

UNIVERSITI TEKNOLOGI MARA

**UTILIZATION OF
IFSAR AND SRTM DEMS FOR
FLOOD SUSCEPTIBILITY MAPPING USING
FUZZY ANALYTIC HIERARCHY PROCESS
(FAHP) IN KEDAH**

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**BACHELORS IN SURVEYING SCIENCE AND
GEOMATICS (HONOURS) - AP220**

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Thesis submitted in fulfilment
of the requirements for the degree of
Bachelors in Surveying Science and Geomatics (Honours)

College of Built Environment.

August 2023

AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Under - Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

Flooding is one of the most damaging natural catastrophes, causing significant financial and human losses each year. Developing accurate flood susceptibility models, understanding the causative factors, and making use of this information are all part of the flood susceptibility problem. Therefore, this study focuses on creating flood susceptibility maps in Kedah, Malaysia, using Interferometric Synthetic Aperture Radar (IFSAR) DEM and Shuttle Radar Topography Mission (SRTM) DEM data, aligning with Sustainable Development Goals (SDGs) 13 and 11. The flood susceptibility area covered Padang Terap, Kubang Pasu and Kota Setar of Kedah. The study aims to estimate the flood factors weightage used in Fuzzy AHP on different DEMs (IFSAR and SRTM) and evaluate flood-prone areas based on 1456 historical flood events from 2010 to 2022. Altogether, six relevant flood factors considered are elevation, slope, topographic wetness index (TWI), rainfall, land use, and flow accumulation. Using the Fuzzy AHP, weightage values were assigned to these criteria using a pairwise comparison matrix with consistency ratio (CR=0.02) that shows the prioritization matrix is acceptable and then combined using the Weighted Overlay feature in ArcGIS software to generate a flood susceptibility map. The flood susceptibility map was validated using sensitivity, specificity and the area under the curve (AUC) of the ROC. Results indicated high accuracy (Sensitivity = 0.97, Specificity = 0.50), with the IFSAR DEM performing better (AUC = 0.92) than the SRTM DEM (AUC = 0.76). Thus, the use of MCDA of Fuzzy AHP for producing flood susceptibility also leads to a higher resolution for IFSAR DEM than SRTM DEM, leading to a high-performing flood susceptibility map in Kedah. This study can serve as an effective tool for mapping flood susceptibility and preparing for damage reduction.

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