International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

Land use and Land Cover Analysis of Nellore using GIS and Remote Sensing Techniques

P. Sai Pradeeep
Asst. Professor,
Geethanjali Institute of Science and Technology
Nellore, A P

Dr. Vijay Kumar
Professor, Principal
Kodada Institute of Technology and
Science, Kodad, Telangana

***Abstract*: The LULC features in Nellore district are particularly associated with agriculture expansion, ground, surface water depletion and urbanization. Monitoring LULC is necessary in order to understand the overall dynamics of population and quality of life. The primary objective of this study is to analyze the LULC of Nellore district, where the increase of population and climate variability causes the greatest environmental impact on vegetation, ground water pollution and also deterioration of bare land. Estimation in ARC GIS for LULC classification from LANDSAT images, to select the best suitable method of classifier for the different features. The classified LULC features are categorised as built-up areas, water bodies, agriculture land and bare land. Remote sensing has great potential to study land use and land cover changes. Nowadays high resolution spatial imagery is available from satellite like world view. An important part of land use and cover changes to a obtain information about the geometric elements of different classes.**

Keywords: Land Use/Land Cover change, Remote Sensing, ARC GIS, LANDSAT images.

I. INTRODUCTION

In an urban environment natural and human-induced environmental changes are of concern today because of deterioration of environment and human health. The study of land use/land cover (LU/LC) changes is very important to have proper planning and utilization of natural resources and their management. Traditional methods for gathering demographic data, censuses, and analysis of environmental samples are not adequate for multicomplex environmental studies, since many problems often presented in environmental issues and great complexity of handling the multidisciplinary data set; we require new technologies like satellite remote sensing and Geographical Information Systems (GIS). These technologies provide data to study and monitor the dynamics of natural resources for environmental management.

Remote sensing has become an important tool applicable to developing and understanding the global, physical processes affecting the earth. Recent development in the use of satellite data is to take advantage of increasing amounts of geographical data available in conjunction with GIS to assist in interpretation. GIS is an integrated system of computer hardware and software capable of capturing, storing, retrieving, manipulating, analyzing, and displaying geographically referenced (spatial) information for the purpose of aiding development-oriented management and decision-making processes. Remote sensing and GIS have covered wide range of applications in the fields of agriculture, environments, and integrated Eco-environment assessment. Several researchers have focused on LU/LC studies because of their adverse effects on ecology of the area and vegetation.

Present study area witnessed rapid development during past decades in terms of urbanization, industrialization, and also population increase substantially. The main objective of this paper is to detect and quantify the LU/LC in an urban area, Nellore from 2001 to2011 using satellite imagery and topographic map.

OBJECTIVES AND SCOPE

Objectives

To prepare the Land use / Land cover map and change detection analysis over a period of 10 years using satellite images of years 2001& 2011, of Nellore district. The goal of the work is also to map and monitor the land use / land cover and identify the area of changes occurred during a year span of 10 years.

Scope of the work

Land use and land cover change mapping will help to take up clear strategies for managing natural resources and monitoring environmental changes. Urban expansion has brought serious losses of agriculture land, vegetation land in the recent years. The improper study of the urban land expansion is responsible for a variety of urban environmental issues like decreased air quality, increased runoff and subsequent flooding, increased local temperature, deterioration of water quality, etc. Knowledge of drainage, land use/land cover and hydro-geomorphology and other terrain attributes are important for planning and management activities. Remote Sensing and GIS both from the conventional sources has proved to be an effective tool in planning for Land and Water Resources management. Land and Water Resources Management will imply utilization of land and water resources for optimal and sustained production with the minimum hazard to natural resources and environment.

LITERATURE REVIEW

JIYA GEORGE, LINDA BABY: Land use Land Cover changes of Aluva Taluk in kerala state were detected by

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

using Remote Sensing and GIS technologies. Multi spectral satellite data of LANDSAT used to map and monitor land use changes occured during 2001 & 2011. Land use classification has been done. By using ERDAS imagine 9.2 s0ftware

S.L SENTHIL LEKHA, S.S KUMAR: This study mainly focuses on the comparision of three different classifiers namely Mahalanobis distance classifier, neural net classifier (NN) and Adaptive coherence estimator in ENVI 5.1 for LULC classification from LANDSAT images. The accuracy was analysed by finding the error matrix using Google earth & photo interpretation and images were generated using QGIS 2.14.4.

SURABH SIVA: Multispectral satellite data and GIS for land use/ land cover mapping has become as primary data sources. Remote sensing data is very useful due to its synoptic view, repetitive coverage and real time data acquisition and GIS for data integration and analysis. It also provides continuous monitoring for planning and management which depends on accurate information on land cover. Therefore land use/ land cover maps are prepared using multispectral and temporal satellite data which provides different levels of spatial information which are used for different application studies. This paper demonstrate the present status of land use-land cover in the Kanpur city on 1:50,000 scale by using satellite data of Resourcesat-1 LISS III (23.5 m) image and Land use/land cover map and other maps had been prepared.

N. NAGARAJAN, S.POONGOTHAI: This study reveals to identify the changes of land use/land cover of rural agricultural watershed of Tamilnadu. The relationship between Land Use and Land Cover Changes (LULCC) has identified using IRS IC LISS III and PAN merged data. Further, the preparation of LULC map using Survey of India (SOI) Toposheet for the year 1972 contain come up to in multipurpose to know the land use pattern. In the same way, the various LULC image classified which has collected from Institute of Remote Sensing (IRS), scanned and digitized using Arc GIS software.

M.PRAMODH KUMAR: Remote Sensing as a direct adjunct to field, recently playing an important role in the study and assess the natural resource in any part of the world. Anthropogenic changes in land use and land cover and land use are often assumed to be identical, they are rather quite different. Land cover may be defined as the biophysical earth surface, while land use is often shaped by human, socio-economic and political influences on the land. Remote Sensing (RS), integrated with Geographic Information System (GIS), provides an effective tool for analysis of land use and land cover changes at a regional level. The geospatial technology of RS and GIS holds the potential for timely and cost – effective assessment of natural resources. The techniques have been used extensively in the tropics for generating valuable information on forest cover, vegetation type and land use changes.

STUDY AREA

The study area is Nellore district, lying between latitude 14°30'24" – 14°38'38" N and longitude 80°04'18"–80°13'08"E in Andhra Pradesh, falling in Survey of India Toposheet No: 66B02. The total area covered is approximately 13076 sq.km. The density of population is 182per sq.km. The eastern portion of the study area is fairly fertile and prosperous. The sandy coastal belt extends from the sea for 5 to 6 km into the interior. Average annual rainfall in the study area is 1041 mm and the average maximum and minimum temperatures are 39.6°C and 20°C respectively.

MATERIAL USED

DATA COLLETION FOR LAND USE/LAND COVER MAPPING

Remote Sensing data represent a powerful tool to understand the dynamics of the agriculture where the images allow a synoptic view of the area. In addition to an integrated data base, a Geographic Information System (GIS) combines different data sets and simultaneously, facilities spatial and temporal analysis. The RS and GIS have played an important role in the present study to assess the natural resources. Anthropogenic changes in land use and land cover are being increasingly recognized as critical factors influencing global change. Preparation of thematic maps: These maps are the true representation of earth's phenomena such as spatial distribution of natural resources existing at the time of survey. In the present study satellite image (IRS P6) which is a true record of the various environmental information on the base map. These map showing spatial distribution of forest, agriculture, soil, water resources etc., and prepared by visual interpretation of the satellite imagery. Visual interpretation is carried out based on the image characteristics like tone, size, shape, pattern, texture etc. in conjunction with existing map/literature. These pre-field thematic maps are modified substantiated and confirm after limited field checks.

SOFTWARE USED

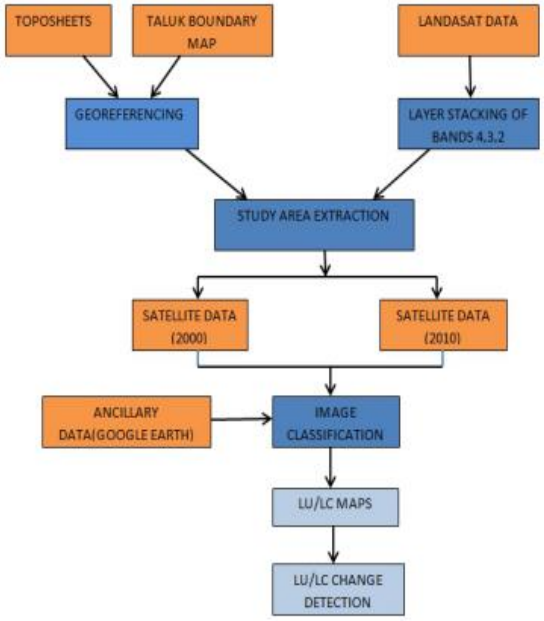
Land use land cover using ARC GIS 10.3 software is one of the power tool for extracting the land use and land cover layers from toposheets and satellite imageries from different platforms like Google earth pro, ARC maps and bhuvan maps etc., The land use and land cover classes includes agriculture land, built up area, water bodies and barren lands.

The feature classes were identified based on the visual interpretation of the satellite imagery coupled with flied checks.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

Pre-processing & processing of raw data, preparation of thematic maps were simple comprehension of the procedure embraced.

METHODOLOGY



The complete system of software, hardware, application and personal required capturing, storing, manipulating, analysing, managing, and present all types of spatial or geographical data is Geographic Information System. Spatial data means data related to space which can include elevation data, rainfall data, land cover data, population data, consumer's data, etc. Various types of software are available for these types of analyses at present we are using ARC GIS software. First of all data such as of remote sensing data, are imported then preprocessed. Then, thematic maps are generated. A number of thematic maps are displayed in terms of layers simultaneously such that each layer displays a different type of data of the same area. All these data and information can be further analyzed and compared using relevant geoprocessing tools. Finally, a wide variety of individual maps can be produced using GIS by displaying a selected number of layers and exporting them. GIS is thus a powerful modern tool for handling spatial data and answering spatial questions

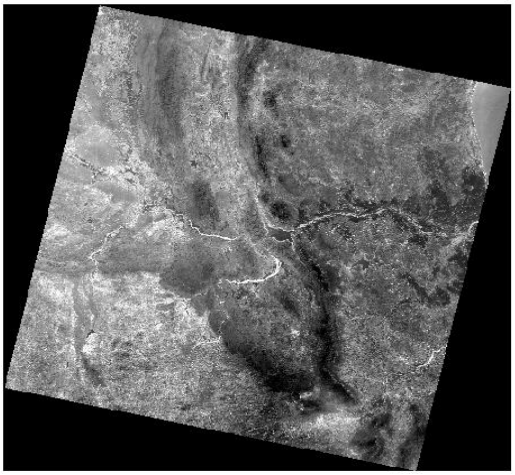
Landsat data are extensively used in research and mapping works throughout the world. Various Landsat satellites have been launched till date, Landsat 8 being the most recently launched satellite.

Image Classification: Image classification refers to the task of classifying a multi band raster image into a number of classes to produce thematic land cover maps. Different types of object have different types of spectral reflectance curves (i.e.: They absorb and reflect different wavelengths differently). Using this principle, the multiband raster can be classified into a number of classes. There are basically two methods in which image classification is carried out.

1) Unsupervised classification Method: In unsupervised classification, the image is classified based upon natural groupings of spectral classes into a number of classes as specified by the analyst.

2) Supervised classification method: In supervised classification, a number of training samples is created by the analyst and classification is carried out based upon those training samples. Thus, the accuracy of results of supervised classification depends highly on the quality of training data and analyst's experience.

Satellite image of Nellore



Landsat image of Nellore by ARCGIS software

The above image is obtained from USGS earth explorer

CLASSIFICATION OF STUDY AREA

1. Agriculture Land: These are the lands mainly used for farming and for production of food and other commercial

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019

and horticultural crops. With the help of satellite data, it is possible to identify various agricultural land uses up to level III. The different types of agriculture lands are identified in the study area and described below in detail. These include the agricultural areas identified by their characteristic green colour and water bodies are characterized by dark blue& built-up area is characterized by Red colour and bare land or waste land characterized by white colour. Crop lands are found in and around the water bodies. The agricultural lands occupy 77% of the area; the major land use is under agriculture. The percentage of agricultural area may decrease in the coming years due to urbanization and industrialization.

2. Built up area: This is an area of human habitation developed due to non-agricultural use and has a cover of buildings, transport and communication, utilities in association with water, vegetation and vacant lands.

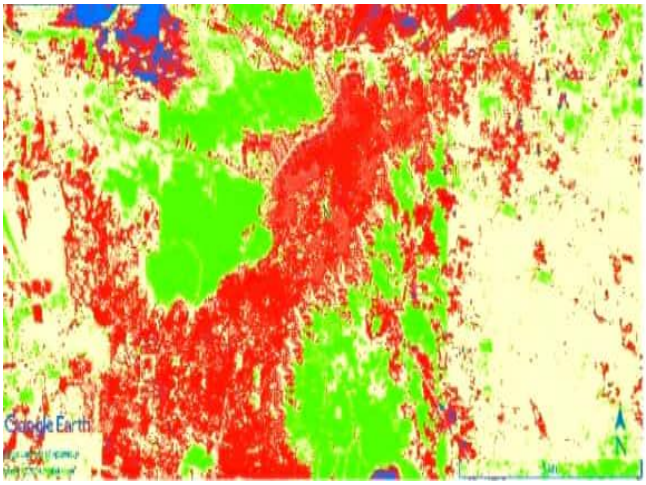
3. Wasteland: Wasteland is a degraded land which is not used for any purpose. The wasteland of the Nellore was classified into three categories as Land with scurb, Gullied/Revinous land and Barren Rocky / StonyWaste / Sheet Rock Area.

4. Water bodies: This comprises of surface water bodies of tanks and ponds. These are identified on satellite image in blue to dark blue or cyan in tone depending on the depth of water and bunds. Tanks are the source of water for agriculture and domestic purpose in Nellore and are also source for ground water recharge. Depending on the monsoon rainfall and utilization of water, both wet and dry tanks are seen.

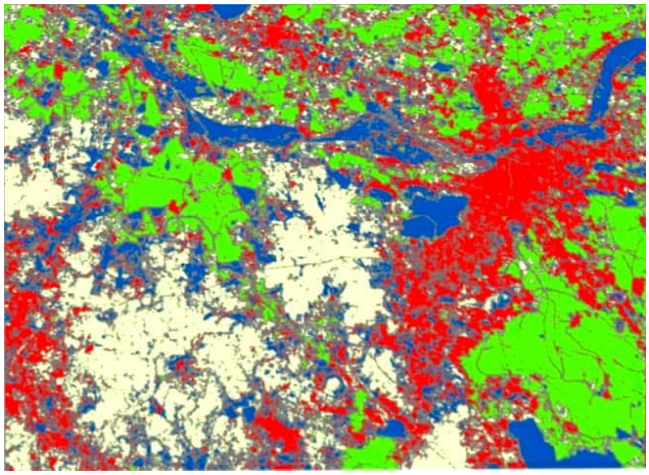
RESULTS AND DISCUSSION

Land use/Land cover Mapping and Change Detection

In the present study, Landsat satellite imagery of different years (2001 and 2011) was classified and comparesd for the land use/land cover analysis. The classified images obtained after preprocessing and classification which are showing the land use and land cover of Nellore district.



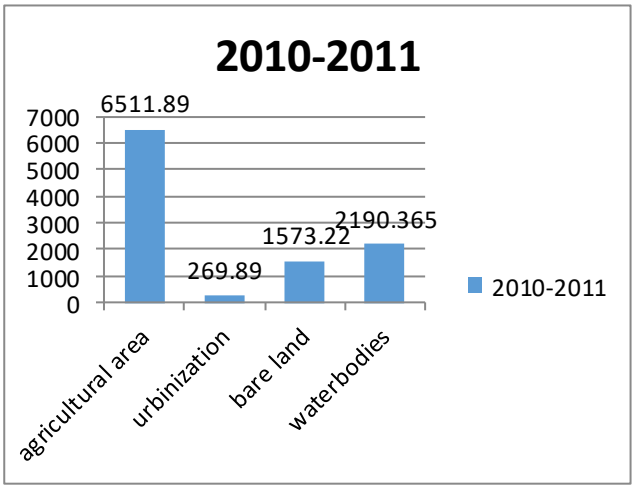
The above image shows that the ARC Map for the year 2010.



The above image shows that the ARC Map for the year 2018.

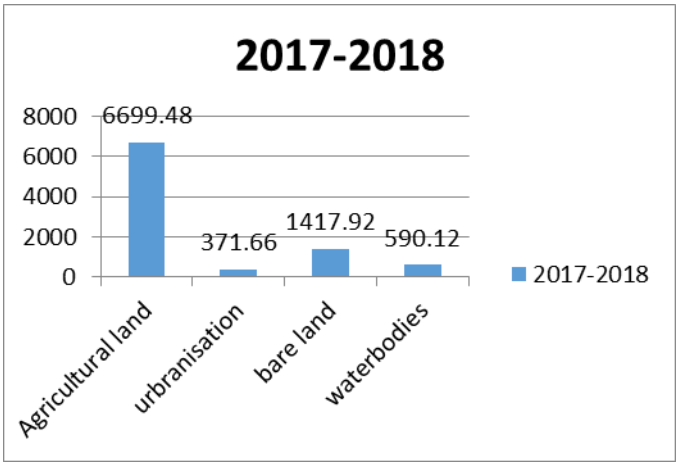
The below table shows that the change detection analysis of Nellore district.

S.No.	CLASSES	AREA (Sq.km.) in 2010	AREA (Sq.km.) in 2018
1.	Agricultural land	6511.89	6699.48
2.	Built up areas	269.89	371.66
3.	Waste land/barren lands	1573.22	1417.92
4.	Water bodies	2190.36	590.12



In the above graph X-axis shows that particular LULC and Y-axis shows that area in sq.km, for year 2010-2011.

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 8 Issue 06, June-2019



In the above graph X-axis shows that particular LULC and Y-axis shows that area in sq.km, for year 2017-2018.

CONCLUSION

Mapping and monitoring of Land use/Land cover is important for many management and planning activities as it is considered as an important element for understanding the earth and its whole system. The present study shows how well LULC classification and its change analysis of the year 2010 and 2018 of the study area can be easily carried out by using Remote sensing and GIS technology. The results show that there is noticeable increase in Agriculture area of 3% and increase in Built up area of 37.7% and decrease in waste land of 9.87% and decrease in water bodies of 73%. The classification results are likely to be affected by various factors such as quality of the input datasets, classification methods etc. Information on land use/land cover and possibilities for their optimal use is essential for the selection, planning and implementation of land use schemes to meet the increasing demands for basic human needs and welfare.

REFERENCES

[1] Jiya George and Linda Baby (2016),"Land use/Land cover mapping with change detection analysis of Aluva Taluk Using Remote sensing and GIS", International Journal of Science, Engineering and Technology, ISSN:2348-4098, volume 4, Issue 2.

[2] Rita Basanna, A.K.Wodeyar (2013),"Supervised classification for LULC Change Analysis", International Journal of Computer applications, ISSN: 0975-8887, volume 66, No.21.

[3] P.Santhana Kumar, J.Vasantha seelan, (2017), "Evaluation of Land use and Land cover change detection for a city using QGIS", SSRG International Journal of Civil Engineering, ISSN: 2348-8352.

[4] S.L.Senthil Lekha, S.S.Kumar (2018), "Classification and Mapping of Land use Land cover change in Kanyakumari district with remote sensing and GIS Techniques",International journal of applied Engineering Research,ISSN:0973-4562 volume 13,Number 1 (2018) pp. 158-166.

[5] Dr.P.K.Srimani,F.N.A.Sc., Mrs.Nanditha Prasad (Ph.D),"Land use and Land cover mapping by using remote sensing and GIS techniques- a case study of kasaba Hobli, Hoskete Taluk, Bangalore Rural district, Karnataka, India", International journal of Engineering Research and Technology, ISSN: 2278-0181, volume 2, Issue 1.

[6] T.Suneela, G.Mamatha (2016),"Detection of Land use and Land cover changes using Remote sensing and GIS Techniques",International journal of Electrical, Electronics and data communication, ISSN: 2320-2084, volume 4, Issue 12.