

## Analysis of Rockfall Hazard along Himalayan Road Cut Slopes

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**Abstract :** With a vast area of India comprising of hilly terrain and road cut slopes, landslides and rockfalls are a common phenomenon. However, while landslide studies have received much attention in the past in India, very little literature and analysis is available regarding rockfall hazard of many rockfall prone areas, specifically in Uttarakhand Himalaya, India. The subsequent lack of knowledge and understanding of the rockfall phenomenon as well as frequent incidences of rockfall led fatalities urge the necessity of conducting site-specific rockfall studies to highlight the importance of addressing this issue as well as to provide data for safe design of preventive structures. The present study has been conducted across 10 rockfall prone road cut slopes for a distance of 15 km starting from Devprayag, India along National Highway 58 (NH-58). In order to make a qualitative assessment of Rockfall Hazard posed by these slopes, Rockfall Hazard Rating using standards for Indian Rockmass has been conducted at 10 locations under different slope conditions. Moreover, to accurately predict the characteristics of the possible rockfall phenomenon, numerical simulation was carried out to calculate the maximum bounce heights, total kinetic energies, translational velocities and trajectories of the falling rockmass blocks when simulated on each of these slopes according to real-life conditions. As it was observed that varying slope geometry had more fatal impacts on Rockfall hazard than size of rock masses, several optimizations have been suggested for each slope regarding location of barriers and modification of slope geometries in order to minimize damage by falling rocks. This study can be extremely useful in emphasizing the significance of rockfall studies and construction of mitigative barriers and structures along NH-58 around Devprayag.

**Keywords :** rockfall, slope stability, rockmass, hazard

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