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Landslide Zonation Mapping and Risk Management Studies in Malshej Ghat Section

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Abstract: Factors including earthquake, storms, volcanic eruptions, human modification of land has increased levels of causing landslide in last decades. Paper presented will give the mapping done in and around Ghat section with direct-indirect methods, there causes, impacts in last decades and way of preventing such landslides. The landslide susceptibility study gives an idea of the stability condition of the slopes so that it can be used for planning any further construction activity and remedial measures. Thus the detailed on landslide zonation mapping and risk management of Malshej Ghat are reveals which are discussed in detail.
Keywords: Risk management, Landslide, Natural hazards, Mapping, GPS

I. INTRODUCTION

A natural disaster like landslide is the outcome of combination of a natural hazard and human activities. Landslides cause a lot of casualties in a year especially those cities sited nearby foothills are more vulnerable to landslides. Depending on triggering factors, landslides vary in comparison as well as in the rate of movement.

Landslides occur due to several factors such as physio-chemical variables, which contribute to landslide susceptibility, such as geology, slope characteristics, geotechnical properties, drainage patterns and dynamic variables which tend to trigger landslides such as rainfall and earthquakes.

It is necessary to take into account the temporal aspect of landslide hazard in order to carry out a complete quantitative assessment of the phenomenon. Identification, mapping, monitoring of landslide susceptible zones would help in the mitigation and rehabilitation.

Thus the landslide area was taken along Malshej Ghat section a mountain passage located between thane and Pune road in Maharashtra.

This road is not very good with a lot of potholes section. The place transforms into a green bed with lots of waterfalls, streams during the rainy season which becomes a popular destination during monsoons. To avoid damaged during landslide which may lead to loss of valuable time, money and causes insecurity in the humans life it is necessary to study landslide on a major scale.

II. INDIAN SCENARIO OF LANDSLIDE

India due to various climatic changes, rapid increasing activities on mountainous region, damaged the hilly areas and lead to the greatest damages to the Indian economy resulting in requirement for prevention techniques, the money required, time elapsed, etc. In India 0.49 million sq. km of the terrain is susceptible to landslide.

In this study location were identified from interpretation of aerial photographs and field survey. Lithological and geomorphologic factors such as petrology, slope stability, geological structure, relative relief, drainage conditions and land use were considered for assessment of susceptible zones for land sliding and risk management studies.

Vegetation, slope, precipitation, soil characteristics are the main causes which may lead to failure. The study aimed at zonation mapping and classification of the area into relative classes with the intensity and frequency.

The problem of landslide in the hilly areas due to failure occur through residual soil layers, at brawn between peak soil substance strength and typical residual strength values are of much concern with respect to economic losses and human casualties. There are certain causes due to which landslide occurs such as earthquake, angle of slope, rainfall, and change in vegetation.

III. STUDY AREA OF MALSHEJ GHAT

(Malshej ghat section, Pune-Thane, Maharashtra)

Study under the ghat section stretches about 13.7 km which is a run of 22 minutes and cuts the Sahyadri range to join Pune to Kalyan and make route Kalyan-Nagar highway. It was to study the lineament distribution and for validation of field data. The study area considered is as shown in fig.1 and fig.2.



Fig.1 Satellite imagery of study area

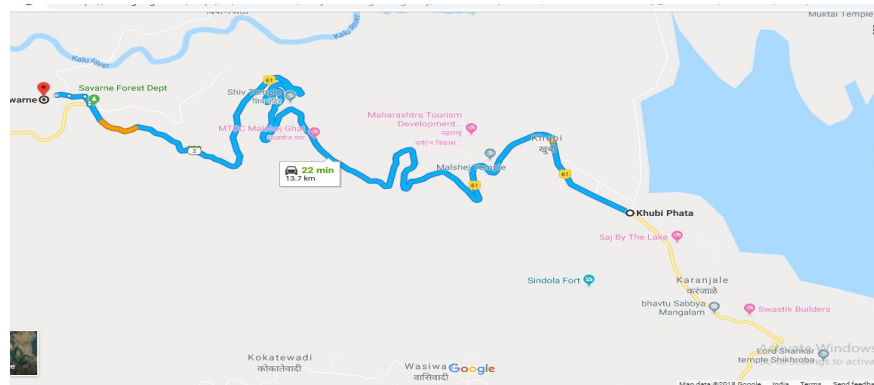


Fig.2 Terrain map of study area

IV.METHODS OF LANDSLIDE

Different methods and techniques have employed to analyse the causes of landslide .A brief line of different method is described below:

- 1) *Direct method*: It consists of Geological mapping where
 - a) During survey direct relationship between hazards and environmental setting at site is done for evaluation.
 - b) Distribution analysis for actual location by field survey and aerial photographic interpretation.
- 2) *Indirect method*: It consists two different approaches heuristic and statistical techniques.
 - a) *Heuristic Approach*: Heuristic approach is based on the factors influencing landslides such as rock type, slope analysis, land use pattern, landform, etc.
 - b) *Statistical Approach*: In statistical analysis the combination of factor that have led to landslide occurrence on the past, determine statistically and qualitative predictions are made for landslides free areas with similar conditions.

V. SOIL ANALYSIS AND RESULTS

The soil samples are collected at different landslide sections on which various tests are carried out. Following are the analytical results conducted on different samples shown in table 1.

SAMPLE	PLASTIC LIMIT (%)	LIQUID LIMIT (%)	SPECIFIC GRAVITY
I.	54.00	39.96	3.86
II.	64.00	42.73	4.56
III.	55.16	43.40	1.53
IV.	56.80	43.40	3.83
V.	45.18	57.11	1.40
VI.	41.83	45.68	3.24

Table 1 Test results on soil samples

These are the parameters which defines nature of soil, water holding capacity of a soil grains. Amount of water content in each soil sample shows its plastic limit, liquid limit and specific gravity. Atterberg limit are the basic parameter of soil of which tests were conducted.

1) *Landslide Images:* Landslide observed of various slopes along the road section of the ghat with area, height and volume respectively. Co-ordinates are given with respective direction along the mountainous side as shown in fig. 3.

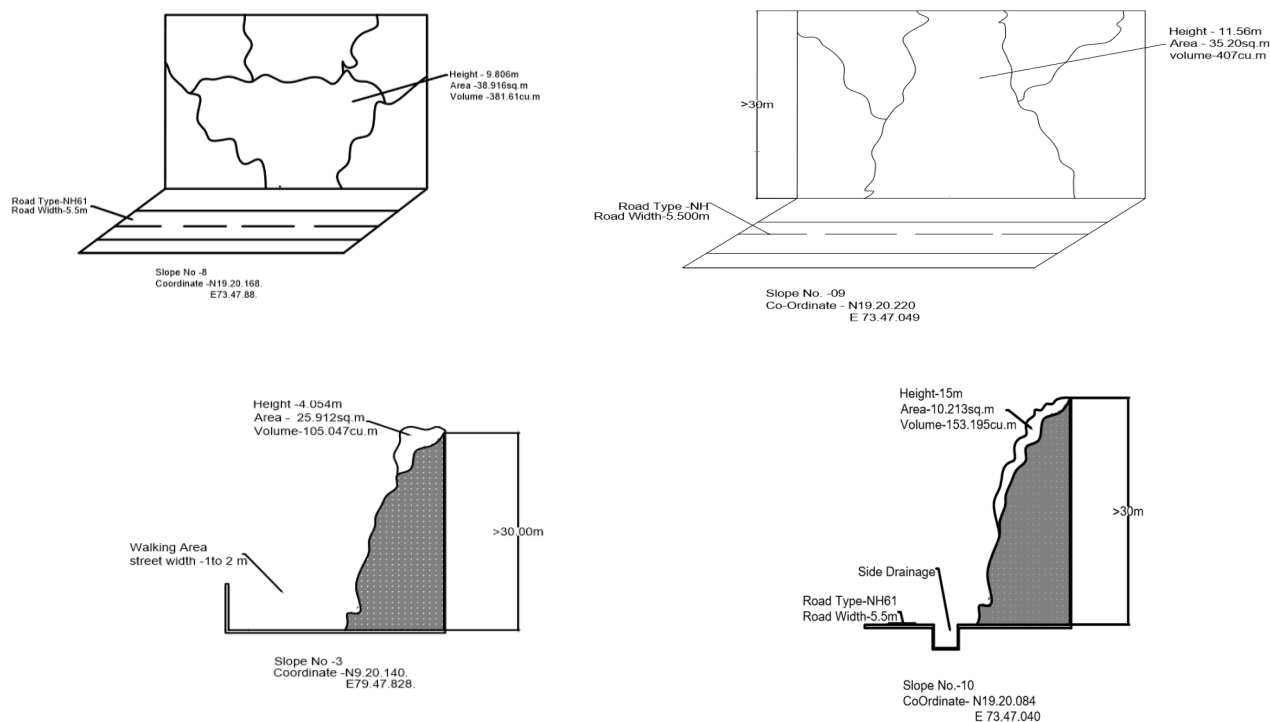


Fig. 3 Co-ordinates for various landslide sections

VI.CONCLUSION

This study gives the zones of landslides occurrence around ghat section subjected to tremendous effects through GIS and GPS through which susceptible maps are determined. The soil sample shows area subjected to high susceptible, very high susceptible and medium to low susceptible zone. The data obtained can be utilized by land use planners, workers for management & engineers to decrease losses of current and future landslides through various minimization procedures.

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