INTISARI

Bendungan Panglima Besar Soedirman merupakan salah satu bendungan besar di Indonesia dengan fungsi utama penyediaan irigasi, air baku, dan pembangkit listrik tenaga air. Namun, sedimentasi yang terjadi secara signifikan telah mengurangi kapasitas tampung dan umur efektif bendungan. Salah satu upaya untuk mengatasi permasalahan sedimentasi adalah dengan melakukan *flushing* melalui *drawdown culvert* (DDC). Proses *flushing* ini menghasilkan aliran air berkecepatan tinggi yang dapat menyebabkan gerusan lokal (*local scour*) di dasar sungai hilir, yang berpotensi merusak struktur bangunan dan mengganggu kestabilan morfologi sungai. Penelitian ini bertujuan menganalisis pengaruh *flushing* terhadap kedalaman gerusan lokal pada Sungai Serayu dan mengusulkan strategi mitigasi dampak gerusan tersebut.

Metode penelitian menggabungkan pengumpulan data primer berupa pengukuran geometris sungai, analisis gradasi sedimen, serta data teknis saluran DDC. Data sekunder diperoleh dari PT. PLN Indonesia Power terkait operasi *flushing* dan volume sedimentasi dalam kurun waktu 2023-2025. Analisis kedalaman gerusan dilakukan menggunakan lima metode empiris, yaitu USBR (Lacey 1984), Martins (1975), Chian Min Wu (1983), Damle et al. (1966), dan Mason dan Arumugam (1985), dilengkapi evaluasi tipe aliran dengan perhitungan bilangan Froude. Hasil perhitungan dibandingkan dengan kondisi lapangan untuk menilai efektivitas mitigasi yang telah diterapkan.

Hasil penelitian menunjukkan bahwa *flushing* melalui DDC menghasilkan aliran superkritis dengan bilangan Froude sebesar 1,05 dan kedalaman gerusan lokal bervariasi dari 12,39 meter hingga 27,19 meter tanpa mitigasi tambahan. Pemasangan *sky jump* tipe *circular-shaped flip bucket* di ujung saluran terbukti efektif mendispersikan energi aliran, sehingga kedalaman Sungai Serayu di hilir pintu DDC memiliki kedalaman sekitar 4-5 meter, meskipun *flushing* melalui DDC dilakukan secara berkala setiap bulan. Mitigasi lain seperti penggunaan rip-rap pada dasar sungai dan pengurangan intensitas *flushing* dengan metode pengerukan (*dredging*) juga direkomendasikan guna memperpanjang umur teknis bendungan dan melindungi struktur sekitar. Upaya ini guna menjaga kestabilan morfologi sungai hilir sekaligus mengendalikan dampak lingkungan akibat aktivitas *flushing*.

Kata kunci: Gerusan lokal, *flushing* Sedimentasi, dan analisis kedalaman gerusan.

ABSTRACT

The Panglima Besar Soedirman Dam is one of the largest dams in Indonesia, with its main functions being irrigation, raw water supply, and hydroelectric power generation. However, significant sedimentation has reduced the dam's storage capacity and effective lifespan. One of the efforts to address the sedimentation problem is by conducting flushing through a drawdown culvert (DDC). This flushing process generates high-velocity water flow that can cause local scouring at the downstream riverbed, potentially damaging the structure and disrupting the river's morphological stability. This study aims to analyze the impact of flushing on local scour depth in the Serayu River and propose mitigation strategies for the scouring effects.

The research method combines primary data collection in the form of river geometric measurements, sediment gradation analysis, and technical data on the DDC channel. Secondary data was obtained from PT. PLN Indonesia Power regarding flushing operations and sedimentation volumes during the period 2023-2025. Erosion depth analysis was conducted using five empirical methods: USBR (Lacey 1984), Martins (1975), Chian Min Wu (1983), Damle et al. (1966), and Mason and Arumugam (1985), supplemented by flow type evaluation using Froude number calculations. The calculation results were compared with field conditions to assess the effectiveness of the mitigation measures implemented.

The results of the study indicate that flushing through the DDC produces supercritical flow with a Froude number of 1.05 and local scour depths varying from 12.39 meters to 27.19 meters without additional mitigation. The installation of a circular-shaped flip bucket sky jump at the end of the channel has proven effective in dispersing flow energy, resulting in a depth of approximately 4–5 meters in the Serayu River downstream of the DDC gate, despite regular flushing through the DDC every month. Other mitigation measures, such as the use of gabions and reducing flushing intensity through dredging, are also recommended to extend the technical lifespan of the dam and protect surrounding structures. These efforts aim to maintain the stability of the downstream river morphology while controlling environmental impacts resulting from flushing activities.

Keywords: Local scour, flushing sedimentation, and scour depth analysis.