Facet based Landslide Hazard Zonation of Kodaikanal Hills , Dindigul District , Tamilnadu

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Abstract

Kodaikanal is the second important hill station in Tamil Nadu. Landslide occurrence is a frequent and recurring phenomenon in Kodaikanal Hills, causing loss of lives and damage to roads, dwelling units, properties and agricultural lands. Many a time landslides cause road blocks disrupting traffic putting the tourists and local people into hardship. Rapid development is taking place in Kodaikanal Township and the surrounding areas. It was felt that the time is befitting to evaluate the landslide hazard status for better planning and selection of suitable sites for future development and to provide adequate slope protection measures.

Pursuing Landslide Hazard Zonation is the primary step towards landslide hazard management and mitigation. With this objective, assessment of landslide susceptibility on 1:50,000 scale was taken up in Kodaikanal Hills. About 700sq.km area bounded by latitudes 10˚11'00" and 10˚25'00" and longitudes 77˚17'00" and 77˚50'00" falling in parts of Survey of India Topo sheets No.58 F/7,8,11,12&15 has been covered.

Kodaikanal Hill Range - a narrow, long linear plateau trending ENE – WSW, is the eastern extension of Western Ghats. The elevation of the plateau varies from about 360m to about 2500m above m.s.l. The hill is characterized by undulating plateau land forms with deeply dissected fringe slopes. The plateau is subjected to extensive fluvial erosion evidenced by the presence of conspicuous ridge and valley topography in the northern part. Trellis and sub-trellis are the most prevalent drainage patterns with straight courses, indicating structurally controlled nature of majority of the drainages. Sub-dendritic pattern is seen mainly in the undulating plateau areas.

The hills are occupied by rocks of Khondalite and Charnockite Groups and Peninsular Gneissic Complex. Soil and lateritic profiles, developed by weathering of the bedrocks, are the predominant capping materials present in the area. Alluvial, colluvial and pediment materials occupy small areas of the hill. Three phases of folding and four sets of joints/lineaments / faults are the structural fabrics deciphered from the rock mass present in the area.

An inventory of 198 slides and failures indicated the presence of planar and toppling rock failures in the moderately weathered rock mass on the cut walls along roads in the reaches with unfavorably oriented weak planes with completely weathered seams in the fringe slopes. Foliation parallel joint with weathered seam is the causative plane for most of the planar failures. Occasionally, joint planes trending N40˚ to 60˚E – S40˚ to 60˚W are found to be the sliding surface. Only the foliation joint planes are the causative planes for the toppling failures. Soil covered slopes of the undulating plateau under forest and plantation cover are devoid of contemporaneous slide. Whereas medium to small scale landslides are seen in the

cultivated soil covered slopes that are affected by toe erosion. Debris flows and old slide scars are present mainly on the fringe slopes and at some places on the moderately dissected valley slopes. Debris/soil falls, slips and slides are the cut slope failures seen along the roads in deeply dissected fringe and moderately dissected valley slopes. Shallow sheet failures are noticed at a few places on steep slopes with thin soil cover in the fringe areas.

Landslide hazard zonation of the area has been carried out adopting Modified BIS Guidelines taking slope facet as the fundamental unit. A total of nine parameters for the individual facets have been evaluated and eight thematic maps were prepared. Seven thematic maps are single parameter based and the eighth map is based on two parameters. Individual LHEF rating value for the parameters was assigned to each facet by superimposing the numbered facet map on the various thematic maps. The LHEF rating values are added to arrive at Total Estimated Hazard (TEHD) value for individual facets for assessing the hazard status and prepared final hazard (Susceptibility) map.

Developmental activities are spreading to the neighboring areas of Kodaikanal Township, such as, Senbaganur, Vilpati and Attuvampatti. The present studies indicate that parts of these areas fall under high hazard. The well developed Mother Therasa College slope is found to fall in moderate hazard. Well knitted surface and sub-surface drainage arrangements can stabilize slide prone slopes to a large extent. In addition, designed slope cuts with adequate protection, for siting dwelling units and other structures will also provide stability to fragile slopes. Major parts of the newly aligned Addukkam – Periyakulam road and select reaches of Ganguvarpatti – Kodaikanal and Perumalmalai – Palani - roads fall under high hazard category. Based on the studies, identified areas for mesozonation mapping and important landslides/critical slopes warranting detailed studies, in addition to arriving at the control and corrective/preventive measures.