Earthquake induced Slope Stability Analysis for Muzaffarabad area using factor of safety methods

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The research work is based on earthquake induced slope stability analysis for Muzaffarabad area which is a part of Hazara Kashmir Syntaxis that lies within the NW Himalayan Fold and Thrust Belt. Three slope stability models were developed for steeply dipping natural and soil cut slopes at different sites around the study area under available soil geotechnical data, also three different records of strong motion horizontal acceleration data with varying PGA values were used.

Slope stability analysis is carried out with the help of factor of safety methods which includes Limit Equilibrium Methods and Finite Element Method. Limit Equilibrium Methods are basically used to find out the stability of the slope at equilibrium state and Finite Element Method is used to find out the amount of disturbance or instability of the slope under earthquake loading. Earthquake induced slope stability is measured in terms of critical acceleration, which depends on the mechanical soil properties and slope geometry.

The results indicate that soil cut slopes with high cohesive strength in the area are less prone to fail under intensive ground shaking, no matter how much the slope is steep. Soil cut slopes with low cohesive strength in the area are more susceptible toward ground shaking.

From slope stability analysis, the maximum ground acceleration at Muzaffarabad area inferred to be greater than 0.9 g for steep natural and soil cut slopes because the computational results indicates that the failure of the soil slopes containing even moderate shear strength properties are imminent under such ground strong motions.

Housing and constructions on soil slopes containing steep angel and low strength in study area should not be allowed. Although, these slopes can be stable for high slope angles under static conditions, they are prone to failure during earthquakes.