

Paper Number: 490

Controlling factors for landslide initiation in the seismo-tectonically active and high rainfall regions of North East India

Sarkar, N. K.

Geological Survey of India, CHQ, Kolkata- 700 016, India. Email: niroj4@gmail.com

Regional to site specific scale field based studies across the North East Region of India carried out by the author so far document landslides and slope failures of highly variable nature (state, activity & style), magnitude (very small to very large), type (material involved & movement), intensity and distribution. Critical review of the generated database from such studies indicates landslide initiation in the four major geo-environmental domains of the North East, namely Himalayan, Trans Himalayan, Precambrian gneissic complex & and Tertiary sedimentary fold belts. The observed landslide initiation processes are influenced by domain specific combinations of variable predisposing and triggering factors. Landslide initiation in the Himalayan domain is understood to be influenced by altitude, slope aspect, proximity to regional thrusts/neo-tectonic faults and litho-structural set up. They are triggered by high anomalous monsoon rainfall and combination of high rainfall, anthropogenic interferences and occasionally by large seismic events.

The identified predisposing factors for landslide initiation in the Himalayan domain are the higher intensity of weathering in bedrock, significant reduction of rock mass strength proximal to the regional thrusts, presence of large amounts of colluvial material, older and recent debris, highly variable depth of overburden, narrow linear valley configuration and higher rate of incision by the rivers.

In the Trans Himalayan domain, landslide initiation is significantly controlled by the high erosion rate of the slope due to neo-tectonic adjustment. The predisposing factors are steep slope, reduced rock mass strength, presence of large volume of variable compacted coarser debris and active surface hydrological networks. The triggering factors are high anomalous rainfall and earthquakes. The huge released mass moved down the slope during earlier co-seismic triggering are variably settled in different level of the valley slope down to the trunk river and are subjected to the action of active surface drainage network.

The landslide initiation in the Tertiary Fold belt is largely influenced by litho-structural assemblages of the slope and triggered by high intensity monsoon rainfall, and anthropogenic activity near the urban centers/road networks. The higher reaches of sandstone dominated topography at places shows signature of past mass wasting and movement of huge masses down to the lower slope. The variably disposed slide masses of older landslides are susceptible to reactivation through climatic triggering.

Landslide/slope failure in the Precambrian Granite gneiss complex is related to the changed predisposing conditions (steepening of slope, changed condition of slope forming material and changed hydrological situation) in the urban centres, proximal to the road networks and triggered by varying

combination of high rainfall and anthropogenic activity. The slopes failures are largely reported along the road corridors/urban centres which are the result of large scale excavation, static loading of the slope involving exposed rock-mass and overlying overburden material.

The understanding of the landslide initiation/reactivation process in these four geo-environmental domains of NE India helps in selection of domain specific appropriate methodologies and approach for multi-scale landslide susceptibility and hazard assessment.

