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Change detection analysis of Mangrove Forest in Nagayalanka mandal of Krishna district, AP, India, using with Remote Sensing and GIS techniques.

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Remote Sensing,
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Abstract

Remote Sensing and GIS techniques has become the most powerful scientific tools for the study of various Earth resources and related features, the application potential of Remote Sensing is so huge that the large areas of land can be studied for various applications within very short period.Temporal Changes in LU/LC have been studied based on LandSat Data, IRS data and GIS software.The advent of colored satellite imageries has revolutionized the Remote Sensing activity. GIS serves as an efficient system of complications, classification, storage, synthesis, analysis or retrieval of relevant information of spatial and non spatial origin.

Mangroves are a group of trees and shrubs that live in the coastal intertidal zone, and cover the coastline in dense patches, Mangroves are some of the only coastal plants that can live in saltwater.Mangrove Forest succeeds near the mouths of large rivers due to river deltas provide lots of sediment (sand and mud) and Mangrove roots collect the sand and mud (sediments) and slow the water's flow, helping to protect the coastline and preventing erosion. Mangrove Forests also occurs along estuaries and deltas on tropical coasts. Temperate rainforests filled with evergreen and laurel trees are lower and less dense than other kinds of rainforests because the climate is more equable, with a moderate temperature range and well-distributed annual rainfall. A prominent section of Mangrove stretch is observed in Nagayalanka Mandal Nachugunta reserved forest, Sorlagondi reserved forest, and Yelichetladibba reserved forest.

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1. Introduction

Geographical Information Systems (GIS) and Remote Sensing (RS), it was very useful to land cover mapping and the inventory of natural resources, quantitative estimations of biophysical properties of land surface features and in tracking how landscape changes over time. The study (land cover maps at different dates) revealed the aerial estimates of mangrove extension or regression .The mangrooves outside the forest boundary have been converted to aquaculture where as no change in erosion and accretion Ramasubramanian. Water withdrawal for brackish and inland aquaculture, and options to produce more fish in ponds, fresh water use in inland and coastal pond aquaculture, and also options to increase productivity while reducing water use as total fresh water use depends on feed-associated and system associated water losses, the system-associated water losses are dependent on total area, evaporation, infiltration and water replacement. Salt affected area was increased due to brackish water, tidal inundation and aquaculture (Krishnakumar et al. (2011)). The present study was undertaken to map the Mangrove Forests change in Nagayalanka Mandal of Krishna District, Andhra Pradesh, India.The main objective of the research work is to make a

Land Use/Land covers assessment using Remote Sensing and GIS technique

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2. Study area:

The study area is located in eastern part of Krishna district, Andhra Pradesh, India. The area covered in this investigation is about 414.86 km^2. The area is geographically lying in between 80° 49' 0'' and 81° 3'0"E longitude and 15°42' 0'' and 15°58'10" N latitude, the study area is shown in the Fig.1.

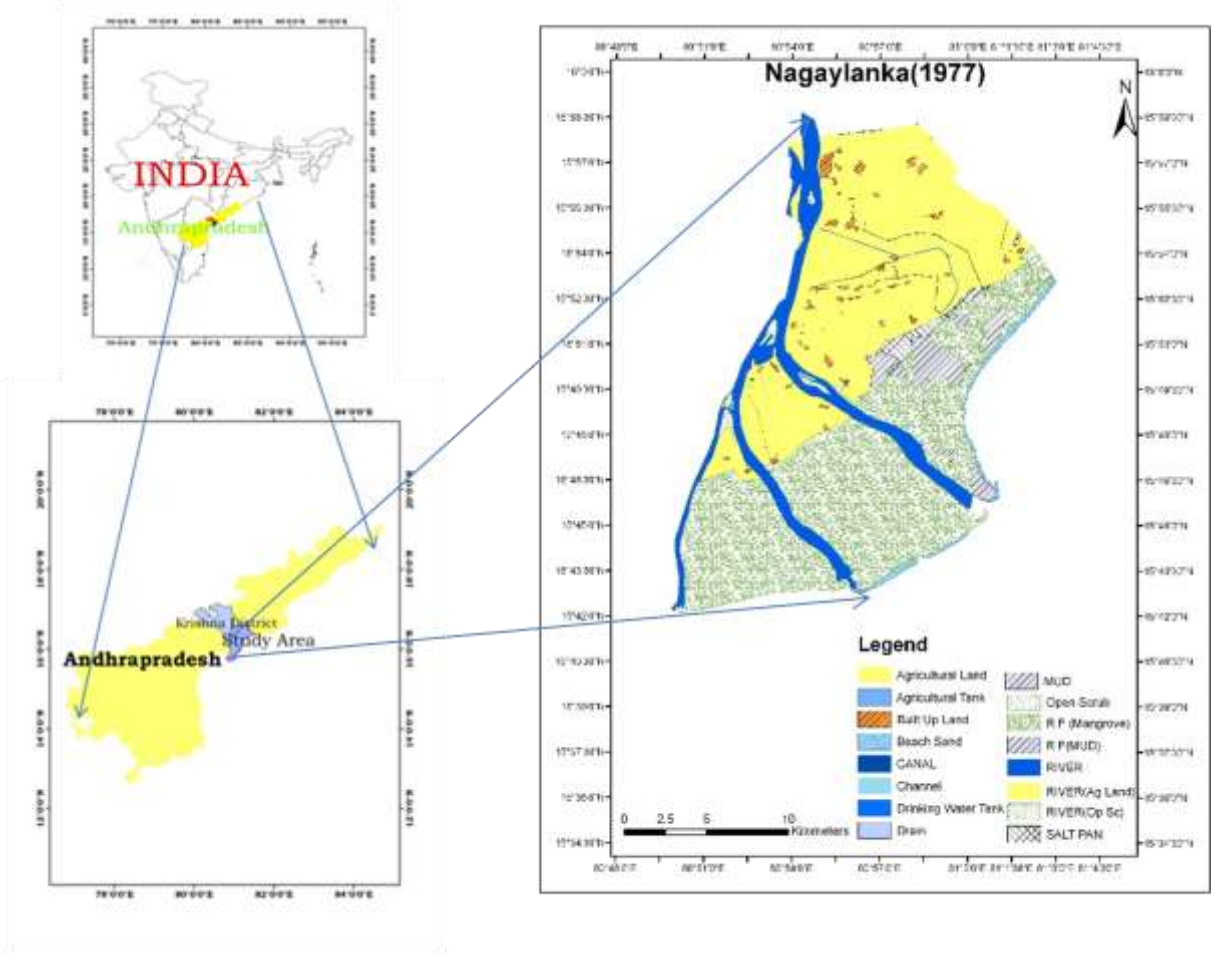


Figure 1: Location Map of the Study Area

The study area Nagayalanka mandal having three viz.Nachugunta reserved Forest, Yellichattladibba reserved forest, Sorlagondi reserved forests.The mangrove forests are located at Nachugunta, Jinkapalem villages (Nachugunta reserved Forest), Yellichattladibba, Rajulankavillages (Yellichattladibba reserved forest), Sorlagondi, Gullalamodha, Kota upakallu villages (Sorlagondi reserved forest), of Nagayalanka mandal mangrove forests is described as a dense thicker or woody aquatic vegetation or forest cover, occurring in tidal waters near estuaries and along the confluence of delta in coastal areas. It includes species of the general Rhizophora and Aviccunia.

Data Used

1. The set of the Toposheets used in the current study are Survey of India topo sheet index numbers of Area of Study on 1:50,000 Scale., 65 D/16, 66 E/1, 65H/4,66 A/13 and A/14.
2. The satellite data used for present analysis and the respective period of acquisition are presented in the Table

Table:1: Satellite Data used for the LU/LC Analysis

Date of Acquisition	Path/Row	Satellite/Sensor
01st Jun, 1977	152/49	Landsat Data – MSS
10th Nov, 1990	142/49	Landsat Data – TM
03rd Oct, 2000	142/49	Landsat Data – ETM
17th & 27th Mar, 2010	142/49	IRS-ID LISS-III

Methodology:

To fulfill the objectives of this study, three types of approaches have been attempted, such as below stages:

(A) Pre-field work stage: Preparation of base maps for Land use / Land cover analysis

(B) Fieldwork stage: Visiting places in the study area and extracting ground truth information for classifications

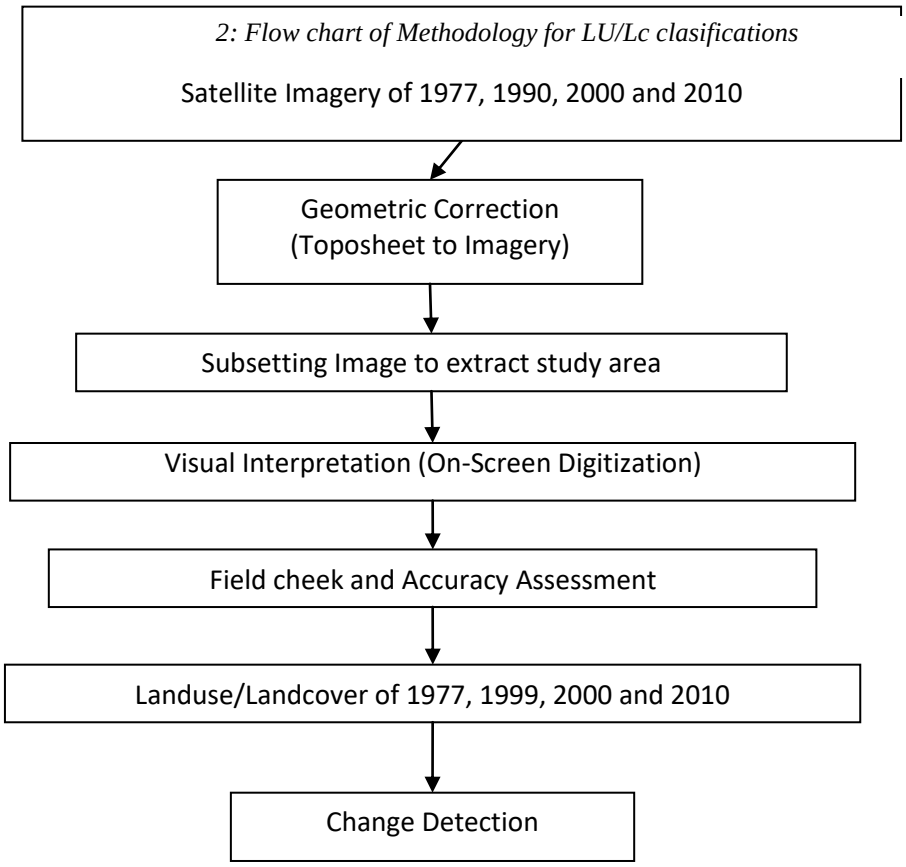
(C) Post-fieldwork stage**:**

1)Editing and Creation of attributes to all the coverage

2) GIS analysis and Generation of Final land use /land cover output maps.

Interpretation of multi-date optical remote sensing data for the purpose of study of Aqua culture activities in the study area .ARC GIS 9.3 and ERDAS IMAGINE 9.1 are powerful tools for extracting the Aqua culture development in the study area. The flow chart of the methodology is given below in Fig:2.

Flow Chart



Results and discussions:

Land use / Land cover information is the most important for vegetation Cover and water conservation and management. Updating of Land use / Land cover mapping is required to various departments, information of in the form of maps and statistical data is very vital for spatial planning, management and utilization. Statistical data in records and publications, up-to-date information on the changing land use patterns, process are in adequate, inconsistent and unavailable. Remote Sensing data and GIS techniques offers alternate, accurate and faster mode of data collection and updating and their spatial distribution in space and time of Land use / Land cover information.The detailed Land use / Land cover classes' maps for the years 1977, 1990, 2000 and 2010 of the study area were given in the Fig: 3

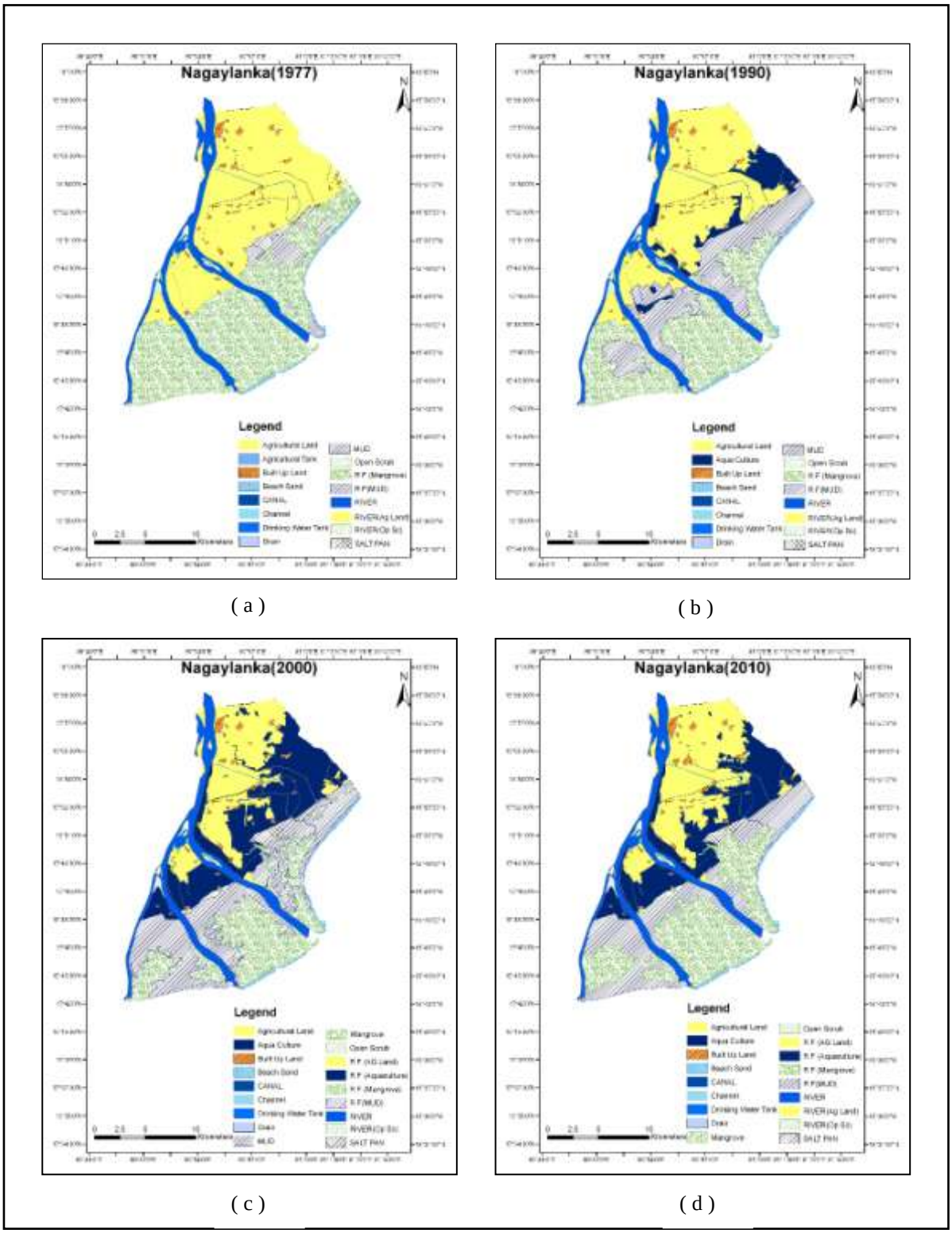


Figure 3 :Land use / Land cover classes' maps for the years 1977, 1990, 2000 and 2010

The Reserved Forests (mangrove forests) have shown a significant change during the study period during the years 1977-2010. The total area under this category include the Classes viz., Mangrove forests (Aqua-Culture, Agriculture, Mud ares, and Salt pan) etc classified in the study area attribute data information is obtained in Table.2.

Table: 2: Land use / Land cover classes of the Nagayalanka Mandal

Category	Extent of the category (in sq.km) & its respective percentage							
	1977	%Area	1990	%Area	2000	%Area	2010	%Area
Agricultural Land	165.51	39.90	134.20	32.35	76.81	18.51	90.81	21.89
Agricultural Tank	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aqua Culture	0.00	0.00	25.10	6.05	92.86	22.38	78.55	18.93
Beach Sand	5.05	1.22	5.05	1.22	5.05	1.22	5.05	1.22
Built Up Land	5.54	1.33	5.54	1.33	5.62	1.35	6.23	1.50
CANAL	0.20	0.05	0.20	0.05	0.20	0.05	0.20	0.05
Channel	0.33	0.08	0.33	0.08	0.33	0.08	0.33	0.08
Drain	1.18	0.28	1.18	0.28	1.29	0.31	1.29	0.31
Drinking water Tank	0.24	0.06	0.24	0.06	0.24	0.06	0.26	0.06
Mangrove	0.00	0.00	0.00	0.00	0.48	0.12	0.97	0.23
MUD	2.85	0.69	14.25	3.44	0.09	0.02	0.00	0.00
Open Scrub	3.78	0.91	2.66	0.64	3.03	0.73	2.80	0.67
Reserved forest(Aqcul)	0.00	0.00	0.00	0.00	2.26	0.55	2.92	0.70
Reserved forest	165.17	39.81	120.45	29.03	86.68	20.89	98.67	23.78
Reserved forest (MUD)	14.52	3.50	59.23	14.28	89.76	21.64	77.36	18.65
Reserved forest (Agricul Land)	0.00	0.00	0.00	0.00	0.87	0.21	0.63	0.15
River	42.27	10.19	42.27	10.19	42.27	10.19	42.27	10.19
River (Agricultural Land)	1.12	0.27	1.12	0.27	1.12	0.27	1.12	0.27
River (Open Scrub)	1.63	0.39	1.63	0.39	1.63	0.39	1.63	0.39
Salt Pans	5.46	1.32	1.42	0.34	4.28	1.03	3.80	0.91
	414.86	100.00	414.86	100.00	414.86	100.00	414.86	100.00

Impact on Mangrove Forest: In the study area some of the Mangrove forest conversion to shrimp ponds in Nachugunta reserved forest, yellichattladibba reserved forest, and Sorlagondi reserved forest,

Impact on Agricultural land: In the study area agriculturallands are largely converted to aquaculture tanks

Impact on Mud areas: In the study area some of the mud areas largely converted in to Aquaculture ponds.

Impact on Soils: Sea water pumping into aquaculture tanks of the study area and its long contact with these fertile soil results the conversion these land into saline soils.

Mangrove Forest

Mangrove Forest

Degraded Mangrove Forest

Conclusion :1) From the study some of the mangroves and natural vegetation areas existed have been progressively cut down and replaced by aquaculture tanks 2)In the study area, drainage system is not considered good, due to fact that the polluted drain water is merging at various points with the good water from channels. 3) Fresh water aquaculture tanks act as a groundwater recharges particularly nearest to the coast for controlling the salinity intrusion into the groundwater References:

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