

Geophysical Investigation and Management Plan of a Shallow Landslide along the NH-44 in Atharamura Hill, Tripura, India

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Abstract: In any effective landslide hazard mitigation plan, in-depth knowledge about the causes of instability is required. Consequently, it is essential to study geological, geotechnical, meteorological and anthropogenic factors that influence the landslide. For the present study a geophysical investigation has been carried out on a large landslide, on the slopes of Tertiary siltstones, mudstones, shales and sandstones at Atharamura Hill, Tripura. Different techniques have been used, including measurement of micro-slope using Total Station, clinometers and the LISCAD software for terrain modeling and determining the total volume of the material displaced and total area affected by landslides and analysis of soil properties to understand the present condition of the scarps. Results obtained through field investigation and laboratory testing revealed that the underlying cause of the slide could be (a) the adverse geological formation with unconsolidated sandy materials and occasional intersection of silt or clay layers, (b) the hydrological condition with continuous seepage through fractures, and (c) cutting of hill slopes for reconstructing and widening of the road (NH44). This latter anthropogenic influence has been triggered by an intense precipitation event during the monsoon season.

Keywords: landslide, instability, hazard, geophysical investigation, human interference

1 Introduction

In India, about 10% of total population was affected by natural disaster in 2008; among this 0.5% of the population were affected by landslides only. According to the Geological Survey of India (GSI 2009), 0.49 million km² or 15% of land area of this country is vulnerable to landslide hazard. Of the areas vulnerable to landslide hazard, 0.098 million km² are located in the North-East region.

Landslides are common hazardous phenomena in hilly area of Tripura especially in North and Dhalai districts. Almost every monsoon period, when heavy downpours occur, this phenomenon takes place. The hilly terrain of Tripura is prone to landslides due to its geological

instability, neo-tectonic activity (Sen et al 2015) and extreme rainfall infiltration during monsoon season (Fookes and Wilson 1966, Varnes 1978).

Moreover, rapid developmental activities, such as, construction of roads and railways through highly rugged hilly terrains, have intensified these hazardous phenomena in recent decades. The landslide incidences have reportedly increased ever since the road and other infrastructural developments have accelerated in hill areas (Ghosh et al 2012). Such infrastructural developments have significant impacts on life and property in many parts of Himalaya, especially in those areas with high population densities and land use. During intensive field survey, it is found that most of the landslides occurred along the national highway (NH-44). Blocked and damaged

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