EVALUATION OF LAND USE AND LAND COVER CHANGE DETECTION FOR AN CITY USING QGIS

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Abstract**—**

Land use and land cover change detection study over the year 2000-2017 have been carried out for the study area of Oragadam to poonamalle (Kanchipuram District). For this study the Multi Temporal data sets of the years 2000,2010 and 2017 from LANDSAT TM, ETM+ and OLI images of different land use and land cover change have been identified using visual image interpretation techniques. The major part of the study area is covered by Agricultural land which covers about 130.748 sq.km in year 2000,97.373 sq.km in year 2010 and 50.834 sq.km in year 2017;Industrial area which covers about 6.105 sq.km in year 2000,12.183 sq.km in year 2010 and 20.186 sq.km in year 2017;Barren land 16.1782 sq.km in year 2000,38.019 sq.km in year 2010 and 69.805 sq.km in year 2017;Settelement area which covers about 31.144 sq.km in year 2000, 63.843sq.km in year 2010 and 93.748 sq.km in year2017;water body which covers about 31.0177 sq.km in year 2000,50.921 sq.km in year 2010 and 20.190 sq.km in year 2017.The output maps were Analysed and Digitilized. After the analysis of land use and land cover change detection we conclude Agriculture area are reduce and urban areas are Increased**.**

Keyword—QGIS9.3,Kanchipuramdistrict,GIS,Land use,Land cover,Remote sensing.

I. INTRODUCTION

Land use land cover change detection analysis is essential for planners to understand land use changes in urban areas for planning sustainable development. With the dynamic urbanization and industrialization process, there is an increasing pressure on land, water and environment causing pollution, traffic congestion, and infrastructure pressure, rising taxes and neighborhood conflicts particularly in the metropolitan cities. Urban sprawl is the scattering of new development on isolated tracts, separated from other areas by vacant land. Urban extend has been criticized for inefficient use of land resources and large encroachment onto the agricultural lands. Due to the large scale urban extend, the cities are expanding in all directions with changes in land use pattern.

Remote sensing has great potential to study land use and land cover changes Nowadays high resolution spatial imagery are available from satellite like worldview. An important part of land use and land cover change is to obtain information about the geometric elements of different classes.

II OBJECTIVES OF THE STUDY:

- To identify the spatial and temporal pattern land use and land cover change using Remote sensing and GIS
- To identify driving factors of urban growth using satellite images for different years.

- To validate the urban development of the study area using change detection analysis.

III LITERATURE REVIEW

Evaluation of Land Use and Land Cover Changed Detection Using RS & GIS A Model Study From Vijayawada,AP (Arjun dhakal) how to prepare the Land use and land cover change has become a central component in current strategies for managing natural resources and monitoring environmental changes. Urban expansion has brought serious losses of agriculture land, shrub, barren land and water bodies.In this project an attempt is made to study the changes in land use and land cover in Vijayawada region over period of time i.e. from 2002 to 2012.the study has been done through remote sensing approach using land sat imageries of this region.

Application of land change modeler for prediction of future land use land cover for Vijayawada city (k.sundara kumar) how to predict and analyse the present and future growth of vijayawada city of the year 1973,2001,2014. to predict the land use and land cover images of 2030 to 2040 of using terrset software..A total area 85515.75 hectares was taken as study area which has potencial for expansion. Prediction of future lulc image will be helpful for proper planning of urban environmental management.an accuracy of more than 80% was obtained in all stages. the output images were analysed and presented.

Land use and land cover change detection study over the year 1990-2001 have been carried out for the study area of usilampatti block in Madurai district.(Pradeep.c)discuss this paper to predict and analyse the present and future growth of USILAMPATTI BLOCK of the year 1990,2001 This data can be recorded and can be compared with future data to find out the impact of humans on the natural environment and natural changes.the finding are major part of the study area is agricultural land, which covers about 86.5 sq.km in 1990 and 67.288sq.km in2001;wasteland covers about 68.371sq.km in 1990 and 76.233 sq.km in 2001 build up covers about 1.976sq.km in 1990 and 2.68sq.km in 2001.Thus the output images were analysed and presented.

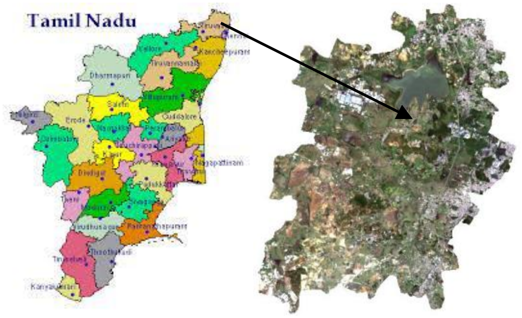
Dhanasekarapandian.MSelvan.p,chandran.s,chandra mohan have discussed about the change of land use and land cover using quantitative method to expound the impact of land use and land cover in Giruthumalriver sub basin from a period of year 1990 to 2010.To analyse the dynamic nature location and magnitude of changes within the land use classes for the period 1990 to 2010The result of poor irrigation facility and could not be regular monitoring of land activities the satellite images of study area acquired during 1990 to 2010 periods have offered a rich source of information about land use and land cover change detecting and assessing.land use changes have been detected by image processing method in ERDAS imagine 8.5 and Arc GIS 9.3.Thirteen land use classes have been identified and growth truth observation was also performed to check the accuracy of the classification.the present study has brought to light that the agricultural land that occupied about 29.86% of basin area in 1990 and was decreased to 18.13% of basin area in 2010 and settelement increased 9.8% of total area of basin in 2010.

Identification and monitoring the change of land use pattern using remote sensing and GIS (Asif mahmood) have discussed how to predict and Analyse the present and future growth of Dhaka city of the year 1990,2003,2010. This data can be recorded and can be compared with future data to find out the impact of humans on the natural environment and natural changes. the output images were analysed and presented.the remotely detected land use and land cover change from 1990 to 2010 shows that Dhaka is gradually changing as vegetative cover and open spaces have been transformed into buildings areas,low land and water bodies into reclaimed build up lands. These changes are mainly governed by unplanned urban expansion.this paper presents an integrated study of urbanization trends in Dhaka city.dhaka is a sheer examble of having poor legislative actions inefficient management and lack of public awareness which leads the urbanization to an unplanned and resource consuming development.

IV DESCRIPTION OF STUDY AREA

The study area is chosen based on the preliminary investigation of growth patterns in Chennai Metropolitan Area (CMA). The study area is located in the periphery of Chennai city which has rapid urban development resulting large land use change in the last decade due to the development activities in the area and Oragadam, Sriperumbudur taluk of Kanchipuram district is a fastest growing suburb in Chennai metropolitan area. It is located in the strategic location between NH45 and NH4. It is also known as the biggest automobile hub in south asia. Poonamalle is a fastest developed area with a population of 57,224(2011 census).

Poonamalle to oragadam



III DATA AND METHODOLOGY

3.1 Data Collection

This research is dependent on secondary data. To prepare the base maps for analysis purpose and applying the different methods to achieve the study objectives, Landsat satellite images (2000, 2010 and 2017) have been collected from *Knchipuram Space Research & Remote Sensing Organization* (*SPARSO*). Table shows the details of the Landsat satellite images used for analysis from Land sat-5,Land sat -7 ETM+, Land sat -5-TM.Map Projection of the collected satellite images is Universal Transverse Mercator (UTM) within Zone 46 N–Datum and of the co-ordinate system World Geodetic System (WGS) 84 and the pixel size is 30 meters.

3.2 DATA PREPARATION

The collected images are pre-processed by radiometric or geometric corrections. Radiometric corrections include correcting the data for sensor irregularities and unwanted sensor or atmospheric noise, and converting the data so they accurately represent the reflected or emitted radiation measured by the sensor.

Image enhancement is solely to improve the appearance of the imagery to assist in visual interpretation and analysis. Contrast stretching has been performed to increase the tonal distinction between various features in a scene, and spatial filtering to enhance (or suppress) specific spatial patterns in an image. Arithmetic operations (i.e. subtraction, addition, multiplication, division) are performed to combine and transform the original bands into "new" images which better display or highlight certain features in the scene. The image pre-processing, enhancement and transformation operations are done using Arc GIS 10.2.

3.3 LAND USE / LAND COVER CLASSIFICATION

Using the basic colors red, green and blue (RGB), it is possible to prepare different images. To distinguish between different cover types or ground objects like buildings, roads, and vegetation, these images are useful. We have choose the FCC of RGB= bands 4, 3 and 2 for this study. This combination normally makes built-up areas appear blue, vegetation red, water bodies from dark blue to black, soils with no vegetation from white to brown.

Image classification refers to grouping image pixels into categories or classes to produce a thematic representation. Image classification comprehends various operations that can be applied to photographic or image data. These include image restoration, image pre-processing, enhancement, compression, spatial filtering, and pattern recognition and so on. There are two basic methods of image classification: supervised and unsupervised. Supervised classification relies on the priori knowledge of the study area. Therefore, for this study, a supervised classification method has been used.

3.4 IMAGE CLASSIFICATION

After developing training samples for all land cover classes the next step is to classify the images based on these training samples. This has been done using the Interactive Supervised Classification Toolbar in Q GIS 9.3. This latest version of ArcGIS enables us to perform the land cover classification without creating any signature files, which was primitive for the older versions.

Land use/cover types	Description
Water bodies and Wetlands	River, permanent open water, lakes, ponds and reservoirs ;Permanent and seasonal wetlands, marshy land, rills and gully, swamps
Built-up	Residential, commercial and services, industrial, transportation, roads, mixed urban, and other urban
Vegetation and cultivated land	Deciduous forest, mixed forest lands, palms, conifer, scrub and others Crop Fields, Fallow lands and vegetable lands
Bare soil/Exposed soil	Exposed soils, sand fill, landfill sites, and areas of active excavation

3.5 Generalization

Sometimes many isolated pixels may be found after image classification . These isolated pixels belong to one or more classes that differ from surrounding pixels. Therefore it is necessary to generalize the image and remove the isolated pixels. Filtering is the solution for this type of problem. After a vector-to-raster conversion, mode filters are good for filling gaps between polygons. Therefore, a 3×3 mode filter has been applied to generalize the supervised classified land cover images. This post-processing operation replaces the isolated pixels to the most common neighboring class. Finally the generalized image is reclassified to produce the final version of land cover maps for 2000, 2010 and 2017.

3.6 Image pre-processing

The set of Landsat ETM+ data were initially geo-corrected and rectified. The whole scene sizes of the satellite imagery of ETM+ data were cropped to the study area. The study area includes Chennai city administrative area and a 10km buffer from the city boundary. The final subset imagery of the study area was obtained using ENVI Imagine for further classification Of all the various data sources used in GIS, one of the most important is undoubtedly that provided by remote sensing. Through the use of satellites, we now have a continuing program of data acquisition for the entire world with time frames ranging from a couple of weeks to a matter of hours. Very importantly, we also now have access to remotely sensed images in digital form, allowing rapid integration of the results of remote sensing analysis into a GIS The development of digital techniques for the restoration, enhancement and computer-assisted interpretation of remotely sensed images initially proceeded independently and somewhat ahead of GIS. However, the raster data structure and many of the procedures involved in these *Image Processing Systems* (IPS) were identical to those involved in raster GIS. As a result, it has become common to see IPS software packages add general capabilities for GIS, and GIS software systems add at least a fundamental suite of IPS tools. IDRISI is a combined GIS and image processing system that offers advanced capabilities in both areas.

3.7 Landuse

The Landuse of the study area were interpreted from satellite images using GIS, which consisted of differentclasses.Landuse with consistent classification for two time periods is needed for the calibration of model. Input data for the study area prepared as a subset of main image. The collected images are pre-processed by radiometric or geometric corrections.radiometric corrections include correcting the data for sensor irregularities and unwanted sensor or Admospheric noise and converting the data so they accurately represent the reflected or emitted radiation measured by the sensor. Image enhancement is solely to improve the appearance of the imagery to assist in visual interpretation and Analysis.contrast stretching has been performed to increase the tonal distinction between various features in a scene and spatial filtering to enhance specific spatial patterns in and Image.Arthmeticoperations(Addition,subtraction,multiplication,Division)areperforme to combine and transform the original bands into new images which better display are certain feautures in scene.the image preprocessing enhancement and transformation operations are done using QGIS 9.3.

3.8 Excluded areas

Exclusion is defined as areas which are resistant to urbanization.Excluded area chosen for this analysis includes water bodies of tanks and canals. These areas are mainly extracted from the classified land cover data.

3.9 Urban extent

Satellite imageries of the study area for the year 2000, 2017 and have geo referenced using Arc GIS. Landsat images of resolution 30m and 15m was used for on-screen digitization of the extent of built structures.

3.10 Population density

The population data were collected from census of India for 2000, 2010 and 2017. The density maps were prepared using population data and urban map in Arc GIS. Table 3.2 represents the village population census.

TABLE 3.2 POPULATION CENSUS DATA

	POPULATION				POPULATION		
VILLAGE NAME	2000	2010	2017	VILLAGE NAME	2000	2010	2017
Alagooor	127	286	302	Navalur	629	758	3539
Amarambedu	376	894	1187	Neelamangalam	673	1042	1575
Ammanumbakkam	40	85	390	Oddankaranai	521	610	323
Arambakkam	390	513	1242	Oragadam	653	822	1985
Athanancheri	1239	2334	3668	Orathur	1124	1549	1744
Ayyancher	467	820	1121	Padappai	6713	8285	14063
Chembarambakkam	819	878	1505	Panapakkam	103	143	458
Erumaiyur	618	2047	2379	Pazhanthandalam	2962	3353	4777
Gunduperumbedu	389	566	1020	Peerkankaranai	10986	17511	25871
Irumbedu	239	308	323	Pennalur	1163	1604	2610
Irungattukottai	1219	1439	3904	Perinjambakkam	231	393	1379
Kadaperi	5798	93	157	Perungalathur	12376	19594	37342
Kaduvancheri	349	405	484	Pillaipakkam	1093	1747	1741
Kanchivakkam	398	479	644	Poonamallee	28832	42612	64213
Karanaithangal	97	122	182	Poonthandalam	568	1009	3117
Karasangal	1980	2215	3858	Puducheri	239	336	815
Katrambakkam	1177	1453	2157	Puduppair	458	551	788
Kavalkazhani	38	53	140	Pulikaradu	219	245	325
Kavanur	1009	2104	1586	Salamangalam	1127	1229	2547
Keelakal	107	142	281	Serapanacheri	734	866	976

Kilambakkam	6791	18435	26865	Sethupattu	658	809	1027
Kolathur	666	965	1774	Sikkarayapuram	7230	8763	10187
Kollacheri	1979	2089	3793	Sirukalathur	1285	2348	6117
Korukkanthangal	678	737	503	Sirumathur	782	873	1034
Kovur	3086	5948	10961	Somangalaam	2398	3569	4376
Kozhumanivakkam	644	1260	2729	Tambaram	19637	25634	383718
Kundrathur(TP)	23137	27128	42126	Thandalam	2074	2680	5546
Madaviagam	123	362	828	Thirumudivakkam	1264	3027	4083
Mahanyam	798	835	1860	Thiruneermalai(TP)	14569	19228	30702
Malaipattu	810	883	1078	Thundalkalani	973	1122	781
Malayambakkam	3598	5025	8250	Tirunageswaram	567	632	821
Mangadu	11225	22127	38188	Tukkanampakkam	2034	2894	3425
Manimangalam	4972	5363	8198	Urapakkam	9693	13445	29122
Mannivakkam	2344	9783	13308	Vaipoor	1003	1316	1803
Mathur	453	732	1628	Valarpuram	1361	1965	2368
Mevalurkuppam	5134	4230	5798	Vandalur(CT)	5767	13375	16852
Mudichur	2358	3673	15438	Varadarajapuram	474	1973	5846
Naduveerampattu	2554	4517	6291	Vattambakkam	413	560	663
Nallamperumbedu	43	85	168	Vellarai	210	379	426
Nallur	779	741	4618	Vellerithangal	84	108	185
Nandambakkam	1782	9343	11239	Vengadu	721	939	1011
Nandivaram	21874	26576	44098	Venjuvancheri	310	406	649
Nariyambakkam	376	412	566	Venkatapuram	928	1210	2137

RESULTS AND DISCUSSION

4.1 INTRODUTION

The quality of the input data and the selection of optimal parameter ranges should be considered carefully to improve the calibration result. The calibration process has resulted in the determination of a set of land use and land cover change to quite accurately simulate the observed growth in the study area.

4.2 LANDUSE

Landuse map is prepared by onscreen visual interpretation of satellite map. The NRSC level II classification is adopted for mapping. A Landuse interpretation key for Agricultural land, urban area, barren land, forest area, dense scrub, scrub land and water body classes were used for Landuse map preparation.

Fig 4.1, 4.2 and 4.3 for the year of 2000, 2010 and 2017.

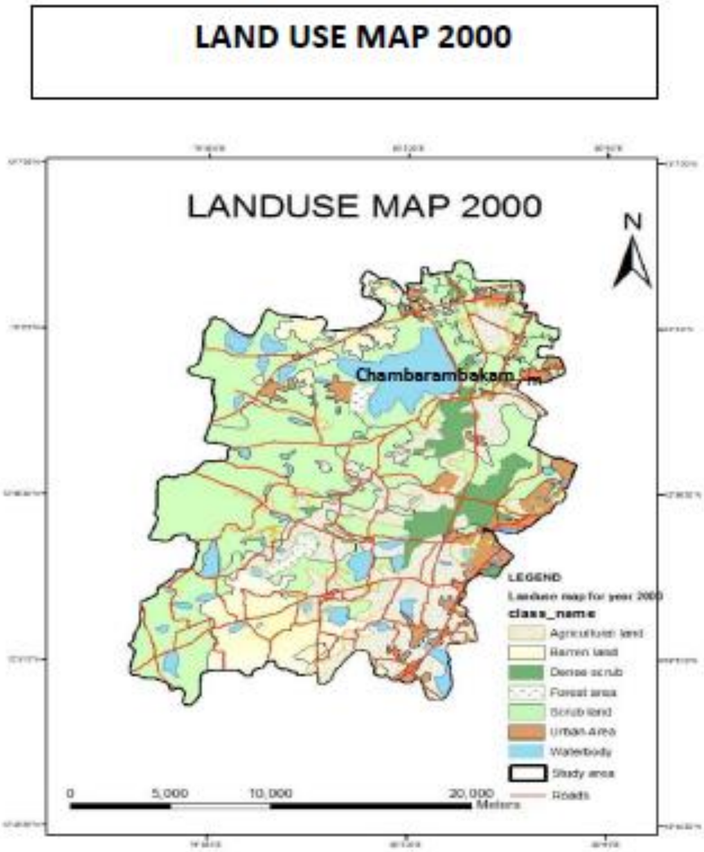


Fig 4.1 Landuse map of the study area in the year of 2000

DESCRIPTION	AREA IN Sq.kms
AGRICULTURE LAND	130.74834
INDUSTRIAL AREA	6.10571
BARREN LAND	16.1782
SETTELEMENT	31.144485
WATER BODY	31.017724

LAND USE MAP 2010

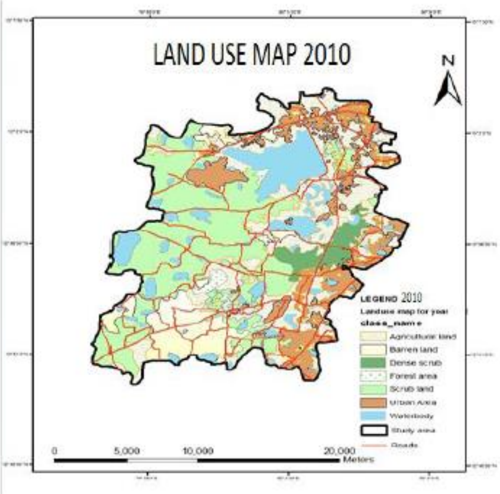


Fig 4.2 Land use map of the study area in the year of 2010

DESCRIPTION	AREA IN Sq.kms
AGRICULTURE LAND	97.373152
INDUSTRIAL AREA	12.183452
BARREN LAND	38.019873
SETTELMENT	63.84378
WATER BODY	50.921662

EXCLUSION AREA MAP

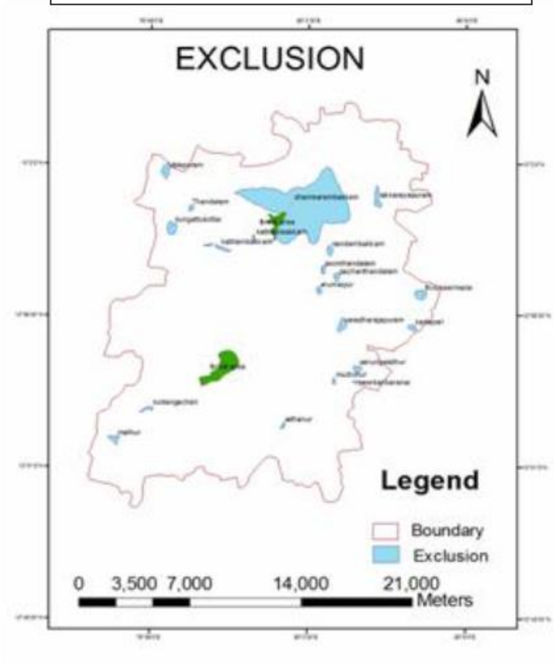


Fig: 4.4 Excluded area of the study area

LAND USE MAP 2017

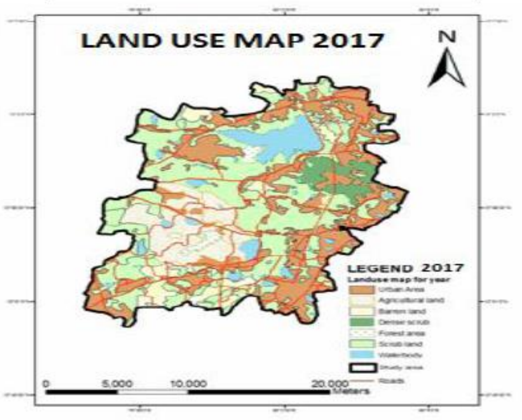


Fig: 4.3 Land use map of the study area in the year of 2017

DESCRIPTION	AREA IN Sq.kms
AGRICULTURE LAND	50.834312
INDUSTRIAL AREA	20.18679
BARREN LAND	69.805913
SETTELEMENT	93.748384
WATER BODY	20.190495

URBAN EXTEND 2000

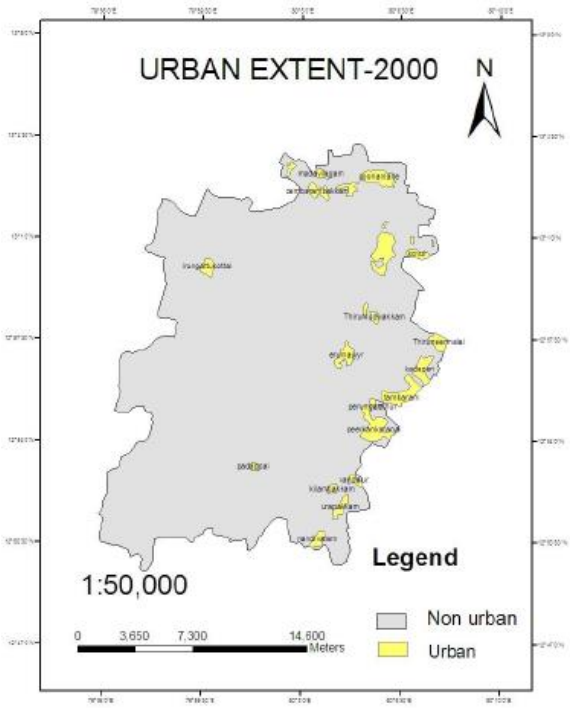


Fig: 4.5 Urban extent area of the study area 2000

URBAN EXTENT 2017

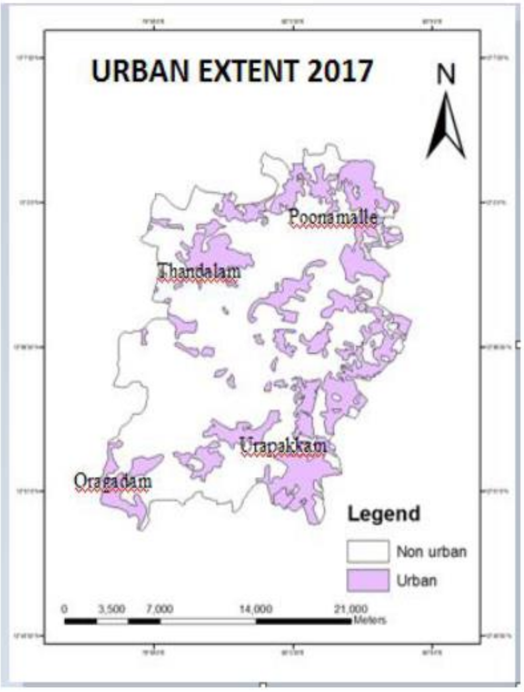
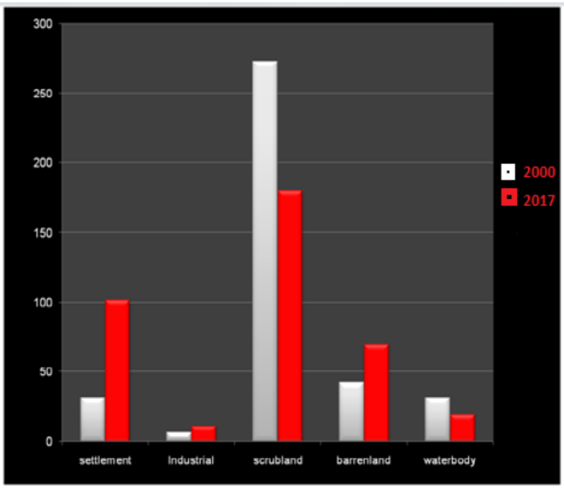


Fig: 4.6 Urban extent area of the study area 2017

V CONCLUSION

Land use and land cover classification of oragadam to poonamalle area of kanchipuram district using remote sensing and GIS was described in the study. landsat images of oragadam to poonamalle area of kanchipuram district of year 2000, 2010, 2017 are analyzed by moderately accurate interactive supervised classification toolbar in Q gis9.3. And various land feautures are delineated, compiled and prepared. The areas of each class were estimated and finally general land use maps for both 2000, 2010,2017 data were prepared. Remote sensing has changed the way of resource evolution studies with the use of multi temporal satellite data it has become increasingly possible to monitor the state of the resource and land use and land cover changes has been successfully monitored. In the present study various resources were identified in which the agricultural area is the predominant land use, since most of the build ups are rural settelements. By proper management of irrigation systems agricultural areas can be increased check dams can be build in the foothills to preserve water so that the ground water level will increase in those area. This will directly help in agricultural production. Government can conduct awareness programs with the help of NGOs to the local villagers in order to develop the waste lands in to usable agricultural lands. The agricultural areas need more and immediate attention since 70% of the country's population depends.

INFERENCES (2000 and 2017)



References

[1] Application of land change modeler for prediction of future land use and land cover a case study of vijayawada city, *International conference on science,ICSTM 978-81-931039-6-8.*

[2] Land use and land cover dynamic analysis using satellite remote sensing and gis techniques –a case study of girudhumal river sub Basin, Tamilnadu, India, International journal of geomatics and geosciences volume 5,no 4,2015,ISSN 0976-438.

[3] Evaluation of land use and land cover changed detection using RS & GIS a modal study from Vijayawada,AP,International journal of engineering and innovative technology (IJEIT) volume 3, issue4,October 2013.

[4] Idendification and monitoring the change of land use pattern using remote sensing and GIS: a case study of Dhaka city,IOSR journal of mechanical and civil engineering (I0SR-JMCE) e- ISSN: 2320-334X, Volume6,issue 2(mar-apr.2013)

[5] Land use and land cover change detection a case study of usilampatti block,Madurai district,Tamilnadu,International journal of geomatics and geosciences volume 4,no4,2014,ISSN 0976-4380

[6] Claire A, Jantz A, Scott J, Goetz B, David Donato C, Peter Claggett D (2010), "Desigining

and implementing a regional urban modeling using sleuth". *Computers, Environment and Urban Systems* 34, 1–16.

[7] Claudia Maria De Almedia, Antonia Miguel Vieira Monteiro, Gilberto Camara, Britaldo Silveria soares, Gustavo coutinho cerqeria, Cassio lopes Pennachin and Michael batty(2005). "GIS and Remote sensing as a tool for the simulation of urban land use change", *International Journal of Remote sensing*, Vol.26, No.4,pp.759-774

[8] Fengming Xi, Yuanman Hu, Hong S He, Xiaoqing Wu..(2009), "Simulate urban growth based on RS, GIS, and SLEUTH model in Shenyang-Fushun metropolitan area northeastern China". Ministry of Housing and Urban-Rural Development of China

[9] Jeff Onsteda and Keith C. Clarkeb (2011), **"**The inclusion of differentially assessed lands in urban growth model calibration: a comparison of two approaches using SLEUTH". *International Journal of Geographical Information Science*, 26:5, 881-898,

[10] Lakshmi KantaKumar, N., Nikhil G Sawant, Shamita Kumar (2011), "Forecasting urban growth based on GIS, RS and SLEUTH model in Pune metropolitan area". *Institute of Environment Education and Research Volume* 2, No 2,