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Evacuation shelter suitability modeling under combined geo-hydrological hazards in Western Ghat region, India

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Geo-hydrological hazards like floods and landslides are common in mountain regions. During a disaster, evacuation shelters become a primary need of people. We develop a model to find suitable locations for emergency shelters in flood and landslide strikes in a rural mountain setting of the Western Ghat region, India. Firstly, susceptibility maps for flood and landslide hazards are prepared using a machine learning (Random forest) algorithm. Then location suitability modeling is done in GIS using the entropy method. The following entropy evolution factors are considered- flood susceptibility, landslide susceptibility, land use, distance from the road, distance from the hospital, distance from the market, distance from the fire station, distance from safe water sources, and the population of settlement cluster area. Model constraining factors like steep slope, high landslide, flood susceptible area, and protected area are accounted for using a cost matrix. The model is compared with community-based suitability mapping and evacuation centers during the past disaster of 2005. The study will contribute towards better disaster-resilient planning of rural mountainous settlements.

Keywords: Evacuation shelter, landslide, flood, random forest, entropy method, GIS