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LAND USE / LAND COVER MAPPING AND CHANGE DETECTION ANALYSIS OF BELAGAVI CITY, KARNATAKA.

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Abstract - *This research study demonstrated the importance of geographical information system and remote sensing technologies in spatial temporal data analysis. In this study, an attempt was made to gain spatial data of LULC of Belagavi city. ERDAS Imagine and Arc GIS software platforms were utilized in the study for LULC mapping and change detection. Landsat-7 and Landsat-8 satellite imageries were acquired and LULC maps were prepared for the years 2000 and 2018. Supervised classification with maximum likelihood algorithm is adopted for LULC classification. The LULC classes are built-up, agriculture area, green and open area and water body. Landsat-7 classification results of the year 2000 were compared with Landsat-8 results of the year 2018. Built-up area was increased drastically and other features agriculture area, green and open area and water body were decreased over the time period.*

***Key Words*: LULC, GIS, Remote Sensing, ArcGIS, ERDAS**

1. INTRODUCTION

Remote sensing is the technique of acquiring data or information of an area or object from a distance mode that is without having physical contact with area or object. Geographical information system is the phenomenon of acquiring geographical data. Remote sensing technology and geographical information system provide efficient methods for analysis of land use issues and tools for land use planning and modelling [10]. Present study is based on such advances. The aim of the study is to quantify the changes in land use land cover of Belagavi city.

The evaluation of changes in land use / land cover is exceptionally vital to have appropriate arranging and utilization of resources and their administration. Land use and land-cover change, as one of the main driving forces of global environmental change, is central to the sustainable development debate [3]. Traditional practices such as census, collection of demographic data and evaluation of environmental samples are inadequate for complex studies. Advances such as geographical information system and remote sensing gives information to study and to monitor the resources for environmental administration. Land use / land cover change information has an important role to play at local and regional as well as at macro level planning [1]. Land use / land cover change has become an important component in current strategies for managing natural resources and monitoring environmental changes for sustainable environmental planning and management [8].

1.1 IMPORTANCE OF LAND USE LAND COVER

Land use / land cover is blended with the financial development of the nation. Land use / land cover represent the properties of earth surface. Land cover is the characteristic state of the earth surface, which is vital tool for the design of land use. Correlation of land cover with the environment, leads to the control of the hydrological cycle, climate, climatic expectations. Land cover plays an imperative part within the carbon cycle. Land cover reflects the accessibility of food, water, fuel, timber and protect assets for human.

2. STUDY AREA

Study of Belagavi city lies in North West of Karnataka and located in western part of India as shown in figure 1. The city lies at the border of Goa and Maharashtra state. The coordinates of Belagavi city are 15degree 51minutes North 74degree 30minutes East. The Belagavi city has an area of 94 square kilometers and has an elevation of 784 meters from MSL.

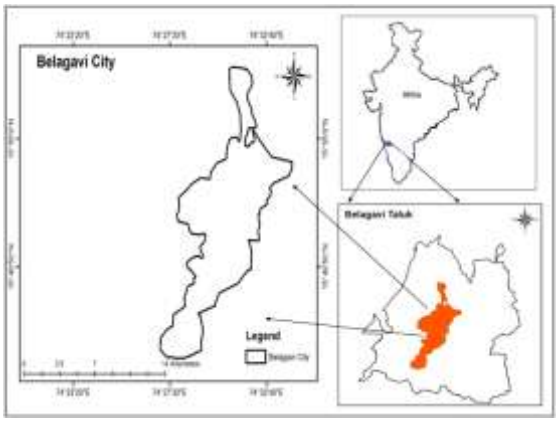

Figure-1: Location Map of Study

3. METHODOLOGY

Land use / land cover maps preparation of Belagavi city was carried out from two set of satellite imageries retrieved for 2000 and 2018 time periods. Urban maps and census

datasets were also used in the study. Landsat 7 imagery for 2000 and Landsat 8 imagery for the year 2018 were acquired. The generalized methodology flowchart of study is as shown in figure 2.

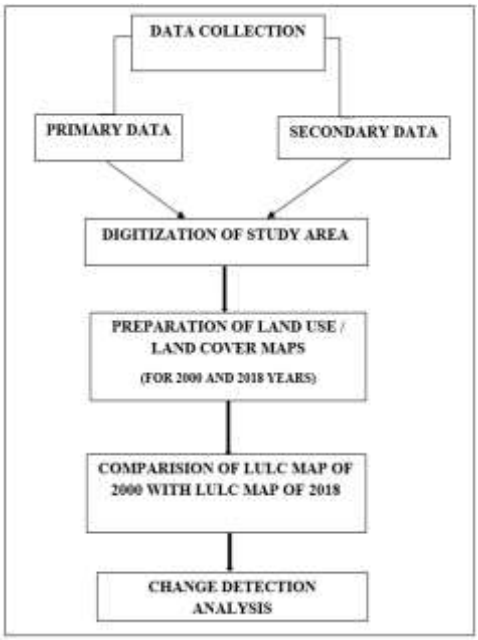

Figure-2: Generalised Methodology

3.1 DATA COLLECTION

The required datasets for the study are Urban Maps, Census Data and Satellite Imageries.

Primary Data: Satellite imageries of Landsat 7 and Landsat 8 datasets over a time period are taken in the present study. Landsat 7 data for the year 2000 and Landsat 8 data for the year 2018 are downloaded as shown in table 1.

Table-1: Satellite Datasets Used for the Study

Satellite	Date	Resolution	Path	Row
Landsat 7	14-03-2000	30 meters	146	49
Landsat 8	08-03-2018	30 meters	146	49

Secondary Data: Urban maps and census data of Belagavi city were collected from Belagavi Urban Development Authority (BUDA). These datasets are required for the digitization and delineation of study area.

3.2 DIGITIZATION OF STUDY AREA

The preparation of digitized study area map includes set of operations, with software platforms and datasets. ArcGIS is a geographical information system, operating with geographical information and maps. It is used for preparing and utilizing maps, acquiring and assembling geographic information, analyzing map information, managing and transferring of geographic information into database.

3.3 PREPARATION OF LAND USE LAND COVER MAPS

Preparation of land use land cover map of the study area is the second part of the methodology. This involves classification of study area into land use / land cover categories using Earth Resources Data Analysis System (ERDAS) Imagine and satellite datasets. ERDAS Imagine is an image handling software platform that permits users to process geospatial imagery, vector data and other imageries. Presently ERDAS Imagine software is used for land use land cover mapping of the study area and also for change detection mapping of study area.

3.4 CHANGE DETECTION ANALYSIS

Change detection strategy helps analyst to understand the issues, designing, planning and also helps for better monitoring and conservation practices. Change detection can be found by comparing the values of one lulc map with another lulc map, having same study area. Landsat 7 for the year 2000 and Landsat 8 for the year 2018 compared to know the changes happened in the lulc classes with respect to area.

4. RESULTS AND DISCUSSIONS

The classification of land use land cover depends upon the study area and objective. Supervised classification is carried out using ERDAS Imagine software platform in the present study. The study area is classified into Built-up area, Green and open area, Agriculture land, and Water body. Land use / land cover maps were prepared for the year 2000 and 2018 using Landsat datasets as shown in figure 3 and 4.

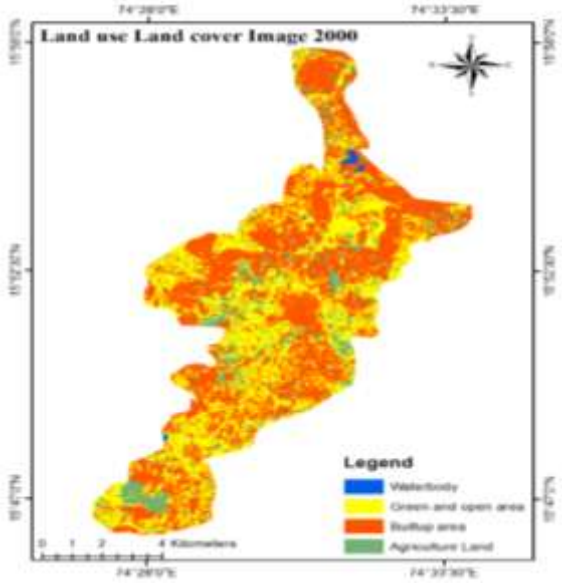

Figure-3: Landsat 7 LULC Map of Belagavi City 2000

Table-2: Landsat 7 LULC Classification of Belagavi City 2000

LULC Classes	Area in sq.km.
Agriculture land	9.2156
Built-up area	46.616
Waterbody	0.3652
Green and open area	35.8795
Total	92.0763

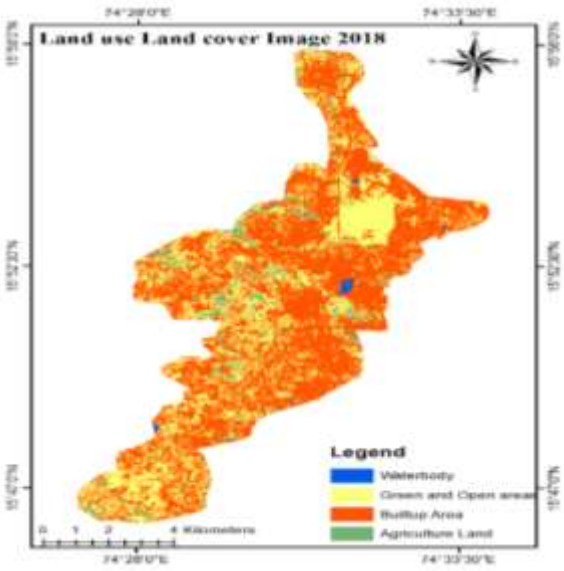

Figure-4: Landsat 8 LULC Map of Belagavi City 2018

Table-3: Landsat 8 LULC Classification of Belagavi City 2018

LULC Classes	Area in sq.km.
Agriculture land	4.5912
Built-up area	56.8932
Waterbody	0.2982
Green and open area	30.2937
Total	92.0763

4.1 COMPARISON OF LANDSAT 7 2000 MAP WITH LANDSAT 8 2018 MAP

Landsat 7 map for the year 2000 of Belagavi city is compared with Landsat 8 map for the year 2018 of Belagavi city. The classified categories are Agriculture land, Built-up area, Green and open area and waterbody. With respect to area, the classes were compared and their variations are quantified tabulated in table 4.

Table-4: Comparison of Landsat 7 2000 with Landsat 8 2018

LULC Classes	Area in the year 2000	Area in the year 2018	Change
Agriculture land	9.2156	4.5912	-4.6244
Built-up area	46.6160	56.8932	10.2772
Waterbody	0.3652	0.2982	-0.0670
Green and open area	35.8795	30.2937	-5.5858
Total	92.0763	92.0763	

As the LULC classes are compared the changes obtained are, major increase in Built-up area with decrease in Agriculture land, Green and open area, and waterbody. Built-up area is increased to 56.8932 sq.km. from 46.616 sq.km. Agriculture land is decreased to 4.5912 sq.km. from 9.2156 sq.km. Green and open area is decreased to 30.2937 from 35.8795 sq.km. Waterbody is decreased to 0.2982 sq.km. from 0.3652 sq.km.

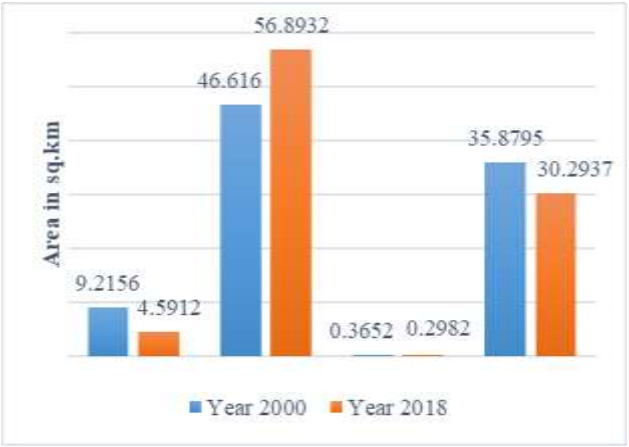

Figure-5: Comparison of Landsat 7 2000 with Landsat 8 2018

5. CONCLUSIONS

In this study, using data sets such as urban maps, census data and satellite data an attempt is made to understand the land use / land cover of Belagavi city with the help of Arc GIS and ERDAS Imagine software. The land use / land cover classification and change detection analysis is performed for the study area. Based on the results obtained from the land use / land cover classification and change detection analysis, major drastic increment in built-up area is found among the classification. Green and open area, agriculture area and water body features are decreased among the classification

The increment in built-up zones has the most noteworthy effect on the environment by leading to disturbance and degradation of soil. The decrement in Green and open area, agriculture area and water body affect the environment by creating problems such as erosion, imbalance in carbon cycle, lowering hydrological cycle, increasing surface runoff, lowering the ground water infiltration, lowering ground water capacity and ground water recharge. Land use / land cover changes creates imbalance between biotic and abiotic components, which necessitates the proper planning and execution strategies to monitor the land use / land cover in urban areas.

REFERENCES

[1]. Ashutosh Singh, Shalini Singh, Purushottam Kumar Garg, Kalmesh Khanduri (2013); "Land Use and Land Cover Change Detection: A Comparative Approach Using Post Classification Matrix and Discriminate Function Change Detection Methodology of Allahabad City", International Journal of Current Engineering and Technology, ISSN 2277-4106, Vol.3, Issue 1, 2013, pp. 142-148.

[2]. Basavaraj Paruti, B Santhaveeranagoud (2014); "Land Use / Land Cover Change Detection by Multi-Temporal Remote Sensing Imageries: Bangalore City India (1992-2012)'', international academy of science, engineering and technology, ISSN 2278-9987, Vol. 3, Issue 1, 2014, pp 51-58

[3]. Dr.C.Sarala (2013); "Landuse / Landcover and NDVI Analysis for Halia Catchment", International Journal of Advanced Research in Engineering and Technology, ISSN 0976-6480, Vol.4, Issue 5, 2013, pp. 126-133.

[4]. Haile E. Getachew, Assefa M. Melesse (2012); "The Impact of Land Use Change on the Hydrology of the Angereb Watershed, Ethiopia", International Journal of Water Sciences, Vol. 1, Issue 4, 2012, pp.1-7.

[5]. Hari Krishna Karanam, Victor Babuneela (2017); "Study of Normalized Difference Built-Up (NDBI) Index in Automatically Mapping Urban Areas from Landsat TM Imagery'', International Journal of Engineering, Science and Mathematics, ISSN 2320-0294, Vol. 6, Issue 8, 2017, pp. 239-248.

[6]. Madhuri. H. V. J, Sridhar P. (2017); "Application of Remote Sensing and GIS in Land Use / Land Cover Mapping and Change Detection in Hyderabad, India", International Journal of Research in Engineering, ISSN 2395-4396, Vol. 3, Issue 1, 2017, pp. 90-98.

[7]. Nagraj S. Patil, Vishwanath Awati, Nataraja M., (2017); "Sustainable Integrated Stormwater Management Using SWMM5.1", International Journal of Earth Sciences and Engineering, DOI: 10.21276/ijee.2017.10.0611.

[8]. Nayana S. Ratnaparkhi, Ajay D. Nagne, Bharti Gawali (2016); "Analysis of Land Use / Land Cover Changes Using Remote Sensing and GIS Techniques in Parbhani City, Maharashtra, India", International Journal of Advanced Remote Sensing and GIS, ISSN 2320-0243, Vol. 5, Issue 4, 2016, pp. 1702-17081.

[9]. Nitin n mundhe, ravindra g. jayabhave (2014); "Impact of Urbanization on Land Use / Land Cover Change Using Geo-Spatial Techniques", International Journal of Geomatics and Geosciences, ISSN 0976-4380, Vol. 5, Issue 1, 2014, pp. 50-60.

[10]. O.S. Olokegeon, O.F. Lyiola, K. Lyiola (2014); "Application of Remote Sensing and GIS in Land Use/Land Cover Mapping and Change Detection in Shasha Forest Reserve, Nigeria", The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Vol. XL-8, 2014, pp. 616-616.

[11]. Prakasam .C (2010), "Land Use Land Cover Change Through Remote Sensing Approach: A Case Study of Kodailkanal taluk, Tamil nadu", International Journal of Geomatics and Geosciences, ISSN 0976-4380, Vol. 1, Issue 2, 2010, pp. 158-158.

[12]. Praveen Kumar Mallupattu, Jayarama Reddy, Sreenuvasula Reddy (2013); Analysis of Land Use / Land Cover Changes using Remote Sensing Data and GIS at an Urban Area, Tirupati, India", The Scientific World Journal, 2013.

[13]. S. Balaselvakumar, P. Sujatha, A. Ilanthirayan (2015); "Land Use Land Cover Change Detection in Lalgudi Block, Tiruchirappalli District – Using Remote Sensing and GIS Techniques", International Journal of Engineering Research and Applications, ISSN 2248-9622, Vol. 5, Issue 5, 2015, pp. 108-117.

[14]. Vikram Agone (2015); "Change Detection of Land Use / Land Cover by Using Remote Sensing and GIS", Journal of Remote Sensing and Earth Sciences, Vol.1, Issue 1, 2015, pp. 15-20.

[15]. Vinod kumar H A, Dr. Paresh Chandra Deka (2016); "Land Use Land Cover Analysis of Sub Watersheds in Belgaum using Remote Sensing and GIS", International Journal for Scientific Research and Development, ISSN 2321-0613, Vol. 3, Issue 11, 2016, pp. 147-152.

[16]. Y. Zha, J. Gao, S. Ni (2003); "Use of Normalized Difference Built-Up Index in Automatically Mapping Urban Areas from TM Imagery", International Journal of Remote Sensing, ISSN 0143-1161, Issue 3, Vol. 24, pp. 583-594.

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