Shoreline Change Study along the Coast of Cuddalore, Tamil Nadu, South India

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Abstract— In the present study, an attempt has been made to map shoreline changes of Cuddalore coast, Tamil Nadu, South India using remote sensing and GIS. The shoreline is rapidly changing land forms in the coastal area. In coastal GIS and its deliver the more evidence's about on coastal land form dynamics. Therefore, accurate detection and continuous monitoring is very important to realize the coastal processes and dynamics of various coastal features. This study is to investigate the shoreline change along the coast of Cuddalore Tamil Nadu, South India, using ArcGIS and IRS and LANDSAT data. (2000 – 2012) are used to extract the shoreline and the data are handled by using the ERADAS IMAGE software and examined by ArcGIS 9.3 workstation. The study area reveals particular areas have been undergone erosion and accretion. Lesser changes could be noticed along the northern and southern part of the coast. Some necessary measures have been taken by the government for the coastal zone management. The ecological importance of the mangroves, afforestation of mangroves should be increased in the study area to reduce the wave height considerably during extreme events, such as major storms and tsunami and protect the coast from erosion. The coastal area erosion and deposition have been increased in some areas along the coast. The study proves that, geospatial science has got immersive applications of changes like this.
Key words: Shoreline Change, Erosion, Accretion

I. INTRODUCTION

Coastal zone is a unique environment, this area of interaction between land and sea and thus both terrestrial and marine environments influenced this zone. Coastal zones are most fragile, dynamic and productive ecosystem and are relatively often under pressure from both anthropogenic activities and normal processes, and it supports a large amount of floral and faunal biodiversity. Boundaries of coastal zones are defined in different ways depending on the focus of interest and availability of data. Coastal zone of India have to include 26% of the total population. More people are unprotected to natural costal vulnerabilities such as storm surges, tsunamis, and shoreline erosion. The individual hazards such as storms, cyclone's tsunamis, sea level change and shoreline variation have been carried out by several researchers they are studied in the north Indian ocean, Arabian sea and the bay of Bengal Indu Jain, *et al.* (2006), Unnikrishnan and Sankar (2007), Kumar, *et al.*(2008).

Shoreline is defined as the line of intersection between the land and water body. The shoreline was unique features of the earth surface. Space and technologies have the capability to provide information over a large area on a repetitive source and therefore very useful in recognizing and monitoring numerous coastal features. Today these technologies are indispensable when emerging appropriate action plans for development in any coastal area. After the great Indian Ocean tsunami (26 december-2004) along the

coastal area was effected different morphological changes and variations in sea level were continuously observed. These are induced sudden erosions dissimilar to seasonal variations in the south-eastern part of India. It is one of the twenty seven features recognized by the international geographic data committee and a quickly changing land form in the coastal area. It delivers a more detailed picture of shore line change through time and how adjacent shore forms evolve in concern with the related coastal land forms. Ramesh, R. *et al.* (2010). They are the key factors in coastal GIS and offer more information on coastal land form dynamics. Hence accurate detection and frequent monitoring of shoreline are very essential to understand the coastal processes and dynamic of various coastal features. As a pilot studies a composite hazards line map along with current shoreline changes has been prepared for a short coastal region of the Cuddalore district based on its morphological changes and erosion changes.
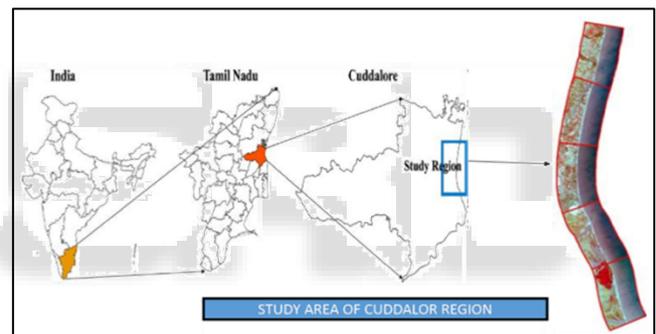
II. STUDY AREA

Fig. 1: Location map of the study area

The area Cuddalore port was under the control of different countries before the independence of India. This is the large developed town within the state of Tamil Nadu south India, which has experienced rapid rates of coastal expansion. The coastal stretch of Cuddalore covers from Gadilam estuary to the north to Pitchavaram mangroves in the south entire length of the study area 42 km along the Bay of Bengal and west by Panruti and Virthachalam Taluk of Cuddalore district. It lies between 11°23'57" and 11°48'03"N latitudes, and 79°38'11" and 79°01' 08" E longitudes (Fig.1) covering the area the Gadilam River flows through the town and splits the Cuddalore old town from the new one. River Uppnar is one of rivers passing through the industrial coastal town of Cuddalore in south east the coast of India along with River Gadilam in the north which drains into the Bay of Bengal. This region found in a lot of surface - water bodies in the western side of the study area connected to the river, and a large thermal power plant sewage find its way into the river through this water body many large and small - scale industries being established along the Uppnar River bunk. The coastal zone of Cuddalore includes production of fertilizers, dyes, chemicals and mineral processing plants, and metal – based industries and another key place are

Pitchavaram mangrove forest. This is an eco–tourist spot in Cuddalore is known for its picturesque beaches, particularly Silver Beach and Swamiyarpettai beach.

III. DATA AND METHODS

In this study used for primarily extracting the shoreline changes from the IRS and LANDSAT satellite data. The Survey of India (SOI) topographical map are used in the base map. The district map and other map prepared by the help in the GPS field survey, and this is useful for the secondary data.

A. Shoreline Mapping

Shoreline is defined as the line of interaction between land and water body. It is informal to define but problematic to capture because the demarcation is always changing. The shoreline changes is the horizontal movement of specific shoreline the shoreline position changed as accretion or erosion. The demarcation and areal extend of the sites of erosion, and accretions were mapped and digitized and exported to shape file format for further analysis in Arc GIS 9.3 software. The extracted shorelines were analyzed in the help of software finally the shoreline change status for the periods of (2000 – 2012) (Fig. 2) was analyzed.

IV. RESULT AND DISCUSSION

The present study shows the shoreline change depends on both natural coastal processes, and anthropogenic activities indicate the shorelines, baselines and transects along the area of the coastal zone the variation of different shorelines shown on the map. The map shows the corresponding accretion and erosion the areas were increased and decreased that indicates accretion and erosion zones.
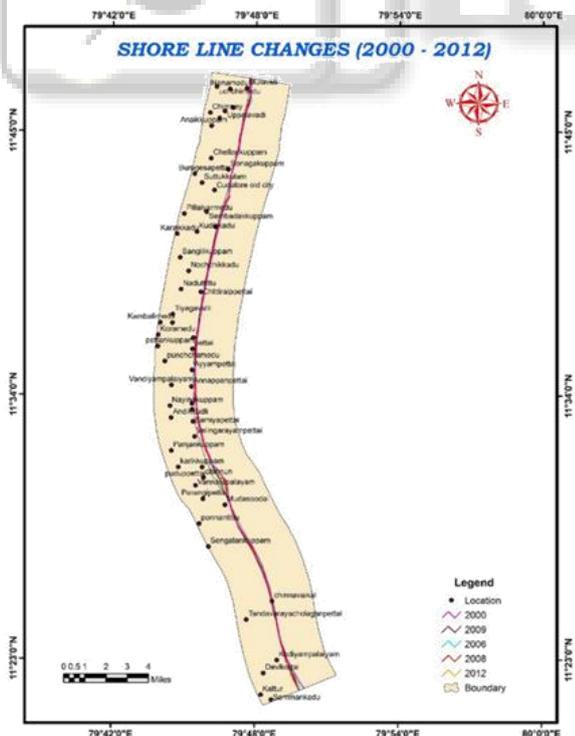

Fig. 2: Map Showing the Shoreline Changes

A. Shoreline Change Analysis

The shoreline is one of the significant dynamic coastal features where the land and sea meet. In any open coast, when artificial structures such as harbor or breakwaters interfere with the littoral current shoreline changes drastically. In India have shoreline changes using the satellite data along the Indian coast. During the low tide condition, extreme land is exposed and even low water line/land water boundary and high water line distinctly visible. This enables better mapping of the shoreline. In these study, shoreline positions and changes in the last 12 years and periodical change during 2000- 2012 reveal that the shoreline positions of either erosion or deposition. The shoreline change map from 2000-2012 indicates that erosion was observed in geomorphic features like beaches, beach ridges, brackish water/creeks, and coastal plain during the study erosion noticed at Devanampatanam, Chittirapettai, Periyakuppam, Ayyampettai and Reddiyarpettai in the north to central and in the southern part of the study area. Shoreline advances was noticed at Cuddalore old town, in the north and Saamiyarpettai, Pudupettai in the middle of the study area.

The base line distance of shoreline from 2000-2012 (Fig: 3) which indicates the erosion was noticed more than half the length of the coastline of the study area. The erosion occurred to the north to central part except Cuddalore old town and Madasoodal in the southern part of the study area. The minimum and maximum distance of erosion was noticed at Sonagakuppam, Madasoodal, and Chinnavaikal. The lowest and highest length of accretion was noticed at Swamiyarpettai, Pudupettai, and Chinnun. The southern part of the study area.
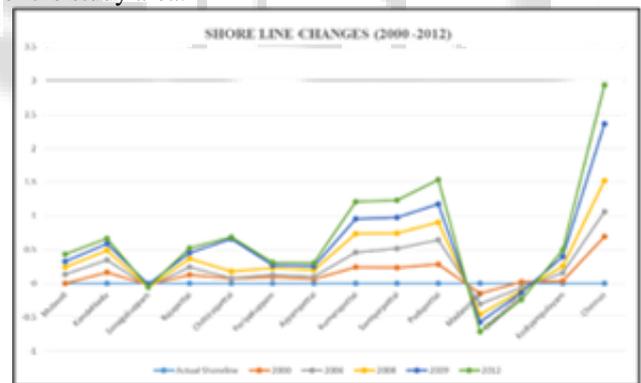

Fig. 3: Shoreline Changes (2000 – 2012)

V. CONCLUSION

The shoreline changes in the studied using an integrated approach using topographic map, remote sensing and GIS. The shoreline study shows the maximum and minimum deposition erosion areas along the coastal. The 2000-2012 shoreline changes showed a lot of maximum and minimum erosion and deposition. The shoreline changes are predicted for the vulnerability of coast. The shoreline changes indicates the both normal and anthropogenic procedures along the coast. Modify the shoreline configuration and its control the erosion and deposition of the coastal zones. The study finally focused the influence of both natural and anthropogenic coastal processes in the study area.

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