A GIS and Remote Sensing based integrated approach for Landslide Susceptibility Mapping of Gilgit River Basin

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Landslides are considered as one of the most catastrophic natural hazards in the world. The Northern Pakistan with its complex topography and active seismicity has a history of massive landslides which destroyed the infrastructure, blocked rivers and damaged communities. Landslide susceptibility maps are crucial for assessing risks and informed decision-making in planning safety measures, construction, and disaster management. This research focuses on the outcomes of statistical models in Geographic Information System (GIS) utilized for the generation of landslide Susceptibility maps using remote sensing data for Gilgit River Basin, Northern Pakistan. The input raster map layers were developed by considering the major landslide indicator groups i) Environmental factors which involves slope, aspect, slope curvature, elevation, lithology, vegetation index, distance to major river channel, and distance to active faults, ii) Causative features of rainfall and seismicity. The correlation between the identified landslide hazard zones and these factors was developed by integration of built-in GIS models such as Analytical Hierarchy Process (AHP), Weighted Overlay Index (WOI) and Fuzzy overlay method. The resultant Landslide Susceptibility maps classified the area of interest into very high, highly susceptible, moderately susceptible and less hazardous zones. By analyzing the finalized hazard maps developed by the three statistical approaches, it is observed that most of the high zones of hazard are existed either near the active fault or along the main Gilgit river channel. This study illustrates yet simple and straightforward but effective ways of producing such regional-level susceptibility maps which could serve as guide maps in order to perform detailed landslide hazard studies for planning of the infrastructure projects including embankment dams, highways, and bridges in the concerned areas.