INTISARI

Waduk merupakan salah satu infrastruktur vital yang memiliki peran penting dalam penyediaan air irigasi dan pengendalian banjir. Agar fungsi tersebut tetap berjalan optimal, diperlukan upaya pemeliharaan secara berkelanjutan. Namun, tantangan utama yang dihadapi adalah akumulasi sedimentasi yang berimplikasi pada penurunan kapasitas tampungan waduk. Kapasitas tampung Waduk Selorejo mengalami penurunan hingga 38% setelah beroperasi selama 44 tahun. Kondisi tersebut semakin diperburuk dengan belum adanya kegiatan monitoring sedimentasi secara periodik yang dapat menyajikan informasi terkini mengenai perubahan topografi dasar waduk. Tujuan utama dari proyek akhir ini yaitu memberikan informasi mengenai kondisi topografi dasar dan sedimentasi Waduk Selorejo.

Metodologi yang digunakan meliputi akuisisi data *Multibeam Echosounder* (MBES) yang selanjutnya dikoreksi terhadap georeferensi, pergerakan kapal (*roll, pitch, dan heave*), serta kecepatan rambat suara. Proses *cleaning* dilakukan menggunakan *EC-3D, histogram cleaning*, dan *manual point editor* untuk menghilangkan *noise*. Evaluasi kualitas data dilakukan melalui kalibrasi *patch test* dan uji akurasi dengan mengacu pada standar *International Hydrographic Organization* (IHO) S-44 Edisi 6.2.0 Tahun 2024. Peta batimetri disusun dengan interval kontur 8, 10, dan 15 meter, sementara pemodelan 3D topografi dasar waduk dibuat menggunakan perangkat lunak NaviModel. Untuk analisis sebaran sedimen, data *backscatter* dikonversi dari nilai *digital number* menjadi intensitas pantulan (dB), kemudian diklasifikasikan berdasarkan standar akustik sedimen untuk memetakan distribusi material dasar seperti tanah liat, lumpur, pasir, kerikil, dan batuan besar.

Hasil tugas akhir menunjukkan bahwa uji kualitas data menghasilkan nilai standar deviasi sebesar 0,075 m pada tingkat kepercayaan 95%, dan nilai tersebut masih berada dalam batas toleransi IHO Orde Khusus. Analisis *backscatter* memperlihatkan bahwa sebaran sedimen terbagi secara spasial, meliputi tanah liat di bagian barat dan selatan, lumpur di wilayah tengah, pasir di timur laut, serta kerikil dan batuan besar di area tertentu. Model 3D yang dihasilkan mampu merepresentasikan topografi dasar secara detail, sedangkan peta batimetri berhasil menggambarkan kedalaman antara 7 hingga 17 meter dengan kontur yang menunjukkan pola morfologi cekungan alami. Peta tersebut juga menampilkan keberadaan lima objek bawah air berupa endapan padat, bongkahan batuan, dan sisa struktur buatan manusia. Dengan demikian, model 3D dan peta batimetri tidak hanya menyajikan visualisasi morfologi dasar secara akurat, tetapi juga memberikan pemahaman ilmiah mengenai kondisi sedimentasi yang memengaruhi kapasitas tampung Waduk Selorejo.

Kata kunci: Sedimentasi, Batimetri, *Multibeam Echosounder*, Pemodelan 3D, Waduk Selorejo.

ABSTRACT

Reservoirs are vital infrastructures that play an important role in providing irrigation water and controlling floods. To ensure their functions remain optimal, continuous maintenance efforts are required. However, the main challenge faced is sediment accumulation, which reduces reservoir storage capacity. The storage capacity of Selorejo Reservoir has decreased by up to 38% after 44 years of operation. This condition is further exacerbated by the absence of periodic sediment monitoring activities that could provide updated information on changes in reservoir bottom topography. The primary objective of this final project is to present information on the bottom topography and sedimentation conditions of Selorejo Reservoir.

The methodology includes data acquisition using a Multibeam Echosounder (MBES), which was subsequently corrected for georeferencing, vessel motion (roll, pitch, and heave), and sound velocity. Data cleaning was carried out using EC-3D, histogram cleaning, and manual point editor to remove noise. Data quality evaluation was performed through patch test calibration and accuracy assessment based on the International Hydrographic Organization (IHO) S-44 Standard, Edition 6.2.0 of 2024. Bathymetric maps were produced with contour intervals of 8, 10, and 15 meters, while 3D modeling of the reservoir bottom topography was conducted using NaviModel software. For sediment distribution analysis, backscatter data were converted from digital number values into reflection intensity (dB), and then classified based on acoustic sediment standards to map the distribution of bottom materials such as clay, silt, sand, gravel, and boulders.

The results of this study indicate that the data quality test produced a standard deviation of 0.075 m at a 95% confidence level, which remains within the IHO Special Order tolerance. Backscatter analysis revealed that sediment distribution is spatially divided, consisting of clay in the western and southern parts, silt in the central area, sand in the northeast, and gravel and boulders in certain areas. The generated 3D model accurately represented the reservoir bottom topography, while the bathymetric map depicted depths ranging from 7 to 17 meters with contours illustrating the natural basin morphology. The map also identified five underwater objects, including solid deposits, rock boulders, and remnants of man-made structures. Thus, the 3D model and bathymetric map not only provide accurate visualizations of the reservoir bottom morphology but also contribute scientific insights into sedimentation conditions that affect the storage capacity of Selorejo Reservoir.

Keywords: *Sedimentation, Bathymetry, Multibeam Echosounder, 3D Modeling, Selorejo Reservoir.*