Semi-Quantitative Landslide Risk Assessment in the Northern Pakistani Himalayas Using Remote Sensing and Building Typology Data

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In the Kaghan Valley, an area in northern Pakistan that is particularly vulnerable to landslides, this study suggests an integrated method to evaluate landslide risk, hazard, and vulnerability. In order to address the serious hazards that landslides pose to infrastructure, communities, and the environment, the study makes use of publicly available geospatial data in conjunction with semi-quantitative methodologies such as SMCE models. The study uses Google Earth Pro, high- resolution DEM, and satellite data to construct a full landslip inventory, which is subsequently confirmed through field surveys in order to develop a thorough understanding of landslide dynamics in the Kaghan Valley. A hazard map is developed by combining landslide-triggering factors with a susceptibility map generated using the WofE model. Due to limitations in temporal inventory data, hazard estimation relies on PGA and rainfall data, achieving an accuracy of 85% as assessed by AUC. In addition to hazard assessment, the study incorporates an extensive geographic database comprising building footprints, road networks, population data, and land cover information, obtained through remote sensing and field surveys. Vulnerability mapping encompasses various indicators across physical, social, environmental, and economic domains, analyzed through spatial multi-criteria evaluation techniques. For risk assessment, a semi-quantitative approach is adopted to classify relative risk levels into five categories: very low, low, moderate, high, and very high. The resulting landslide risk index map serves as a crucial tool for identifying hotspots and implementing effective risk mitigation strategies. Notably, the study's methodology stands out for its comprehensive integration of diverse data sources, enabling a holistic understanding of landslide risk in the Kaghan Valley.