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Geographical analysis of Population growth and Urban Expansion of Aurangabad city using Geoinformatics

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ABSTRACT

Growth of population is increased a number of peoples in habiting given over the period of time whereas urbanization is process of population focus in particular area. Urbanization is the dynamic process of worldwide phenomenon. Urban growth is affected by human interference and natural phenomena such as agricultural demand and trade. Urban area extends in transformed times period were extracted by supervised classification technique of satellite image, and then the population data were coupled to complete the analysis. The remote sensing data and Geographical information system has been used widely to analyze and the pattern of urban growth. These causes are influenced by population growth, government policy and economic development. The built up area data and population data were used to assess and investigate the urban growth process and its spatial pattern. 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 growth of urban population in Aurangabad city considered from 1901 to 2011. The highest growth rate of population in Aurangabad city was observed in 1981 i.e. 91.48 and lowest the population growth rate was observed from 1911 to 1921 i.e. -6 per cent. Presently total population in Aurangabad city is 1175116 persons and its decadal growth rate in 41.17. There is significant decrease of agriculture area and increase in settlement area from year 1991 to year 2017.The rapid urban growth has been transformed most of the agricultural land and vegetation cover had been convert into residential area.

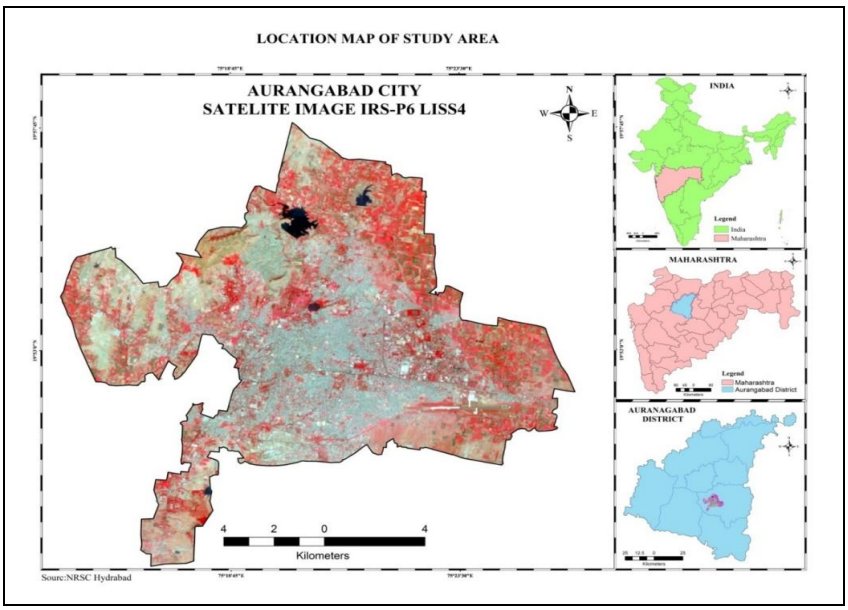
1. Introduction

The growth of urban population influx in the urban area and physical expansion of the built-up area outside the city limit are the investigation as important factor for increased demands for more land as well as land use changes. Population Growth is increased a number of peoples in habiting given over the period of time whereas urbanization is process of population focus in particular area. The process of urban growth is contributed by population growth and migration. The built up area data and population data were used to assess and investigate the urban growth process and its spatial pattern. 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 process of urban growth is contributed by population growth and migration. Urban growth is global phenomenon and it is also process of directly impact on the ecological, economic and social activities in urban area. 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. Urban expansion 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 remote sensing data and Geographical information system has been used widely to analyze and the pattern of urban growth.

2. Study Area

The selected study area was Aurangabad city in Marathwada region, it is a district and divisional headquarter of the Marathwada division. Aurangabad city is one of the famous industrial and fastest growing cities in Asia and which is well famous for its Industrial auto cluster. It is located in the central part of Maharashtra. The figure no.1 has been showing the location between 19º 53' 59'' North latitude and 75º 22' 46'' East longitudes. The Aurangabad city is located on the Deccan trap stand by dhudhna valley between the Lakhwara ranges of the northern side and Satara hills are located in southern part of city. Aurangabad municipal corporation was "A'' class municipal council it's having area about 54.4 Sq. Km in 1982. Then municipal council converts into Municipal Corporation in 1982

Additional 18 villages including corporation limits. It's having area of the city 138.50 Sq.km In 2011.The total area of Aurangabad city was divided into 60 wards in 1991 (83) 2001 and (99) 2011.



Map.No.1 Location Map

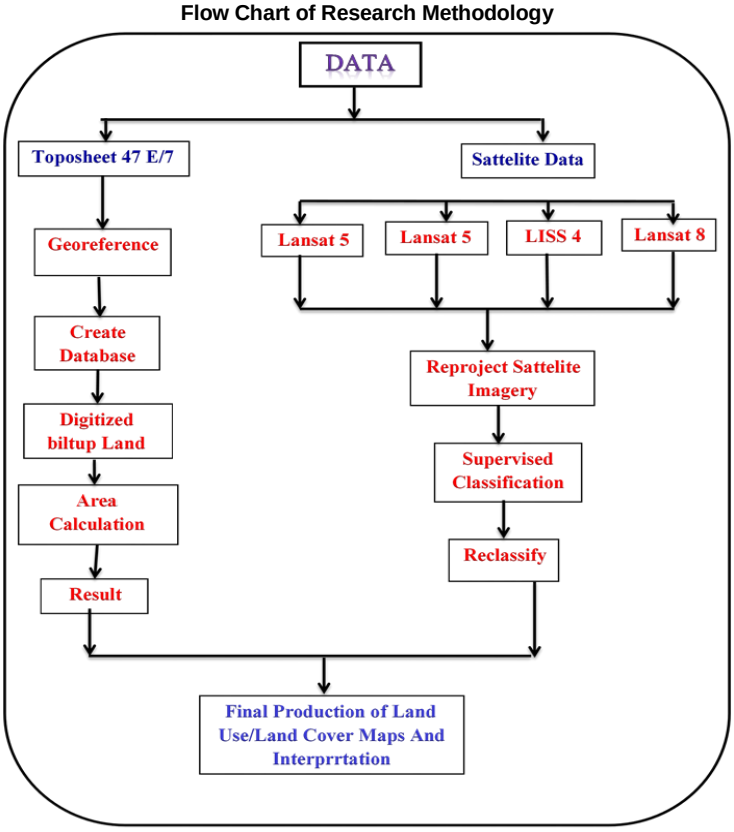
3. Objective

1. To Analyze the population Growth of Aurangabad City
2. Examine the Land use land cover change detection of Aurangabad City
3. To Study the growth of built-up land in Aurangabad city

4. 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), IRS P6 LISS4 and Landsat-8 TM data were using to map the urban growth from 1991 to 2011.the major land use are identify from SOI Toposheet 47 M/7.the classify land use map of 1991, 2001, 2011and 2017.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 Research Methodology



5. Population Growth

A Growth rate of the population is expressed as a percentage increased or decreased in population previous census and hence this is called usually decadal growth of the population. The trend of population growth of the study area shows regular growth in population, which indications similarity with the growth of population in Aurangabad city.

Aurangabad City

Table 1. Population Growth 1961-2011

Sr. No	Year	Total Population	Absolute Growth Rate	Growth Rate
1	1961	97701	-	-
2	1971	165253	67552	69.14
3	1981	316421	151168	91.48
4	1991	592709	276288	87.32
5	2001	833311	240602	45.36
6	2011	1175116	341805	41.017

Source: Census of India, Aurangabad District 1961-2011

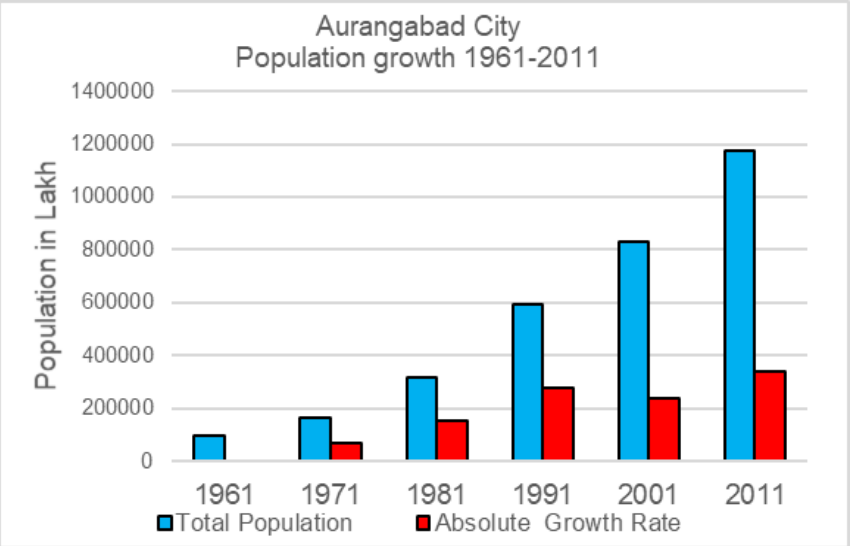


Figure no.1 Population Growth 1961-2011

The decade growth rate gives changed picture, which the growth rate of population of Aurangabad city shows Continuous increase of population from 1961-2011. The population growth rate of the city which shows 69.14 percent in 1961-1971. The next decade population growth rate has increased up to 91.48 in 1971-1981. The population growth rate of the Aurangabad city has continually increased from the 1961-1981. While trend of the growth rate of the city indicates decline during the decade from 1991-2011 which is decreased population growth rate i.e. (87.34) in 1991, (45.36) was 2001 and 2011 (41.01).

6. Ward wise Population growth

It is similarly significant that the ward level in the city area and population distribution is uneven in the city, which is generally economic and social aspects impact of the city area. To identify the spatial design of population growth in the city individually ward has been considered as a spatial unit. Therefore the total population of the city is considered into five classes they are as follows:

Table 2.Ward Wise Population Growth

Population	1991	2001	2011
Below- 5000	14	5	0
5000 - 10000	32	45	37
10000-15000	6	22	48
15000-20000	3	8	7
Above-20000	5	3	7
Total Wards	60	83	99

Source: Completed by Researcher

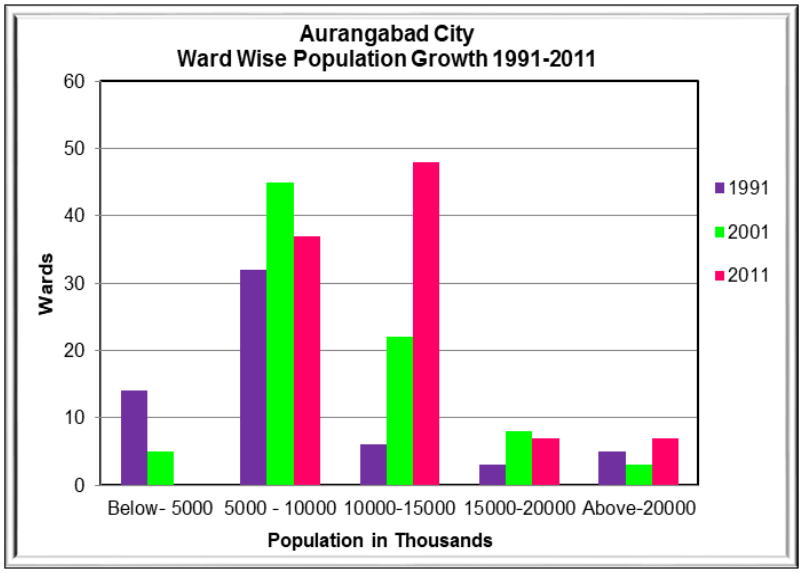
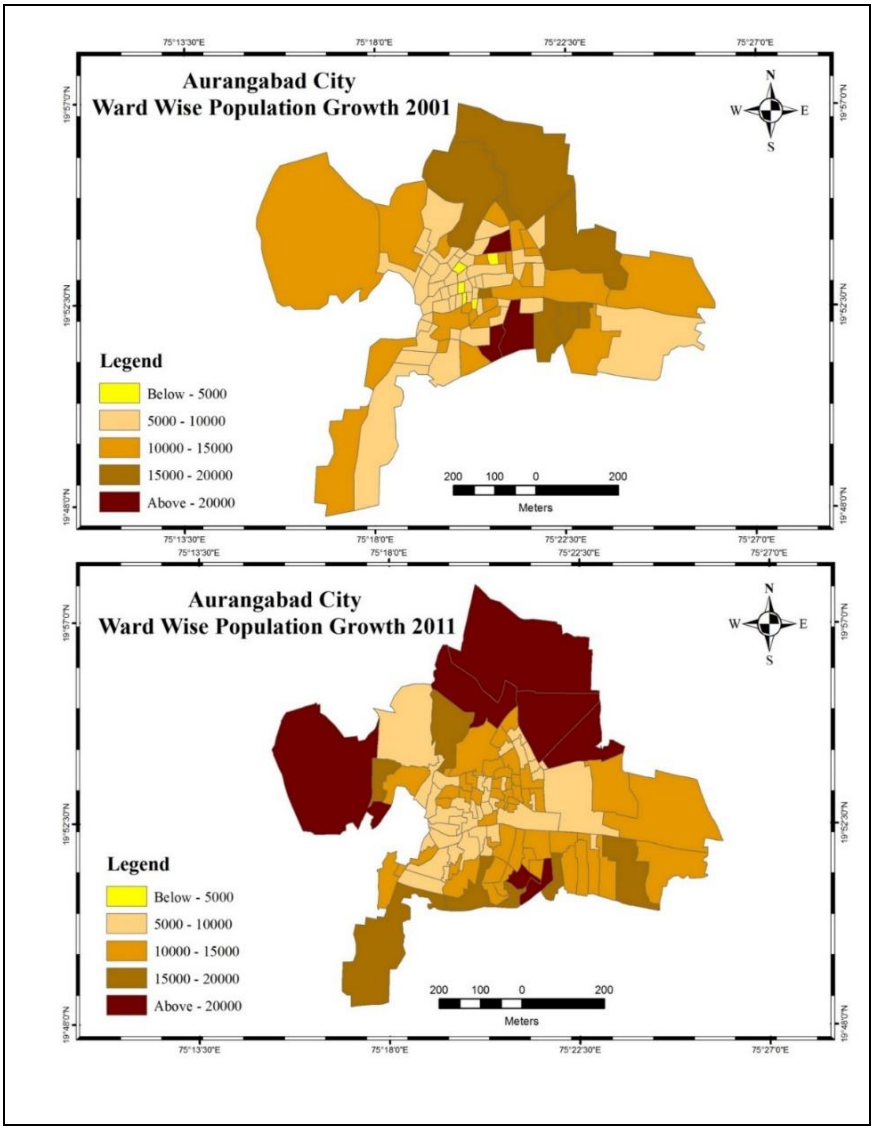


Figure no.2 Ward Wise Population Growth 1991-2011

A proportional study of ward-wise population growth of shows that, there are important changes in the population Growth in different wards. The spatial growth of population has observed the base on ward level in the city from 1991-2011. Above given table no 2 shows the ward wise population growth of Aurangabad city in 1991-2011, there were 14 wards with a population of less than 5000 in 1991 but in 2001 it decreased to 05 wards, but in 2011 no any ward found in this category.



Map.No.2 Ward Wise Population Growth 2001-2011

The population growth from 10000 to 15000 in 1991 there were 06 wards, and in 2001 it increased to 22 ward. In 2011 the number of wards has increased to 48 ward having 10000-15000 population. There were a total of 05 wards in 1991, more than 20000 population and 3 wards in 2001 whereas in 2011, there were 07 such wards having more than 20000 population.

7. Land Use Land Cover Change Detection

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. 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 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.

8. Land Use Land Cover Change in 1991-2001

According to table 3 showing that built-up area increased 22.25% (13.97 sq.km) of the total land area from 1991-2001.

Table No.3 LULC 1991-2001

Land Use Pattern	1991	2001	Change in Sq. Km	LULC Area Changed in %
Built-up Land	34.5	48.47	13.97	22.25
Water body	1.47	0.3	-1.17	-1.86
Barren Land	35.14	52.58	17.44	27.78
Agricultural Land	48.18	22.39	-25.79	-41.07
Vegetation	19.55	15.13	-4.42	-7.04
Total Area(Area in Sq.km)	**138.84**	**138.84**	**-**	**100.00**

Source: Completed by Researcher

Barren land is the most of changes i.e. 27.78 percent (17.44 sq.km) of the total land area. It would also be observed that the mostly changes on the agricultural land i.e.41.07 percent (-25.79), agricultural area has continually decreased in this period. Vegetation area also decreased i.e.-7.04 (-4.42 sq.km) because of most of the Vegetation has been converted in to built-up land and barren land, lastly water body occupied -1.86 percent (-1.17 sq.km) water body depends on the monsoon.

9. Land Use Land Cover Change in 2001-2011

Table no.4 LULC 2001-2011

Land Use Pattern	2001	2011	Change in Sq.Km	LULC Area Changed in %
Built-up Land	48.47	58.23	9.76	47.71
Water body	0.3	0.59	0.29	1.46
Barren Land	52.58	47.61	-4.97	-25.06
Agricultural Land	22.39	19.03	-3.36	-16.94
Vegetation	15.13	13.38	-1.75	-8.83
Total Area(Area in Sq.km)	**138.84**	**138.84**		**100.00**

Source: Completed by Researcher

According from the table no.4 showed that built-up land highest occupied i.e. 9.76 sq.km (47.71%) the total area of the Aurangabad city from 2001-2011. The increased of built-up land evident of urban sprawl and other product of civilization i.e. developed new housing societies, new housing construction, road construction, and other. Waterbody had an occupying area change 0.29 sq.km (1.46) because of water body has depends on the monsoon. Barren land, Agricultural land, Vegetation decreased respectively i.e. -4.97 (- 25.06 %), -3.36 (-16.94%) and -1.75 (-8.83).

Table No.5 LULC 2011-2017

Land Use Pattern	2011	2017	Change in Sq.Km	LULC Area Changed in %
Built-up Land	58.23	64.58	6.35	50.00
Water body	0.59	0.48	-0.11	-0.87

Barren Land	47.61	43.68	-3.93	-30.94
Agricultural Land	19.03	17.63	-1.4	-11.02
Vegetation	13.38	12.47	-0.91	-7.17
Total Area(Area in Sq.km)	**138.84**	**138.84**		**100**

Source: Completed by Researcher

According to given table no.5 showed land use land cover change from the 2011-2017. It is the evident from the supervised classification map 2017 that built-up area has been increased to better than extend that the 2011 of Aurangabad city. The built up area has been increased from 2011-2017 i.e. 6.35 sq.km (50.00 %), built-up area has been increased day by day because of new housing societies and road construction increased by the city limit. Water body, Barren Land, agricultural land and Vegetation land has been decreased respectively i.e.-0.11 sq.km (-0.87),-3.93 sq.km (-30.94), -1.4 sq.km (-11.02) and -0.91 sq.km (-7.17).

Table No.6 LULC 1991-2017

Land Use Pattern	1991	2017	Changed in Sq.km	Area Changed in %
Built-up Land	34.5	64.58	30.08	38.94
Water body	1.47	0.48	-0.99	-1.28
Barren Land	35.14	43.68	8.54	11.06
Agricultural Land	48.18	17.63	-30.55	-39.55
Vegetation	19.55	12.47	-7.08	-9.17
Total Area(Area in Sq.km)	**138.84**	**138.84**		**100.00**

Source: Completed by Researcher

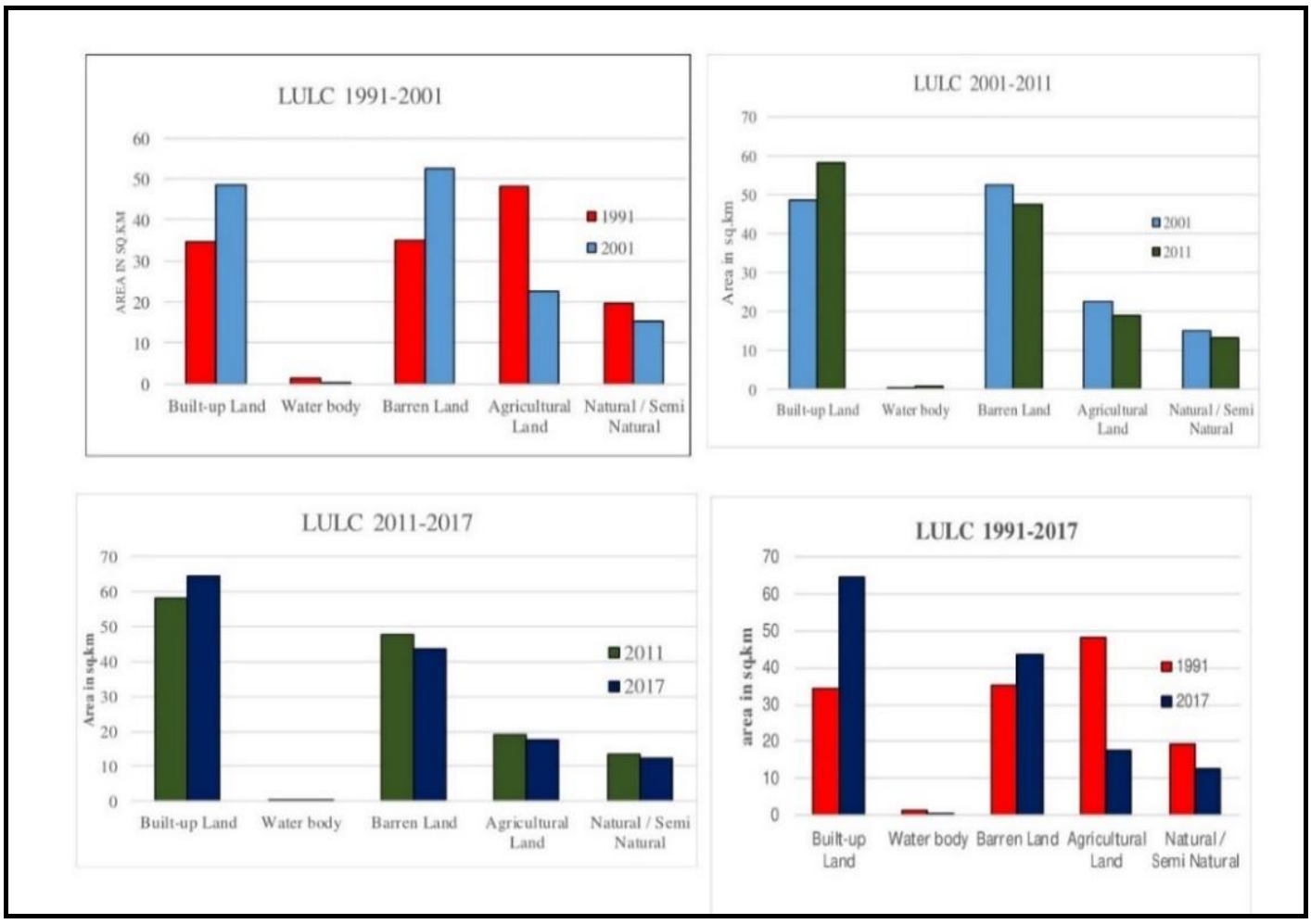
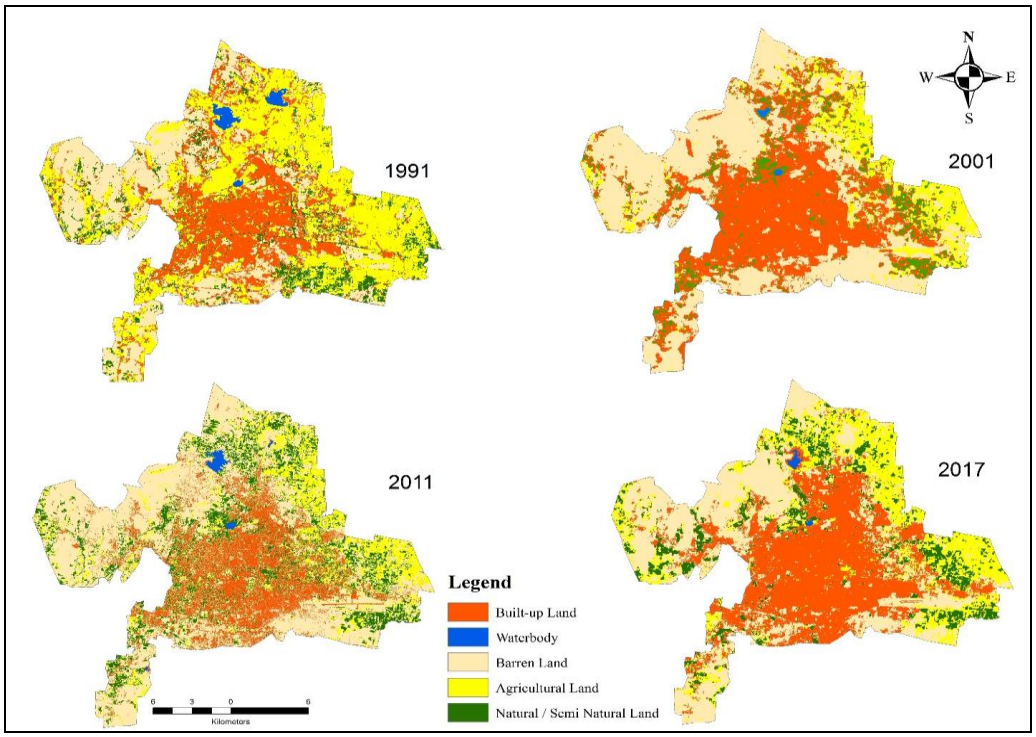


Figure no.3 Land Use Land Cover Change Detection 1991-2017



Map.No.3 Land Use Land Cover Change Detection 1991-2017

10. Growth of Barren Land

According to table no.6 and given supervised map from 1991-2017 has been showed land use land cover changing continually. Which is indicates suddenly growth of built-up land from the period of 1991-2017 i.e.30.08 sq.km. Overall 38.94 % built-up area has been increased from the given period. The agricultural and other land has been decreased but built-up land (residential and public utilities) continuously increased. The Geometric analysis has shown that water body area is reduced by the -0.99 sq.km (-1.28 %) include the Salim ali Lake, Sawangi reservoir and Kham river. The waterbody occupying area is 1.47 sq.km in 1991 and 0.48 sq.km area in 2017. The water body area was decreased because of the less rainfall. After the satellite image supervised classification we have found barren land increased 8.54 sq.km (11.06 %) area from the 1991-2017. The Barren land occupying the total area was 35.14 sq.km in 1991 but in 2017 barren land increases up to 43.68.sq.km. Agricultural and Vegetation land decreased respectively i.e.-39.55 % and -9.17 %. Agricultural and Vegetation area has been converted in to the residential area. The main reason for urban land use changes development of city, industrial growth and demand of settlement area.

Table No. 7 Aurangabad City
Growth of Built-up land 1972-2017

Sr. No	Year	Area	Increased Built-up land in Sq.km	Total Built-up area increased in %
1	1972	40.5	6.43	15.88
2	1991	138.84	34.5	24.85
3	2001	138.84	48.47	34.91
4	2011	138.84	58.23	41.94
5	2017	138.84	64.58	46.51

Source: Completed by Researcher

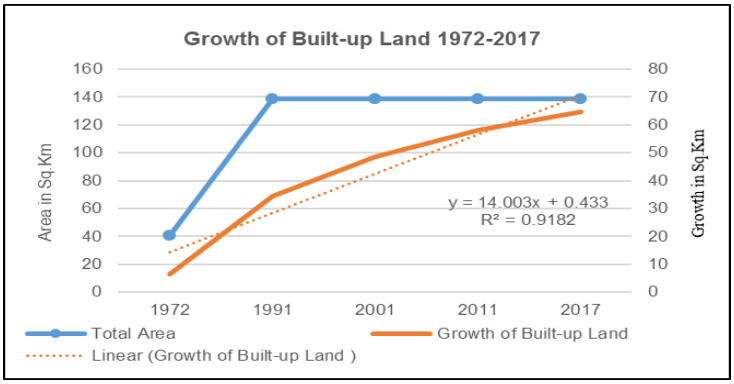
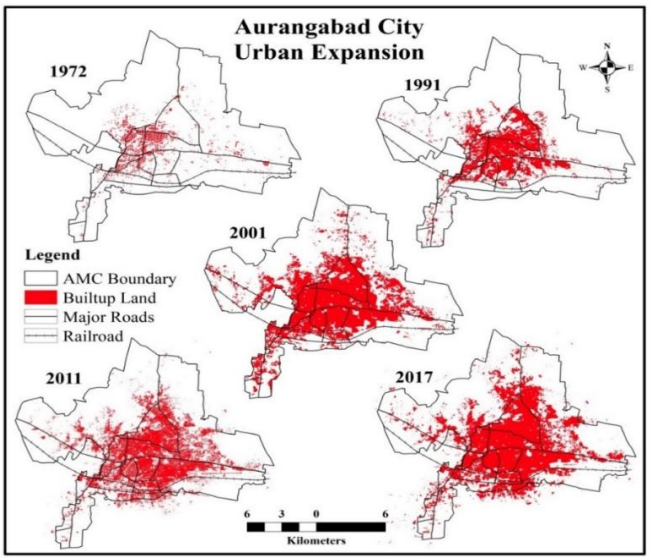


Figure no.4 Growth of Built-up land

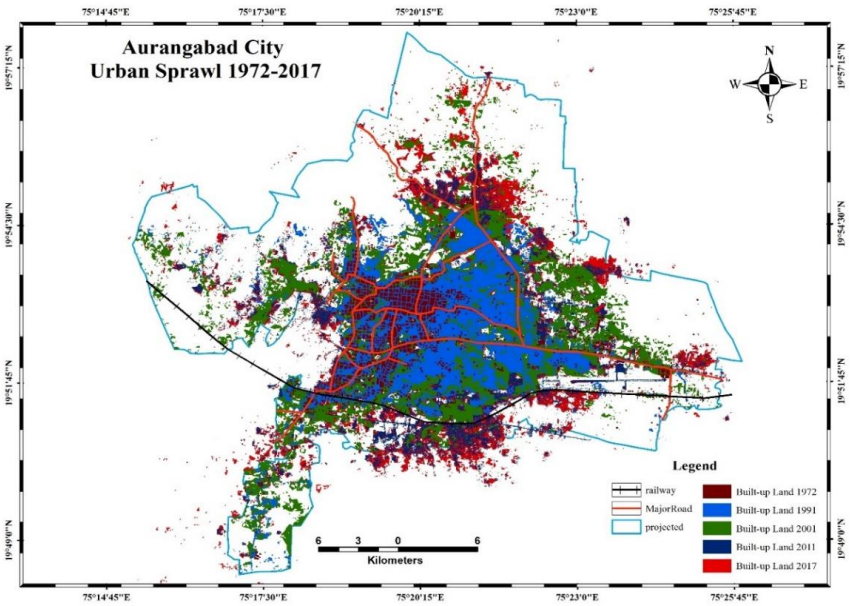
above given the table no.7 has showed that the growth of built-up land from the 1972-2017.The growth of the urban changes was observed in from the aerial increase of the city that accelerated the agricultural land transformed in to the built-up land. The urban sprawl can be computed as presented in above given table from the 1972-2017 built-up land increased from 6.47 sq.km to 64.58 sq.km. In 1972 the total area was 40.5 sq.km whereas 6.43 sq.km of them were under the built-up land. Growth of urban population induces the built up area to spread out. The growth rate of built up area is correlated to population growth rate of city.

11. Conclusion

The decadal population growth rate gives changed picture, which the growth rate of population of Aurangabad city shows Continuous increase of population from 1961 to 2011.The population growth rate of the Aurangabad city was continually increased from the 1961 to 1981. Ward wise population growth of Aurangabad city in 1991 to 2011, there were 14 wards with a population of less than 5000 persons in 1991 but in 2001 it decreased to 05 wards, but in 2011 no any ward found in this category. Which is indicates suddenly growth of built-up land from the period of 1991 to 2017 i.e.30.08 sq.km. Overall 38.94 % built-up area has been increased from the given period. The agricultural and other land has been decreased but built-up land (residential and public utilities) continuously increased. The water body area was decreased because of the less rainfall. After the satellite image supervised classification we have found barren land increased 8.54 sq.km (11.06 %) area from the 1991-2017. The Barren land occupying the total area was 35.14 sq.km in 1991 but in 2017 barren land increases up to 43.68.sq.km. Agricultural and Vegetation decreased respectively i.e.-39.55 % and -9.17 %. Agricultural and natural area has been converted in to the residential area. The main reason for urban land use changes development of city, industrial growth and demand of settlement area. In 1972 the total area was 40.5 sq.km whereas 6.43 sq.km of them were under the built-up land. Growth of urban population induces the built up area to spread out.



Map.No.4 Urban Expansion of Aurangabad City



Map.No.5 Urban Sprawl of Aurangabad City

References

1. Dr. P. A. Khadke, & Mr. R. U. Kharat (2017) "Urban Land Use Classification And Change Detection Analysis Using Geospatial Technology: A Case Study Of Aurangabad City" Scholarly Research Journal, MAY-JUNE 2017, VOL- 4/31, ISSN-2278-8808, Page-5239-5248.
2. Mr. R. U. Kharat and Dr. P. A. Khadke (2018) "Spatio-Temporal Analysis of Urban Population Growth and Distribution in Aurangabad City" International Journal of Research in Social Sciences, Vol. 8 Issue 3, March 2018, ISSN: 2249-2496 Impact Factor: 7.081, Page-428-440.
3. Firoz Ahmad, Laxmi Goparaju (2016) "Analysis Of Urban Sprawl Dynamics Using Geospatial Technology In Ranchi City, Jharkhand, India" Journal Of Environmental Geography, 9 (1–2), 7–13. DOI: 10.1515/jengeo-2016-0002 ISSN: 2060-467X. Page.07-13
4. Julian D. Marshall (2007) "Urban Land Area and Population Growth: A New Scaling Relationship for Metropolitan Expansion" Urban Studies, Vol. 44, No. 10, 1889–1904, September 2007, Page.1889-1903.
5. Dr. Ahmed Ibrahim Ramzi "Urban Expansion and Population Growth in Ras Sudr City Using Remotely Sensed Imagery" preceding.
6. Milan Naik (2013) "Urban Sprawl of Bhubaneswar City Using GIS Applications and Entropy" Thesis Department of Civil Engineering National Institute of Technology, Rourkela May, 2013.
7. Sandeep Kumar and Randhir Singh Sangwan (2013) "Urban Growth, Land Use Changes and Its Impact on Cityscape in Sonipat City Using Remote Sensing and GIS Techniques, Haryana, India" International Journal of Advanced Remote Sensing and GIS,2013, Volume 2, Issue 1, pp. 326-332, Article ID Tech-157 ISSN 2320 – 0243.
8. Sassan Mohammady (2014) "A Spatio-Temporal Urban Expansion Modeling A Case Study Tehran Metropolis, Iran" Landscape & Environment 8 (1) 2014. 10-19.
9. Eiman A. Mohammed (2015) "Urban Expansion and Population Growth in Omdurman City, Sudan Using Geospatial Technologies and Statistical Approaches" American Journal of Earth Sciences, 2015; 2(1): 1-7, published online January 30, 2015.
10. Majid Farooq & Mohammad Muslim (2014) "Dynamics And Forecasting Of Population Growth And Urban Expansion In Srinagar City – A Geospatial Approach" The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XL-8, 2014 ISPRS Technical Commission VIII Symposium, 09 – 12 December 2014, Hyderabad, India.
11. Manish K Tiwari (2012) "Mapping and evaluation of urban sprawl using an integrated approach of Remote Sensing and GIS Technique (Review)" International Journal of Advanced Technology & Engineering Research (IJATER), ISSN NO: 2250-3536, Volume 2, Issue 1, January 2012.
12. Asad Ali Khan* , Sana Arshad , Muhammad Mohsin (2014) "Population Growth and Its Impact on Urban Expansion:A Case Study of Bahawalpur, Pakistan, Universal Journal of Geoscience 2(8): 229-241, 2014, DOI: 10.13189/ujg.2014.020801.
13. T.V. Ramchandra and Uttam Kumar "Geoinformatics for Urbanization and Urban Sprawl Pattern and Analysis" Geoinformatics for Natural Resource Management, ISBN-978-160692-201-8.
14. Minakshi and Shivani Singh (2017) "Geospatial Analysis of Urban Sprawl Patterns in Amritsar City, Punjab, India" International Journal of Applied Information Systems (IJAIS) – ISSN : 2249-0868 Foundation of Computer Science FCS, New York, USA Volume 11 – No. 8, January 2017 – www.ijais.org
15. Pardeep Kumar (2016) "Urban Sprawl Of Hisar City Using Remote Sensing & GIS –A Case Study" ISSN: 2278 – 7798 International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 5, May 2016.
16. Mbuta K. Shadrack (2011) "Mapping Urban Sprawl and Its Impacts - A Case Study of Ruiru Sub County, Kiambu County" Project. June 2011
17. Musa1, J., Yunusa 2, M.B., Adamu3, M., Mohammed4, A. (2016)'' Change Detection Analysis of Land use and Land cover In Kafanchan, Kaduna State''IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT), e-ISSN: 2319-2402,p- ISSN: 2319-2399.Volume 10, Issue 5 Ver. II (May. 2016), PP 01-10 www.iosrjournals.org.
18. Selçuk Reis (2008)'' Analyzing Land Use/Land Cover Changes Using Remote Sensing and GIS in Rize, North-East Turkey" Sensors 2008, 8, 6188-6202; DOI: 10.3390/s8106188.
19. Anirban Mukhopadhyay1, Sandip Mukherjee2, Garg. R.D3, Tuhin Ghosh1 (2013)'' Spatio-Temporal Analysis Of Land Use - Land Cover Changes In Delhi Using Remote Sensing And Gis Techniques'' International Journal Of Geomatics And Geosciences Volume 4, No 1, 2013, Issn 0976 – 4380. Page-213-223.
20. Nayana S. Ratnaparkhi1, Ajay D. Nagne2 and Bharti Gawali (2016)'' Analysis of Land Use/Land Cover Changes Using Remote Sensing and GIS Techniques in Parbhani City, Maharashtra, India'' Cloud Publications International Journal of Advanced Remote Sensing and GIS ,2016, Volume 5, Issue 4, pp. 1702-17081,ISSN 2320 - 0243, Crossref: 10.23953/cloud.ijarsg.54

