



## **URBAN LAND USE CLASSIFICATION AND CHANGE DETECTION ANALYSIS USING GEOSPATIAL TECHNOLOGY: A CASE STUDY OF AURANGABAD CITY**

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### **Abstract**

*Urbanization is the dynamic process of worldwide phenomenon. Urban growth is affected by human interference and natural phenomena such as agricultural demand and trade. These causes are influenced by population growth, government policy and economic development. Remote sensing and geographical information system (GIS) are very valuable and advance technology is providing current land use information. The mostly changes of land use in these areas can be described as other type of land use has been converted into urban land. The present study highlights significance of remote sensing in the change detection of urban land use changes for the deferent times periods of (1991 to 2011) using the satellite imagery. Satellite imageries Landsat-5 Tm (1991), Landsat-5 Tm (2001) and IRS P6 LISS4 data were using to map the urban land use for 1991 to 2011. Remote sensing imagery is the most important data resources of GIS. Global Position System also uses for capture the major features identification in the corporation area. Present work has carried out with the help of computer based GIS and Image processing software. The present study has shown that remote sensing techniques have tremendous potential for mapping and monitoring of land use. There is significant decrease of agriculture area and increase in settlement area from year 1991 to year 2011. The rapid urban growth has been converted most of the agricultural land into built-up land.*

**Keywords:** *Urban land use, Remote sensing, Geographical Information System,*



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### **INTRODUCTION:**

Urban growth is worldwide phenomenon and it is also process of directly impact on the ecological, economic and social activities in urban area. Remote sensing data has been used for land use classification of land use changes. Remote sensing imagery is the most important data resources of geographical information system. Geographical information system is the most powerful tool for the data collection, data storage, retrieving,

transformation and display spatial data from the real world. The remote sensing is capacity to given the accurate and current information to map making measure and display the different element of urban growth. The urban land use changes are a major issue of the global level. Land cover is a which cover of the earth surface and described changes include the land cover of urban area, water bodies, settlement, forest land, barren land, agricultural and recreational etc. The urban spread means the urban settlements spread to the rural fringe like. Growth of built-up area separate the city limits. Urban geography is the most important branch of human geography it the study of evolution of urban and its function and development of surrounding of urban region. It is study to urban centers in situation of geographical factor. Urban growth is indicating to the urban population growth. It is the including population growth of urban area and increased of urban size. The urbanization is depending on the social and economic activities in society and development. Urban growth is the concern as the different process of land use changes of urban area. Urban growth is the defined the expansion of newly developed as the isolated areas separate from the other area. The process of urban growth is contributed by population growth and migration. Urbanization indicates population increase in urban areas, the growth of secondary and tertiary activities. Indian cities are experiencing an accelerated pace of growth since independence. Cities are now emerging ascenders of domestic and international investments in an era of economic changes, liberalization and globalization. The economic development of the region has been linked with the level of urban growth. The urban land use changes are mostly removed the vegetation and concert agricultural land for human activities like housing construction, road construction and livestock etc. The main causes are directly impact by the urban growth these are economic development of area, industrial growth, government policies and uncontrolled population growth. The GIS and Remote Sensing are technology advanced technology has been provided the current land use information of earth surface. The urban land use changes described the types of land use convert by the urban area

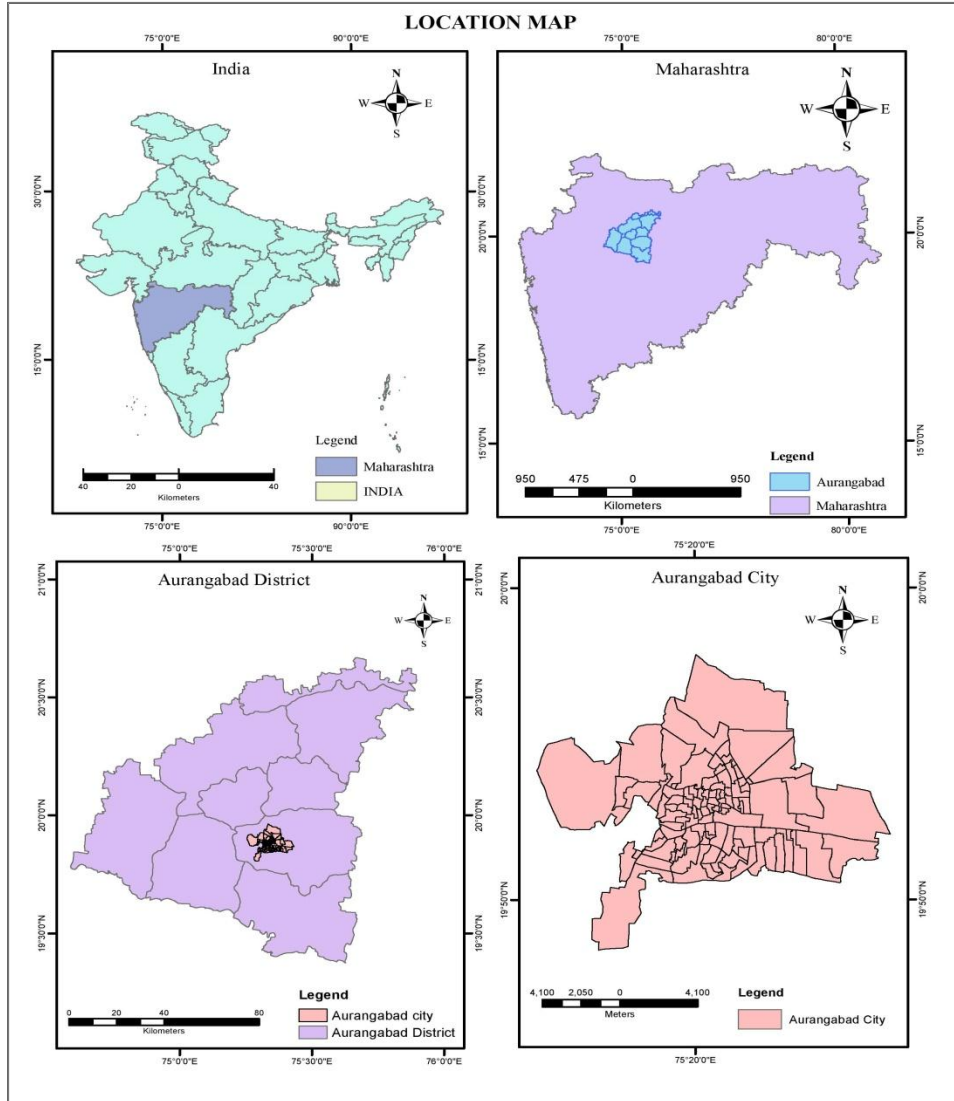
**OBJECTIVE:**

1. To Study of Population Growth and Density of Aurangabad city.
2. To Classify the Urban land uses.
3. To study of changing urban land use using Satellite Images.

**STUDY AREA:**

Geographical location of the Aurangabad Municipal Corporation between 19 ° 53'59'' north latitude and 75 ° 22'46'' East longitude. The Aurangabad city has situated from mean sea level of 581mts. It is a district and divisional headquarter located on the Kham

river. The city of Aurangabad situated on the Deccan trap stand by the Dudhna valley between the Lakhwara ranges of the northern side and satara hills are located in southern part of the city. It is having area of the 138.50 sq. Km. its total population is 609206 male and female 565910 as per 2011 census.

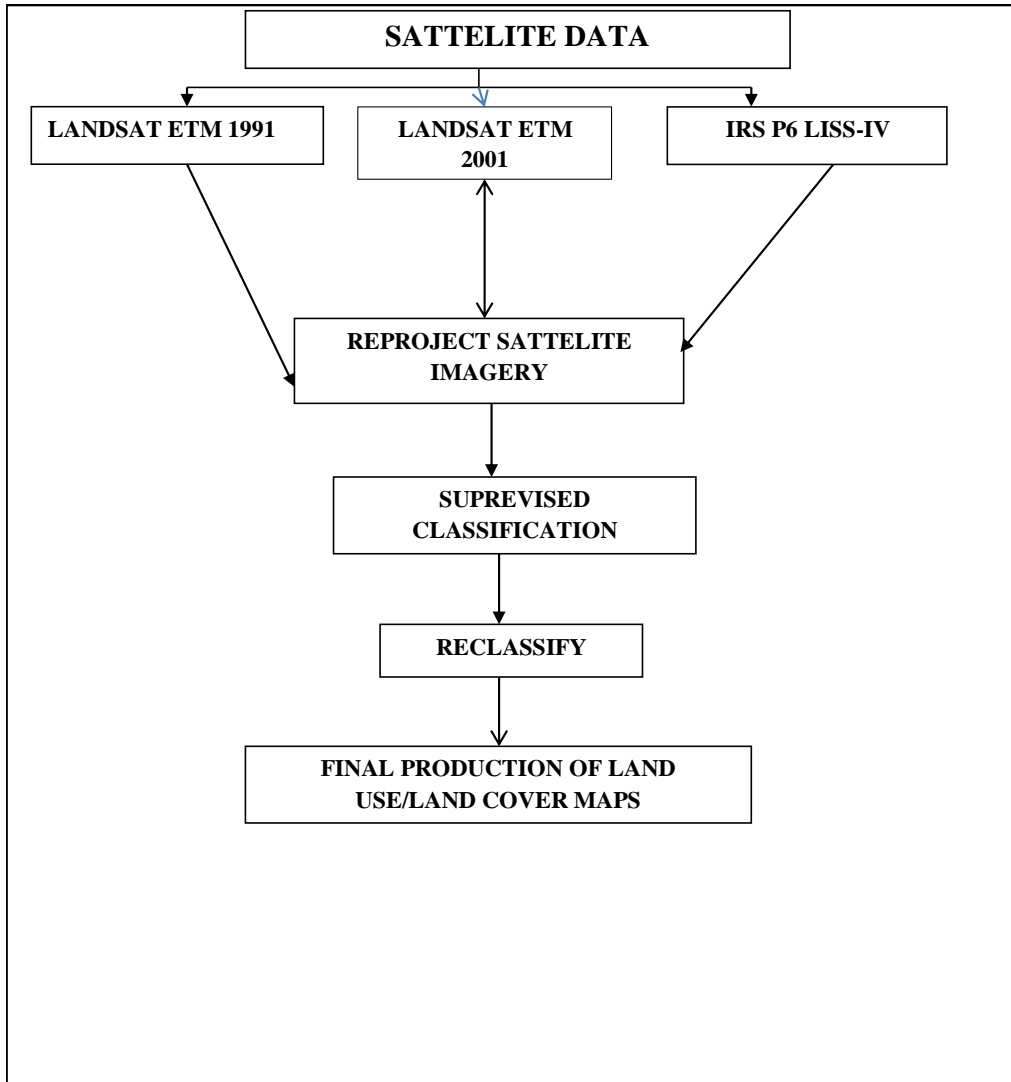


### **DATA COLLECTION AND METHODOLOGY:**

The collected data has been processed and analyzed by using different quantitative, statistical technique. Prepare the base map of survey of India SOI topographic sheet map, Satellite imageries LANDSAT-5 TM (1991), LANDSAT-5 TM (2001) and IRS P6 LISS4 data were using to map the urban growth for 1991 to 2011.the major land use are identify from SOI Toposheet 47 M/7.the classify land use map of 1991, 2001 and 2011.sattelite images we are used for the land use classification. Global Position System also uses to

capture the major features identification in the corporation area. Present work has carried out with the help of computer based GIS software and Image processing software.

**FLOW CHART OF METHODOLOGY**

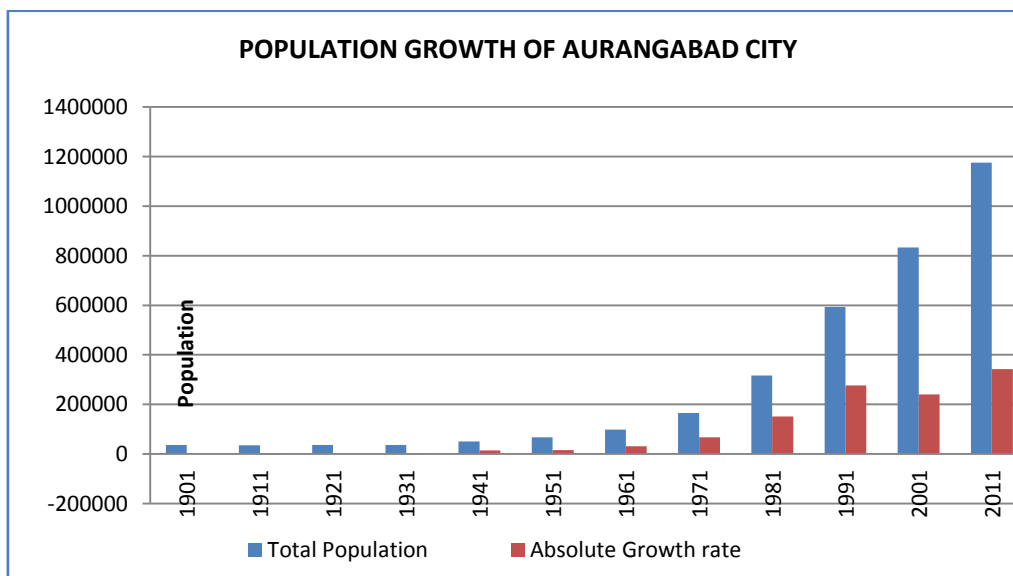


**GROWTH OF POPULATION IN AURANGABAD CITY**

(1901 to 2011)

| Sr.no | Year | Total Population | Absolute Growth Rate | Decadal Growth Rate |
|-------|------|------------------|----------------------|---------------------|
| 1     | 1901 | 36837            |                      |                     |
| 2     | 1911 | 34902            | -1935                | -5.25               |
| 3     | 1921 | 36876            | 1974                 | 5.66                |
| 4     | 1931 | 36870            | -6                   | -0.02               |
| 5     | 1941 | 50924            | 14054                | 38.12               |
| 6     | 1951 | 66636            | 15712                | 30.85               |
| 7     | 1961 | 97701            | 31065                | 46.62               |
| 8     | 1971 | 165253           | 67552                | 69.14               |
| 9     | 1981 | 316421           | 151168               | 91.48               |

|    |      |         |        |        |
|----|------|---------|--------|--------|
| 10 | 1991 | 592709  | 276288 | 87.32  |
| 11 | 2001 | 833311  | 240602 | 45.36  |
| 12 | 2011 | 1175116 | 341805 | 41.017 |



Growth Rate of population is expressed as the percentage growths or decreases in population over the previous census this is generally called as the decadal growth rates of population. The decadal growth of population indicates the percentage if the addition of population to the earlier census. Growth of urban population considered from 1901 to 2011 in Aurangabad city. The maximum growth rates are found in Aurangabad city from 1971 to 1991 i.e. 69.14 percent in 1971, 1981 (91.48 percent) and 1991 (87.32 percent). Overall highest growth rate found in 1981. Negative growth rates were found in year 1911 and 1931 which have registered negative growth rates of -5.25 and -0.02 percent respectively.

**POPULATION DENSITY OF AURANGABAD CITY**

(1961 TO 2011)

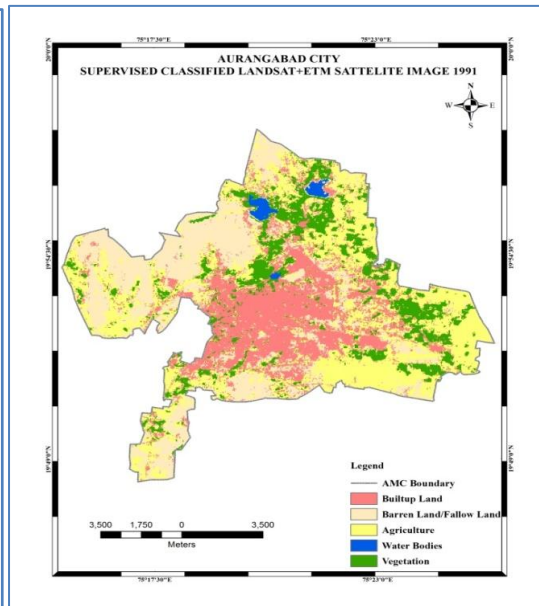
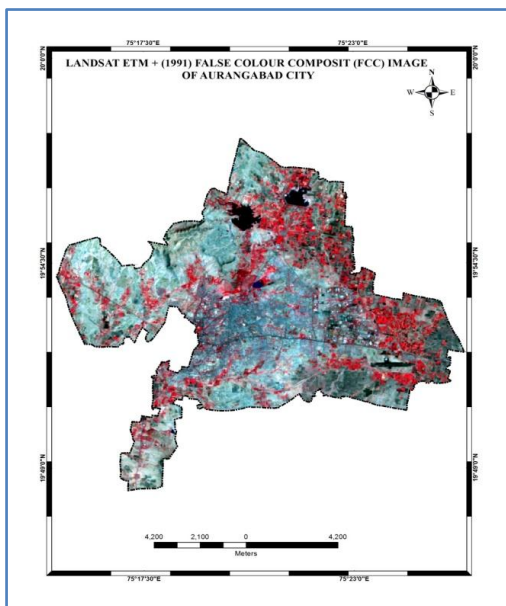
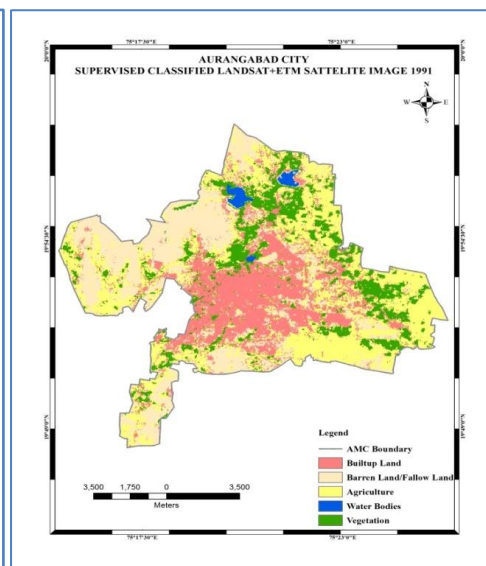
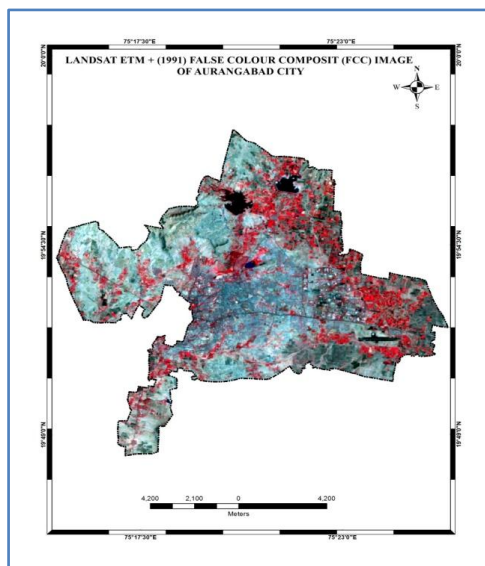
| Year | Population | Area Km | Sq. Density |
|------|------------|---------|-------------|
| 1961 | 87579      | 40.87   | 2143        |
| 1971 | 150483     | 40.79   | 3689        |
| 1981 | 298937     | 54.2    | 5455        |
| 1991 | 573272     | 138.5   | 4139        |
| 2001 | 873311     | 138.5   | 6305        |
| 2011 | 1175116    | 138.5   | 8485        |

The average population density of Aurangabad city was 2143 persons per Sq.km in 1961, it increased up to 3689 and 5455 persons per sq.km in 1971 and 1981 respectively. Aurangabad municipal corporation was ‘‘A’’ class municipal council it’s having area about 54.4 sq. Km in 1982. Then municipal council was converts into Municipal Corporation in

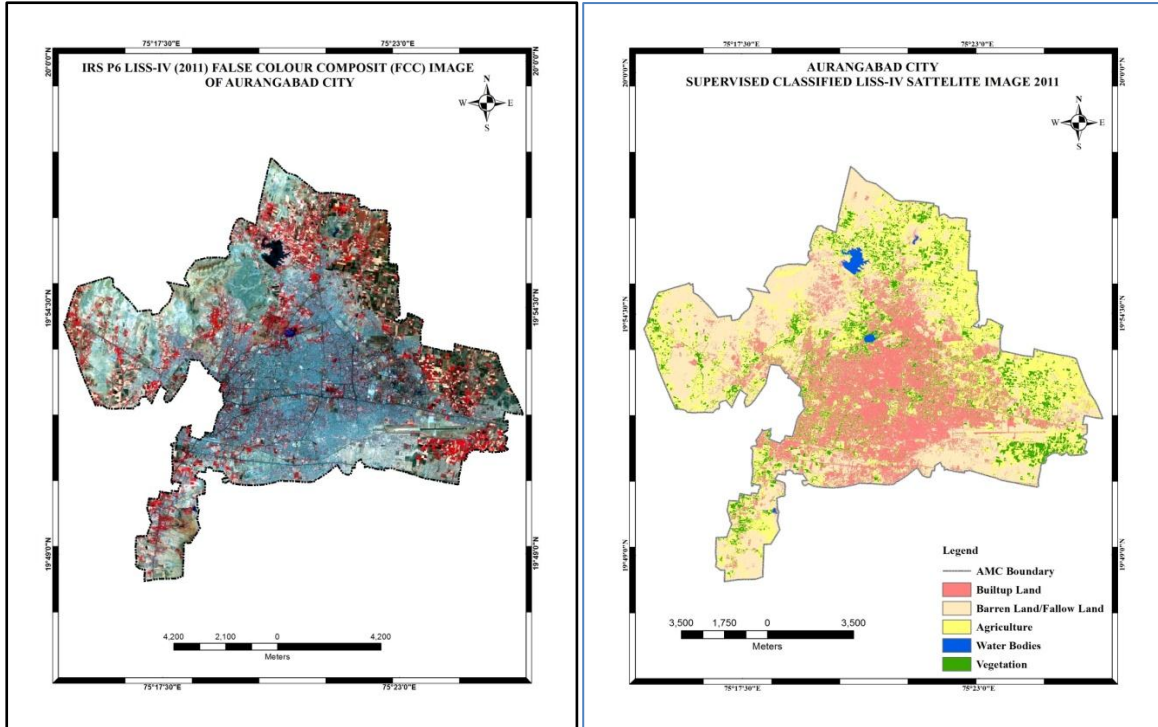
1982 Additional 18 villages including corporation. In 1982, the Municipal Corporation area increased by 84.30 Sq.km and total area has been extended up to 138.50 Sq.km. Population density is decreased in the year of 1991 as compared to population density in 1981. In 1991 density were 4139 persons per Sq.km, while in the year 2011 population density increased to 8485 persons per Sq.km

**LAND USE CLASSIFICATION:**

The following paper has given the detailed urban land use classification for using the Landsat and Lissiv4 satellite data. Urban land use classifies total five categories that are agricultural land, water bodies, barren land, vegetation and settlement of Aurangabad Municipal Corporation.





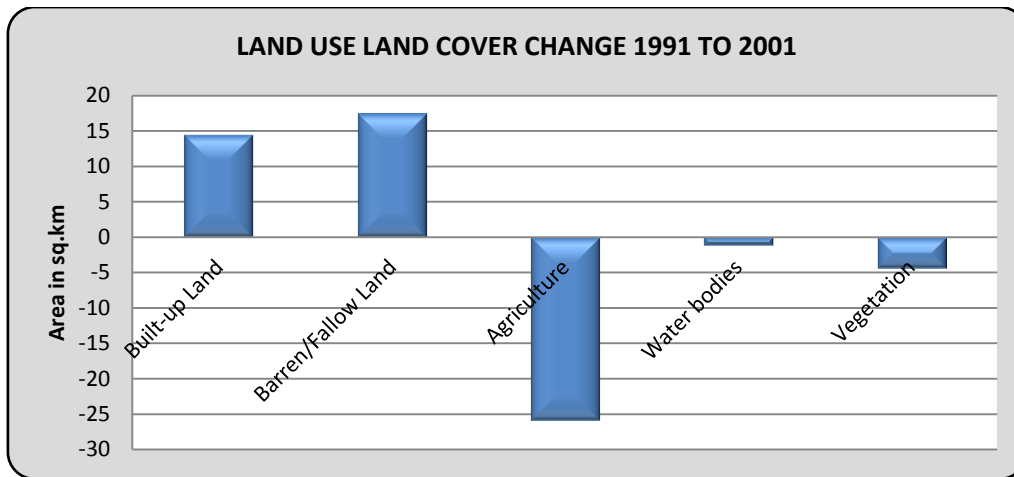


**LAND USE CHANGE DETECTION:**

The Satellite data has been analyzed to the urban land use classification of Aurangabad city. The urban land changes the agricultural land changing in to settlement area. Barren land has been increased its different reasons. These are the Industrial growth and second are after 1982 the municipal council converts into Municipal Corporation in 1982 and Additional 18 villages including corporation area then its area has been increased upto 138.84 sq.km.

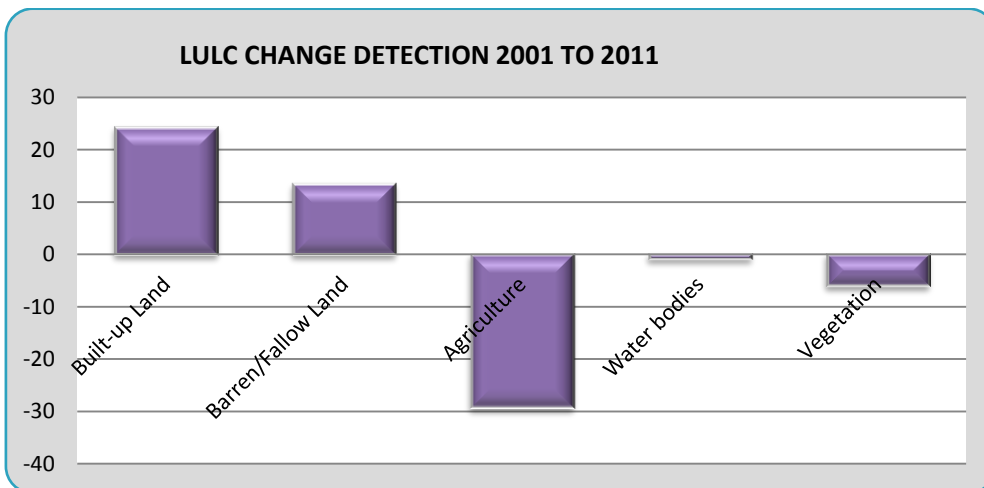
**Land use land cover change detection 1991 to 2001**

| Sr. No | Land use category  | 1991          | 2001          | Change |
|--------|--------------------|---------------|---------------|--------|
| 1      | Built-up Land      | 34.5          | 48.47         | 13.97  |
| 2      | Barren/Fallow Land | 35.14         | 52.58         | 17.44  |
| 3      | Agriculture        | 48.18         | 22.39         | -25.39 |
| 4      | Water bodies       | 1.47          | 0.3           | -1.17  |
| 5      | Vegetation         | 19.55         | 15.13         | -4.42  |
|        | <b>Total</b>       | <b>138.84</b> | <b>138.84</b> |        |



**LULC CHANGE DETECTION 2001 TO 2011**

| Sr. No | Class Name         | 2001 (sq.km)  | Area | 2011 (sq.km)  | Area | Change (sq.km) |
|--------|--------------------|---------------|------|---------------|------|----------------|
| 1      | Built-up Land      | 48.47         |      | 58.23         |      | 9.76           |
| 2      | Barren/Fallow Land | 52.58         |      | 48.51         |      | -4.07          |
| 3      | Agriculture        | 22.39         |      | 19.02         |      | -3.37          |
| 4      | Water bodies       | 0.3           |      | 0.61          |      | 0.31           |
| 5      | Vegetation         | 15.13         |      | 13.58         |      | -1.55          |
|        | <b>Total</b>       | <b>138.84</b> |      | <b>138.84</b> |      |                |



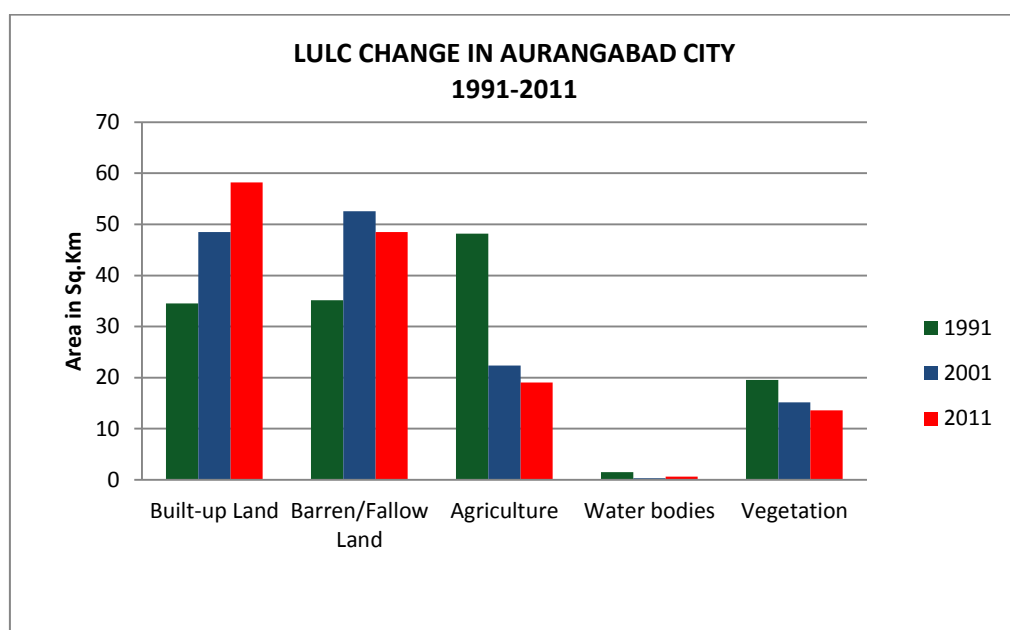
After supervised classification of satellite image land use change has been detected from 1991 to 2011 in Aurangabad city. The built up area has been increased from 34.5 sq.km to 58.23 sq.km and found 14.42 sq.km increased in built up area. Barren land observed 17.44 sq.km increased from 1991 to 2011 because of plotting for new construction and reserve land for the public and semi-public uses by government but not built up yet. Most important negative change found in agricultural are i.e. 48.18 sq.km in 1991 to 19.02 sq.km in 2011 and overall changes found decreased by -25.79 sq.km is agricultural area of Aurangabad city.



Agricultural area decreased due to agricultural land convert in to non-agricultural land use e.g. settlement, industrial, and roads. Etc.

**Land use land cover change detection 1991 to 2011**

| Sr. No | Land use category  | 1991 (Area in sq.km) | 2001 in (Area sq.km) | 2011 in (Area sq.km) | in Change (sq.km) |
|--------|--------------------|----------------------|----------------------|----------------------|-------------------|
| 1      | Built-up Land      | 34.5                 | 48.47                | 58.23                | 19.73             |
| 2      | Barren/Fallow Land | 35.14                | 52.58                | 48.51                | 13.37             |
| 3      | Agriculture        | 48.18                | 22.39                | 19.02                | -29.16            |
| 4      | Water bodies       | 1.47                 | 0.3                  | 0.61                 | -0.86             |
| 5      | Vegetation         | 19.55                | 15.13                | 13.58                | -5.55             |
|        | <b>Total</b>       | 138.84               | 138.84               | 138.84               | <b>00</b>         |



Water bodies and vegetation also observed the negative change i.e.1.17 sq.km and 4.42 sq.km respectively from 1991 to 2011 in Aurangabad city. Small water bodies have found in city area these are Salim Ali Lake, Harsool Lake and Sawangi water body.

**CONCLUSION:**

The present study has shown that remote sensing techniques have tremendous potential for mapping and monitoring of land use. The geographic information system and remote sensing tools are very useful for the urban land use classification. There is significant decrease of agriculture area and increase in settlement area from year 1991 to year 2011. The rapid urban growth has been transformed most of the agricultural land and vegetation cover had been convert into residential area. The total agricultural land is 48.18 sq.km in 1991 presently area is decreased up to 19.03 sq.km. In 2011 that is the decreased to -25.19 percent.

The main reason for urban land use changes development of city, industrial growth and demand of settlement area.

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