

Detection of land surface changes and environmental impact brought on by urban sprawling

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Abstract— Land use and land cover (LULC) recently these days became a major component to handle natural resources and managing changes occurring in the features of environment. which is due to the expansion of the urban area, lead to environmental impacts of agriculture land, vegetation land and water bodies. Followed by this the urban sprawl created many environmental issues. For example: decreased air quality and increase in the temperature etc., in this work I took Gulbarga Urban to study the urban expansion and LULC change that took place in from year 1974 to 2014. To know the changes happened in the year 2014 by comparing with data's, remote sensing methodology is used in this study which provides major coverage mapping & classification of land cover features such as vegetation, soil, water, forest etc. A wide range of environmental parameters can be measured including the land use, satellite images of different years taken in to consideration. After image processing, classification is done so as to classify images in to various different land use categories.

the jurisdictions of Panchayats, which have neither financial resources nor technical expertise to plan and solve the problems of growing cities out of their limit. The urban authorities also ignore to manage the rapidly developing urban areas. Cities growths are not planned, monitored and mapped correctly using recent techniques. Hence, there is a need to map all the cities scientifically to detect changes that have occurred within and around built-up areas and also to propose new extensions in under-developed areas of the city.

Location Map and Objectives of Study

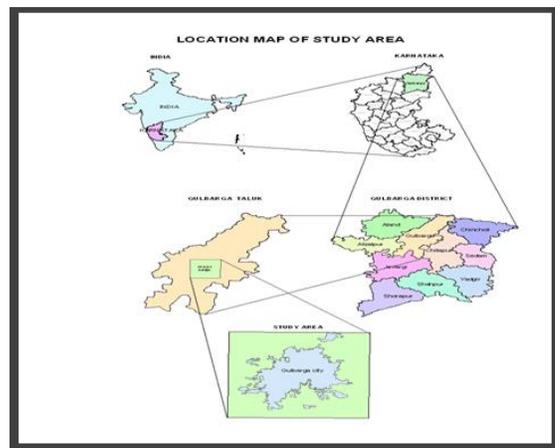
Gulbarga City is a headquarters of the Gulbarga District, one of the 30 Districts of Karnataka State and is also the Divisional Headquarters. The Gulbarga revenue Division consists of the Districts of Gulbarga, Bidar, Raichur, Bellary, Koppal, and Yadgir.

Keywords: Physical and hydrological information, Arc GIS Ver 10.1 etc...

I. INTRODUCTION

The urban centers prolong on land and it is the land that puts up the major part of the entire environment. Any environmentally well-matched town planning must start up with a comprehensive look on the use of land. Consequently, there is a great need for detailed data and information to planners about the extent, coverage and spatial distribution of diverse urban land uses, housing distinctiveness, growth patterns, population, urban development, infrastructure availability, utilities, urban fringe, etc. The rapid and random expansions of cities are a typical phenomenon of urban landscape in India. The expansions of the cities within and beyond their limits are sadly remained a neglected area in urban research. There is no definite boundaries where urban area ends and rural area starts. The cities spread out within

Map 1.Location Map



1.2 OBJECTIVES

1. To evaluate and analyze the land use changes and urban sprawl due to population growth and land demand for providing better management of Infrastructure.

2. To study the environment impact due to the Rapid growth of Gulbarga City by using Geographic Information System and Remote Sensing technique.
3. To design Environment infrastructure for mitigating the Environment problems.

II. MATERIALS AND METHODOLOGY

In the present study, the maps showing tank details have been prepared from digital data of IRS1C and 1D of LISS III and SOI Topomaps. These satellite image and Toposheets have been geo-referenced using Arc GIS (V10.1) software. The tanks have been delineated using SOI Toposheets on 1:50,000 scale. The tanks areas are considered for the analyses are summarized in detail in table no 1. Arc GIS software have been used for digitization and computational purpose and also for the output generation is shown in fig1.

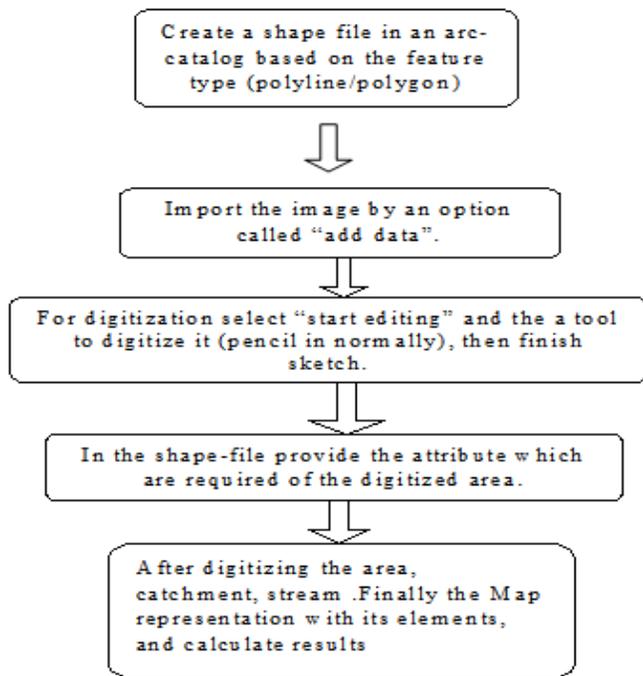


Fig.1 Arc GIS Methodology chart

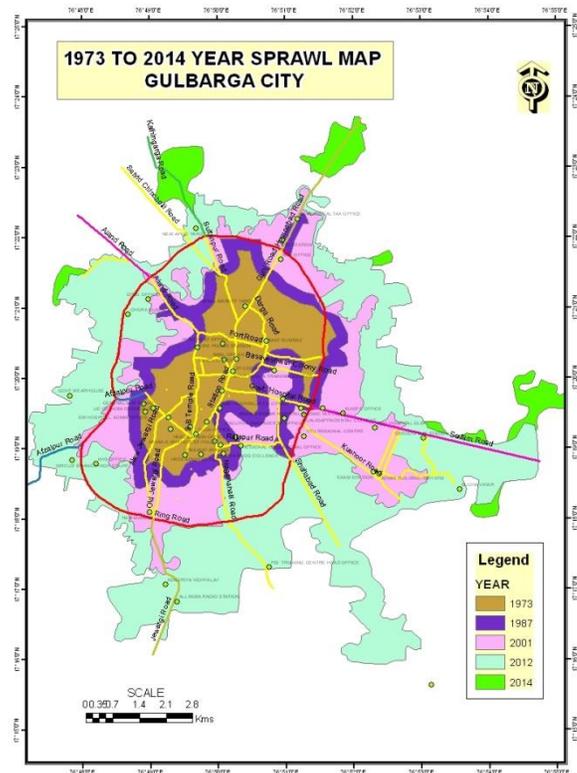
III.RESULTS AND DISCUSSIONS

The urban development system is analyzed by the Arc GIS Software and compiled the results by above methodology.

3.1 CHANGE DETECTION THAT TOOK PLACE DURING THE PERIOD 1973 and 2014:

Change detection analyses describes and quantify differences between images of the same scene at different times. The classified images of the four dates can be used to calculate the area of different land cover and observe the changes that are taking place in the span of data. This analysis is very much helpful to identify various changes occurring in different classes of land use like increase in urban built-up area or decrease in shrub and so on.

Map 1. Showing 1973 to 2014 sprawl map



The above map shows the areas of each year

Table 3.1: Areas of Gulbarga city for decade 1973-2014

Year	Area in Ha
1973	1269.57
1987	2138.65
2001	3995.53
2011	4371.45
2014	8855.83

Environmental impacts

LAND USE CHANGES

TABLE-3.2. TOTAL BUILT-UP AND NON BUILT-UP AREA (1987-2008)

Sl.No.	Year	Total Area (km ²)	Total Built-up Area (km ²)	Total Non Built-up Area (km ²)
1.	1973	88.56	12.7	75.86
2.	1987	88.56	21.39	67.17
3.	2001	88.56	39.96	48.6
4	2011	88.56	43.71	44.85
5	2014	88.56	88.56	

As per above mentioned maps year 2014 total area is 88.56 km². In the 1973 built up area as per above maps 12.7 km² the built-up area of Gulbarga City grew by in 1987 21.39 km², the built-up area of Gulbarga City grown in 2001 39.96 sq.km, and from 2011 it grew by 43.71 sq.km.

Between 1973 and 2014, the growth was more than 2.5 times, i.e., 75.86 sq.km. This shows that the increasing built-up area of Gulbarga City exercises a lot of pressure on the land available in the City and the City's limits have been pushed towards the adjacent villages. Recently, three villages had been added to the old municipal limit and the total area of Gulbarga City increased. As shown in above table.

3.3 Analysis of air Quality of Gulbarga City

Table 3.13 (Refer Appendix 3.1) reveals that suspended particulate matter is found ranging from 9.78 µg/m³ to 337.10µg/m³ and also irrespirable particulate matter between 29 µg/m³ and 102.45 µg/m³ and on most days both the pollutants are above the standard limits Higher values are found the impurities in air during the weekends.

3.3.1 Traffic, Travel and Air Pollution:

The traffic at the Janata Bazar Circle on week days has been observed a total of 155,049 vehicles were counted on all days of a week in 2011, of which Monday (22,830; 14.72 percent) Thursday (23,122; 14.91 percent),Friday (26,206; 16.9 percent), and Saturday (28,386; 18.31 percent)

accounted for nearly 65 percent of the 12-hour traffic of that week.

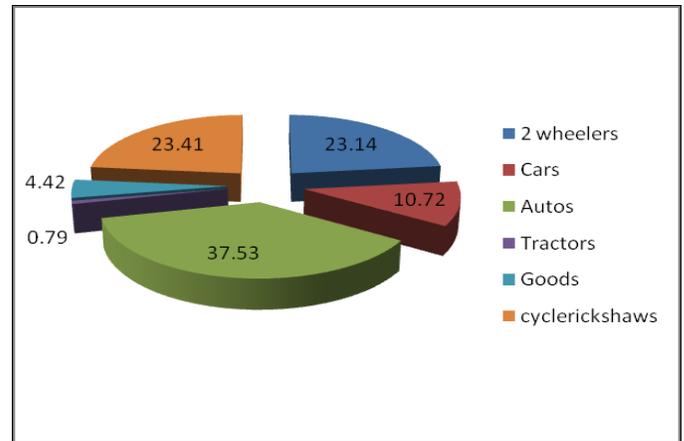


Figure3.3.1.: Traffic Volumes by Modes at JB Circle

Source: Traffic Survey by the researcher, 2011.

Higher concentrations of pollutants are in the air during weekends but most of the times from Friday (158.32µg/m³) to Monday (SPM-50.87µg/m³, RSPM-63.46µg/m³). The highest of suspended particulate matter is 115.68µg/m³ against the standard value of 30µg/m³ and respirable particulate matter is 81.27µg/m³ against the standard value of 70µg/m³. As the GDA circle is the mid junction between the bus stand and the railway station, a large traffic is found during weekends. Commuters are large in Gulbarga as it is the divisional headquarters and an educational centre. Impurities are found high during the weekends because of heavy traffic which is shown as true by the traffic survey. 12-hour traffic survey at the GDA Circle on all days of a week has been reported in Table 3.18 (Refer Appendix 3.1). The traffic volume is very high at the GDA Circle when compared to the Janatha Bazaar Circle. **It is 253,183 vehicles strong, with high volumes on Monday (46,550; 18.39 percent), Friday (54,233; 21.42 percent) and Saturday (35,610; 14.06 percent).**

represents the week long survey at the GDA Circle.

Agriculture: During 2012 the total geographical area of the Gulbarga city was 21754.46 hectares, of which agriculture area was 12064.59 hectares land not available for cultivation was 2213.75 hectares, the below table and figure shows the land change in land surface

Table 3.2.3

DESCR	2001
Agriculture_Land	12980.52
Built_Up_Land	3402.49
Industrial_Area	212.34
Tank	70.44
Vacant_Land/Wastelands	3087.29
	21754.08

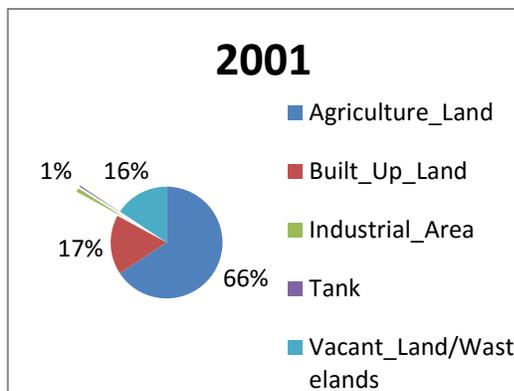


Figure 3.3.2

Table 3.3.2

DESCR	2012
Agriculture_Land	12064.59
Built_Up_Land	5051.34
Industrial_Area	390.20
Tank	22.57
Vacant_Land/Wastelands	2213.75
	21754.46

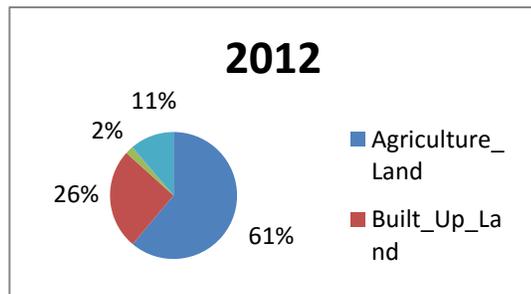


Figure 3.3.3

Mitigation

1. Reducing the Agriculture production and activity.
2. Degrading the land for stone cruse mining activity.
3. Encroachment of tanks in the city problem for Ground water recharge.
4. Cutting trees for Road development in the city.
5. Over Built up and fastest city developing reducing the natural resource.
6. Rain harwasting.

CONCLUSIONS AND SCOPE FOR FUTURE STUDIES

- As discussed above that an integrated approach of GIS and RS can play very important role in the study of Land use land cover area, industrial area, built up area, and it's planning development.
- Change detection analyses describes and quantify differences between images of the same scene at different times. This analysis is very much helpful to identify various changes occurring in different classes of land use like increase in urban built-up area or decrease in shrub and so on.
- The satellite images of 1974 and 2014 indicate that there is linear and nonlinear type of sprawl along the transportation arteries of the Gulbraga City, particularly along the State Highways, around the City.
- During The study period it is found that there is maximum increase in the built up area, in 2011 the area was 3402.49 Ha (17%) & in 2012 it is found 5051.34Ha (26%).hence there is increase of 11.15% of built up area with respect to the total area of study area(10130.73Ha).
- During The study period it is found that there is Decrease in the crop land area, in 2001 the area was 12980.52 Ha (66 %) & in 2012 it is found 12064.59 Ha (61%), hence there is decrease of 1 % of crop land with respect to the total area of study area(21754.46Ha)..

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BIOGRAPHIES



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