ABSTRACT

The Bedadung Watershed (DAS) is a critical area with hydrological and ecological functions, making vegetation monitoring a crucial aspect of land conservation efforts and disaster mitigation such as floods. One of the commonly used indicators for vegetation monitoring is the NDVI (Normalized Difference Vegetation Index), as it effectively represents vegetation density and health both spatially and temporally. This study explores the application of the Discrete Wavelet Transform (DWT) filter based on Daubechies 4 (db4) to enhance the quality of NDVI data in multitemporal vegetation monitoring within the Bedadung Watershed, Jember.

The processing steps included masking the study area, calculating NDVI from red and near-infrared spectral bands, and applying level-1 DWT to filter out high-frequency components. Evaluation was conducted using statistical approaches including RMSE, MAE, R^2, mean NDVI (Ma and Md), as well as graphical and distributional visualizations of NDVI values.

The results indicate that the Discrete Wavelet Transform (DWT) method is effective in reducing noise in NDVI imagery without altering its spatial structure. The average coefficient of determination (R^2), which exceeds 0.89, reflects a high level of agreement between the filtered NDVI data and the original. Additionally, the low RMSE and MAE values—approximately 0.05 and 0.01, respectively—indicate good accuracy. The distribution of NDVI values also became more uniform after filtering, suggesting that the smoothing effect of DWT operates optimally. The average NDVI value increased from 0.1091 (original) to 0.1147 (DWT) over the 2019–2023 period, indicating an overall improvement in vegetation data quality. Therefore, the implementation of Daubechies 4 DWT is considered suitable for long-term vegetation analysis in the context of land conservation and flood mitigation in the watershed.

Keywords: *NDVI, Daubechies DWT, Bedadung Watershed, Landsat 8, multitemporal analysis, image filtering*