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Impact of Frequent Land sliding: A Case Study of Ambeghar Village in Patan Tashil

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DOI-

Introduction:

A landslide is a mass movement of material down a slope, such as rock, earth, or debris. They can happen suddenly or more slowly over long periods of time. When the force of gravity acting on a slope exceeds the resisting forces of a slope, the slope will fail and a landslide will occur. Landslides are natural hazard which is caused by several geophysical & anthropogenic factors. Landslides are caused by disturbances in the natural stability of a slope. They can accompany heavy rains or follow droughts, earthquakes, or volcanic eruptions. Mudslides develop when water rapidly accumulates in the ground, resulting in a surge of water-saturated rock, earth, and debris. The four main types of movement are fall topples. Slides (rotational and translational) flows. The impact of a landslide can be extensive, including loss of life, destruction of infrastructure, damage to land, and loss of natural resources. Landslide material can also block rivers and increase the risk of floods. Pune One of the biggest landslides in the state has occurred here. Raigad recently a landslide, named the biggest after 2016 in Pune, occurred here. Satara a huge landslide took place near Pratapgarh Fort and Ambeghar Village in Patan tehsil recently. These landslides are dangerous, occur suddenly and cause significant damages (Guzzetti et al., 1999). It plays a significant role in the evaluation of landforms while constituting a severe natural hazard in many regions

Study Region: According to Census 2011 information the location code or village code of Ambeghar village is 564353. Ambeghar village is located in Patan tehsil of Satara district in Maharashtra, India. It is situated 15km away from the sub-district headquarter Patan (tehsildar office) and 60km away from district headquarter Satara. As

per 2009 stats, the total geographical area of village is 719 hectares. Ambeghar has a total population of 810 peoples, out of which male population is 421 while the female population is 389. Literacy rate of Ambeghar village is 56.54% out of which 72.45% males and 39.33% females are literate. There are about 163 houses in Ambeghar village.

Objectives:

1. To assess the social impact of the landslides in the study area.
2. To assess the economic impact of the landslides in the study area.

Hypotheses: -

1. Continuous landslides events are responsible for economic backwardness
2. Social life is affected by landslides

Data base & Methodology: The study is mostly based on both primary and secondary data sources. The collected data is processed to analyses the pattern of landslides. To analyses the impact of landslides socio-economic status, the same technique is applied for calculation.

Sampling Techniques and Sample Size: A stratified random sampling technique is used for different homes with different distances from the study region, particularly, in the Abegha Village. Total 100 respondent reply in researcher interview.

Discussion & Result: Data Sheet For Preliminary Investigation of Landslide: Ambheghar Village

| | Field | Description |
|----|------------------------------|--|
| 1 | Slide No (LS.No) | : MH/SAT/47G15/2021/10 |
| 2 | State | Maharashtra |
| 3 | District/Taluka | Satara/Patan |
| 4 | Toposheet | 47/G/15 |
| 5 | Name of the slide | Ambheghar Debris slide 2. Ground crack |
| 6 | NH/SH/LOCALITY | The village is located approx. 14km in the southwest of Patan and can be accessed through Morgiri road. |
| 7 | Latitude | 1. N17°16'56.1' (Debris Slide) 2. N17°17'17'.04' (Ground Crack) |
| 8 | Longitude | 1. E73°50'1.1' (Debris Slide) 2. E73°50'4.9' (Ground Crack) |
| 9 | Length | 5m |
| 10 | Width | 4m |
| 11 | Height | 2m |
| 12 | Area | -- |
| 13 | Depth | 0.5m |
| 14 | Volume | - |
| 15 | Run out distance | 5m |
| 16 | Type of Material | Debris |
| 17 | Type of movement | Slide |
| 18 | Rate of Movement | Rapid |
| 19 | Activity | Active |
| 20 | Distribution | Enlarging |
| 21 | Style | Single |
| 22 | Failure Mechanism | Shallow Planar Failure |
| 23 | History: (Source: Villagers) | Old cracks had developed in cultivated land of the village in 2019, Presently they are almost filled by transported material brought by rain water during rainy season. Ground cracks and slide initiated in agricultural land and near nala, on 23rd July 2021. |
| 24 | Geomorphology: | |

| | | |
|---|---|--|
| 4 | The area is represented by hillslopes with flat and wide intermediate topographic benches. The village is located on one such E-W training topographic bench at upper level (828m from MSL). The upslope (toward south) of the village is gentler, whereas moderately dissected slopes followed by a wide bench and Morna reservoir are seen in the downslope (towards north) of the village. Small topographic depressions/seasonal nala are seen on either side of the village. | |
| 2 | Geology: | |
| 5 | The rock types exposed in the area are basaltic lava flows. The overburden thickness on the slopes is very less (0.5 to 1m), whereas the flattish benches have thick insitu/transported soil. | |
| 2 | Structure: A | |
| 6 | | |
| 2 | Landuse/Landcover: | |
| 7 | Cultivated land and settlements. The road to Ambheghar (Varche) has extensive slope cut. Further upslope there is sparse vegetation. | |
| 2 | Hydrological Condition | Affected area was damp due to rainfall during visit. |
| 8 | Triggering Factor: | Heavy and continuous rainfall for 2-3 days. Rainfall on 23 rd July 2021 was 321.3mm (in patan Taluka) |
| 9 | | |
| 3 | Death of person | 120 |
| 0 | | |
| 3 | People affected | 289 |
| 1 | | |
| 3 | Livestock loss | 25 |
| 2 | | |
| 3 | Communication | Nil |
| 3 | Infrastructure | 15 house damage |
| 4 | | |
| 3 | Agriculture/forest/Barren | Slide is a small slope failure near nala/drainage. Cracks are observed in agricultural land of the village. |
| 5 | | |
| 3 | Geo-Scientifics Causes: | |
| 6 | Debris Slide | |
| | The preparatory factor responsible for the slide is presence of nala/drainage near the cultivated land. | |
| | Rainwater percolation within the rock-overburden interface and saturation of the slope forming material by heavy and continues rainfall has ultimately led to failure of the slope. | |
| | Toe erosion/cutting by debris flow along nala bank also facilitated the failure. | |
| | Ground Cracks: | |
| | The preparatory factor is presence of thick overburden soil. | |
| | The heavy rainfall caused saturation and | |

| | |
|--------|--|
| | facilitated the development of pore water pressure in overburden material. This caused reduction of strength of the material and led to differential settlement of the ground resulting in development of cracks. Modification of natural slope by cutting terraces for agricultural field and impounding of water for paddy cultivation also acted as aggravating factors for reduction of material strength and deformation of ground. |
| 3 7 | Remedial measures: Maintain some buffer (at least 5m) from the Nala drainage, where neither cultivation nor any houses should be constructed. Shifting of few houses located in downslope near the edges of the hillslope (No construction in 10-15m area from the edge of the hill slope) The flow path of the natal drainage on both sides of the village should be cleared from any obstruction like cultivation. Paddy/any cultivation requiring impounding of water should not be allowed in the upslope of the village. Sealing of ground cracks with impervious material and ground compaction may be done. |

Finding & Suggestions:

Effects on Human Lives: While asking about the causalities and injuries to human lives in their villages, some respondents, the landslides caused causalities in their village and some person replied that there were not any causalities in their village. From these, 289 people got injured. 120 People death in cause of landslide. Causality Economical Damage Harm to Livestock Agricultural Damage Change in Underground Water Table Displacement of Villages Effects of landslides in Study area, 289 persons effected,

Effects on Infrastructure: While asking about economic loss 15 house damage to their homes or other structures was reported by the respondents in the study area.

Effects on Livestock: While asking about effects on livestock, 41 people replies that they get harm to their livestock in this landslide. Due to collapsing of wall or shed on livestock. 20 people replies that they do not get harm to their livestock in this landslide because they had no livestock or they tied their livestock at open space. Total 25 animal dead in cause of landslide

Effects on Agriculture: When Respondents are asked for agriculture damage during earthquake, 64 people replied that they undergo the agriculture damage near hilly area in study area like

displacement of agricultural land, debris fall on their land, crack on land, landslide etc. 36 respondents not experience any damage to Agriculture.

Change in Market Place and Fairs: While enquiring about any change in the weekly market, after the landslide 72 respondents of the study area answered that there was a change in market structure and market place, and 28 respondents of the study area said there was no change in the market

Conclusions

A preliminary, assessment was carried out on 13.08.2021 in village Ambeghar Considering the prevailing ground condition, small dimension of the failure incidences there it low risk to the village from such failures. The early implementation of the remedial measures and suggestion given are very much required. The slide has occurred near nala/drainage of the village. It has small dimension and has low risk to the village. But initiation of small failures is seen towards edge of the slope in the downslope of the village, which may create problem in future. Therefore, suggested remedial measure may be executed at the earliest to reduce the risk. No need of rehabilitation of entire village. Only few houses situated in 10-15 m zone from edge of the hill slope in downslope may be shifted to safer place.

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