Land Use and Land Cover Change Detection Mapping in the Lake Masab Cheruvu Basin, Rangareddy District, Telangana, India.

D.Rama[1], Dr.Y.Ram Mohan[2], Dr.S.Sreenivasulu[3]
[1]*Research Scholar in Center for Spatial Information Technology, JNTUH-UCEST*
[2]*Senior GIS Consultant.*
[3]*Professor in Department of Civil Engineering, JNTUH-UCEST*

Abstract: For various decision support systems, the detection of land use and land cover (LULC) change based on remote sensing data is a crucial source of information. Land conservation, sustainable development, and the management of water resources all benefit from the information gathered through the detection of changes in land use and land cover. Therefore, determining the change in land use and detecting land cover in the Masab Cheruvu basin is the focus of this study. Image processing techniques were utilised to contrast changes in land cover between the years 2000, 2010, and 2020 using 30m spatial resolution Landsat satellite data. The modifications were found using Arc GIS and Erdas Imagine software. Five land cover classes—Barren Land, Builtup, Vegetation, Water body, Wetland—were used in the categorization. The result shows a decrease in natural resources and an increase in built-up capital. Urban growth occupied 68% of the entire lake basin.

Keywords: Landuse Land Cover, Lake Basin, Change Detection.

1. INTRODUCTION

An area's shift in land use and land cover is a result of natural and socioeconomic factors, as well as how people have acted on them over time and space. Population expansion in the system, economic growth, and physical characteristics including topography, slope condition, soil type, and climate are the main drivers of changes in land use and land cover (LULC) (Yalew et al., 2016). Changes in land use are a result of historical processes that have to do with how humans have used the land. It alters the availability of many resources, such as water, soil, and vegetation (Ahmad, 2014). The amount of evapotranspiration, groundwater infiltration, and overland runoff is directly impacted by changes in land use. Considering global dynamics and their responses to environmental and socioeconomic causes, land use and land cover change is a crucial topic (Hurni et al., 2005). On a global and local level, changes in land use and cover have a negative impact on climatic patterns, natural disasters, and socioeconomic dynamics (Hegazy & Kaloop, 2015). For selection, planning, sustainable land resource management, and understanding the changes in hydrological processes to meet the rising demands for basic human needs and welfare, information on land use/cover and potentials for their best use are crucial.

According to (Imbernon et.al,1999) change detection is useful in a variety of applications connected to detecting changes in land use and land cover (LULC), including agriculture, urban growth, and landscape changes. For effective land management and decision-making, it is crucial to comprehend landscape patterns, changes, and interactions between human activities and natural phenomena (Rawat & Kumar, 2015). Remote sensing (RS) and geographic information systems (GIS) are excellent and powerful techniques for analysing the spatial and temporal evolution of LULC (Serra et al., 2008). These days, investigations to detect changes in land use and cover can use and benefit from remote sensing data (Yuan et al., 2005). The most popular source of data for detecting, quantifying, and mapping LULC trends is remote sensing data.

Population increase has been the main driver of change in land use and land cover in the majority of developing nations, including Ethiopia (Geremew, 2013). Studies on LULC changes with a range of causes, such as demographic pressure and the resulting demand on environmental resources, have been undertaken in Ethiopia (Zeleke & Hurni, 2001). These investigations demonstrated that there were regional variations in the pattern, direction, and intensity of LULC change. According to this study, LULC change analysis is essential for environmental protection strategy and basin resource management that is sustainable.

2.MATERIALS AND METHODS

2.1 Study Area

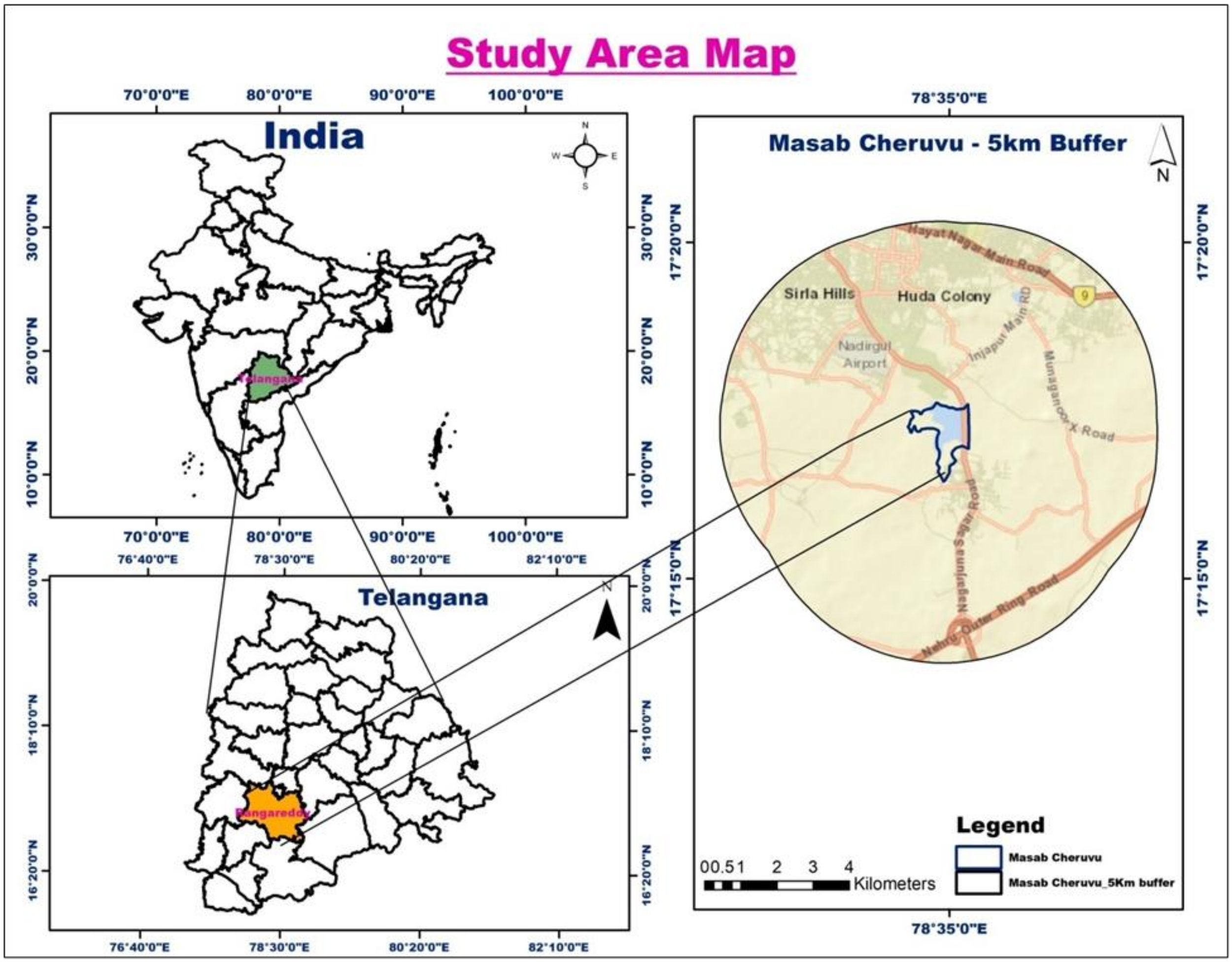

Fig.1. Study Area Map – Masab Cheruvu Basin

It is also called as TurkaYamjal Cheruvu, located in Turkayamjal Village, Abdullapurmet Mandal in Rangareddy District. Spatial Location - 17°17'16.96"N, 78°35'8.67"E with a Water Spread Area of 158.87 Ha as per Survey of India Toposheet.It comes under Hyderabad Metro Development Authority (HMDA) jurisdiction. Lake is very vulnerable to pollution and encroachment as it is in an urban agglomeration area.

2.2 Data Used

The Satellite platform has a unique sensor called Landsat Image that can record multispectral imagery. Visible, reflecting infrared, and thermal infrared energy are among the electromagnetic spectrum bands that are captured in Landsat multispectral images. The choice of appropriate remotely sensed data for picture classification requires an understanding of the advantages and disadvantages of various forms of sensor data (Gomez et al., 2016; Lu & Weng, 2007).

Table.1. Showing Information of Satellite Data.

S.NO	Satellite Name	Path/Row	No of Bands	Date of Acquisition	Spatial Resolution
1	Landsat-V	144/048	7	31/01/2010	30m
2	Landsat-V	144/048	7	13/11/2015	30m
3	Landsat-VIII	144/048	9	08/01/2020	30m

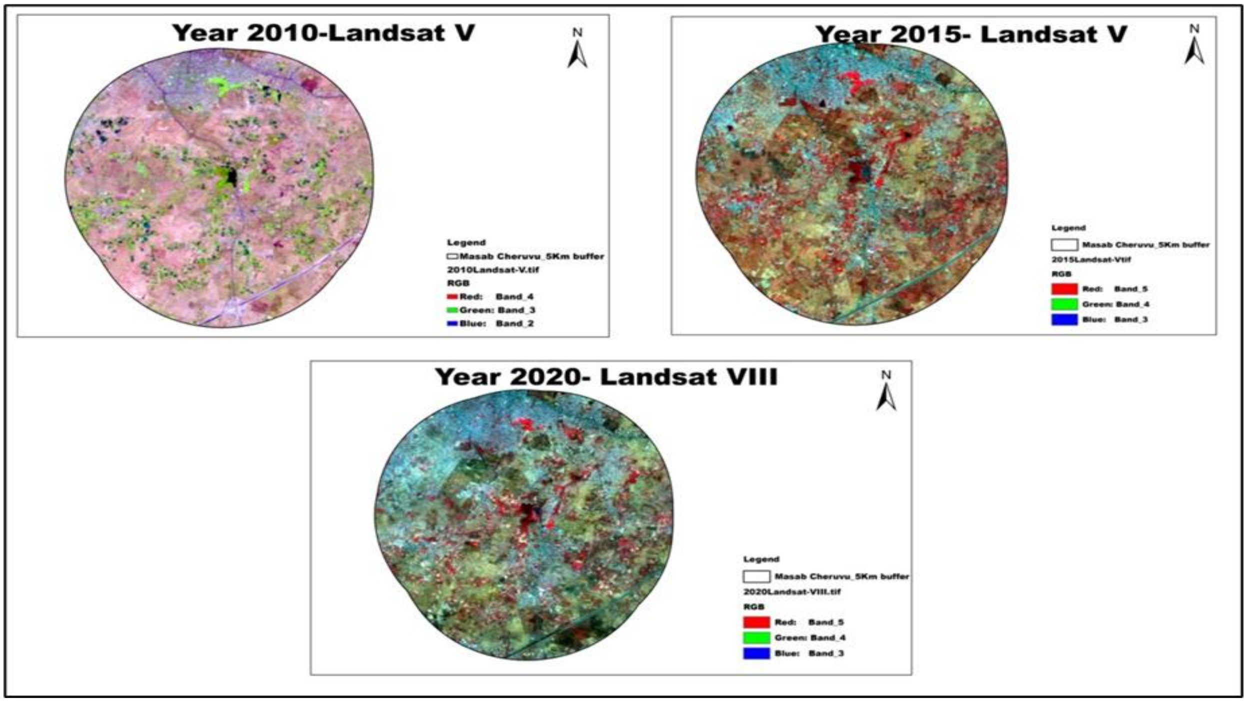

Figure.2. Display of Satellite Data.

2.3 Basemap

The base map of Masab Lake is digitised through Survey of India toposheet no. 56K11. The digitised lake is buffered for a radius of 5km to generate the study area basin. The generated basin is taken as the boundary for further research.

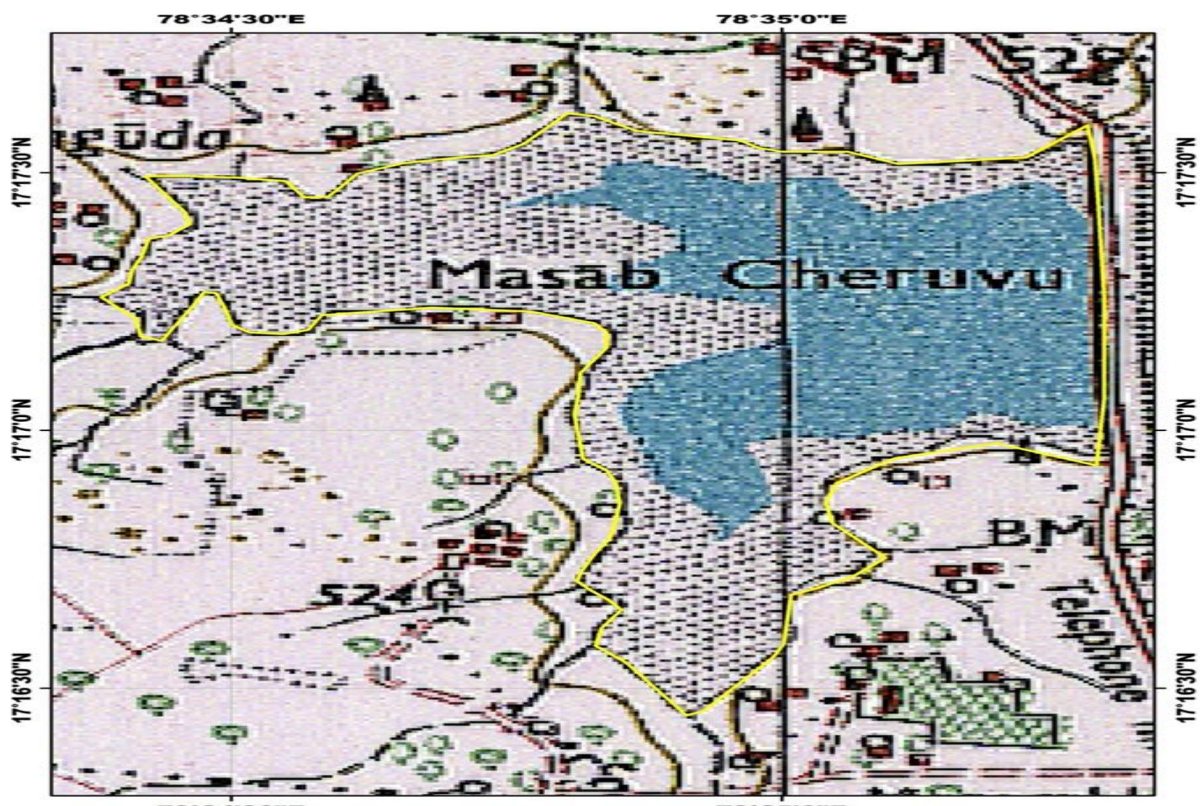

Fig.3.Display of Shape file Boundary

From the above figure shape file boundary delineated area is 158.58 Ha and 5km buffer area is 14800Ha.To perform picture classification, the raw data needs to be appropriately preprocessed and prepared so that error resulting from the earth's geometry, radiometric effects, and atmospheric effects may be taken into account. The preprocessing stage's standard technique has included the identification and restoration of erroneous lines, geometric picture registration or rectification, radiometric calibration, atmospheric correction, and topography correction.

1.4 Supervised image classification

In this procedure, pixels that depict patterns that one is familiar with or could recognise with the use of data from other sources (such as Google Earth) are chosen. Before choosing training samples, one needs to be familiar with the data, the target classes, and the methods to be applied. It controlled the classification of pixels as they were assigned to a class value by assigning priorities to various classes.

2. RESULTS AND DISCUSSION

The result shows the land use change from 2010 to 2015 and 2020. The classification method used is Supervised classification in Erdas with 50 training samples for each class. Each training sample is checked with the pixel-to-pixel method from Google Earth software. The spatial resolution for each satellite image is 30m. Classes chosen for supervised classification as study areas fall under urban areas are Barren land, Builtup, vegetation, wetlands, Wetland and waterbodies.

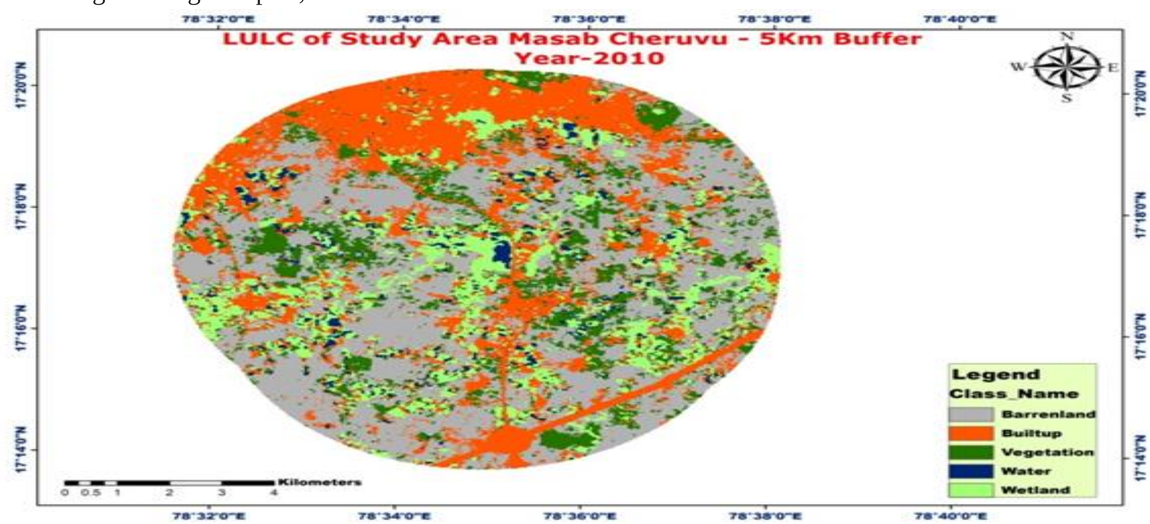

Fig.4.LULC Classification of Study Area in year 2010.

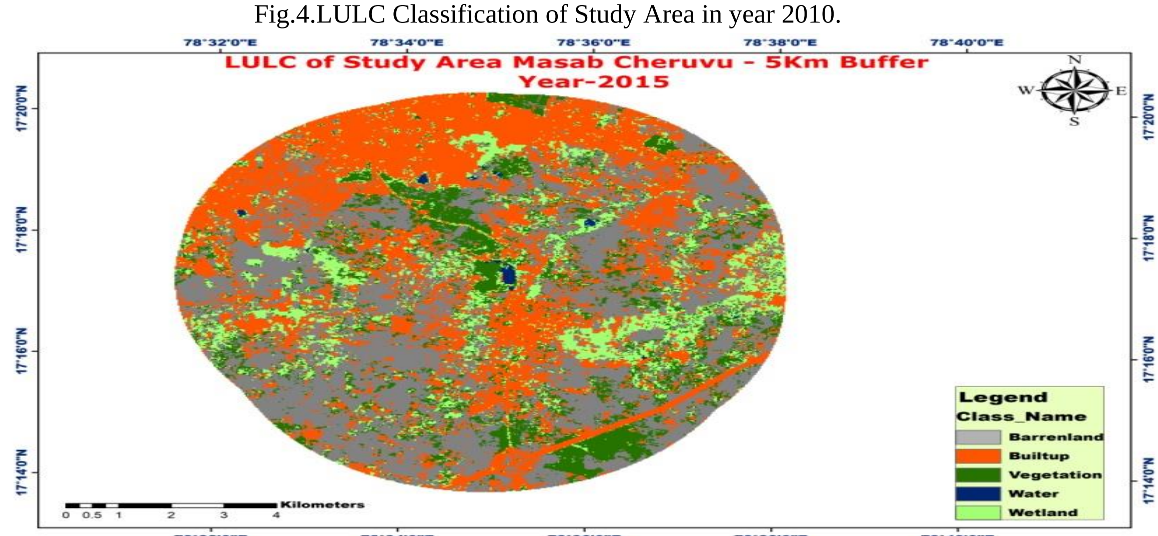

Fig.5. LULC Classification of Study Area in year 2015.

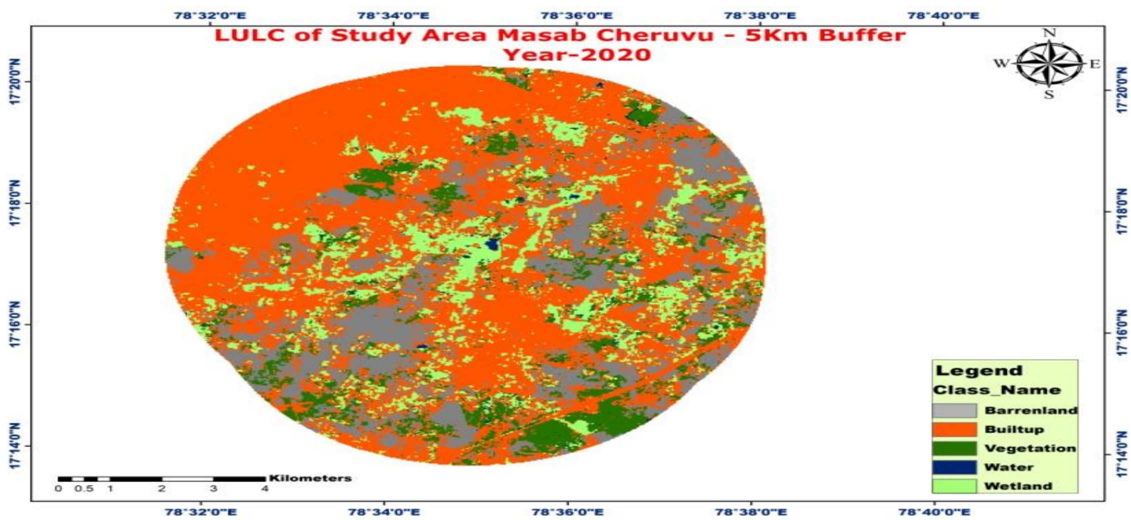

Fig.6. LULC Classification of Study Area in year 2020

3.1 Overall accuracy

This accuracy provides the confusion matrix's overall findings. By dividing the entire amount of accurate pixels (diagonal values) by the total amount of pixels in the confusion matrix, it is determined. The minimum accuracy number for a reliable land cover classification, according to (Anderson,1976), is 81%. On the other hand, accuracy levels that certain users find acceptable for agiven task may not be found acceptable by other users (Geremew, 2013).

Table.2.Showing LULC Information in Hecaters

Class	2020	2015	2010
Barrenland	2102.621	4230.727	4706.682
Builtup	10106.24	7648.581	6765.579
Vegetation	1063.124	1554.888	1467.118
Water	66.47894	48.0008	281.3944
Wetland	1499.819	1356.08	1617.504
	14838.28	14838.28	14838.28

4.CONCLUSION

The geographical analysis was done to describe the patterns of land cover change and the overall changes in land use through time. The principal classes of land use and land cover in the basin were Forestland, Bush/Shrubland, Grassland, Cultivated Land, and Residential Area. Changes in land use and cover was shown from figure 4 to figure 6. Overall result displays the natural resources like water, wetland, bareland classes are converted to builtup class.

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