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Application of Fuzzy Set Theory to Landslide hazard zonation mapping in Limbe (Cameroon)

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A landslide susceptibility map (LSM) depicts division of land surface into zones of varying degrees of stability based on the estimated significance of causative factors in inducing failure. In this study, Fuzzy Set Theory (FST) was employed to develop a LSM for the Limbe Community (southwest Cameroon). Landside susceptibility was assessed through the following successive phases; (1) landslide inventory mapping to ascertain effects of contributory factors such as geology (inherently weak layers, structural controls, scar size, hydrogeology), Topography (gradient, relative relief) and human impact (vegetation cover, land-use), (2) division of the study area into facets, and (3) application of FST by decision tree analysis. For each facet, the combined rating of the susceptibility potential based on all criteria on a given branch of the decision tree, and the weight or relative importance of each criteria on the same branch of the decision tree were expressed by Fuzzy Membership Values (FMV). Based on the combined rating, FMV described three susceptibility classes as follows; low (0–0.4), moderate (0.4– 0.7) and high (0.7 – 1). From the results, FMV obtained for the study area ranged from 0.2 to 0.8, with 42.8 % of slopes in the area classified as highly susceptible, 42.8% moderate and 14.4 % low. High susceptibility was attributed mainly to the geology of the area and partly due to anthropogenic factors.

