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RESEARCH ARTICLE

A STUDY OF LAND USE LAND COVER CHANGE DETECTION THROUGH REMOTE SENSING AND GIS FOR NAGAPATTINAM COASTAL STRETCH, SOUTH INDIA

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ABSTRACT

The Land use/ land cover map generated from Landsat and Resource sat image from 1991, 1999, 2008 for the coastal tract of Nagapattinam district. The changes were noticed along the coastal tract. The inferred data were validated in the field and the results were derived. agricultural land, fallow land, build up land, water bodies, river, mangrove, mangrove forest, land with scrub, land without scrub, and port, this shows the major land cover on this area. The results indicate that agriculturalland and fallow land are the dominant land use tone in Nagapattinam coastal tract. There is very less land cover modification isnoticed in mangrove, mangrove forest, and Salt pans in the study area.

INTRODUCTION

Land use/ land cover assessment is more effective by remote sensing techniques (Gurugnanam et al.2008) land use land cover change allows one to identify major changes for the identification of the major changes in and case behind the processes, and also characterization of landuse dynamics (Ademiluyi et al., 2008). In addition, aiding the ecological management of the land, land cover and use information may be used for planning, monitoring and assessment of development, industrial activity or reclamation. In digital image classification, an interpreter evaluates several characteristics such as tone, texture, size, pattern, shape and association, and his own knowledge about the land cover distribution.

Study Area

The study area of Nagapattinam district of coastal tract (Fig.1)is located in the delta region ofCauvery in the southern part of the Bay of Bengal in south east coast of India. The major rivers are Arasalar, Tirumalarajanar, Vettar, Kaduvaiyar and Harichcandranadi (tributaries of river Cauvery) pass through the granitic terrain and agricultural belt in a region (figure. 1). Recently, numerous smallscale Aquaculture farms have established along the Vedaraniam canal.

METHODOLOGY

Land satSatellite data of 1991, 1999 and Resource sat Satellite data of 2008 image were used for generating land use / land cover map,with the help of Arc GIS.Along the shoreline it is buffered for 10 km. to classify the image.The satellite images were digitized the different land use land cover in Arc GIS software. Different landuse features were mapped as Agriculture land, Fallow land, Build up land, water bodies, River, Mangrove, Mangrove forest, land with scrub, land without scrub, and port, their changes were analyzed with the help of GIS. The use of multi-temporal satellite data on a large scale possesses a number of challenges including geometric correction error, noise erasing from atmospheric effect, error arising from changing radiance geometer and instrument errors. All these were carried out.

Land use/ land cover

In the present study, three land use/ land cover maps were prepared based on digitized method by Arc GIS; Land sat 1991, 1999 and Resource sat of 2008. Initially, land use / land cover maps had six classes in the Level I category like agricultural land, built-up land, forest, water bodies, waste land (NRSC classification scheme 2010). However, after field visits, six classes have been further classified into eighteen classes of Level II categories. The Level II category features are as follows: fallow land, agriculture,land with scrub, land without scrub, sandy area, wasteland, river, sea, mangrove forest (forest), Built-up land and aquaculture pond (others). The land use/land cover spatial distribution maps were prepared from Landsat, Resource sat satellite data in GIS platform and are shown in Figs. 2, 3, 4 and chart 2.1, 3.1, and 4.1.

Agricultural Land

The land primarily used for farming and for production of food. It includes land under crops (irrigated and un-irrigated), fallow land and plantations and were observed in the field. The results of the analysis of satellite data for the year 1991, 1999, and 2008 are given below. The agricultural land was gradually reduced. The correlated year of1991-1999 is 1292.3 Km^2(25%), in the year 1999-2008 753.55

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Km^2(15%) and 1991-2008 753.55 Km^2(15%) agricultural land was same in Km^2.

Fallow land

It is described as agricultural land, which is taken up for cultivation, but it is temporarily allowed to rest un-cropped for one or more seasons, but not less than one year. These lands are particularly those which were seen devoid of crops at the time when the satellite imagery was taken of both seasons. The total area occupied under the agricultural fallow land was 1991-2000 is 479.74 Km^2 (8%), 2000-2009 is 1001.6 Km^2 (19%) and 1991-2009 is 1000.9 Km^2 (19%)

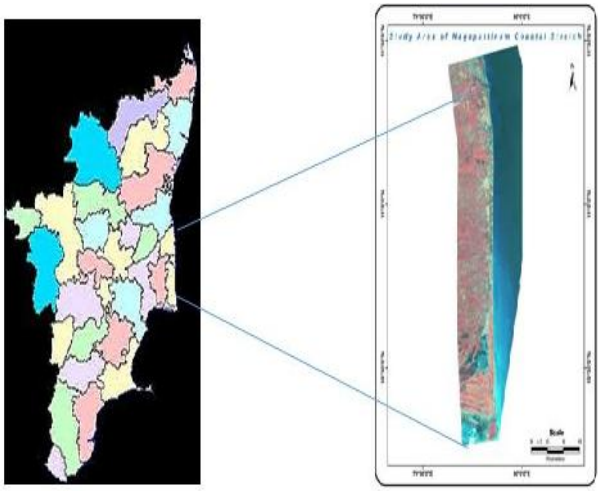

Fig.1 Study area Map

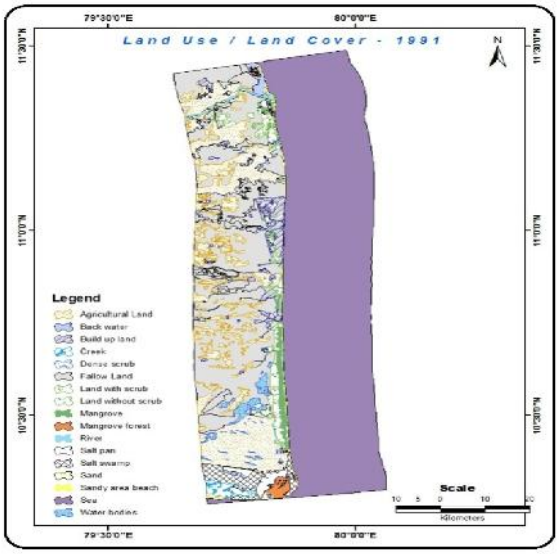

Fig.2 Land use land cover map 1991

Built-up land

It is defined as an area of human habitation which has a cover of buildings, transportation, communication utilities in association with water, vegetation and vacant lands. Moreover, they are sparsely present in the entire study area. The built-up-land occupied an area of 1991-2000 is 96.3 Km^2 (2%), 2000-2009 is 125.78 Km^2 (1%) and 1991-2009 is 126.3 Km^2 (2%)respectively in the study area.

Water bodies

It is an area of impounded water, areal in extent and often with a regulated flow of water.It includes man-made lakes/tank/canals, besides river/stream and creeks and observed in the field (Plate 4). The total area occupied by water bodies in the study area was 1991-2000 is 89.1 Km^2, 2000-2009 is $Km^2$and 1991-2009 is 68.06 Km^2.

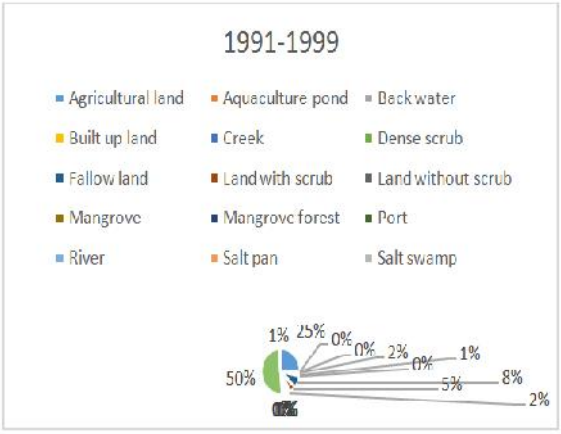

Chart (2.1) Land use/Land cover and its percentage (1991-1999)

Land with scrub

Land with scrub is a type of wasteland. A very small portion of the study area is characterized by this type of feature. It is identified in the satellite data by its light blue or light green color but without pattern with medium to coarse texture and as isolated patches spread over the study area (Table 5.10 to 5.12). The total area covered under this category in the year 1991-2000 is 266.56 Km^2, 2000-2009 is 221.02 Km^2 and 1991-2009 is 215.59 Km^2respectively.

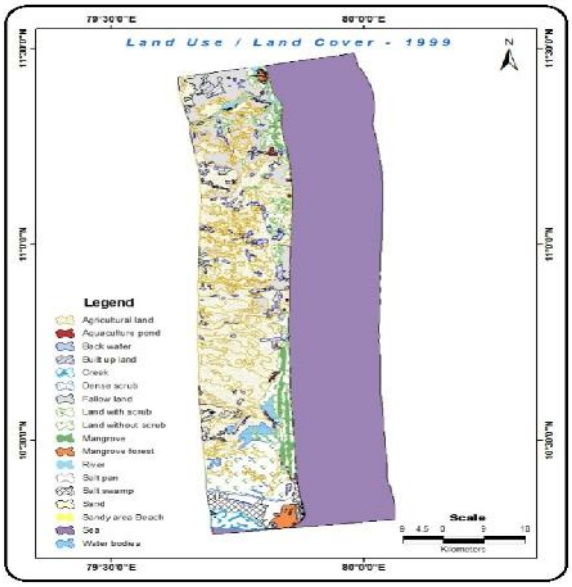

Fig. 3 Land use land cover map 1999

Land without Scrub

Land without scrub is another type of wasteland inferred by its distinct light grey to white color and medium to coarse texture. It is devoid of vegetation and observed in isolated patches around the scrub land. The total area covered under this category was 1991-2000 is 122.34 Km^2, 2000-2009 is 55.98 Km^2 and 1991-2009 is 58.54 Km^2. respectively.

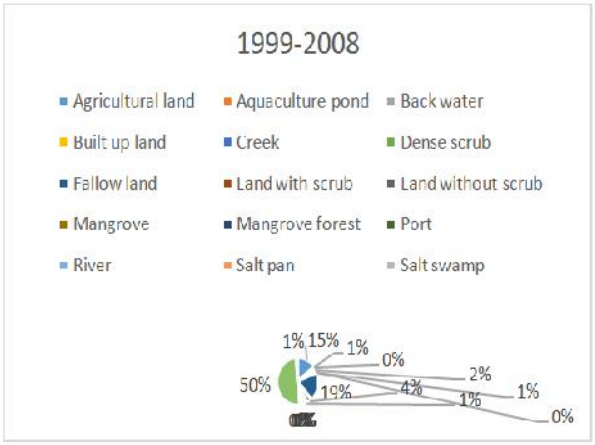

Chart (3.1) Land use/ Land cover and its percentage (1999-2008)

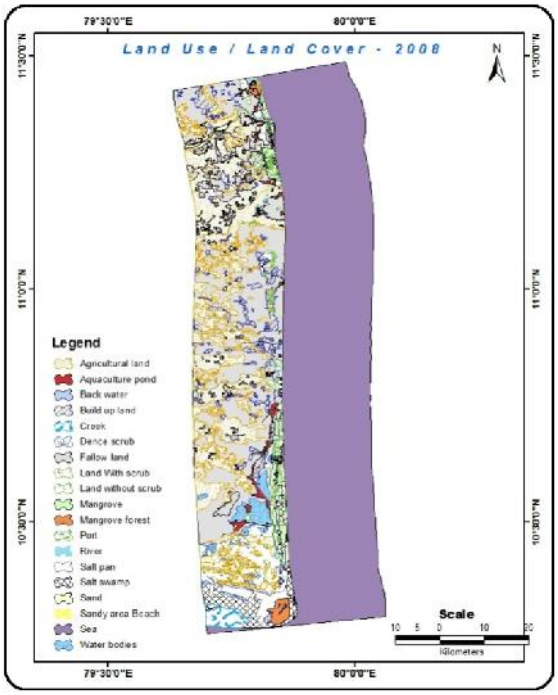

Fig.4 Land use land cover map 2008

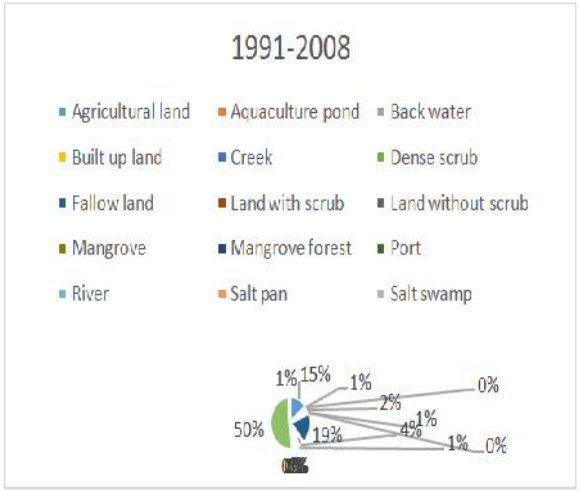

Chart (4.1) Land use/ Land cover and its percentage (1991-2008)

Mangrove Forest

Mangrove forest is an area with the notified boundary bearing an association, predominantly of trees and other vegetation types capable of producing timber and other forest produce. Mangrove forest establishes in coastal areas where river water mixes with sea water. The satellite data shows bright red to red tone. Such types of forests are observed in the southern part of the study area and their areal extent are 1991-2000 is 72.4 Km^2, 2000-2009 is 90.1 Km^2 and 1991-2009 is 107.54 Km^2 respectively.

Aquaculture Pond

The aquaculture pond is generally observed in the regions that are near to the seashore. It is identified by its light blue or white color, medium to coarse texture and well developed pattern. The areas occupied by aquaculture ponds are very small and their areal coverage is 1991-2000 is 31.54 Km^2, 2000-2009 is 35.47 Km^2 and 1991-2009 is Km^2.

CONCLUSION

The present study shows that satellite remote sensing based land cover mapping is very effective for coastal land use/ land cover changestudies. The land use/ land cover studies has been conducted with the land sat satellite data of 1991, 1999 and resource sat data of 2008. It shows minor changes in the Agricultural land and Fallow land. There is an increase trend of Buildup land, Aquaculture pond and land with scrub. Were noticed changes for other land covertypes. This is an essential tool for future planning and management of coastal regions. It has been more observed for coastal land use types like Agricultural and Buildup land. This is not much significant changes were noticed in other land forms.

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