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Debris Flow Mapping Using Geographical Information System Based Model and Geospatial Data in Middle Himalayas

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Abstract : The Himalayas with high tectonic activities poses a great threat to human life and property. Climate change is another reason which triggering extreme events multiple fold effect on high mountain glacial environment, rock falls, landslides, debris flows, flash flood and snow avalanches. One such extreme event of cloud burst along with breach of moraine dammed Chorabri Lake occurred from June 14 to June 17, 2013, triggered flooding of Saraswati and Mandakini rivers in the Kedarnath Valley of Rudraprayag district of Uttrakhand state of India. As a result, huge volume of water with its high velocity created a catastrophe of the century, which resulted into loss of large number of human/animals, pilgrimage, tourism, agriculture and property. Thus a comprehensive assessment of debris flow hazards requires GIS-based modeling using numerical methods. The aim of present study is to focus on analysis and mapping of debris flow movements using geospatial data with flow-r (developed by team at IGAR, University of Lausanne). The model is based on combined probabilistic and energetic algorithms for the assessment of spreading of flow with maximum run out distances. Aster Digital Elevation Model (DEM) with 30m x 30m cell size (resolution) is used as main geospatial data for preparing the run out assessment, while Landsat data is used to analyze land use land cover change in the study area. The results of the study area show that model can be applied with great accuracy as the model is very useful in determining debris flow areas. The results are compared with existing available landslides/debris flow maps. ArcGIS software is used in preparing run out susceptibility maps which can be used in debris flow mitigation and future land use planning.

Keywords : debris flow, geospatial data, GIS based modeling, flow-R
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