Shoreline Change Analysis along the East Coast of Sri Lanka: A Remote sensing-Based Approach

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The changes along the eastern coastlines of Sri Lanka have been investigated for short- and long-term natural and anthropogenic processes. Such coastal changes can be classified as either negative (coastal erosion, seawater intrusion) or positive (coastal accretion) impacts. The understanding of such impacts can directly be applied to coastal conservation/management and the designing of coastal engineering structures. In this study, the authors examined Landsat 5, 7, and 8 sun-synchronized earth resources satellite data for understanding coastal changes since 2000. These Landsat series have advanced sensors (e.g., thematic mapper (TM), enhanced thematic mapper plus (ETM+), operational land imager (OLI)) for data acquisition. Data selection, pre-processing, and processing were carried out using a geographic information system (GIS). Besides, the authors developed a new model known as "*Jargon's script*" for data preprocessing and processing. Modified Normalized Difference Water Index (MNDWI) is the important algorithm of *Jargon's script* models that helps to extract water and land features. The threshold value for the MNDWI to get maximum contrast of objects was identified as 0.13. Furthermore, the current study covered nearly 1043 km coastline along major coastal zones such as Jaffna, Mullaitivu-Trincomalee, Batticaloa-Hambantota, Matara, etc. Long-term and short-term coastal changes were then determined using Digital Shoreline Analysis System (DSAS) software linked to ArcMap 10.6. Results identified five major parameters such as net shoreline movement (NSM), shoreline change envelope (SCE), endpoint rate (EPR), linear regression rate (LRR), and weighted linear regression rate (WLR). In this study, coastal geomorphological changes were classified into eight classes based on the annual variation of EPR values, such as extreme erosion (>-10 m/year), high erosion (-10 to -5 m/year), moderate erosion (-5 m/y to -2.5 m/year), low erosion (-2.5 to 0 m/year), low accretion (0 to +2.5 m/year), moderate accretion (+2.5 to +5.0 m/year), high accretion (+5.0 m/y to +10 m/y), and extreme accretion (> +10 m/year). Those parameters can be used to visualize spatial and temporal variations of geomorphological changes along this coastline, and such variations can be used to correlate natural (monsoon, sea-level rising) and anthropogenic activities. According to the EPR results of Karainagar east, Kalido beach has the highest coastal erosion compared to other coastal areas.

Keywords: Shoreline change rate; Satellite images; Coastal geomorphology; Sediment dynamics; East coast of Sri Lanka