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Flood susceptible mapping and risk area delineation using logistic regression, GIS and remote sensing

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Abstract

Recently, in the year 2006, 2007 and 2008 heavy monsoons rainfall have triggered floods along Malaysia's east coast as well as in different parts of the country. The hardest hit areas are along the east coast of peninsular Malaysia in the states of Kelantan, Terengganu and Pahang. The flood cost nearly millions of dollars of property and many lives. Floods are considered to be one of the weather-related natural disasters. Many methods exist to provide qualitative estimations of the risk level of flood susceptibility mapping within a watershed. This paper presents construction of a flood susceptible map for presumptive flood areas around at Kelantan river basin in Malaysia using a statistical model and GIS. To evaluate the factors related to flood susceptible analysis, a spatial database was constructed from a topographical map, geological map, hydrological map, Global Positioning System (GPS) data, land cover map, digital elevation model (DEM) data, and precipitation data. An attribute database was also constructed from field investigations and historical flood areas reports for the study area. Logistic regression model was applied to determine each factor's rating, and the ratings were overlaid for flood susceptibility mapping. Results indicate that flood prone areas can be performed at 1:25,000 which is comparable to some conventional flood hazard map scales. The flood prone areas delineated on these maps correspond to areas that would be inundated by significant flooding. Further, risk analysis has been performed using DEM, distance from hazard zone, land cover map and damageable objects at risk. DEM was used to delineate the catchments and served as a mask to extract the highest hazard zones of the landslide area. Qualitatively, the model seems to give reasonable results with accuracy observed was 85%.

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Keywords

Flood susceptibility analysis; logistic regression model; Geographic Information System; GIS; Remote Sensing

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