

Precipitation Intensity: Duration Based Threshold Analysis for Initiation of Landslides in Upper Alaknanda Valley

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Abstract : The entire Himalayan range is globally renowned for rainfall-induced landslides. The prime focus of the study is to determine rainfall based threshold for initiation of landslides that can be used as an important component of an early warning system for alerting stake holders. This research deals with temporal dimension of slope failures due to extreme rainfall events along the National Highway-58 from Karanprayag to Badrinath in the Garhwal Himalaya, India. Post processed 3-hourly rainfall intensity data and its corresponding duration from daily rainfall data available from Tropical Rainfall Measuring Mission (TRMM) were used as the prime source of rainfall data. Landslide event records from Border Road Organization (BRO) and some ancillary landslide inventory data for 2013 and 2014 have been used to determine Intensity Duration (ID) based rainfall threshold. The derived governing threshold equation, $I = 4.738D^{0.025}$, has been considered for prediction of landslides of the study region. This equation was validated with an accuracy of 70% landslides during August and September 2014. The derived equation was considered for further prediction of landslides of the study region. From the obtained results and validation, it can be inferred that this equation can be used for initiation of landslides in the study area to work as a part of an early warning system. Results can significantly improve with ground based rainfall estimates and better database on landslide records. Thus, the study has demonstrated a very low cost method to get first-hand information on possibility of impending landslide in any region, thereby providing alert and better preparedness for landslide disaster mitigation.

Keywords : landslide, intensity-duration, rainfall threshold, TRMM, slope, inventory, early warning system

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