FLOOD RISK MAPPING USING HEC-RAS SOFTWARE: A CASE STUDY OF THE MELANTAI RIVER, MALAYSIA

UNDERGRADUATE THESIS

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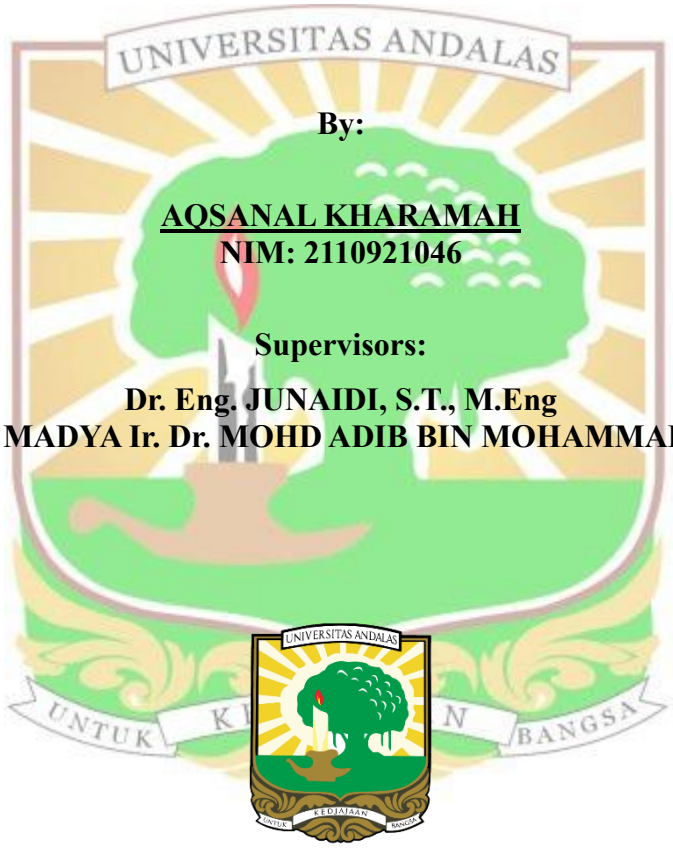

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ABSTRACT

The increasingly frequent flooding phenomenon in the Kluang region of Johor indicates the need for a comprehensive study of the river flow system and inundation potential. This study aims to map the flood risk in Sungai Melantai using HEC-RAS software as a hydrodynamic simulation tool. The methods used include rainfall analysis with empirical IDF curves, peak discharge estimation using the HSS Snyder method, and unsteady flow modelling at various return periods (25, 50, and 100 years). The simulation results show that some sections of Melantai River have high runoff potential, especially in the 50 and 100-year scenarios, where the water level exceeds the river bank. The resulting inundation maps provide a visualization of the affected area and flood depth that can be used for disaster mitigation and management planning. The findings emphasize the importance of technical interventions and spatial policies to reduce flood risk in the study area.

Kata kunci : Flood Simulation, HEC-RAS model, Inundation

ABSTRAK

Fenomena banjir yang semakin sering terjadi di wilayah Kluang, Johor, mengindikasikan perlunya studi komprehensif tentang sistem aliran sungai dan potensi genangan. Penelitian ini bertujuan untuk memetakan risiko banjir di Sungai Melantai dengan menggunakan perangkat lunak HEC-RAS sebagai alat simulasi hidrodinamika. Metode yang digunakan meliputi analisis curah hujan dengan kurva IDF empiris, estimasi debit puncak dengan metode HSS Snyder, dan pemodelan aliran tak tetap (unsteady flow) pada berbagai kala ulang (25, 50, dan 100 tahun). Hasil simulasi menunjukkan bahwa beberapa bagian Sungai Melantai memiliki potensi limpasan yang tinggi, terutama pada skenario 50 dan 100 tahun, di mana muka air melebihi tepian sungai. Peta genangan yang dihasilkan memberikan visualisasi area terdampak dan kedalaman banjir yang dapat digunakan untuk perencanaan mitigasi dan manajemen bencana. Temuan ini menekankan pentingnya intervensi teknis dan kebijakan spasial untuk mengurangi risiko banjir di wilayah studi.

Kata Kunci : Simulasi Bnajir, Model HEC-RAS, Genangan