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A landslide susceptibility prediction on a sample slope in Kathmandu Nepal associated with the 2015's Gorkha Earthquake

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In 2013, some landslides induced by heavy rainfalls occurred in southern part of Kathmandu, Nepal which is located southern suburb of Kathmandu, the capital. These landslide slopes hit by the strong Gorkha Earthquake in April 2015 and seemed to destabilize again. Hereby, to clarify their susceptibility of landslide in the earthquake, one of these landslide slopes was analyzed its slope stability by CSSDP (Critical Slip Surface analysis by Dynamic Programming based on limit equilibrium method, especially Janbu method) against slope failure with various seismic acceleration observed around Kathmandu in the Gorkha Earthquake. The CSSDP can detect the landslide slip surface which has minimum Fs (factor of safety) automatically using dynamic programming theory.
The geology in this area mainly consists of fragile schist and it is prone to landslide occurrence. Field survey was conducted to obtain topological data such as ground surface and slip surface cross section. Soil parameters obtained by geotechnical tests with field sampling were applied.

Consequently, the slope has distinctive characteristics followings in terms of slope stability:
(1) With heavy rainfall, it collapsed and had a factor of safety Fs <1.0 (0.654 or more).
(2) With seismic acceleration of 0.15G (147gal) observed around Kathmandu, it has Fs=1.34.
(3) With possible local seismic acceleration of 0.35G (343gal) estimated at Kathmandu, it has Fs=0.989.
If it were very shallow landslide and covered with cedars, it could have Fs =1.055 due to root reinforcement effect to the soil strength.
(4) Without seismic acceleration and with no rainfall condition, it has Fs=1.75.

These results can explain the real landslide occurrence in this area with the maximum seismic acceleration estimated as 0.15G in the vicinity of Kathmandu by the Gorkha Earthquake. Therefore, these results indicate landslide susceptibility of the slopes in this area with strong earthquake. In this situation, it is possible to predict efficiently the landslide susceptibility in earthquakes in this area by this method.