Flood susceptibility analysis (FSAn) using multi-criteria evaluation (MCE) technique for landuse planning: A case from Penampang, Sabah, Malaysia

ABSTRACT

Flooding is one of the main natural disasters in Sabah, Malaysia. Several current cases of disastrous flooding were recorded particularly in Penampang area, Sabah (e.g. July 1999; October 2010; April 2013; October & December 2014). Substantial downpour has triggered floods and caused extreme loss in Penampang area. The 2014 floods have affected 40,000 people from 70 villages. The objectives of this research are (i) To determine the factors contributing to the flood occurrences; (ii) To analyst the Flood Susceptibility Level (FSL); and (iii) and to produce the flood hazard map for the study area. In this study, eight (8) parameters were considered in relation to the causative factors to flooding, which are: rainfall, slope gradient, elevation, drainage density, land use, soil textures, slope curvatures and flow accumulation. Flood Susceptibility Analysis (FSAn) map was produced based on the data collected from the field survey, laboratory analysis, high resolution digital radar images (IFSAR) acquisition, and secondary data in year 2014. FSL was defined using Multi Criteria Evaluation (MCE) technique integrated with GIS software. Based on the FSAn, approximately 3.17% of total study area classified as Very High Hazard (VHH), 4.55% as High Hazard (HH), 15.52% as Moderate Hazard (MH), 15.72% as Low Hazard (LH) dan 61.04% as Very Low Hazard (VLH) respectively. Based on the risk rate, requirements for the development procedure has been recommended in this paper. The map produced will be a very useful source for consulting, planning agencies and local governments in managing risk, land-use zoning and redressal efforts to mitigate risks. Besides, the method used in this study can easily be applied to other areas, where other factors may be considered, depending on the convenience of data.