

Spatial Prediction of Snow Avalanche Susceptibility using Statistical Methods in the Western Indian Himalayas

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Abstract

Spatial prediction of snow avalanches through susceptibility mapping is the first and most crucial requirement for disaster mitigation and preparedness. The Indian Himalaya is full of natural hazards and anthropogenic activities. Among all the geohazards and human activities, snow avalanches are the most significant due to their frequent impact on transportation, infrastructure, and local geology. The present study prepares a snow avalanche susceptibility map for the Leh-Manali area of Himachal Pradesh and the UT of Ladakh using thirteen causative factors. The present study takes 110 avalanche locations, and an avalanche inventory is prepared using remote sensing data, historical records, and field investigation. The four statistical approaches employed are Frequency Ratio (FR), Information Value (IV), Certainty Factor (CF), and Weight of Evidence (WoE). Among these, the SASM map prepared using the Certainty Factor (CF) model achieves higher accuracy, both in success rate and prediction rate, than the other models. The performance and accuracy of the implemented models were assessed using the AUC-ROC method. The final results show that the major snow avalanches, as well as highly susceptible zones, are distributed along the Leh-Manali highway, NH-3.

Keywords

Snow Avalanche susceptibility zonation (SASM), Frequency Ratio (FR), Weight of evidence (WoE).