

Calculation of Shallow-Landslide Rainfall Threshold for Libon, Albay, Philippines Using TRIGRS

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In a rainfall event caused by a cold front and a low pressure area during the 14th until the 21st of February 2008, the Albay province experienced several landslides with \$4.6 million in damages to infrastructure alone. Aside from delineating areas that are highly susceptible to landslide, it is important to determine shallow-rainfall threshold aid in the development of an early warning system. The study area was carried out on an area in Libon town in Albay with approximately 1000 residents living near the high hazard area. Using TRIGRS software (Transient Rainfall Infiltration and Grid-based Regional Slope-stability analysis), 6 different sustained rainfall intensities with the duration of 24 hours were simulated to a 5-meter resolution IFSAR (Interferometric Synthetic Aperture Radar)-derived DEM (Digital Elevation Model). Topographic, soil strength, and hydrologic parameters were assigned to each pixel of the given DEM grid to compute for the factor of safety using the theory on Infinite Plane Slope Stability to produce a shallow-landslide susceptibility map. The values of the different rainfall intensities were selected to represent different rainfall events equal (1.26mm/hr), less than (.5 and 1mm/hr) and greater than (1.5, 2.73, 7.5 mm/hr) the infiltration rate of the soil. After comparison, there were no observed differences in the hourly variation of the Factor of Safety Maps for 1.26 mm/hr and greater intensities. The rainfall threshold determined to be 4.5 to 5mm of effective accumulated rainfall on which the pixels that failed ($FS < 1$) matched the landslide inventory from 2003-2014 and the shallow-landslide hazard map. This study shows that in determining rainfall thresholds for shallow landslides the effective infiltration rate and hydraulic diffusivity of the soil serves as factors on how fast the slope reaches instability during a rainfall event. The results of this study may be treated as the worst case possible due to the sustained intensities and may be further improved through simulations using data of actual rainfall events, considering varying rainfall intensities and durations.

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