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GIS based multicriteria analysis for flood hazard assessment: A case study from Walawe River basin, Sri Lanka

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Flood hazard mapping has been recognized as a crucial task supporting disaster management efforts. For the study, the lower reach of the Walawe River, which drains the suburbs of the island's southern region, was selected due to its regular flooding. This study used ArcGIS and remote sensing data, and the river basin extent was extracted from satellite images available for the Walawe River, Sri Lanka. Multi-criteria decision analysis (MCDA) was used in this process. The main criteria evaluated are land use, rainfall data, drainage density, elevation, slope, and soil type around the river basin. These criteria are reclassified into five categories depending on the highest to lowest risk of vulnerability to flood. The Analytical Hierarchical Process (AHP) was used to give the weights for the mentioned criteria, and as the outcome, the weighted overlay map (flood hazard map) was obtained and classified under five categories. According to the results, the flood hazard assessment map shows that 25.74% (646.09 km²) and 1.92% (48.13km²) of the study area was under high or very high hazard levels, respectively, with more populated regions, water bodies, and agricultural land, as well as low-lying flat terrain with lower elevations. The Walawe River basin's lower watershed has high and very high flood-prone areas, while the upper catchment has low and very low flood-prone areas, according to the geographical distribution of the flood hazard map. Low and very low flood hazard zones comprised 18.63% of the total area, whereas moderate flood hazard areas comprised most of the basin. According to the current study, this aims to identify areas within the Walawe River basin that are at risk of flooding, to assess the potential impact of floods on people, property and the environment which support the development of flood risk reduction measures and to provide public awareness.

Keywords: Causative Factors, Flood Hazard Mapping, GIS, Multicriteria Analysis, Remote Sensing