

Erosi tebing sungai merupakan salah satu proses geomorfologi fluvial yang dapat menyebabkan perubahan morfologi sungai, kehilangan lahan, serta mengancam infrastruktur di sekitar sungai. Sungai Oyo segmen Srikeminut memiliki karakteristik berbelok dengan variasi bentuk penampang dan kondisi tebing yang berpotensi mengalami erosi akibat interaksi antara faktor hidraulik dan karakteristik material penyusun tebing. Penelitian ini bertujuan untuk menganalisis karakteristik hidraulik aliran, mengidentifikasi distribusi parameter hidraulik yang mempengaruhi erosi serta menentukan zona yang berpotensi mengalami erosi berdasarkan integrasi analisis hidrologi, pemodelan hidraulika, dan geomorfologi fluvial.

Penelitian dilakukan dengan memanfaatkan data geospasial hasil pemotretan *Unmanned Aerial Vehicle* (UAV) dan pengukuran langsung penampang sungai untuk memperoleh informasi morfologi dan geometri sungai. Analisis hidrologi dilakukan untuk menentukan debit banjir pada lokasi penelitian. Selanjutnya, pemodelan hidraulika menggunakan *Hydrologic Engineering Center's River Analysis System* (HEC-RAS) dilakukan untuk menganalisis karakteristik aliran, meliputi kecepatan aliran (*velocity*) kedalaman aliran, dan tegangan geser aliran (*shear stress*). Karakteristik fisik tanah tebing dianalisis berdasarkan gradasi butiran dan berat jenis tanah. Hasil analisis hidraulika dan karakteristik tanah kemudian diintegrasikan untuk mengidentifikasi potensi erosi tebing Sungai Oyo pada segmen Srikeminut.

Hasil penelitian menunjukkan bahwa distribusi *velocity* dan *shear stress* tidak merata di sepanjang segmen sungai. Nilai parameter hidraulik tertinggi umumnya terkonsentrasi pada jalur utama aliran (*thalweg*) dan di sisi luar tikungan, sedangkan sisi dalam tikungan menunjukkan nilai yang lebih rendah sehingga menjadi area deposisi sedimen. Lokasi dengan kombinasi kecepatan tinggi, kedalaman relatif besar, dan tegangan geser tinggi memiliki potensi erosi yang lebih besar. Hasil interpretasi *Unmanned Aerial Vehicle* (UAV) menunjukkan bahwa beberapa lokasi yang diprediksi memiliki nilai parameter hidraulik tinggi juga memperlihatkan indikasi erosi tebing di lapangan. Integrasi parameter hidraulik, dan geomorfologi fluvial menghasilkan identifikasi zona kerentanan erosi yang dapat digunakan sebagai dasar dalam pengelolaan sungai dan mitigasi kerusakan tebing.

**Kata kunci:** Erosi, HEC-RAS, UAV, *velocity*, *shear stress*

## **ABSTRACT**

Riverbank erosion is one of the fluvial geomorphological processes that can cause changes in river morphology, land loss, and threats to infrastructure surrounding rivers. The Srikeminut segment of the Oyo River is characterized by meandering channels with variations in cross-sectional geometry and bank conditions, making it potentially susceptible to erosion due to interactions between hydraulic factors and the characteristics of bank materials. This study aims to analyze flow hydraulic characteristics, identify the distribution of hydraulic parameters influencing erosion, and determine potential erosion zones based on the integration of hydrological analysis, hydraulic modeling, and fluvial geomorphological analysis.

The study utilized geospatial data obtained from Unmanned Aerial Vehicle (UAV) imagery and direct measurements of river cross-sections to obtain information on river morphology and geometry. Hydrological analysis was conducted to determine the flood discharge at the study site. Subsequently, hydraulic modeling using the Hydrologic Engineering Center's River Analysis System (HEC-RAS) was performed to analyze flow characteristics, including flow velocity, flow depth, and flow shear stress. The physical characteristics of riverbank soils were analyzed based on grain-size distribution and specific gravity. The hydraulic analysis results and soil characteristics were then integrated to identify the potential for riverbank erosion along the Srikeminut segment of the Oyo River.

The results show that the distributions of flow velocity and shear stress are not uniform along the river segment. The highest hydraulic parameter values are generally concentrated along the main flow path (thalweg) and on the outer banks of meanders, whereas the inner banks of meanders exhibit lower values and therefore tend to function as sediment deposition areas. Locations characterized by a combination of high flow velocity, relatively large flow depth, and high shear stress have a greater potential for erosion. UAV-based interpretation indicates that several locations predicted to have high hydraulic parameter values also exhibit indications of riverbank erosion in the field. The integration of hydraulic parameters and fluvial geomorphology enables the identification of erosion susceptibility zones, which can serve as a basis for river management and riverbank erosion mitigation.

**Keywords:** Erosion, HEC-RAS, UAV, velocity, shear stress