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Identifying The Land Use And Land Cover Changes Using Remote Sensing And GIS Techniques In Chamarajanagara District.

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Abstract: *LULC is and essential part of any study related to land use. The terms land use and land cover is often used interchangeably but each terms has its own unique meaning. Land use is the physical material at the surface of the earth or ground like vegetation, urban, water bodies etc., Land use is the description of how people utilize the land for the different activities and refers to the purpose of land serves. This article is asses the LULC in the chamarajarajanagara district. The LULC changes has been identified in nine classes for the two decades by using different satellite images in GIS software. To identify the LULC by using the two different year of satellite imagers. The overall result shows that there is a marginal increase of area by forest, lake, fallow land, villages and mining and decrease of aera in agriculture cropland and agriculture plantation etc.*

Key words; *LULC, Chamarajanagara district, Agriculture crop land, Plantation land etc*

Introduction

Land use and land cover is an essential part of any study related to land use. Land Use and Land Cover LULC generally refers to the categorization or classification of human activities and natural elements on the landscape within a specific time frame based on established scientific and statistical methods of analysis of appropriate source materials. It has various methods of classifications. Various type of LULC elements is there like Urban or Built-up Land, Agricultural Land, Forest Land and many more.

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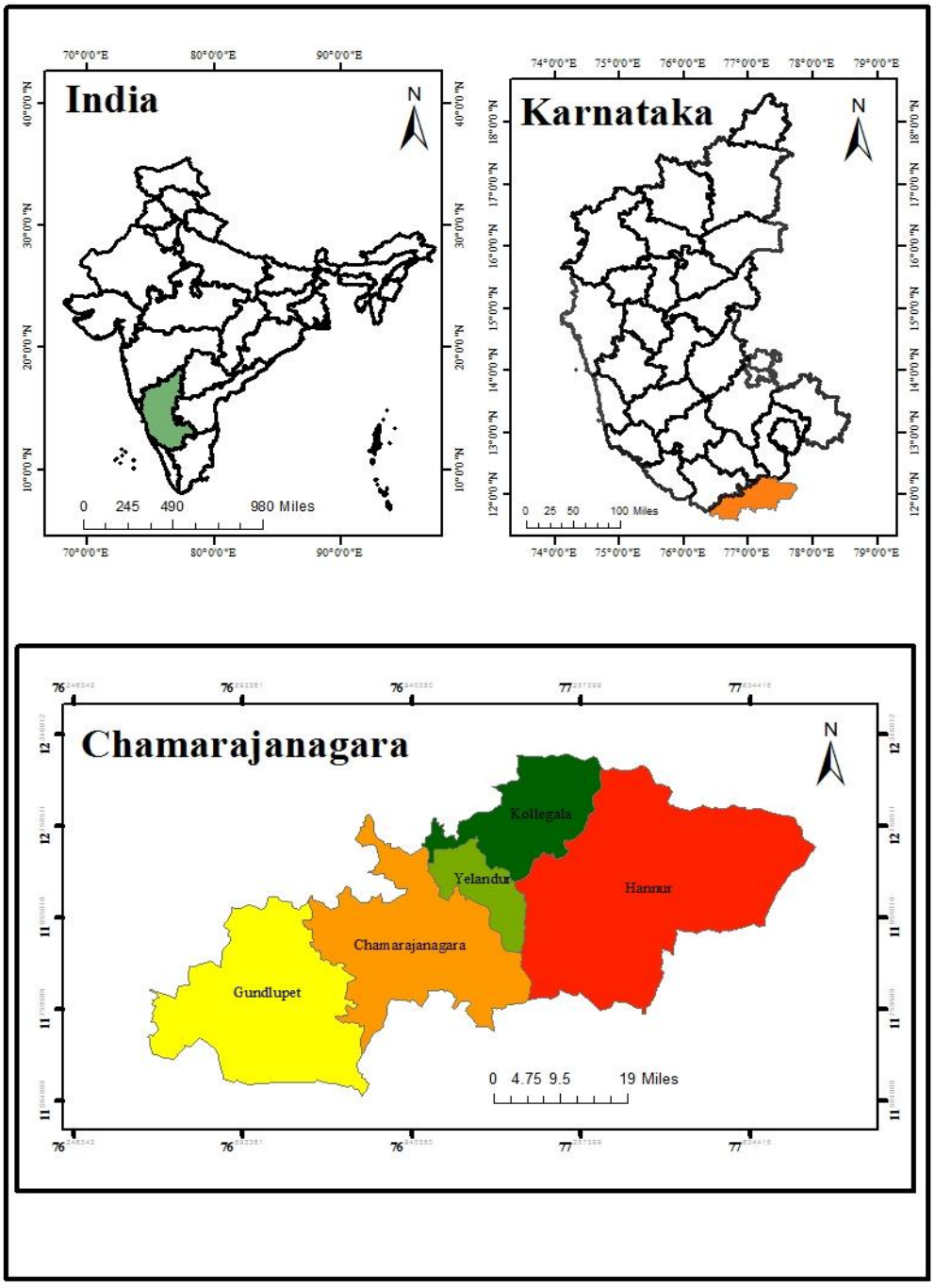
Need of LULC: In order to understand for what the land is being utilizing and the change thus taken place the study of land use and land cover is very much important. Almost every accessible piece of land today is being utilized for some or the other purpose directly affecting human needs. Not only is the land being used intensively, but is also evolving and changing with time. What was agricultural land 10 years ago, is most likely to be urban land today. What was forest land is probably a plantation right now. The rapid and intensive changes in land use and land cover (LULC) have created the need to quantify these changes in numbers and maps, so that we can understand that are happening in our ecosystem and environment and leverage this information to the best use possible. Change detection can be shown for the same region at two different time periods using present and past land use/land cover information of the area

Land use and land cover analysis using GIS and remote sensing is significant for understanding the changes in the physical appearance and ecological status of land. It helps in monitoring and quantifying the changes in different land cover types over time. By analyzing satellite imagery and applying classification techniques, such as supervised classification, it is possible to generate thematic maps and quantify the changes in land cover classes. This information is crucial for land use planning and decision-making, as it provides insights into the trends and patterns of land use changes, such as urban expansion, agricultural land loss, and changes in water bodies. Additionally, the analysis of land surface temperature in relation to land cover types helps in understanding the urban heat island effect and its impact on the environment. Overall, the use of GIS and remote sensing enables the tracking, analysis, and assessment of land use and land cover changes, contributing to better land management and environmental planning.

Study Area: Chamarajanagara district is the southern-most district in the state of Karnataka. It was carved out of the original larger Mysore District in the year 1997. Chamarajanagara town is the headquarters of this district. Chamarajanagara district is consisting of 5 taluks, Namely Chamarajanagara, Hanur, Gundlupet, Kollegala and Yelandur. It is bordered by Mysore and Mandya district of Karnataka state in the North, Nilgiris and Coimbatore districts of Tamilnadu state in the South east, Wayanad district of Kerala state in South-West. The geographical area of Chamarajanagar district is about 5,101 Km^2. The district is located in the southern tip of Karnataka state and lies between the North latitude 11^o $40^{'}$and 12^o $06^{'}$and East longitude 76^o $24^{'}$and $77^o46^{'}$. It falls in the southern dry zone. Chamarajanagar lies in the

southern dry zone having an average rainfall of 811.75mm. The temperature typically varies from 64°F to 94°F and is rarely below 59°F or above 99°F. There are 5 towns and 509 villages in this district. Chamarajanagar population is estimated to be 1,418,900 in 2023 and the tauk wise population of the district is as follows.

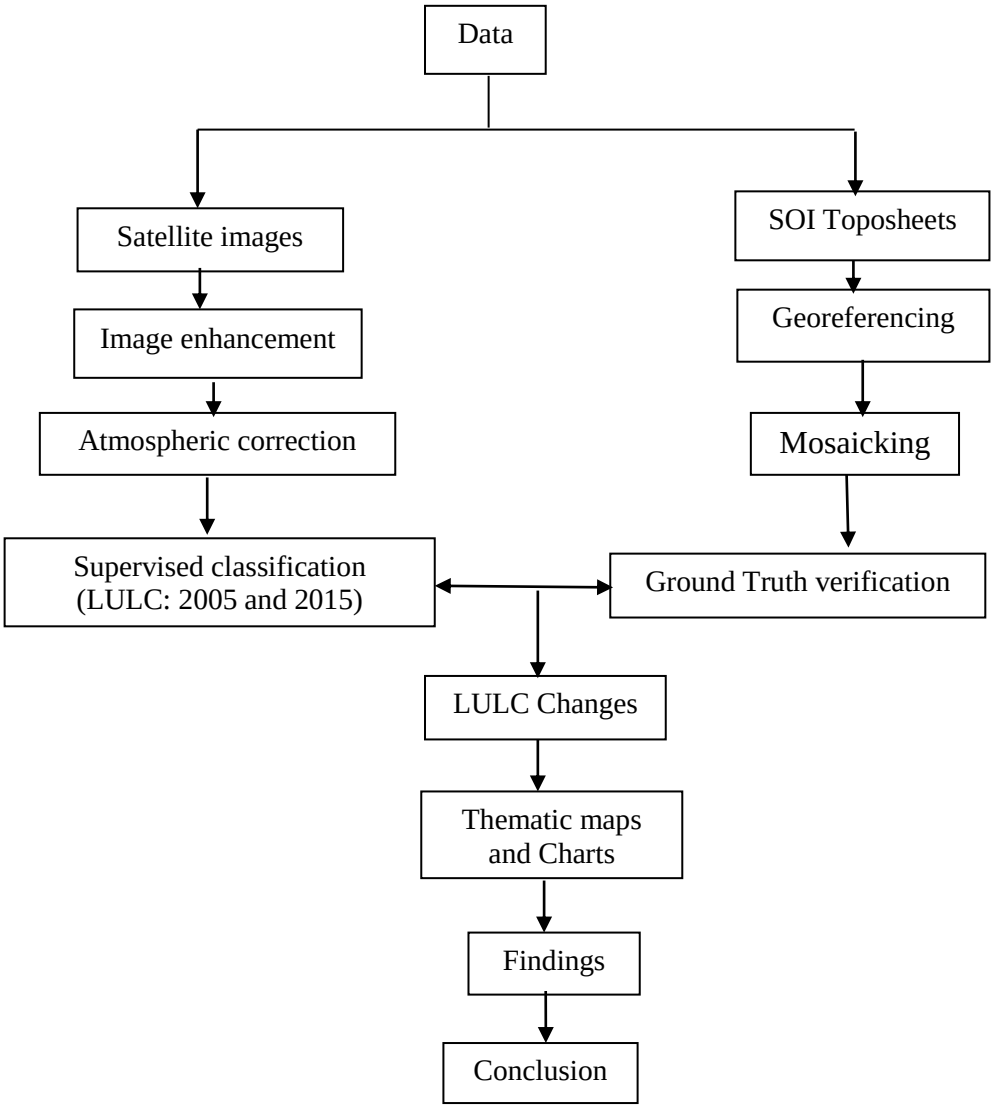
Location Map of study area



Objective and Methodology:

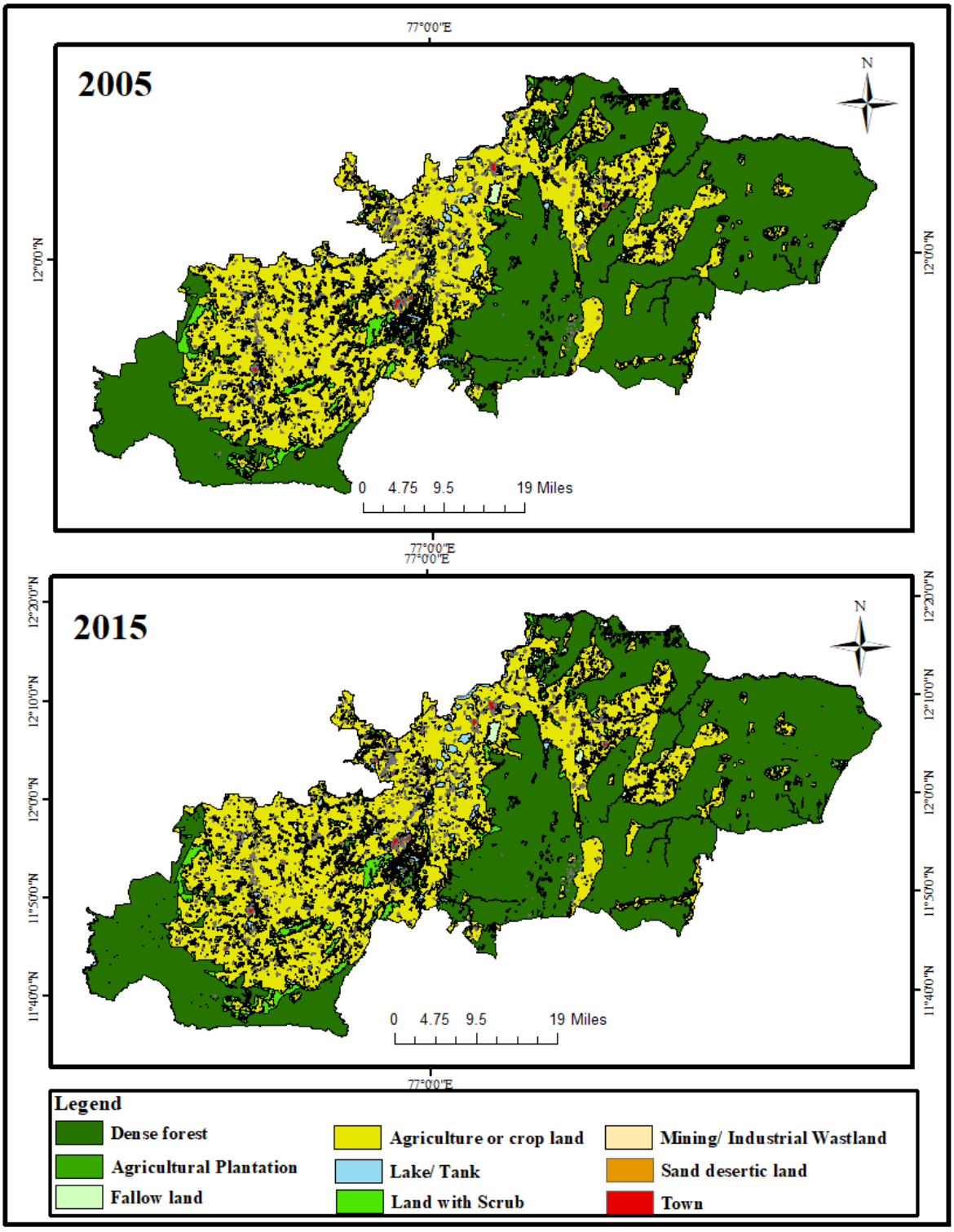
The main objective of this article is to study the land use and land cover of the Chamarajanagra district and identify the land cover changes in the study area. The base map for the study region for the georeferencing will be done by using the survey of India toposheets numbering 57D/12, 57D/16, 57H/12, 57H/16, 57H/3, 57H/4, 57H/8, 58A/10, 58A/13, 58A/14, 58A/5, 58A/6, 58A/7, 58A/9, 58E/1, 58E/2, 58E/5 and 58E/9 of 1:50000 scale. This study by using the satellite images of two different years i.e., 2005 and 2015. The supervise classification method has been used for identifying the LULC classes. GIS software has been used for the analysis, classification of satellite images, preparing thematic maps and other area calculations. Microsoft Excel has been used for preparing tables and graphs of the land cover changes. The workflow of this study is shown below on the flowchart to easily understand the process.

METHODOLOGY FLOW CHART



Land use and Land cover of the study area: Land use and land cover is largely determined by the ecological conditions, altitudes, geological structure, slopes, and climatic condition along with technological, socio-economic and institutional set-up. The changes occur due to Population growth, industrialization and urbanization.

Map. 1. Land use and Land cover Description for the period of 2005-06 and 2015-16



Nine major classes of land use and land cover (table 1 & map 1) have been chosen for the study for a period of 2005-06 and 2015-16 are according to hierarchy dense forest, agriculture crop land, agricultural plantation, land with scrub, lake/tank, fallow land, towns/villages, sand desertic land and miming/ Industrial wasteland comprised of 5639.10 Sq.km.

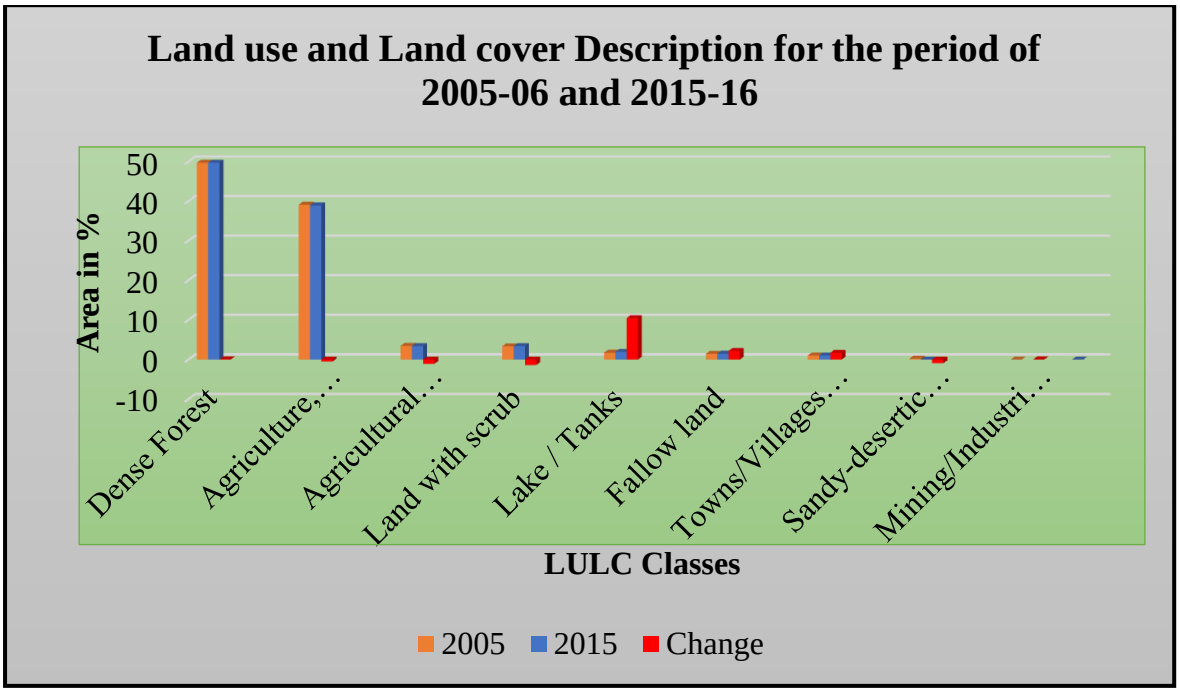
Table.1. Land use and Land cover Description for the period of 2005-06 and 2015-16

Land use classes	2005 (area in sq km)	2015 (area in sq km)
Dense Forest	2802.28 (49.69%)	2803.66 (49.71%)
Agriculture, Crop land	2205.19 (39.10%)	2194.51 (38.91%)
Agricultural Plantation	193.60 (3.43%)	191.55 (3.39%)
Land with scrub	188.54 (3.34%)	185.97 (3.39%)
Lake / Tanks	97.00 (1.72%)	108.32 (1.92%)
Fallow land	82.06 (1.45%)	83.87 (1.48%)
Towns/Villages (Rural)	57.17 (1.00%)	58.20 (1.03%)
Sandy-desertic Land/ Salt Affected Land	13.16 (0.23%)	13.04 (0.02%)
Mining/Industrial waste	0.10 (0.001%)	0.12 (0.002%)
Total	**5639.1 (99.9%)**	**5639.2 (99.8%)**

Source: computed by author

Data from the classified maps reveals that there is no much change in the general land use and land cover of the study area Results of the classified maps indicated in table-1and chart-1 shows that there is a marginal increase of area by dense forest, lake/tank, fallow land, towns/villages and mining/industrial waste whereas the increased area in those five types compensated by the decrease of area in agricultural cropland, agricultural plantation, land with scrubs sandy desertic.

Chart.1. Land use and Land cover Description for the period of 2005-06 and 2015-16



Dense forest and agricultural crop land covers more than 89% of the land use and land cover. Dense forest covers highest area in both period of 2005-06 and 2015-16. It was 2802.28 Sq km. amounts to 49.69% and 2803.66 Sq.km 49.71% respectively with an increase of 1.38, sq. km. which is very negligible increase of 0.49% followed by agricultural crop land with 39.10% (2205.19sq.km) in 2005-06 and 38.91% (2194.51sqkm) in 2015-16 with a decrease of 10.68 sq.km. less than -0.48%. Agricultural plantation covers 3.43% in 2005-06 where as a decrease of 2.05sq.km.in 2015-16 with a negative growth of 1.07% amounts to 3.39%. Same scenario can be found in land with scrubs 188.54 sqk. In 2005-05 decreased to 185.97 for the subsequent period. There is a great change is noticed in the land cover of lake and tank with a increase of 10.45% amounts to 11.32 sq.km. It was 1.72% o (108.32 sq.km) of the total area in 2005-05 as against to 1.92% (108.32 sq.km) for the subsequent period. Fallow land registered a growth of 2.15% with a increase of 1.81 sq.km. The area of towns and villages was 57.17 sq.km.in 2005-06 increased to 58.20 sq.km. in 2015-16 with an increase of 1.03 sq. km registering a growth of 1.71% indicates a slight urbanization. There is a decrease of area about .92% amounts to 0.12 sq.km.in sandy and desertic land /salt affected land it was 13.16 sq.km. in 2005-06 reduced to 13.04 sq.km. The land use for mining and industrial waste was very negligible but an increase of 0.02 sq.km. between the period shows a growth of 16.66%.

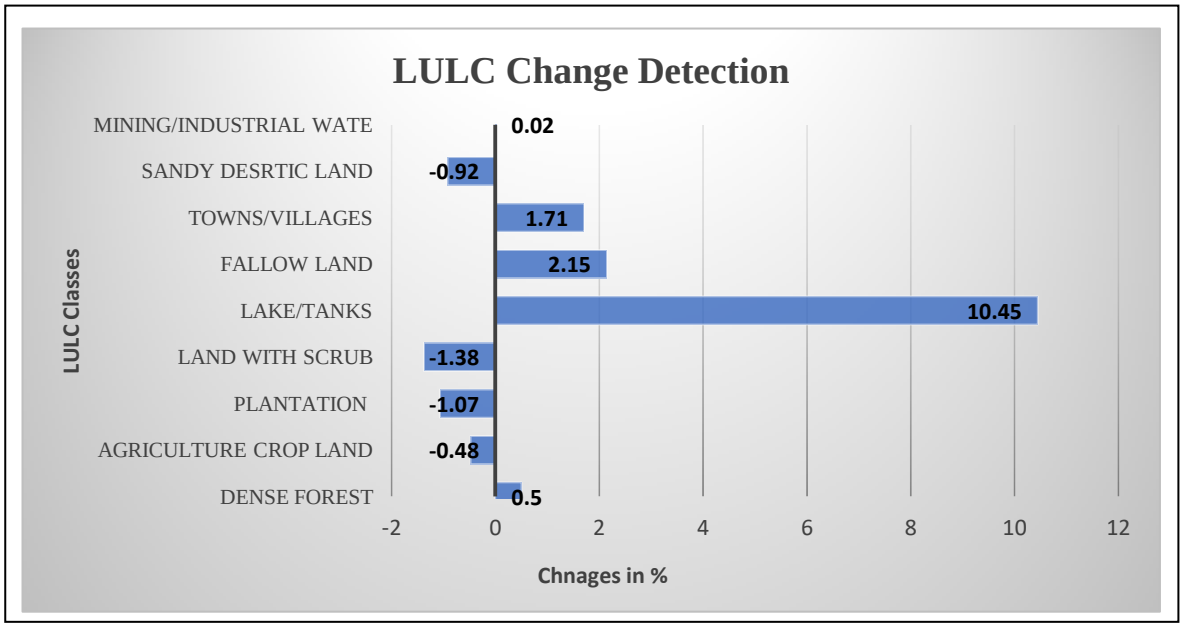
LULC Change Detection of the study area: The previous study of land use and land coverer examined the growth or change in the area and the area increased or decreased in each category of land use and land cover. Here the study relates to change in each category and the reason for the area increased or decreased. Table.2 shows the percentage of land use changes accrued in the different land use classes. As shown in the following table.2 there is an inflow and out flow of area from agricultural crop land, the area was 2205.19sq km in 2005-06 but decreased to 2194.51 sq km for the nect decade of 2015-16 with a decrease of area of 10.68 sq km which has moved to other land use. lowest decreased record in the Sandy- desertic land i.e. 0.12 sq km. The highest land use increased in the field of Lake/Tanks i.e 11.32sq km, Mining/Industrial waste has record lowest increase i.e. 0.02 sq km respectively.

Table.2. **LULC Change Detection of the study area**

Land use classes	Change (from 2005 to 2015 in sq km
Dense Forest	+1.38 (0.049%)
Agriculture Crop land	-10.68 (-0.48%)
Agricultural Plantation	-2.05 (-1.07%)
Land with scrub	-2.57 (-1.38%)
Lake / Tanks	11.32 (10.45%)
Fallow land	+1.81 (2.15%)
Towns/Villages (Rural)	+1.03 (1.71%)
Sandy-desertic Land/ Salt Affected Land	-0.12 (-0.92%)
Mining/Industrial waste	+0.02 16.66
Total	

Source: computed by author

Chart.2. LULC Change Detection of the study area



Conclusion: This research paper is carried out the Chamarajanagara district, which is one of the backward district in the Karnataka state. With the help of the Satellite imagery can be demarcate the land which used for different purpose and it provide the spatial and temporal phenomena of the study region. This research is studying the nine land use classes in the study region between 2005 and 2015. Out of nine land use classes four class area had increased remaining land use classes are decreased. Major change has accrued in the agriculture crop land has decresed from 2205.19 sq km to 2194.51 sq km. The study area of chamarajanagara is very back ward in industrial activity and no major or worth mentioning industries are found. Land with tree cnopy density more than 40%. It is used to refer to land with a tree canopy cover of more than 10% and area of more than 0.5ha. Land and water bodies area has increased form 97 sq km to 108 sq km. Fallow land and town has increased 1.71% and 2.15% respectively.

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