Thesis Structure and Summary

The thesis has ten chapters. The first four chapters deal with the introduction, literature survey, data and method and the geomorphology of the study area. The core chapters deal with the beach topographical analysis, sediment transport, shoreline change detection and modeling, coastal landforms dynamics and mineral mapping etc. The final chapter is devoted to the architecture and development of web based (Intranet site) coastal GIS using ArcIMS. The annexure of the thesis provides the secondary results and data and other related information of the study.

The present study has been performed to collect, analyse and disseminate the information on the dynamics of coastal landforms between Tuticorin and Kanyakumari coast (where hydrodynamic and morphological changes have been frequently observed after the December 2004 Tsunami) by using Remote Sensing and GIS. Quantitative analysis of coastal landform dynamics and the development of conceptual modeling tools will eventually solve various coastal problems and helps to understand the complex and diverse nature of our coastal environment. Several studies on coastal landforms using satellite data have proved its efficiency in understanding the dynamics of coastal landforms and the related processes. Therefore the remote sensing technology with GIS and GPS can be effectively used to classify various coastal landforms and to study their dynamics. Remotely sensed information integrated with the other collateral information through GIS can be effectively used for the conservation of coastal ecosystems.

Here, the satellite data has been processed and analysed by using sophisticated digital image processing and GIS tools. Even though the present study used remote sensing and GIS technology for analysing the dynamics of coastal landforms, the ground verification is very essential for to validate the findings. So, field study has also been performed on the beach topographical and morphological changes, by performing profile surveys on the selected beaches.

The beach profile study emphasizes that the morphology of beaches undergoes dynamic changes in different spatial and temporal scales. Both cyclic (seasonal) and annual changes in the beach topography has been observed. It also reveals that the topographical and morphological changes of beaches are mainly oriented with coastal
geology, shore configuration and seasonal oscillation. The temporal and spatial EOF functions also indicate the rapid changes and random variations along different beaches. The littoral wave processes and the sediment transport of along the coastal stretch have also been monitored during the field observation. The longshore sediment transport also modifies the beach configuration and it leads to erosion/accretion along the shorelines. It also produced different modifications on the coastal landforms along the study area. The present study provides more attention on the dynamics of shorelines along the coast. The spatial and temporal shorelines are extracted from the multi-date IRS satellite data. The natural and geological influences, availability of sediment, relative sea level change modifies the shorelines. The shoreline change rate studies reflect both short-term and long-term changes along the various coastal zones of the study area.

The different coastal landforms and their dynamics are analysed by using remotely sensed satellite images and other secondary data. The dynamics of these coastal landforms has been analysed by performing change detection analysis. The research on landform dynamics reveals that the coastal landforms can exists in both rapid and gradual scales. The extreme climatic events (hurricanes, storms, tsunami etc.), global warming, sea level rise, natural changes and anthropogenic activities have influenced on the rapid changes of coastal landforms. The storms during the monsoon and the recent Indian Ocean Tsunami have also influenced the morphological and hydrological conditions of coastal landforms. The concept of gradual coastal change can be seen as embracing different contexts, both spatial and temporal. The study has also intended on the potential mapping of mineral resources along the coast of Navaladi to Periathalai, by using Landsat multi-spectral satellite data. The obtained results are very useful to perform further advanced sub-pixel mineral mapping methods using hyper-spectral satellite data.

The scope and objective of any scientific study will be rewarded only on the effective utilization of the obtained results by the end users. In-order-to attain this specific task, the obtained results are delivered through ArcIMS, a web based (Intranet) Geographic Information System (GIS) to publish the spatial and non-spatial data including maps and meta data. The ArcIMS technology provides to build and customize the appropriate viewer required by the user community. Thus the present study will be very useful to research and developments, policy making purposes, resource management and environmental protection.