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Application of GIS and Remote Sensing in Urban Growth: A Case Study of Latur City

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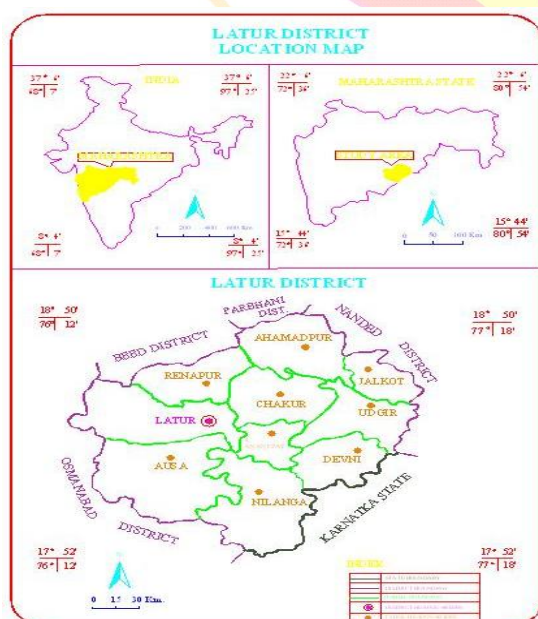
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Introduction:

Most developing countries are urbanizing very fast, much faster than the developed countries, which are already predominantly urban. Most of the South Asian countries are predominantly rural in character and are experiencing this phenomenon, particularly related to their metro cities. Even after sixty two years of independence, the rural settlement of our country do not have good road connectivity. As a result effective implementation, execution and monitoring of the development scheme sponsored by Government and Non-government organizations are not possible. In the year 1981, the Latur as a District Headquarter. There have been noticeable changes in the urban infrastructure scenario of Latur Municipal Corporation (LMC).

The aim of this paper to analyse spatial, environmental and socio-economic consequences of the rapid expansion of Latur city into the surrounding rural areas primarily within the last few decades. Geo-informatics techniques like satellite remote sensing and GIS has been used to assess the rate of the spatial expansion, seen in the perspective of last four decades. The prime focuses are the following:

- The extension of new built up area is mapped from recent medium-scale satellite imagery using a classification algorithm based on visual and digital method. These areas constitute the rapidly expanding frontier of urban Latur into its rural surroundings. The updated land use map is compared with satellite-based maps to check their suitability for urban settlement analysis.
- The recent trends in urban spatial development are analysed with focus on the haphazard nature of the spatial development, e.g. road network and built up land (1982-2005) due to lack of planning and poor land management.



This study was carried out in Latur city located within co-ordinates of latitudes $19^{\circ}27' N$ to $18^{\circ}27' N$ and Longitudes $74^{\circ}44' E$, to $76^{\circ}57' E$, Latur Comprises 65 wards and is connected by air, rail and road. The areal extent of the study area is 1443.59 Sq. km.

Growth of Latur City:

The process of urbanization in India is not different from that of other countries in Asia and Africa. The proportion of the country's population living in towns has increased over the years – from 15.85% in 1901 to 20.30% in 1951 and 30.80% in 2001. Latur is not only the district headquarters, but also the leading city in terms of population size and being the political, economic and cultural nerve centre in Marathwada region.

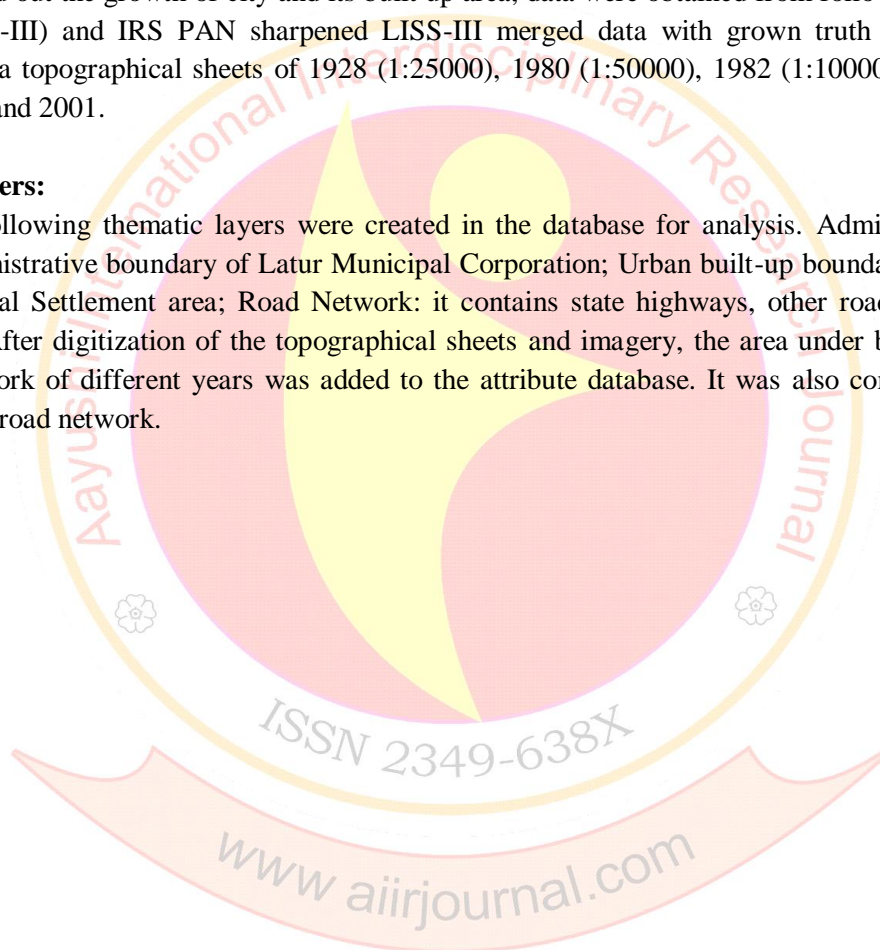
Rapid urbanization has resulted from several factors. Since the 1980s, however, the major factor has been the natural population growth. Latur is experiencing a high rate of growth and it is one of the fastest growing cities in Maharashtra. As per census from 1901 to 1941 the rate of growth was 3.46% per annum, whereas in 1951 to 2001 it was 14.96. After independence in 1951, the population of Latur was only about 35,374. It increased quite appreciably to 2,99,985 in 2001.

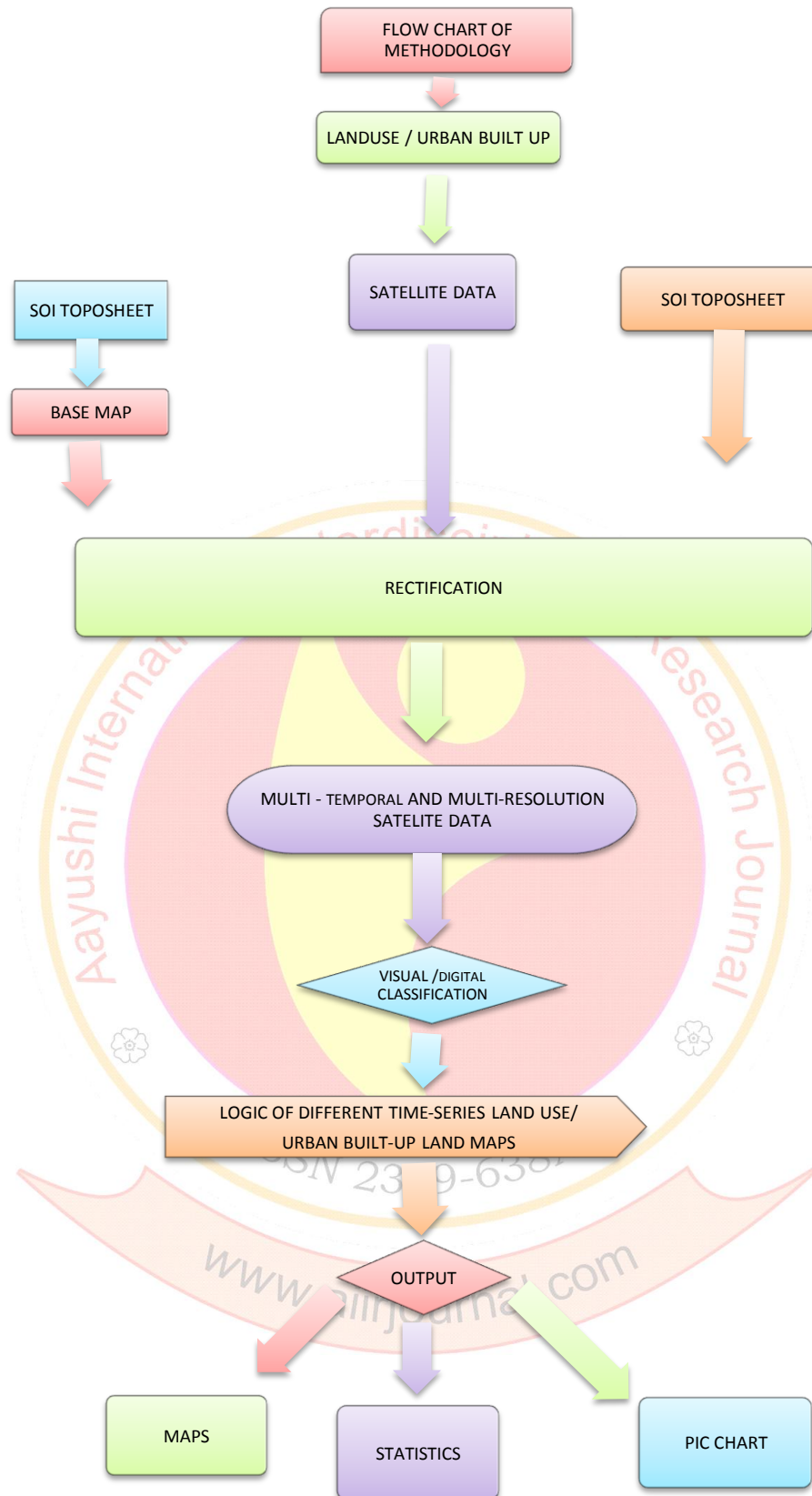
Satellite-Based Methods:

To find out the growth of city and its built up area, data were obtained from following source: IRS-1D (LISS-III) and IRS PAN sharpened LISS-III merged data with ground truth verification; Survey of India topographical sheets of 1928 (1:25000), 1980 (1:50000), 1982 (1:100000), Census of India 1991 and 2001.

Thematic Layers:

The following thematic layers were created in the database for analysis. Administrative: it contains administrative boundary of Latur Municipal Corporation; Urban built-up boundary: it shows Latur Municipal Settlement area; Road Network: it contains state highways, other roads, rails and other layers. After digitization of the topographical sheets and imagery, the area under built-up land and road network of different years was added to the attribute database. It was also compared with master plan of road network.





The road network map has been generated on 1:25000 scales as prepared by the municipality. This gives detailed information regarding the network of metalled, unmetalled and other roads. These roads are connected to every lane and major roads in city centre like Ganjgolai and other points.

Planners call such type of maps as base map. The base map is a major asset for executing a plan. The present study is limited to preparation of urban land use, urban sprawl and road expansion maps for different time periods.

Results and Discussions:

There has been rapid growth of urban population in India over the last four decades. Over 27.78 percent of India’s population lives in about 35,000 urban centers of varying sizes. Latur has been a small but important urban centre in the state of Maharashtra. Its importance lies in providing space for the political and commercial center during the Nizam Raj. Hence, different population communities played a vital role in its social and economic development.

The past history of Latur shows that the city has a small population of 10,479 in 1901. The population grew slightly during 1901-1991. It faced a decline during 1911-1921 (-2905) along with the rest of India, a period when epidemics, took a heavy toll of India’s population. In the subsequent decades of 1941 and 1951, its rate of growth had been higher than national average. In 2011 base year examine and another years from 2021 to 2051 has create a projected population due some changes are possible for best of my knowledge (Table 01).

Due to importance of the city and its environment, people are attracted towards the city and occupy the land for business and residential purpose.

Table 01 : Urbanization in Latur City 1901-2051

Census	Total Population	Increase in Population	Decadal Growth (Rate %)
1901	10479	0	0
1911	7574	-2905	-27.72
1921	16233	8659	-53.74
1931	30760	14527	-47.22
1941	24985	-5775	23.11
1951	35374	10389	-29.36
1961	43218	7844	-18.14
1971	73545	30327	-41.23
1981	111986	38441	-34.32
1991	197408	85422	-43.27
2001	299985	102577	-34.19
2011	349451	49466	-14.15
2021*	398917	49466	-12.4
2031*	448383	49466	-11.03
2041*	497849	49466	-9.93
2051*	547315	49466	-9.03

*Sources: District Census Handbook Abstract, 2001. * Projected Population.*

Levels of Development:

Analysis reveals that 53% of the total 35 wards in LMC are undeveloped and less developed, while 40 percent or 10 wards are developed and highly developed (Table 02). On the basis of

secondary and primary data analysis, it is observed that only 5 wards are truly developed in terms of infrastructure, whereas rest of wards lack basic infrastructure and amenities.

Table 02 : Ward wise Levels of Development

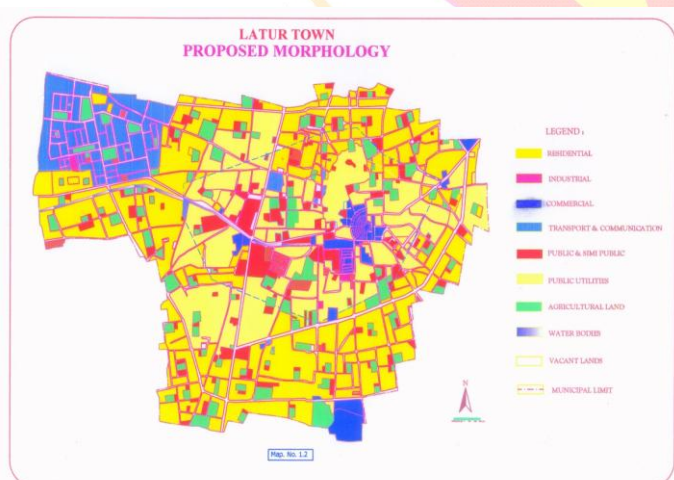
Sr. No.	Levels of Development	No. of Wards	Percent
1	Highly Developed	10	40
2	Developed	05	10
3	Less Developed	05	10
4	Undeveloped	15	40

Source: Primary Survey and Secondary Municipal Data.

Table 02 is based on the primary and municipal level secondary data. Some wards are more developed and some are least. Around 40 percent wards are highly developed, 10 percent developed, 10 percent are less developed and 40 percent are undeveloped wards. Among the 35 wards comprising CBD part of LMC, i.e.

The development has occurred in the areas with well-planned colonies, public facilities or educational institutes. The process of industrialization has put a significant footprint on the regional disparities within wards of Latur. The new industries set up like Harangul and Waswadi have added to the development of the wards. During survey it was noticed that the basic facilities are not available in many ghettos within Latur Municipal Corporation (LMC). Some of the pockets that are dominated by the people of Marata religion, have a higher level of development in terms of basic amenities like water and electricity in pockets in the peripheral areas reveal that about 60 percent of the respondents demand good street-lighting, drinking water and metalled roads. However, the public always demands the easier and safe mode of water supply.

Major Findings:



The Geo-informatics techniques have proved its importance for urban landuse / urban sprawl and urban road network analysis. On the basis of survey and secondary data, the following observations are highlighted:

- Latur city has expanded towards Northeast and Northwest directions. Comparatively SW & SE in uncontrolled manner, engulfing productive cropped areas.
- Latur city is gradually encroaching into surrounding small villages.
- Latur city is putting heavy pressure on the ecologically sensitive areas, due to deforestation and loss of agricultural area.

- The agricultural land has been converted into commercial, residential and the other built-up land when compared in time perspective.
- The increase in infrastructure (especially roads, water, electricity, etc.) has not kept pace with the growth of population. As a result, the city is experiencing disequilibrium in the level of development of different wards and is experiencing traffic chaos.

Conclusion:

The subject of this paper is the urban growth and its haphazard nature which is obvious to anybody travelling on the streets of Latur. Areas are being converted for urban use without any systematic development plan and without a corresponding investment in infrastructure. The results of poor land management are urban areas with inadequate service provision and infrastructure and with a corresponding lack of accessibility that may prove very costly to resolve.

While it is not too difficult to pinpoint the magnitude of the problems and some of their causes, it is clearly more difficult to point out too fast the solutions that will create a more sustainable growth in the outskirts and fringe areas. Access to computers and e-based means of communication have increased significantly in India during the last few years. Also the tools for analyzing and handling digital spatial information have become potentially more accessible for people that are involved in the planning process. This increases the possibilities for assessing the magnitude of the problems in order to create public awareness as well as to handle issues related to land use pattern, infrastructure and environmental planning. This recent development will hopefully facilitate an effort to start addressing some of the problems in a serious manner.

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