

INTISARI

Tingginya laju sedimentasi di Waduk Mrica mendorong PT. PLN Indonesia Power selaku pengelola waduk untuk melakukan berbagai upaya penanganan, salah satunya *flushing* melalui *drawdown culvert* (DDC). Namun, pelaksanaan *flushing* pada tahun 2022 diduga memicu kematian massal ikan di hilir Sungai Serayu, sehingga menimbulkan dampak ekologis, sosial, dan ekonomi yang signifikan. Berdasarkan kondisi tersebut, penelitian ini bertujuan untuk menganalisis kondisi sedimentasi di Waduk Mrica, mengevaluasi pengaruh *flushing* terhadap kualitas air dan ekosistem hilir Sungai Serayu dari aspek teknologi, lingkungan, sosial, dan finansial, serta merumuskan strategi mitigasi yang mendukung pengelolaan sungai secara berkelanjutan.

Data penelitian diperoleh melalui dokumentasi dari berbagai instansi terkait dan dianalisis menggunakan *Microsoft Excel* untuk analisis deskriptif serta *IBM SPSS Statistics* untuk analisis statistik. Uji statistik yang digunakan meliputi *Paired Samples T-Test*, *Independent Samples T-Test*, ANOVA dengan *Tukey HSD*, dan korelasi *Pearson*. Analisis dilakukan terhadap parameter kualitas air seperti *Total Suspended Solids* (TSS), *Total Dissolved Solids* (TDS), dan kekeruhan, disertai evaluasi teknis, ekonomi, serta persepsi sosial masyarakat melalui kegiatan *Focus Group Discussion* (FGD).

Hasil penelitian menunjukkan bahwa Waduk Mrica mengalami akumulasi sedimen signifikan, mencapai jutaan meter kubik per tahun. *Flushing* dengan DDC efektif mengurangi endapan sedimen dan menekan kerugian energi, meskipun memicu peningkatan sementara TSS dan kekeruhan selama 1-2 jam. Massa sedimen mengendap tercatat sebesar 1.288 ton/s di segmen Waduk Mrica-Jembatan Kali Serayu dan 64,5 ton/s di segmen berikutnya. Dampak kualitas air menurun setelah bercampur dengan aliran anak sungai, sementara TDS relatif stabil. Dari sisi sosial, masyarakat menilai *flushing* berdampak terhadap kualitas air dan aktivitas ekonomi hilir. Strategi mitigasi direkomendasikan melalui lima tahap, yaitu monitoring awal dan pembangunan *sediment trap*, pengelolaan *storage*, *sediment harvesting*, *agro-sediment utilization*, serta evaluasi berbasis *adaptive management*. Penelitian ini berkontribusi terhadap pengelolaan sedimen dan konservasi sungai sesuai *Sustainable Development Goals* (SDGs).

Kata kunci: Sedimentasi, *Flushing Drawdown Culvert*, Kualitas Air, Waduk Mrica, Pengelolaan Sungai Berkelanjutan.

Abstract

The high rate of sedimentation in the Mrica Reservoir has prompted PT. PLN Indonesia Power, as the reservoir manager, to take various measures, one of which is flushing through a drawdown culvert (DDC). However, the flushing carried out in 2022 is suspected to have caused mass fish deaths downstream of the Serayu River, resulting in significant ecological, social, and economic impacts. Based on these conditions, this study aims to analyze the sedimentation conditions in the Mrica Reservoir, evaluate the impact of flushing on water quality and the downstream ecosystem of the Serayu River from technological, environmental, social, and financial aspects, and formulate mitigation strategies that support sustainable river management.

Research data was obtained through documentation from various relevant agencies and analyzed using Microsoft Excel for descriptive analysis and IBM SPSS Statistics for statistical analysis. The statistical tests used included Paired Samples T-Test, Independent Samples T-Test, ANOVA with Tukey HSD, and Pearson's correlation. The analysis was conducted on water quality parameters such as Total Suspended Solids (TSS), Total Dissolved Solids (TDS), and turbidity, accompanied by technical and economic evaluations, as well as community social perceptions through Focus Group Discussion (FGD) activities.

The results showed that the Mrica Reservoir experienced significant sediment accumulation, reaching millions of cubic meters per year. Flushing with DDC effectively reduced sediment deposits and suppressed energy losses, although it triggered a temporary increase in TSS and turbidity for 1-2 hours. Sediment mass deposition was recorded at 1,288 tons/s in the Mrica Reservoir-Kali Serayu Bridge segment and 64.5 tons/s in the next segment. Water quality deteriorated after mixing with tributary flows, while TDS remained relatively stable. From a social perspective, the community assessed that flushing had an impact on water quality and downstream economic activities. Mitigation strategies are recommended through five stages, namely initial monitoring and construction of sediment traps, storage management, sediment harvesting, agro-sediment utilization, and evaluation based on adaptive management. This research contributes to sediment management and river conservation in accordance with the Sustainable Development Goals (SDGs).

Keywords: *Sedimentation, Drawdown Culvert Flushing, Water Quality, Mrica Reservoir, Sustainable River Management.*