

Geospatial modeling for sinkholes hazard map based on GIS & RS data

ABSTRACT

The Kinta Valley is an area of karst in the north-western part of Peninsular Malaysia. Over 30 years of uncontrolled land use and development has led to significant changes in topography and geomorphology, such as the appearance of sinkholes. In this paper, geospatial techniques were utilized to the task of evaluating sinkholes susceptibility map using a spatial multi criteria evaluation approach (SMCE). Sinkhole location and a spatial database were applied to calculate eight inherent causative factors for limestone instability namely: lithology, structure (lineament), soil cover, slope, land use mining, urban area features, ponds and rivers. The preparation of the sinkhole geohazard map involved summing the weighted values for each hazard element, which permits the construction of geohazard model; the results of the analysis were validated using the previous actual sinkholes locations in the study area. The spatial distribution of sink-holes occurrence, urban development, faults distribution and ex-mining ponds are factors that are directly responsible for all sinkholes subsidence hazards. Further, the resulting geo-hazard map shows that 93% of recent sinkholes occur in areas where the model flags as “high” and “very high” potential hazard, located in the urbanized part of the valley, while less-developed areas to the west and southwest suffered less sinkhole development. The results can be used for hazard prevention and land-use planning.

Keyword: Geo-hazard mapping; Karst; Sinkholes; Geospatial modeling