ABSTRACT

Shoreline change is a dynamic phenomenon influenced by natural factors such as waves, currents, tides, and sedimentation, as well as human activities in coastal areas. Muara Batu District, North Aceh Regency, is one of the coastal regions experiencing shoreline changes in the form of coastal erosion (abrasion) and accretion, making continuous monitoring essential to support sustainable coastal zone management. This study aimed to analyze shoreline changes, determine the rates of coastal erosion and accretion, and calculate the extent of shoreline changes in Muara Batu District using the *Normalized Difference Water Index (NDWI)* method based on Landsat 8 imagery. The research employed a quantitative descriptive approach using remote sensing and Geographic Information System (GIS) techniques. The research stages included the acquisition of Landsat 8 imagery from 2015 to 2025, geometric correction, image cropping, shoreline extraction using the NDWI method, and shoreline change analysis using the *Digital Shoreline Analysis System (DSAS)* with the *Net Shoreline Movement (NSM)* method in ArcGIS 10.8. The results indicated that shoreline changes in Muara Batu District consisted of two main categories, namely coastal erosion and accretion, with varying magnitudes at different observation locations. Areas experiencing coastal erosion were generally located along coastlines directly exposed to the open sea due to the influence of waves and currents, whereas accretion areas were primarily associated with sediment deposition, particularly around river mouths. The analysis of shoreline change areas revealed variations in the extent of erosion and accretion throughout the study period, reflecting the dynamic nature of the coastal environment in Muara Batu District. The findings of this study are expected to provide valuable information for coastal zone management, spatial planning, and the development of mitigation strategies to reduce the impacts of shoreline changes in North Aceh Regency.

Keywords: Accretion, coastal erosion, DSAS, Geographic Information System, Landsat 8 NDWI, shoreline change.