



Shallow Modes of Slope Failure in Road Earth Cuttings in Sri Lanka

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Abstract

Road associated failures in Sri Lankan landslides that have been investigated to date were highly dependent on geological setting of the cut slope. Numbers of cut slopes and their failure modes were studied in order to understand the influence of factors: slope height and angle, bed rock geology, seepage, overburden geology and geometry of the cut slope on the slope failure. Shallow failure mode (height of failed mass less than 4 m) is a very common feature in these cut slopes when exposed to intense rainfall due to extensive saturation. Slope stability can be evaluated with the use of geometry, shear strength characteristics and geological setting. Importance of geological setting and characteristics of failure modes must be considered when designing structural measures to improve the stability. An understanding of combined effect of geomorphology and overburden geology, which sets stability of a road cutting, is an essential parameter and helps in understanding sliding potential of the immediate upper slope. This study emphasises importance of geological setting, which determines the characteristics of failure modes when designing structural measures to improve the stability. Combined effect of geomorphology and overburden geology, which sets stability of a road cutting, is an essential parameter for designing of remedial measures by reducing sliding potential of the immediate upper slope.

Keywords

Morphology • Geology • Shallow sliding mode • Infinite slope • Factor of safety

Introduction

Sri Lanka has a tropical climate and the mean annual rainfall varies throughout the island with the wet zone receiving over 2,500 mm (maximum of 5,500 mm in Watawala), while the intermediate zone receiving between 1,750 and 2,500 mm and the dry zone receiving less than 1,750 mm of rainfall in a year. A distinct dry season is existent in the dry zone from May to September (Jayasena et al. 2007).

In ancient times, almost total hill country regions consisted of virgin forests with indications of slope stability. With the increase of population and developments, hill slopes of the upcountry of the Sri Lanka have been occupied for settlements and this activity rapidly increased after the British era. An effort was made to avoid soil slopes and use somewhat denser formations (meta-sedimentary rocks) in eroded slopes for the infrastructure developments (Fig. 1).

Good road location can often avoid landslide areas and reduce slope failures. Further, it is necessary not to create instability when cuts are made. It is reasonable to update and define failures in road earth cutting as shown in Table 1.

Other than overburden soil conditions and morphology, road based earth cutting failures are influenced considerably by underlying bedrock conditions (geology, genesis, dip, rock orientation, degree of weathering, inter-planer material)

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