

# ANALYSIS OF RAINFALL EFFECT ON SLOPE FAILURE IN SABAH

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## Abstract

The paper is aimed to characterize the relationship between the landslide events and the critical rainfall intensity-duration from the rainfall analysis. In this study, 10 landslide events that occurred in Ranau, Sabah area between years 2007 to 2015 were investigated and analysed using rainfall threshold based on soil water index (SWI) method. The analysis results showed that both short-intense rainfall (i.e., 1-day) and prolonged antecedent rainfall (i.e., 14, 30-day) played a significant role of the landslide initiations in Ranau, Sabah area. Overall results indicated that this method could simulate the rain infiltration response by the level of soil moisture in the area of landslide.

**Keywords:** *landslide; soil water index; slope stability.*

## INTRODUCTION

In a majority of cases, the main triggering factor of landslides is heavy and prolonged rainfall. Generally, this takes by the rainfall associated with the particularly intense thunderstorm or a long duration rainfall event with lower intensity, such as cumulative effect of monsoon rainfall in Malaysia. The effect of antecedent rainfall on slope instability has been well accepted; however, the durations of antecedent rainfall suggested by various researchers differ considerably. Case studies indicate that geographical location also has an effect on the occurrence of rainfall induced slope failure (Gofar et al., 2007). Experiences in different regions of the world have resulted in different conclusions of defining the duration of the cumulative rainfall. From the foregoing, it is clear that the local rainfall pattern plays an important role in the mechanism of rainfall-induced landslide in an area. The cumulative antecedent rainfall and hourly rainfall intensity are among the basic rainfall variables (Mukhlisin et al., 2015; Ren et al., 2011).

Recently, physically-based models simulating the soil wetting dynamic response to spatial-temporal rainfall variability in complex terrain have been developed in order to enhance the predictability of shallow landslides (Capparelli et al., 2010; Greco et al., 2010; Segoni et al., 2010; Glade et al., 2000). These studies have highlighted that rainfall alone is not adequate to identify slope instability and that the initial soil moisture conditions play a significant role in the triggering of shallow landslides (e.g., Crozier, 1999; Capparelli & Tiranti, 2010; Tsai & Chen, 2010; Godt et al., 2006). Godt et al. (2006) argued that the landslide-triggering rainfall must be considered in terms of its relationship to antecedent rainfall.

With this in view, this paper aims to analyse the effect of rainfall and soil water index (SWI) to assess the critical rainfall pattern of landslide events in Ranau, Sabah area that occurred between years 2007 to 2015. The study finally characterizes the relationship between the landslide events and the critical rainfall intensity-duration from the rainfall analysis.