ASSESSMENT OF COASTAL EROSION IN THE WESTERN COAST OF SRI LANKA USING REMOTE SENSING TECHNIQUES

G.S. Wanigarathna, B.C. Dissanayake *

Department of Civil Engineering, University of Moratuwa, Moratuwa

Coastal erosion represents a critical environmental challenge affecting coastal communities and ecosystems worldwide, with Sri Lanka's west coast being particularly vulnerable due to its exposure to both natural and anthropogenic factors. The west coast, encompassing vital urban centres and tourist destinations, faces increasing threats from rising sea levels, shifting monsoon patterns, and intensive coastal development activities. Traditional ground-based surveying methods for monitoring coastal erosion are constrained by significant limitations, including high costs, labour-intensive requirements, time consumption, and restricted spatial and temporal coverage, making it challenging to capture rapid shoreline changes effectively. Despite the growing vulnerability of Sri Lanka's coastal areas to the combined effects of climate change and human activities, there exists a substantial gap in comprehensive, long-term shoreline change data, particularly in regions affected by seasonal monsoonal conditions and anthropogenic pressures. The spatial and temporal constraints of conventional monitoring approaches have hindered the ability to obtain continuous, high-resolution data necessary for developing effective coastal management strategies. Remote sensing techniques offer a promising solution to mitigate these difficulties by providing cost-effective, comprehensive monitoring capabilities over large spatial scales and extended temporal periods.

This study addresses these challenges by employing remote sensing tools to assess coastal erosion trends at six strategically selected sites along Sri Lanka's west coast: Rathmalana, Magalkanda, Iranawila, Hikkaduwa, Mount Lavinia, and Wadduwa. The research utilises Google Earth Engine (GEE) and CoastSat platforms to analyse shoreline changes from 2000 to 2025 using high-resolution satellite imagery. CoastSat's sophisticated shoreline detection algorithms were implemented to extract and quantify detailed erosion and accretion patterns across the study period, providing unprecedented insights into coastal dynamics. The analysis reveals significant spatial and temporal variations in shoreline behaviour across the study sites. Seasonal analysis demonstrates that Hikkaduwa experiences the most dramatic variations, exhibiting a maximum erosion rate of 16.06 meters per year during the Southwest monsoon period and a contrasting maximum accretion rate of 9.41 meters per year during the Northeast monsoon season. These findings highlight the complex interplay between seasonal climatic patterns and coastal morphodynamics, emphasising the importance of considering temporal variability in coastal management planning. The results underscore the critical need for developing site-specific coastal management strategies that account for the unique local conditions and seasonal variations of each location. The successful application of remote sensing technologies in this study demonstrates their potential as powerful tools for continuous coastal monitoring, offering a scalable and cost-effective alternative to traditional surveying methods. This research contributes valuable insights for coastal zone management and provides a foundation for implementing adaptive strategies to address the growing challenges of coastal erosion in Sri Lanka and similar coastal environments worldwide.

Keywords: Monsoon, Satellite images, Shoreline changes, Coastal erosion, Google Earth Engine

* *Correspondence: chaturad@uom.lk*

GRAPHICAL ABSTRACT