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TEMPORAL ASSESSMENT OF SHORELINE CHANGES IN DHANUSHKODI, RAMESWARAM ISLAND, INDIA, USING REMOTE SENSING AND GIS

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Abstract

Coastal zones are highly dynamic environments where shoreline position continuously responds to natural processes and anthropogenic pressures. Understanding long-term shoreline evolution is essential for effective coastal management, particularly in erosion-prone tropical regions. This study presents a temporal assessment of shoreline changes along the Dhanushkodi coast, located on Rameswaram Island, Tamil Nadu, India, over a 23-year period (2001–2024), using remote sensing and Geographic Information System (GIS) techniques. Multi-temporal Landsat satellite imagery was employed to extract shoreline positions through the application of the Normalized Difference Water Index (NDWI), enabling consistent land–water boundary delineation. Shoreline change rates were quantified using the Digital Shoreline Analysis System (DSAS), applying statistical indicators including End Point Rate (EPR), Linear Regression Rate (LRR), Net Shoreline Movement (NSM), and Shoreline Change Envelope (SCE). The results reveal pronounced spatial variability in shoreline dynamics, with both erosional and accretional trends observed along the study area. Maximum erosion and accretion rates reached approximately −44.1 m/year and 42.9 m/year, respectively, highlighting the highly unstable nature of the coastal system. Significant net shoreline retreat and localized land accumulation were identified, indicating progressive morphological changes over the study period. The findings provide a comprehensive overview of long-term shoreline behavior in Dhanushkodi and demonstrate the effectiveness of integrating remote sensing data with DSAS-based analysis for coastal monitoring and management in vulnerable coastal regions.

Key words: coastal erosion, digital analysis, satellite imagery, shoreline changes

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