ABSTRAK

Banjir merupakan bencana alam paling sering di Indonesia, terutama di daerah dengan curah hujan tinggi dan drainase kurang memadai. BMKG melaporkan peningkatan curah hujan yang meningkatkan frekuensi dan intensitas banjir, menyebabkan kerugian ekonomi besar dan ancaman keselamatan. Analisis debit banjir rencana krusial untuk mitigasi risiko, khususnya di daerah tanpa alat pencatat debit, di mana debit ditentukan dari data hujan. Kabupaten Rokan Hilir, Provinsi Riau, rentan banjir dengan Sungai Rokan sebagai sungai utama yang mengalami lonjakan debit saat hujan. Perubahan lahan dan deforestasi memperburuk risiko. Penelitian sebelumnya menunjukkan kesenjangan, seperti kurangnya integrasi analisis debit dengan model hidrolika HEC-RAS, serta fokus terbatas pada data historis tanpa mempertimbangkan iklim dan lahan dinamis. Penelitian ini menganalisis debit banjir rencana di Sungai Rokan menggunakan HEC-RAS untuk gambaran akurat potensi banjir dan rekomendasi pengelolaan risiko. Metode mencakup analisis hidrologi menghitung debit dari curah hujan maksimum via Hidrograf Satuan Sintetik Nakayasu (HSS Nakayasu), lalu analisis hidrolika dengan HEC-RAS mensimulasikan aliran dan tinggi muka air pada kala ulang 2, 5, 10, 25, 50, dan 100 tahun. Input utama adalah data hujan dan geometri sungai. Hasil hidrologi: Q2tahun = 20.065 m^3/det, Q5tahun = 29.303 m^3/det, Q10tahun = 32.974 m^3/det, Q25tahun = 35.744 m^3/det, Q50tahun = 36.938 m^3/det, Q100tahun = 37.689 m^3/det. Hidrolika HEC-RAS menunjukkan luapan banjir melebihi tebing di beberapa titik kiri-kanan sungai. Tinggi muka air naik seragam sepanjang penampang, variasi 0,48–8,54 m, puncak 8 m di RS 2104 dan RS 2414, akibat debit lebih besar pada kala ulang tinggi. Ini penting untuk evaluasi kapasitas sungai dan identifikasi genangan lokal. Penelitian ini berkontribusi pada pengelolaan risiko banjir di Rokan Hilir, dengan rekomendasi infrastruktur hidraulik, kebijakan air, dan ketahanan masyarakat. Akademiknya, menjadi referensi untuk penelitian teknik sipil dan lingkungan, mendukung ilmu pengetahuan komprehensif.

Kata Kunci: Banjir, Debit Rencana, Sungai Rokan, HEC-RAS

ABSTRACT

Flooding is the most frequent natural disaster in Indonesia, especially in areas with high rainfall and inadequate drainage. The BMKG reports an increase in rainfall that increases the frequency and intensity of flooding, causing major economic losses and safety threats. Flood discharge analysis is crucial for risk mitigation, especially in areas without discharge recording devices, where discharge is determined from rainfall data. Rokan Hilir Regency, Riau Province, is prone to flooding with the Rokan River as the main river experiencing a surge in discharge during rainfall. Land use change and deforestation exacerbate the risk. Previous research has identified gaps, such as the lack of integration of discharge analysis with the HEC-RAS hydraulic model, as well as a limited focus on historical data without considering dynamic climate and land conditions. This study analyzes the planned flood discharge in the Rokan River using HEC-RAS to provide an accurate picture of flood potential and recommendations for risk management. The method includes a hydrological analysis to calculate discharge from maximum rainfall via the Nakayasu Synthetic Unit Hydrograph (HSS Nakayasu), followed by a hydraulic analysis using HEC-RAS to simulate flow and water level at return periods of 2, 5, 10, 25, 50, and 100 years. The main inputs are rainfall data and river geometry. Hydrological results: Q2year = 20,065 m³/sec, Q5year = 29,303 m³/sec, Q10year = 32,974 m³/sec, Q25year = 35,744 m³/sec, Q50year = 36,938 m³/sec, Q100year = 37,689 m³/s. HEC-RAS hydraulics show flood overflow exceeding the embankments at several points on the left and right sides of the river. The water level rises uniformly along the cross-section, varying from 0.48 to 8.54 m, with a peak of 8 m at RS 2104 and RS 2414, due to greater discharge during high recurrence intervals. This is important for evaluating river capacity and identifying local flooding. This study contributes to flood risk management in Rokan Hilir, with recommendations for hydraulic infrastructure, water policy, and community resilience. Academically, it serves as a reference for civil and environmental engineering research, supporting comprehensive scientific knowledge.

Keywords: *Flood, Design Discharge, Rokan River, HEC-RAS*