

LANDSLIDE INVENTORY, SUSCEPTIBILITY MODELING AND MONITORING ALONG THE CPEC, NORTHERN PAKISTAN.

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Abstract

The China-Pakistan Economic Corridor (CPEC) is a strategic project between China and Pakistan with economic, cultural, historical and geo-political significance. However, this ambitious venture is prone to frequent disruption by the geological hazards along the route in northern Pakistan and mountainous region of China. The proposed CPEC traverses through the Himalayan-Karakoram mountain ranges in northern Pakistan which are one of the most rapidly rising mountain ranges on earth with extreme topographic and climatic environment. The route also touches along the largest glaciers outside the Polar Regions, and therefore, is also prone to the glaciers associated hazards. A combined impact of geo-hazards including earthquakes, landslides, debris flows, glacial erosion, flash floods, river incision and unpredictable input of the monsoonal rains make it a region of very high geodynamic activity. The existing Karakoram Highway (KKH), along the CPEC route, has been frequently subjected to damages, human loss and disruption by rock fall, sliding of debris and rock, debris flow, mudflow and flash floods. Different types of mass movements along the KKH are triggered by natural factors including the presence of well-developed rock discontinuities, extensive unconsolidated deposits, high relief, steep natural slopes, torrential rains and seismically active nature of the region. The anthropogenic factors including uncontrolled blasting for roads and buildings construction on slopes also contribute to the landslides in the region. However, for most of the northern areas in Pakistan, landslide susceptibility maps are not available, which can be used for landslide hazard mitigation. This study aims to generate a remote sensing based landslide inventory, analyzing their spatial distribution and develop landslide susceptibility map. A comprehensive landslide inventory is developed through the visual image classification of fine resolution remote sensing images supported with field verification. Landslide causative factors including slope, aspect, land cover, geology, proximity to road, proximity to fault line and proximity to stream network were analyzed to evaluate their influence on the spatial distribution of landslides. The developed landslide inventory map was compared with the landslide causative factors, to evaluate their impact on the spatial distribution of landslides. The derived correlations were used in the Weights of Evidence Modelling and Analytical Hierarchical Model to develop landslide susceptibility maps. The selected landslides along the KKH are being monitored using Time Lapse Camera and UAVs. The derived results shall assist the concerned agencies for mitigating the devastating impacts of landslides along the CPEC.