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JULY 2024

SINKHOLE SUSCEPTIBILITY HAZARD ZONES IN PERLIS USING ANALYTICAL HIERARCHICAL PROCESS (AHP) METHOD

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Thesis submitted to the Universiti Teknologi MARA Malaysia
in partial fulfilment for the award of the degree of the
Bachelor of Surveying Science and Geomatics (Honours)

JULY 2024

DECLARATION

I declare that the work on this project/dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA (UiTM). This project/dissertation is original and it is the result of my work, unless otherwise indicated or acknowledged as referenced work.

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ABSTRACT

Sinkholes are unexpected and unpredictable phenomena pose a tremendous risk to human life, infrastructure, and property. Due to the increase in incidences of sinkholes causing damage in Malaysia since 1968, it is crucial to have a thorough understanding of them and efficient mitigation strategies. The purpose of this research is to apply the Analytical Hierarchical Process (AHP) method for identifying sinkhole hazard zonation areas in Perlis, Malaysia. The objectives of this research encompass the identification of factors contributing to sinkhole formation, and the determination of sinkhole hazard zonation areas. Lithology (LT), soil type (ST), land use (LU), groundwater level (GL), and groundwater wells depth (GWD) are the five successive characteristics for key criteria, each categorized by five sub-classes, which were chosen for this research. A set of relative weights was assigned to each inducing factor and computed through pairwise comparison matrix derived from expert judgment. Lithology and soil types has been identified gives the highest impact to sinkhole development. A sinkhole susceptibility hazard zones as classified into five prone areas such as very low, low, moderate, high, and very high. Very high-risk zones like at Chuping and Oran have sedimentary rocks, high groundwater levels, and significant human activity (buildings), all contributing to land instability. Moderate-risk zone such as at Bintong has the shallowest groundwater level, with agriculture exacerbating soil instability. Low-risk zone such as at Arau get benefits from a deeper groundwater level and potentially more stable soil conditions, despite similar lithological and agricultural factors. In sum, the results indicate that the AHP technique can be beneficial in forecasting natural disasters like sinkhole hazards.

Keywords: Geographical Information System (GIS), Analytical Hierarchical Process (AHP), Multi-Criteria Decision-Making (MCDM), Sinkhole, Hazard Zones, Natural Disaster

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