]. On the other hand, NIRAPAD reported that mainly self-employed, garments workers, day labors live in 1,814 slums in Chittagong city where half of them are at hill slope and at foot hills and these are very risky due to landslide disaster [15]. The main cause of landslide in Chittagong is soil condition, the slope of the hill, hill excavating and deforestation [16]. The hills of Chittagong are sandy and for indiscriminate hill excavating the hill slopes have become unstable, and landslides happen [17]. The increasing annual rainfall has aggravated the occurrence of landslides in Chittagong city [18]. Landslide disasters effect directly on informal settlement (30 % of total settlement) in Chittagong city and from 1997 due to Landslide disaster, people lost their life and property and also become shelter less. For that Government and other organization now try to solve housing problem for long term basis in various ways. Safe and proper housing are one of the main factors to save people from a disaster like a landslide. Housing is also playing an important role in that development. Proper rehabilitation is important for housing for all people is necessary for a healthy city development and city life. As the growth rate of development of Chittagong is very high, proper planning is essential for its development. So it is a burning issue for the Government to rehabilitate the landslide disaster affected vulnerable people properly. Some of the core features and aspects of landslide is discussed in the following section your paper.

## 2 CITY PROFILE OF CHITTAGONG, BANGLADESH

Chittagong is the second largest metropolis in Bangladesh. Situated on the Bay of Bengal, Chittagong has historically been an important center of commerce due to its geo-strategic location and is regarded as the commercial capital of the country. The city is well known for its scenic beauty and the unique combination of hills to the north, flat land bounded by the Karnaphuli River to the southeast, the Halda River Valley to the northeast and the Bay of Bengal to the west. Within the city, there are a number of tidal canals that serve as the main drainage channels. Its diverse ecosystems with low-lying coastal area, beaches, estuaries, lakes and hills create opportunities for different economic activities and social and cultural diversity. Chittagong has been contributing the national economy since the independence of the country in 1971. The

major economic establishments/resources are (1) Chittagong Port. (2) Lots of Garments Industries. (3) huge numbers of medium and heavy Industries (Industrial belt at Fouzdarhat, Baizid Bostami, Kalurghat Industrial, and Patenga industrial area). (4) Natural Beauties such as the Patenga Sea Beach. Batali Hill, Foy's Lake, Karnaphuly river bank, court building, Circuit House, etc. in the city are playing a significant role in the development of Tourism Industry in Chittagong region [10]. Cities are being inundated with people looking for a job and a decent income. The Chittagong City is not an exception to it. Like many developing state cities it is experiencing a rapid growth of population mainly because of rural-urban migration (BBS, 1981, 1991 & 2001). As the new population is added the demand for the different type of infrastructure facilities and services are increased continuously. As different urban authorities of Chittagong are providing inadequately municipal services, the citizens are frequently unsatisfied with the quality of services and facilities. Like many urban centers, most of these services of Chittagong city are confined only to administrative hubs and residential enclaves of the rich and the middle-class people. Chittagong has pucca, semi-pucca and kutcha houses where the private and informal sectors supply most of the housing in Chittagong. Housing and residential processes are in unplanned and irregular approach due to lack of institutional control and monitoring.

## 3 LANDSLIDE IN CHITTAGONG CITY

Since 1997, 15 landslides have killed nearly 400 people in the city and adjacent small urban centers. For example, the landslide disaster in June 2007 that was triggered by intense rainfall killed 128 people and affected 2,072 families in five informal settlements [19]. After the massive landslide of 2007, a technical committee has been created of government agencies, Chittagong City Corporation (CCC), Chittagong Development Authority (CDA), researchers, engineers and NGO workers for identifying priorities for action, land use vulnerability assessment and zoning. That committee divided the city into 3 zones considering risk issues of the landslide. The whole Chittagong city is divided into three different zones depending on vulnerability of landslides which are High Risk Areas (Lebugan Area, Baizid Bostami Area, Kushumbag Residential Area, Batali Hill Area, Motijharna Area), Moderate Risk Area (Foy's Lake Area, Khulshi Area) and Low Vulnerable Areas (Nasirabad Area, Goalpara Slum area) [20]. According to CDA, the following Map shows the landslide area of Chittagong city and on the other hand Bayes and Ahmed shows the area which are risk due to the landslide in Chittagong City and the susceptibility of the landslide is divided into three categories where red color is high risk, yellow is medium and green is low-risk area.

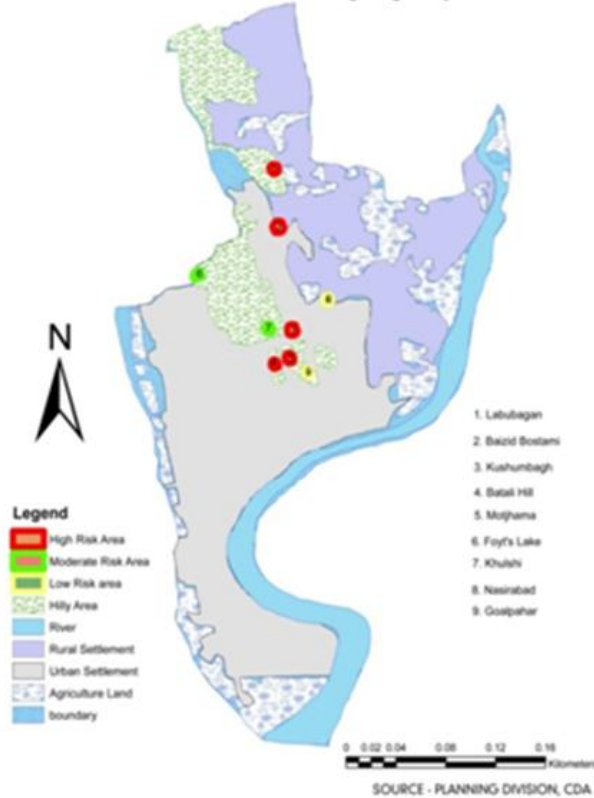
The different government, autonomous and private organizations like Bangladesh Railway, Chittagong City Corporation (CCC), Chittagong Development Authority (CDA), Chittagong Water and Sewage Authority (WASA), and Bangladesh Army are the owners of the hills of Chittagong city, and some large private companies (AK Khan Group, Ispahani Group, James Finley, etc.) and some elite individuals have also owned a portion of the hilly lands of Chittagong [17]. But among them, Bangladesh Railway owned the maximum hill area of Chittagong. People migrating from the village area started to living in open vacant are due to lack of housing. Mainly poor people have to select the area for low housing cost, near to job place. Though they are not getting the services and facilities there, they live there to get a place for shelter in the vacant land which is mainly owned by the Government agencies. Those hill areas are also a risk to landslide disaster but people still living there which are mainly from the informal sector.



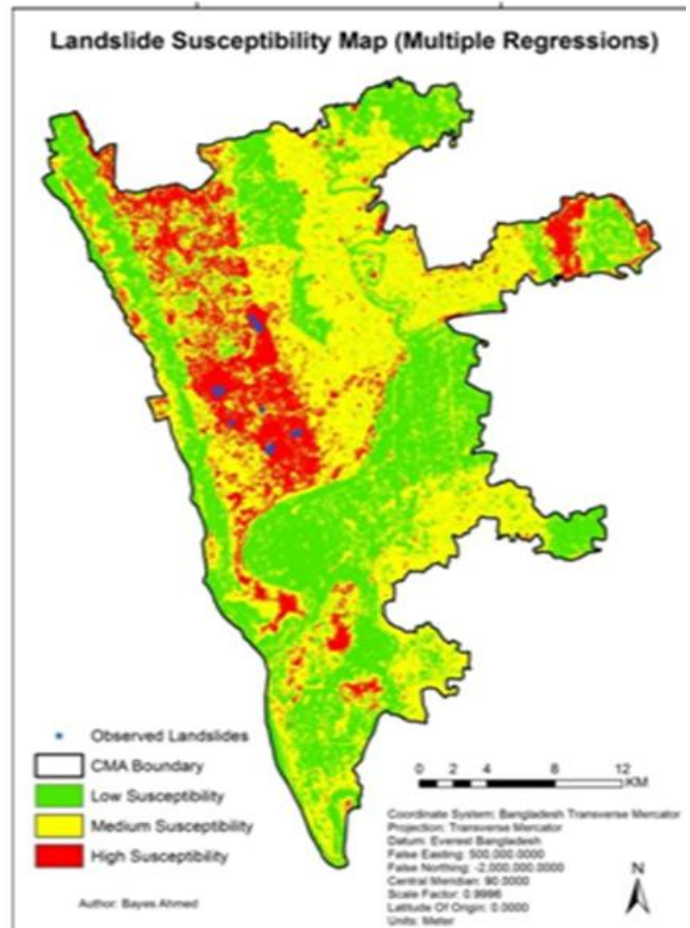
Figure 1 View of Landslide in Chittagong

Source: The Daily Star, Local Newspaper, Bangladesh

Landslide Area and Landuse Pattern of Chittagong City



Map 1.1 and 1.2: Landslide area in Chittagong City  
Source: Bayas & Yiasen 2013



**3 CAUSES OF LANDSLIDE AT CHITTAGONG CITY:**

3.1 Soil Condition: Formation of hill soil is an important factor to trigger landslide. According to geological time scale, hilly area of Chittagong developed in Tertiary age and is composed of unconsolidated sedimentary rocks such as sandstone, siltstone, shale, and conglomerate. The hilly region is underlain by Tertiary and quaternary sediments that have been folded, faulted and uplifted, then deeply dissected by rivers and streams [21]. Sandstones, shale, and siltstone, are the main components of these hill areas and acid properties of hilly soil are easily saturated with water. This is the reason for landslide in the area during rainy season.

3.2 Hill Cutting: Hill cutting is one of the major causes of landslide in Chittagong city. This is being done for construction of building, developing residential/housing area, clay and sand mining and developing road network. [22]. Hill excavating has been identified as one of the major causes of landslide in the study area because all settlements have been developed by hill excavating. Besides this unplanned hill excavating is going on due to the sand collection, road construction, and informal settlements.

**4. SURVEY OF LANDSLIDE AREA IN CHITTAGONG:**

For the survey two landslide affected sites have been selected which are Mothijorna Slum area and BiozeedBostami Informal settlements area. The summaries of the socio-economic condition of the survey are described below.

#### 4.1 Landslide Survey Area 01:

##### General information:

Name of the landslide area: Santinagar Slum, Biozeed Bostami, Chittagong

Location in town:

Nearest Main Road: Hathazari Road

Nearest Landmark: Amin Jute Mill

Nearest Node point: BibirHat

Number of house 750

Total population 3750

Number of dwelling unit surveyed 40

Total area 2.7 acres (approximately)



**Figure 1:** View of the Survey Area 01

Source: Field Survey by Authors 2019



Map 1.1 Location of the Survey area 01 -Santinagar Slum

Source: GIS Map, Planning Department, CDA 2019



Map 2.2 Location of the Survey area 01 -Santinagar Slum.

Source: GIS Map, Planning Department, CDA. Source: Map from Google Earth. 2019

##### Economic Profile:

Average income of the family per month – 9000 taka (Min 6000 Taka Max 11000 taka),

Formal Workers (Factory and Garments): Male 56 % Female 48%

Percentage of casual workers: Male 45% Female 34 %

##### Social Profile:

Average household size (number of members): 5

Percentage of households living as tenants: 90%

Percentage population having - Primary Education: 11%,

Secondary Education: 6%

##### Environmental profile

Percentage of Built-up area - 75 % (approximate)

Percentage of green area 5-8 %

Percentage of open space 20 %

Number of landslide disasters in last ten years: 4

Number of affected persons by landslide: 100

Number houses destroyed by landslide: 18

Percentage of houses vulnerable to landslide: Low 20%, Medium 50 %, High 25 %

##### Services and amenities:

Approach Road: No formal approach road

Water supply: Water available from the common source.

Sanitation: Common Toilet for community

Surface drainage: Open temporary surface drain

Distance of local shopping area: 1 km

Distance of Medical Facilities: 5 km

Distance of Bus stop /Railway station: 2 km

##### Building Condition:

Average area of housing unit: 13 sqm

Floor area per person: 2.6 sqm

Number of room: 01

Material of the house: Wall – Bamboo -80%, Brick Wall 20%, Roof- CI Sheet 90%

Floor: Cement concrete, Door- Bamboo/ Wood, Window- Wood/ CI Sheet

Average Height of the roof: 2.75 sqm

Natural Lighting and ventilation of the house: Not proper

##### Priorities and Aspiration

Percentage of Household desire to shift- 85%

Percentage of Household to pay for rent house - 70%

Demand of Size of house – 20 sqm (0.59 Katha, i.e. 1 Katha = 338 Sq.M.)

Prior Space/Facilities – Safe Bedroom- Kitchen and Toilet

#### 4.2 Landslide Survey Area 02

##### General information:

Name of the landside area: Motijhorma Slum (Part 1), Lalkhanbazar, Chittagong

Location in town: (Map 3.1 & 3.2)

Nearest Main Road: CDA Avenue Road

Nearest Landmark: Wasa Water Tank

Nearest Node point: Ispahani Junction (LalkhanBazar Moor)

Number of house: 1800

Total population: 9820

Number of dwelling unit survey: 40

Total area: 5 acres (approximate)

##### Economic Profile:

(Taka is the currency of Bangladesh. 1USD = 84.53 Taka as on 19.6.2019)

Average income of the family per month – 9500 Taka (Min 6000 Taka Max 11000 Taka),

Formal Workers (Factory and Garments): Male 25 % Female 35%

Percentage of casual workers: Male 65% Female 45%

Percentage of unemployment: Male 10% Female 20 %

Average distance for workplace: 3 to 4km

Percentage of income spent for maintaining housing: 35%

Percentage of household in debt 10-15 %

##### Social Profile:

Average Household Size – 5.5

Percentage of household living in tenants 85%

Percentage population having- Primary Education 15%

Secondary Education 5%

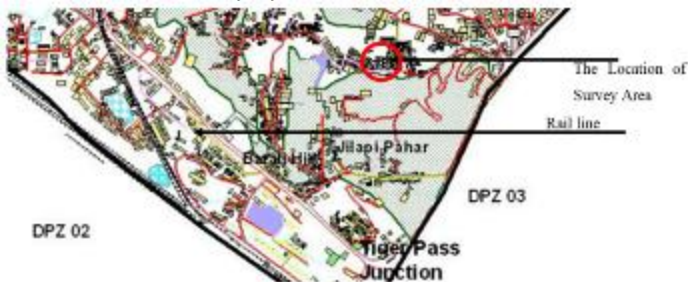
Environmental profile – Landslide

Percentage of Built-up area – Assume: 85 % (approximately)  
 Percentage of green area: 5-8 %  
 Percentage of open space: 10 %  
 Number of landslide disaster last ten year: 5  
 Number of affected people by landslide: 500  
 Number house destroyed by landslide: 45  
 Percentage of house vulnerable for Landslide: Low 20%,  
 Medium 45 %, High 35 %



**Figure 2:** View of Survey area 02

Source: Field Survey by Authors 2019



Map 3.1: Location of the Survey area 02, Motijorna part 1

Source: GIS Map, Planning Department, CDA 2019



Map 3.2: Location of the Survey area 02, Motijorna part 1

Source: Map from Google Earth 2019

#### Services and amenities:

Approach Road: No formal approach road  
 Water supply: Water available from the common source.  
 Sanitation : Common Toilet  
 Surface drainage: Open Katcha surface drain  
 Distance of local shopping area: 1 km  
 Distance of Medical Facilities : 5 km  
 Distance of Bus stop /Railway station: 3 km  
 Building Condition:  
 Area of the housing unit - 12 sqm (0.18 Katha)  
 Floor area per person – 2.6 sqm  
 Number of room 01  
 Material of the house: Wall – Bamboo -90%, Brick Wall 10%  
 Roof- CI Sheet  
 Floor- Cement concrete Door- Bamboo. Wood Window-  
 Wood,/ CI Sheet  
 Average Height of the roof: 2.75 sqm  
 Natural Lighting and ventilation of the house. Not proper  
 Priorities and Aspiration  
 Percentage of Household desire to shift: 85%

Percentage of Households to pay for rent house: 70%  
 Demand of Size of house: 20 sqm (0.59 Katha)  
 Prior Space/Facilities: Safe Bedroom- Kitchen/toilet

#### 4.3 Housing condition of landslide area of Chittagong:

Like most other informal settlements in Chittagong, Biojeed Bostami, Motijahna informal settlement has been built on vacant government land vulnerable to natural disasters - a landslide. A lot of houses are built on the edge of the steep slope, hill top and foot of the hill. This practice makes them extremely vulnerable to landslides. According to the survey report of the students of CUET, the building of Motijorna settlement is in four types – Katcha, Semi pucca, Pucca and Multistoried. Katcha House: Katcha house mainly is built with the cheapest and temporary materials, The Foundation is made earthen plinth with bamboo (sometimes timber) posts. While the wall is made of with organic materials - jute sticks, catkin grass, straw, bamboo mats, etc. and split bamboo framing. Here the roof is of CI sheet.

Semi-Pucca House: In this house the foundation or plinth is made of brick perimeter wall with earth infill (sometimes the plant is brick or cement concrete layer) and walls of bamboo mats; CI sheet; Timber (sometimes split bamboo) framing. The roof is also made with CI sheets.

Pucca House and Multistoried Building: Here the foundation is built with brick or concrete framing, wall is made by of brick, and the roof is reinforced Cement Concrete (RCC).

Layout Pattern: There is irregular pattern in the housing of that study area as shown in Fig. 4 & 5.

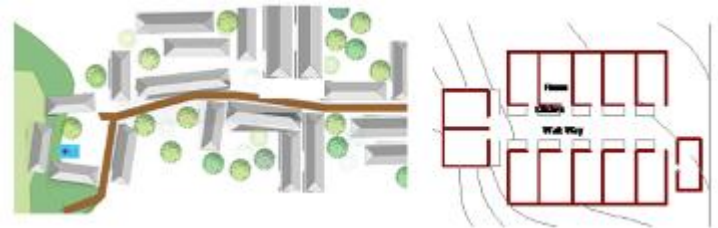
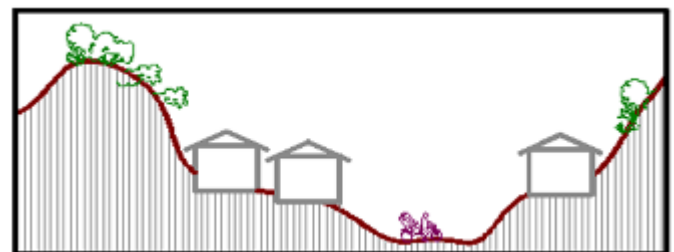


Figure 3: Conceptual Layout Plan

Source: Authors



**Figure 4 Conceptual Cross Section of the settlements**

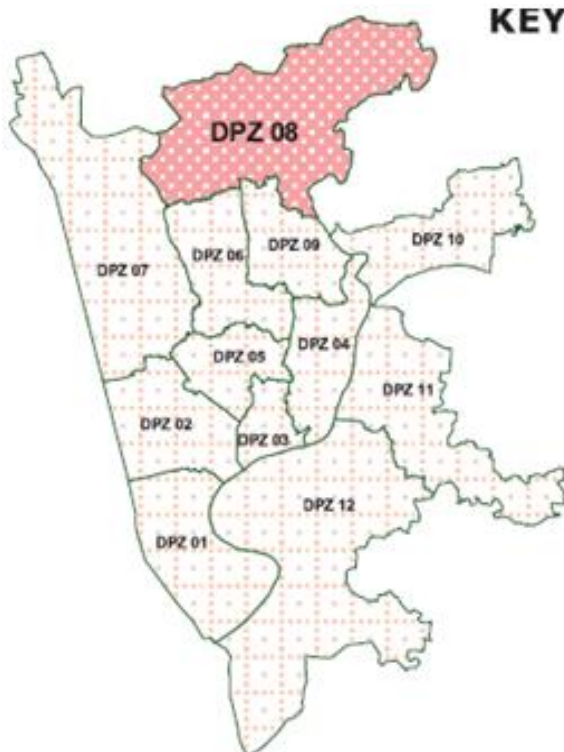
Source Authors

There are different layout plans of the houses in the study area. The most common and vulnerable shelters are in group sharing with common toilet and kitchen facilities. These houses are connected with a narrow corridor and some of them are very near to hill. Common water supply and electricity facility are there. The drainage system is not proper and there is no consideration of rainwater drainage. People living the landslide prone area are mostly illiterate, day laborer and garment workers, low income people, migrated from outside of city mainly for the job, have weak housing infrastructure, have

no access to the basic urban services (water supply, sanitation, electricity etc.) and are facing disaster in nature

**6. ANALYSIS OF NEW SELECTED SITE FOR REHABILITATION:**

The site is located at present at the DPZ 08 which is a proposal site for residential purpose in proposed new township project by Chittagong Development Authority (CDA). In the site analysis, two important issues will be focused- a) the site surroundings, environments and Land use of the site for housing and b) the special potentiality of the site for the Rehabilitation of the landslide affected people for that site.



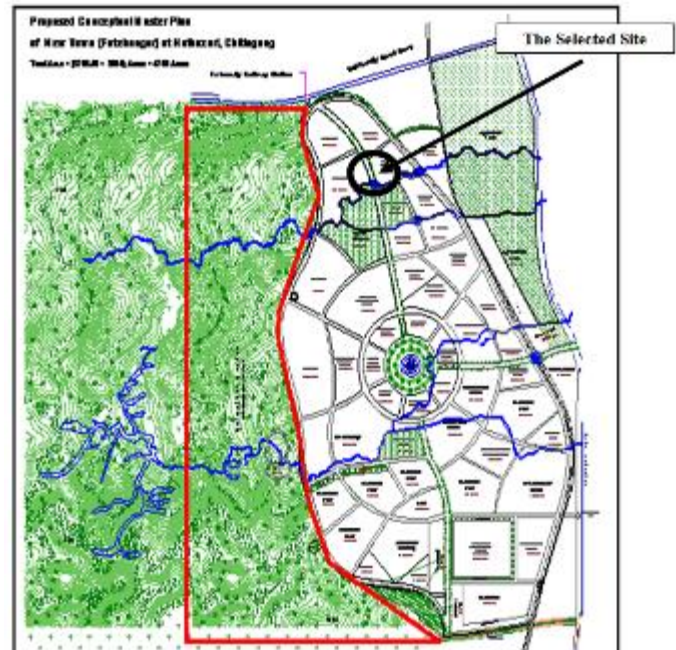
**Map 3:** Map of DBZ of Chittagong City According to DAP 2008  
Source: DAP 2008, CDA

6.1 Brief Description of Site: The Site is located at the northern side of Chittagong at Fatheyabad in Hathazari Thana. According to Detail Area Plan (DAP,) 2008, a new township was recommended in the zone DPZ 08 which is located at Hathazari and Raozanthana (North Chittagong) by the Hathazari Road and near Chittagong University. CDA had a proposal for a new township project whose name is Fathenagar New Township where according to the master plan of the new township the total area is 4700 acres where 2000 acres are reserved for the forest. It is connected to the City by Hathazari Road (N106) to the main city and by Nazirhat-Sholoshahar Railway. The master plan is composed with Government and non-government institutional area, commercial area with a shopping mall, educational area, Cottage industry area, Cultural area with the museum, Health center, industrial plot, Residential area for housing and open playground park, etc. There are a different residential area for a housing project in the master plan and one site which is around 42.16 acres is selected based on its potential.

6.2 Site surroundings and Environments: The site is located in new township area. Chittagong. It is around 25 kilometer from

the Main Chittagong city but very near to the Chittagong University. The Fatheyabad urban area is also situated near the area. The township is surrounded by various landuse on all four sides, as follows.

On North: Chittagong University, University Connection Road and University Railway Station, Residential Village area,  
On East: Fatheabad Urban area, Hathazari Road, Nandir Hat market area and Central Loknath Temple, Fatheyabad Railway Station, and Residential Village.  
On South: Open land and Residential Village.  
On West: Forest area and extension of University area.



**Figure 7:** New Township Layout Plan  
Source: Chittagong Development Authority (CDA) 2019



**Figure 8:** Hathazari Road, and Fateyabad Rail station  
Source: Field Survey by Authors



**Map 4:** Location Of the Site  
Source: Map from Google Earth

There are different residential areas for a housing project in the master plan, and one site with an area of 42.16 acres is

selected. According to the master plan of the new township the selected site is bounded by three roads in East (160' wide), North (60' wide), west side (100' wide) and a Cannel of 60 feet wide at the south. At the west, there are rail tracks which are just after the read and after the rail tracks the reserve forest area is started. In the north side the land use is edu-village and at the east is Cottage industry where the south is an open park and sports complex.

- Site's Potential:
- It is located at DPZ 08 zone of DAP of Chittagong city, and the area is defined as residential area in DAP
- It is safe from the following natural disaster - landslide, flood, and cyclone.
- Good communication to the main city by Rail and Road. The nearest railway station is only 15 min walking distance.
- Landslide effected EWS people can be able to go their job easily by train which is cheaper and economically viable.
- It is located at New Township area which is a proposal of CDA.
- Very near to Chittagong University Area.
- The market, School, and College are available in Fateyabad which is very near to the site.

#### Communication:

The site is connected to the city by Rail and Road. The following Charts Show the Distance and Fair of Bus and Rail from City to the site.

**Table 2.1 :** Fare of bus from City to the proposed site. Source: Field Survey

Route	Distance	Type of Vehicle	Local Fare	Non Stop Service Fare
Muradpur to Fateyabad	11 Km	Bus/ Mini Bus	7 Taka	30 Taka

Source: Authors 2019

**Table 2.2 :** Fare of train from City to the proposed site.

Rail Station	Distance	Fair
Chittagong Central to Fateyabad Junction	19 Km	6 Taka(local), 20 taka (Commuter)
Sholoshahr Jn to Fateyabad Junction	12 Km	5 Taka(local), 20 taka (Commuter)

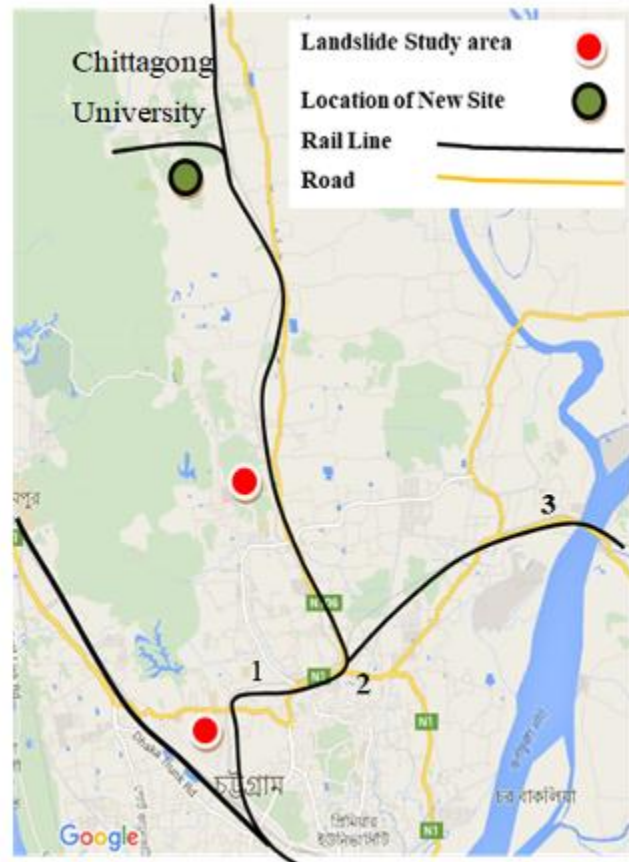
Source: Field Survey. Source: Bangladesh Railway

### 6.3 Rehabilitation Consideration for Landslide affected People:

For any rehabilitation program, the most important issue is the proper survey and find out the community demand and ability of people. From the literature review, it was found that relocation can be the solution for disaster housing, but it should be done after proper analysis of socio, physical condition, financial feasibility and local norms and policies. From the primary field survey and secondary report concerning the landslide affected people, the three issues have been identified. These are major issues which need to be considered while providing rehabilitation housing for the community in Chittagong and similar areas in the developing countries of the world. The three key issues are: Transportation: Currently transportation is an important issue for any relocation. It is far away from the city and people

desire to live in close proximity of the city for many reasons, and benefits that they offer. However this challenge could be mitigated if they are provided with fast, efficient and inexpensive transportation system, connecting the relocation site with the city or central business district. Road Network: The new site is just by the side of Hathazari Road(N106) which is an important national road and directly linked with the city and local bus and other transports are available where the travel time is around half an hour.

Rail Way network: According to the master plan of the new township there is a circular Rail track which will provide mass transport for those inhabitants. This rail track is connected with the existing Nazirhat Sholoshahar Rail



Map 5: Linkage with Existing Landslide area to New proposed site

Source: Map from Google Map (1-Sholoshahar Staion, 2 Muradpur, 3- KalurGhat, 4 Fatheyabad)

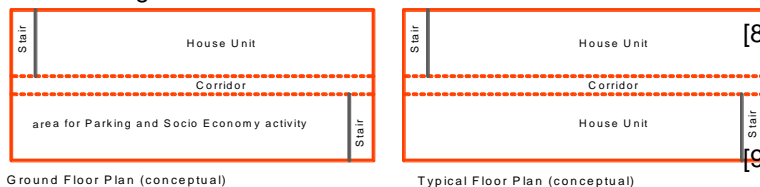
tracks at Fatheyabad Junction Station. So by rail networks the new site is well connected to the city. From Fatheyabad to Sholoshahar (Main City), the travel time is 20 minutes, and the fair is also cheaper (05 Taka) which can be affordable for the poor people. The communication cost site to the city is only 5-7% of their Income. That rail tracks also is passing through the existing landslide affected area, so people can easily travel their previous area from the newly relocated side by train.

Job Opportunity: Poor and low-income people live in that vulnerable area crowd in the city mainly for their job opportunity in the city area. The relocation site also creates job opportunity for that kind of people. They can get a job as a daily home worker in other general housing. It is a new township; there is an opportunity to get a job in the new

industrial area. There is another important issue that there is good transport system with this city and for this they can continue their old job from the newly relocated site. Existing Oxygen and Baozeed Bostami area which is mainly Garments factory zone has a good opportunity for poor people and that places are very near the new site, and there is good transport system with that area to the new site. Safe from Disaster: According to the literature review, relocation is the best program for the landslide area. But the new site should be free from other natural disasters like cyclone, flood, etc. and also free from pollution. The selected new site is free from Landslide as there is no hill in the area. That area is free from flood and cyclone also. The new site area does not have any pollution, and the natural environment of this area is pleasant, with presence of a nice reserved forest at the west. So the relocated people feel safety from a landslide which is their main concern and can also enjoy with natural environments.

#### 6.4 Key Finding:

For rehabilitation of any settlements the important issues are considering their life style, their affordability, job opportunity, transportation and safety. Their affordability depends on their income and expenditure which is related to their transportation, housing condition, availability of services. The built form should be simple with the dimensions according to their affordability. The area of these houses proposed for the rehabilitation of people is calculated to be close to 20 sq.m., including bedroom, kitchen, toilet and common spaces as shown in Fig. 10.



**Figure 10:** Plan of Builtform

Source: Authors 2019

So rehabilitation is essential for the landslide affected people in Chittagong City. The average income of the family is eight to nine thousand and one-third of the income they are ready for house rent. By special government initiatives they can get up to three lakh bank loan for purchasing a house. But the Rehabilitation project should be economically feasible, safe from disaster, communication should be effective and rehabilitated people should get proper job according to their ability.

## 7. CONCLUSION

The hill management technical committee submitted a plan suggesting proper management of the hills through tree plantation, construction of retaining walls or soil consolidation after rehabilitating people of those areas and other risky areas (NIRAPAD, 2010). According to DAP 2008 the development proposal of landslide area is Conservation of the hilly areas and its environmental protection and enhancement. This particular paper analyzes various issues related with relocation and rehabilitation of landslide affected victims. This particular research would help Government to take initiative for proper rehabilitation considering the patterns of living and lifestyle of the disaster affected people. This study is based on case of Chittagong but has a good fitment and wider consideration for

disaster rehabilitation schemes or programs in global south especially related to disasters in hill or hilly areas, such as landslide.

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