Changing Landuse Pattern due to Urbanization in Peripheral area of Surat city with the use of GIS: A Retrospective Study

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Abstract

Urbanization is a process having a major impact on land use characteristics. Basically, as an impact of urbanization the area is observed with rapid change in the land use character of agricultural land. Generally, the agricultural land is used for various development activities like industrial establishments, projects and other urban infrastructure during the process of urbanization. It is necessary to have a periodical assessment of land use change for the developing urban area, which helps to decide the future expansion strategies for the area.

Surat city is located in the state of Gujarat in the western part of India. It is one of the most dynamic cities of India with rapid growth rate due to migration from various parts of Gujarat as well as other states of India. The Surat city is presently spread over an area of 326.515 sq. km. with periodical increase in municipal corporation boundary during last few decades. As a result of urbanization and expansion of municipal corporation limit, the city has undergone drastic change in land use character. In this study, land use change is quantified for the existing seven zones of Surat city during last 16 years using remote sensing and GIS. The study has analyzed the relationship between urban expansion and the loss of agricultural land because of increase in built-up area and other land use.

Introduction

Rapid urbanization and consequent haphazard growth of cities is a global phenomenon and India is no exception. This is resulting in deterioration of loss of agricultural lands, open spaces, loss of water bodies, and depletion of ground water aquifer zones, air pollution, water contamination, health hazards and many microclimatic changes. It is, therefore, desirable to plan for the city and its region in an integrated manner so that in due course as the city grows the periphery can emerge into the whole. In doing so, one cannot only save a good amount of

productive agricultural land but also avoid all natural hazards. In the preparation of environmentally compatible urban and regional plan, it is a prerequisite to understand linkages and interactions that exist between different components of the urban environment. Secondly, the data collected on different aspects of the urban environment has to be translated into useful information for the purpose of urban development. Thirdly, there is also a need to aggregate this information according to administrative/natural and hierarchical units. Basic caveat for this is the availability of systematic, detailed, reliable, timely and accurate information on various facets of urban environment. There are certain shortcoming in regard to acquisition of statics, processing, generation of graphic outputs and their storing in the existing conventional system. Such a lacuna impedes efficient and meaningful planning, implementation of programs and their monitoring. Moreover, by the time the plan is made using conventional surveys, the data becomes old and the plan may not be suitable for implementation. It is in this context, the Orbital Remote Sensing (ORS) data and Geographical Information System (GIS) techniques play a major role by providing reliable, accurate, timely, periodic data and methods of integration of spatial and non-spatial data to create various planning scenarios for decision making. This type of planning scenario help planners and administrators to view various advantages and disadvantages of different perspectives and select best perspective for implementation and monitoring.

Study Area

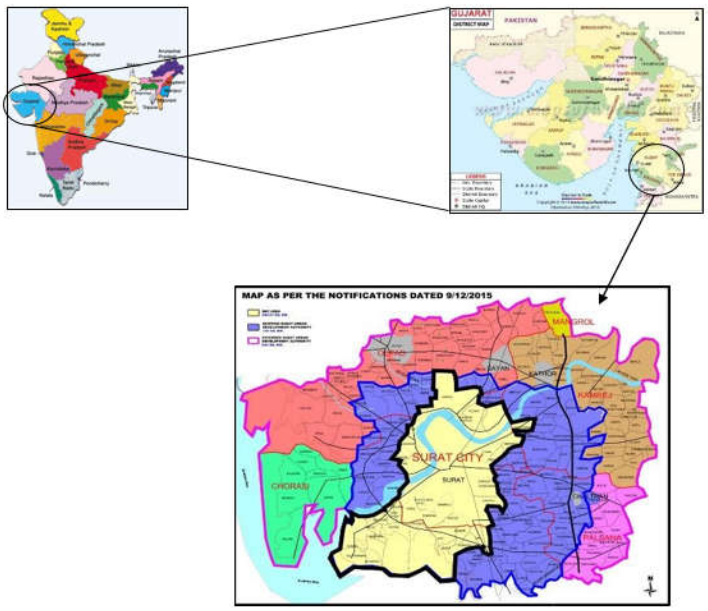

Figure 1 Location of Surat City

Demographic profile

The present study is carried out to study the urban sprawl pattern analysis of Surat City. Surat is second largest city of Gujarat both a way area and population. Surat is fastest growing city of Gujarat. Area of the Surat Municipal Corporation is 326.515 sq.km. It is situated at the bank of Tapi River. Population of the Surat is 44, 61,002 according to Census 2011. Surat has growing tendency due to economic hub of different activities.

As per article in Times of India "Surat is fourth fastest growing city of world and will be the most populous city of Gujarat by 2023". Decadal growth pattern of Land use of Surat City is studied and at the same time, behaviour of population density distribution is observed. Population of Surat city is increasing and spill over in extended area of the city which results in to change of land cover, and urban sprawl. The location of Surat city in the India is shown in below image.

TABLE 1 Area of Zone in km

Sr. No	Zone	Area (in Sq.km.)
1	Central	8.18
2	South West	111.912
3	South	61.764
4	South East	19.492
5	East	37.525
6	North	36.363
7	West	51.279
8	Total	326.515

(Source: Surat Municipal Corporation)

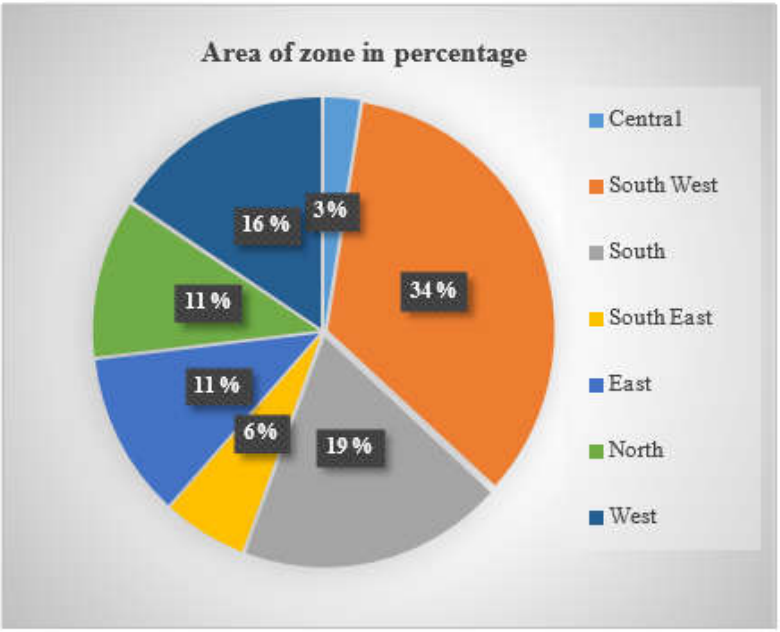

Figure 2 Area of zone in percentage

(Source: Surat Municipal Corporation)

TABLE 2 Zone wise population

Sr. No	Zone	Population (Census 2011)
1	Central	4,08,760
2	South West	3,47,447
3	South	6,95,028
4	South East	7,48,304
5	East	11,37,138
6	North	7,05,163
7	West	4,24,986
8	Total	44,66,826

(Source: Surat Municipal Corporation)

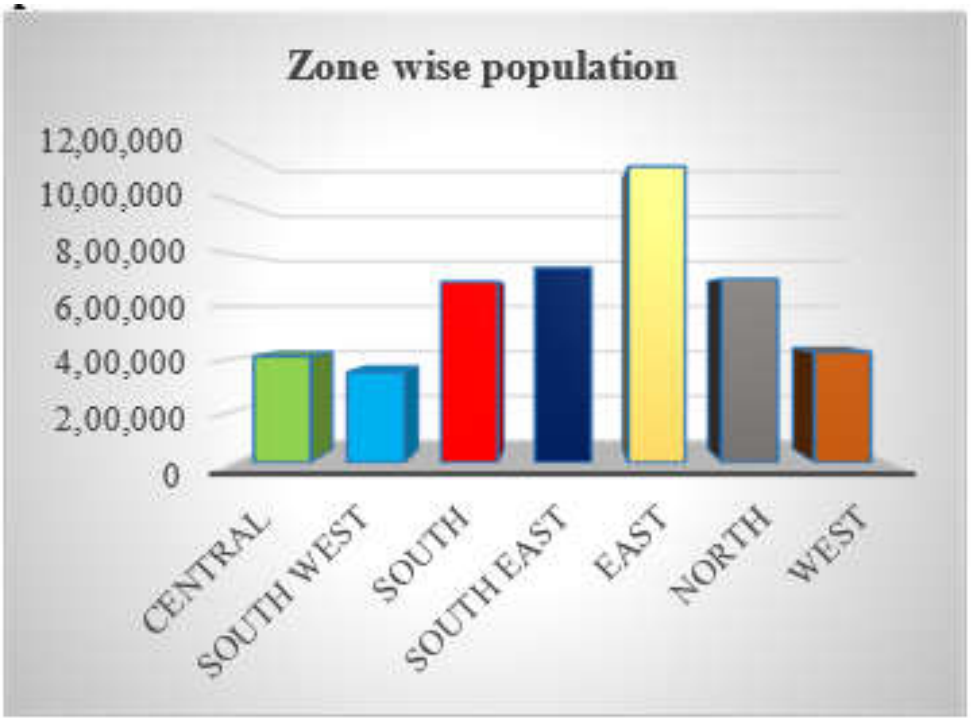

Figure 3 Zone wise population in percentage

(Source: Surat Municipal Corporation)

Study Area justification

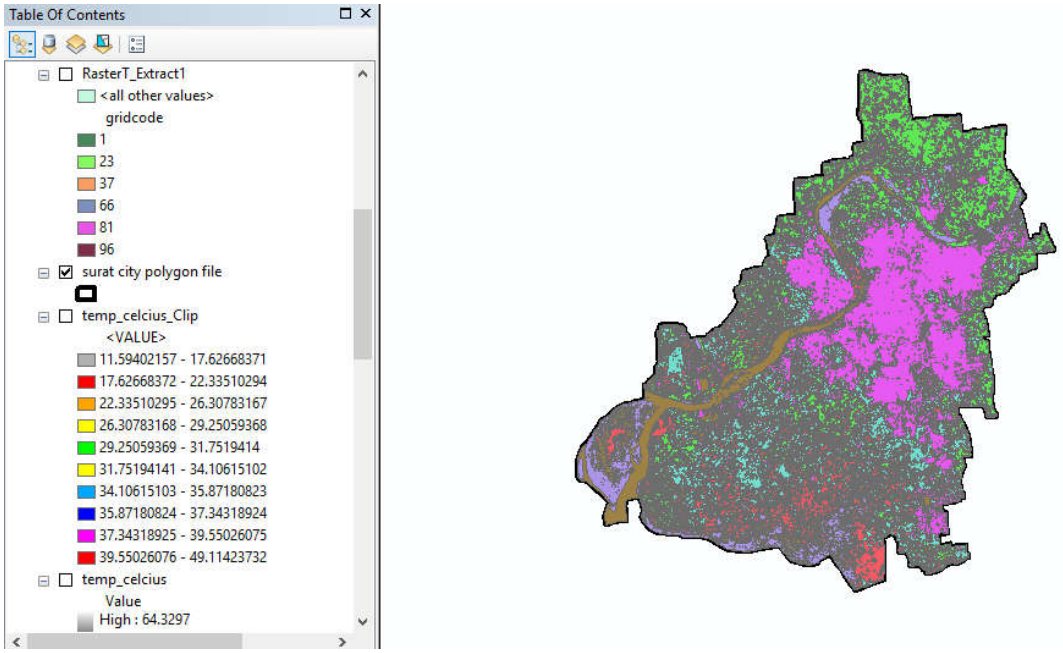

Figure 4Landuse pattern of Surat City 1997

(Source: BISAG)

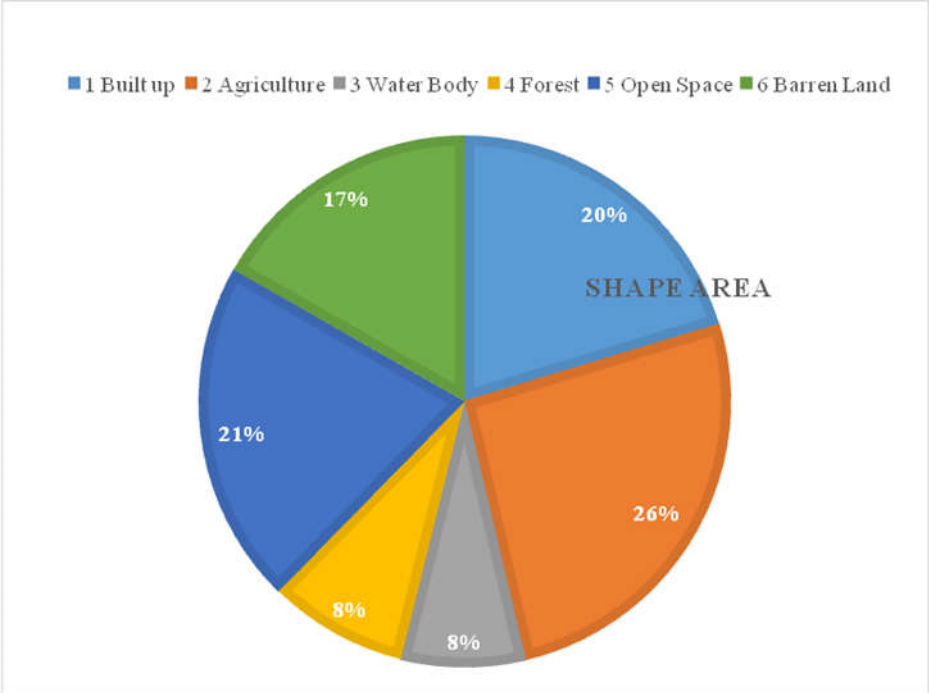

Figure 5 Classification of Landuse of Surat city in percentage 1997

(Source: BISAG)

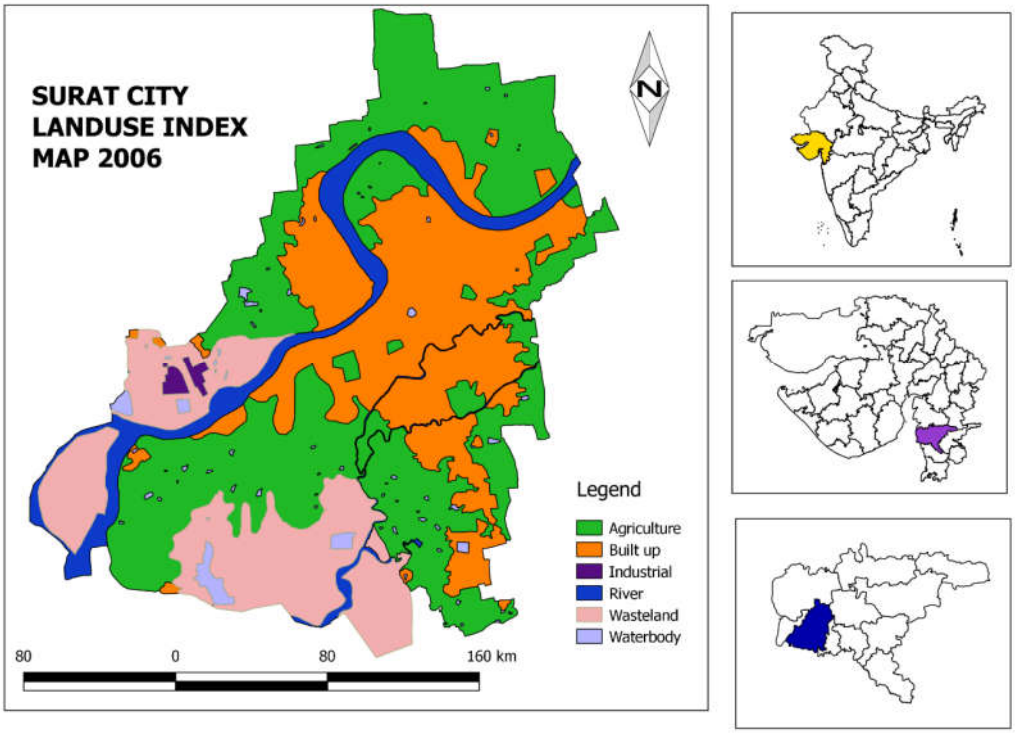

Figure 6Landuse pattern of Surat city 2006

(Source: BISAG)

TABLE 3 Classification of Landuse of Surat city in percentage 1997

SR NO.	CATEGORY	AREA(sq m.)	AREA (ha)	%
1	Agriculture	161626882.5	16162.68825	43.19
2	Built up	106134064.4	10613.40644	28.36
3	Industrial	1976526.643	197.6526643	0.528
4	River	30172811.65	3017.281165	8.064
5	Wasteland	68781087.45	6878.108745	18.38
6	Waterbody	5493296.324	549.3296324	1.468

(Source: BISAG)

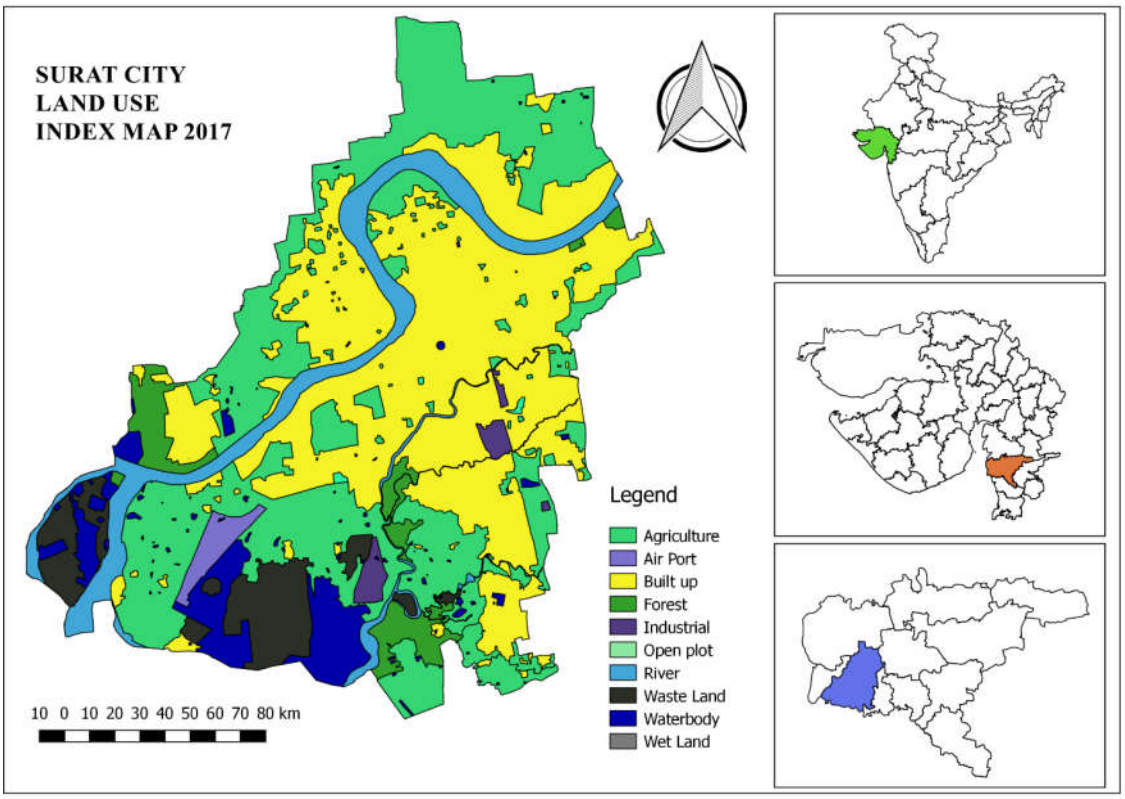

Figure 7Landuse pattern of Surat City 2017

(Source: BISAG)

TABLE 4Classification of Landuse of Surat city in percentage 2017

SR NO.	CATEGORY	AREA (sq m.)	AREA (ha)	%
1	AGRICULTURE	128695142	12869.5142	34.39
2	BUILT UP	139224013.4	13922.40134	37.21
3	FOREST	9357605.25	935.760525	2.501
4	INDUSTRIAL	4872288.76	487.228876	1.302
5	OPEN SPACE	7956446.49	795.644649	2.126
6	PARK	16617.17	1.661717	0.004
7	RIVER	29977020.65	2997.702065	8.011
8	WASTE LAND	18453544.53	1845.354453	4.932
9	WATER BODY	26202768.12	2620.276812	7.003
10	WET LAND	9428869.62	942.886962	2.52

(Source: BISAG)

Recommendations

Based on this research work and findings following recommendations are given.

- It is recommended that urban sprawl pattern analysis must be done before proposing the city limit extension;
- To control the urban sprawl, strong development control regulations should be made for the villages outside the administrative boundary;
- Mixed land use development will have significant effect in lowering urban sprawl;
- To limit the urban sprawl, vertical expansion is recommended instead of horizontal expansion; for example, High rise building with commercial activities at the ground floor following by the residential;
- Urban sprawl can also control by the large scale redevelopment of the area which are becoming the possible reasons for the sprawl;

- It is recommended that personal mode of transportation should be discouraged and public transportation should be encouraged because it is one of the causes of urban sprawl;
- Restrict the amount of land builders and developers can use outside of the city;
- Encourage people to move to downtown areas by lowering costs of property in that areas, by closer to job and entertainment and mixed-use buildings;
- It is recommended that raise public awareness by advertising, bill boards and so on;
- New technology like work from home can also be used to reduce sprawl;
- It is recommended that refresh developed areas by new attracting business, reducing crime, improving schools and so on.

Conclusion

One of the major objective of the study was to identify and analyse the urban sprawl pattern of the Surat city. It is concluded that Surat city has the clustered pattern for both land use and population density. It is found in the spatial directional analysis that study area has three spots where city is spatially growing which are West, North-East and South-East. In the West direction there is space available to accommodate future growth but in the remaining two directions there is no space available, which means city limit needs to be expanded in near future.

References

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