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Assessing and Mapping the Shoreline Change in Pottuvil Region, Sri Lanka from 1987 to 2018: using GIS and Remote Sensing Technique

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Abstract

Coastal changes defined by the accumulation or loss of lands in the near shore area by wave actions. These changes often result from social and natural factors such as human activities, sea-level changes, and Storm surge and hurricane occurrences. Coastal erosion is one of the serious problems in the coastal zone of Sri Lanka. The existing information reveals that more than one third of Sri Lanka's coastline is subject to coastal erosion. The causes and the intensity of the erosion vary from place to place. At present, some changes of the shoreline have occurred in the Pottuvil region in Ampara District, Sri Lanka. The Pottuvil coastal zone is about 28 km long and important for different aspects. Lagoons, mangroves, dunes, beaches, beach associated scrublands, rock outcrops, and marshlands are the major natural terrestrial habitats in the area and recently impacted by shoreline changes. Significant coastal erosion has been reported in 2015 and again repeated in 2017 in the Pottuvil area. This paper assessing and mapping the shoreline changes from 1987 to 2018 using Geographic Information System and Remote Sensing, Arc GIS extension of the Digital Shoreline Analysis System (DSAS). In this context, used available Aerial photographs (1987), Quick Bird Image (2005), Worldview (2014), Worldview (2017) and Google Image (2009) over 1987-2018 for tracking the shoreline change and estimating its change rate. The study region divided into seven shoreline segments based on morphological characters of the coastal zone and DSAS generates 284 transects at a spacing of 100 m from Crocodile rock to Sangamankanda point to calculate the statistical parameters of the Net Shoreline Movement (NSM) and End Point Rate (EPR). The result reveals that the End Point Rate record at the rate of -0.49 m Y^{-1} from 1987 to 2005 and -0.76 m Y^{-1} from 2005 to 2018. The cumulative rate recorded as -0.51 m Y^{-1} . The study identified that in two epochs considered, there were general erosion trend in the shoreline changes and clear indication of the rate of erosion is increased during past fourteen years (most recent years). Analysis result indicated that erosion and accretion occurred due to coastal processes of currents and sediment transport. Further, this study emphasises the importance of the use of GIS and Remote Sensing, Digital Shoreline Analysis System (DSAS) techniques for the detection of shoreline changes in the coastal zone.

Keywords: Coastal changes, Sea-level changes, GIS and Remote sensing, DSAS, End point rat