

Main Central Thrust vis-a-vis Landslide Susceptibility: An Assessment in the Dirang Sector of National Highway Corridors, West Kameng districts, Arunachal Pradesh.

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Abstract

Landslide susceptibility studies were carried out in the Bomdila-Tawang road corridor of western Arunachal Pradesh and a number of landslides/slope failures have been documented in the Dirang-Mohan Camp sector of West Kameng district. The area is in the proximity of the Main Central Thrust (MCT) which defines the tectonic contact between high grade schist/quartzofelspathic gneisses of Sela Group (Early proterozoic) and younger largely meta psammo-peletic sequences of Dirang Formation. The rock mass encountered in the area are found to be moderate to highly weathered, highly fissile with very closely spaced discontinuity, grain flattening at places and overall significant reduction of rock-mass strength (RQD <10 to 20). At places a few shear planes both parallel and oblique to the foliation were observed traversing the rock mass and along which the same was found conspicuously pulverised. A very prominent reactivated rockslide in quartzose gneiss with a prominent crown scar and side scars having an approximate dimension of 200 m x 115 m x 6 m was identified and studied. The rock slide affecting the slope above the road bench triggered by Monsoon rainfall along the slope where rock mass strength has already been significantly reduced presumably due to the effect of the MCT. Similar landslides/slope failures of relatively smaller dimensions have also been recorded almost continuously along the road stretch. It is pertinent to add that the upslope above the road bench shows a number of seepage locations and discontinuous, unguided water courses (abruptly emerges and ends in the slope) responsible for a near flowing ground condition. Further, for a continuous stretch, the overburden (largely in-situ soil with some slope wash material) shows creep movement, which is evident from the conspicuous hockey stick bending of the large conifers in the slope. Large scale excavation for widening of the road bench presently being carried out in the road stretches is also responsible for the identified slope failures. It is pertinent to add that the frequency of landslide/slope failures in the vicinity to the MCT is much greater than in areas away from the MCT.

The significance of MCT near the Dirang, therefore, can be spatially related in respect to the modification of the rock-mass condition, hydrological situation and corresponding slope stability condition. Similar landslide susceptibility studies carried out by GSI at Darjeeling Himalaya indicated that a relatively higher concentration of landslide incidences in and around the MBT and MCT. It is also observed that the areas proximal to the above thrust zones largely come under “High Hazard Zone (HHZ, Class- 4)” and “Very High Hazard Zone (VHHZ, Class- 5) as per the BIS (1998). The above observations are significant in perspective assessment of the regional landslide susceptibility of similar geological domain.

The spatial correlation between MCT and landslides/slope failures can be explained in terms of large (variable) net slip and consequent dragging of the older stratigraphic horizon over the younger one. The same has its effect on the geo-mechanical properties of the rock-mass proximal to the thrust zone. Further, the regional thrusts within the active Himalayan tectogen are prone to reactivation in quaternary to recent times and might have accelerated the erosion process and rate of erosion in the tectonic domain due to periodic rejuvenation of the hydrological network and consequent action on slope mass. Since, landslide is a natural erosion process, initiated largely due to the action of seasonal and/or periodic rejuvenation of the surface and subsurface hydrological network, which acts on some of the variable inherent characters of the slope (causal factors) including that of the rock mass characters, therefore, proximity to the regional thrust like MCT can be related to the higher rate of erosion and consequent landslide susceptibility.