

Landslide Hazard Zonation Using Satellite Remote Sensing and GIS Technology

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Abstract : Landslide is the major geo-environmental problem of Himalaya because of high ridges, steep slopes, deep valleys, and complex system of streams. They are mainly triggered by rainfall and earthquake and causing severe damage to life and property. In Uttarakhand, the Tehri reservoir rim area, which is situated in the lesser Himalaya of Garhwal hills, was selected for landslide hazard zonation (LHZ). The study utilized different types of data, including geological maps, topographic maps from the survey of India, Landsat 8, and Cartosat DEM data. This paper presents the use of a weighted overlay method in LHZ using fourteen causative factors. The various data layers generated and co-registered were slope, aspect, relative relief, soil cover, intensity of rainfall, seismic ground shaking, seismic amplification at surface level, lithology, land use/land cover (LULC), normalized difference vegetation index (NDVI), topographic wetness index (TWI), stream power index (SPI), drainage buffer and reservoir buffer. Seismic analysis is performed using peak horizontal acceleration (PHA) intensity and amplification factors in the evaluation of the landslide hazard index (LHI). Several digital image processing techniques such as topographic correction, NDVI, and supervised classification were widely used in the process of terrain factor extraction. Lithological features, LULC, drainage pattern, lineaments, and structural features are extracted using digital image processing techniques. Colour, tones, topography, and stream drainage pattern from the imageries are used to analyse geological features. Slope map, aspect map, relative relief are created by using Cartosat DEM data. DEM data is also used for the detailed drainage analysis, which includes TWI, SPI, drainage buffer, and reservoir buffer. In the weighted overlay method, the comparative importance of several causative factors obtained from experience. In this method, after multiplying the influence factor with the corresponding rating of a particular class, it is reclassified, and the LHZ map is prepared. Further, based on the land-use map developed from remote sensing images, a landslide vulnerability study for the study area is carried out and presented in this paper.

Keywords : weighted overlay method, GIS, landslide hazard zonation, remote sensing

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