ABSTRACT

The coast, occurring between land and sea is dynamic in nature. It changes gradually, by sequences of hydrodynamic changes, (e.g., river cycles, sea level rise, etc.), geomorphological changes (e.g., barrier island formation, spit development, etc.) and other sudden and rapid seismic and storm events. For integrated coastal zone management and its future sustainability, understanding of this dynamic nature is important. The primary aim of this research work was to study long-term (30 years), short-term (10 years) and seasonal coastal changes utilizing satellite imageries. The satellite data derived information was combined with collateral data on GIS platform. Three techniques, namely shoreline change rate calculation, newly proposed 'three-unit based coastal change study', and conventional beach profiling were followed in this study. The study has been carried out over 113.5 km long coastal stretch along Midnapur Balasore coast of eastern India. Since the area is known to be erosion-prone, several artificial constructions have been made within this stretch. A complex geomorphological association of spits, marshy land, mud flat and estuary also exists along this stretch. The study was carried out by subdividing the coastal stretch into seven 'littoral cells', bounded laterally by natural barriers. The periodic shoreline positions were marked along uniformly spaced transects orthogonal to the reference shoreline positions. Following the statistical methods of Linear Regression, Regression coefficient, Root Mean Square Error (RMSE) estimations, the shoreline change rates have been determined and cross-validated. On the other hand, with identification of three coastal units (land, wetland and water) on different dates, five coastal change units were derived between different dates. Finally, the integrated analysis reveals: (1) For long-term (30 year) shoreline changes, all littoral cells except the first cell (LC1) are under severe erosion; (2) Shorter time intervals are reliable for evaluating shoreline positions for the regions affected by anthropogenic interventions, while longer time interval for unaffected regions; (3) Seasonal (pre and post-monsoon) changes show direct relationship between weather and shoreline shift; (4) 'Three-unit based change study' can be an alternative approach for reliable coastal change study; (5) Short-term (10 years) shoreline changes are found to be matching with the nodal (global) variation of tides.