ASSESSING URBAN SPRAWL & QUALITY OF URBAN LIFE THROUGH GIS TECHNIQUES

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ABSTRACT

Urban sprawl may be a term simply used to describe an area of land in transition from a rural use to an urban use. India has been facing unprecedented population growth coupled with unplanned developmental activities. The rate of urbanization has been increasing in leaps and bounds. Nanded district of Maharashtra is facing one of the fastest sprawl conditions in Marathwada region of Maharashtra. The paper studies the urban sprawl of HUDCO township of Nanded district along with the spatial (changes in built up area, agricultural land, open space, etc) and demographic consequences. To assess the quality of urban life in the study area, the availability and extent of availability (in the background of huge population base and increased urbanization) of certain urban infrastructural facilities such as government hospitals, educational institutes, electric connection, tap water connection, street lights, metalled roads etc were selected as indicators of urban life. Comparative study of 2004 and 2011 was done based on the objectives undertaken. There has been a huge leap in the built up area, population, and decrease in agricultural & open space in 2011 as compared to 2004. However the urban infrastructural amenities surveyed were definitely gasping in the face of rapid urban sprawl in the study area. Google Earth images of the study area along with GIS technique and survey of the area were the methodologies adopted for the present study for the sampled time span.

KEYWORDS: Urban sprawl, built up area, agricultural land area, urban infrastructural factors.
1. INTRODUCTION
Urban sprawl is defined by the Environmental Protection Agency as a pattern of growth that has occurred in an unplanned, ad hoc manner. In India, unprecedented population growth coupled with unplanned developmental activities has led to urbanization, which lacks infrastructure facilities. Dispersed development along highways, or surrounding the city and in rural countryside is often referred as sprawl (Theobald, 2001). The proportion of the country’s population living in urban areas has increased over the years – from 15.85% in 1901 to 20.30% in 1951, 30.80% in 2001 and 31.16% in 2011 (Dhar et al, 2011).

The paper aims at analyzing the spatial and demographic consequences of urban sprawl of HUDCO township into the surrounding rural agricultural areas within a span of a few years along with the present available urban social infrastructural amenities. Google Earth images of the study area were used along with GIS technique to assess the rate of land use change over the sampled time span. Visits to the study area were done to confirm the ground realities of the satellite images regarding land use/land cover. The time span taken for the study is 7 years, which is from 2004 to 2011.

2. OBJECTIVE
1. Analyze the change in the built up area in the study area.
2. Analyze the change in the agricultural land area in the study area.
3. Comparative study of the available urban infrastructural factors in the study area as against the demographic factors.

3. SIGNIFICANCE OF THE STUDY
The study area is facing rapid urban sprawl at the cost of declining agricultural land and open space. Urban sprawl brings with it various negative consequences like green space consumption, loss of farmland etc. The study will focus on these consequences on the study area. Further urbanization requires proper infrastructural development in the neo-zones. So the study will particularly stress on the availability of basic infrastructure in the area. This kind of work has not been done in the study area. It is hoped that the study will prove to be an impetus for the planners and government in general.

4. STUDY AREA
The study area lies to the south of Godavari river and Nanded city. Nanded city comes under the administrative jurisdiction of Nanded district. Nanded city is one of the fastest growing
city of Marathwada regions of Maharashtra. The study area comprises of Waghala Municipality and six other newly merged villages and CIDCO area. The study area lies between latitude 19°5'0"N and 19°9'0"N and longitude 77°16'0"E and 77°21'0"E. For the present study 80.69 Km² area has been demarcated.

![Fig 1: The study area](image)

5. DISCUSSION

5.1 Analyze the change in the built up area from 2004 to 2011 in the study area

Built up area is one of the basic factors in understanding urban sprawl. The built-up is generally considered as the parameter of quantifying urban sprawl (Torrens and Alberti, 2000; Barnes et al., 2001; Epstein et al., 2002). When the urban area/built up area spills out in to the surrounding agricultural land/open area it may be termed as sprawl conditions. Thus this factor was weighed to understand the sprawl conditions of the study area. Apart from built up area open space & scrub vegetation was also studied since they have an important role in understanding the amount of sprawl.
In the backdrop of rapid deforestation to pave way for the development of the suburban areas of the city, the study area at present has NIL forest cover. Scattered trees and shrubs are found in open spaces, unutilized tracts, road side etc. Here open scrub is meant to shrub vegetation in the vacant plots and open spaces. Leaving a plot or open space unutilized for a prolonged period of time develops shrub vegetation. In the study area agricultural lands are bought as potential real estate investment. Once invested the land use pattern change from agriculture to unyielding, unproductive and unutilized land. Prolonged unutilization result in development of shrub vegetation. Open space is the intermediary stage of land use change from agricultural to build up.
Fig 2 shows the built up area in 2004 whereas Fig 3 shows the built up area as in 2011. Table 1 shows the comparative area under different heads for the two sampled years. From the table it is clear that built up area (along with scattered built up) has more than doubled itself in a span of 7 years. In 2004 scattered built up area belonged to suburban and rural settlements. Very low income groups, labourers in both primary & secondary sectors dwelled in these areas. All the areas falling under scattered built up in 2004 has been consumed in built up in 2011 as is evident from the maps. As is clear from Fig 2, built up area was mainly localized in the central part (nodal point of transport lines) of the map, however as is evident from Fig 3 in 2011 built up area has spread along all the transport routes and is no more localized at the centre. There has been 315.28 % increase in the built up area as is evident form Table 1. Sprawl apart from consuming the scattered built up area has also consumed much of the open space and scrub vegetation apart from agricultural land.

Table 1: Comparative area under different categories for 2004 & 2011

<table>
<thead>
<tr>
<th>Categories</th>
<th>2004</th>
<th>2011</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural land</td>
<td>22.62</td>
<td>14.33</td>
<td>-36.65</td>
</tr>
<tr>
<td>Built up area</td>
<td>5.17</td>
<td>21.47</td>
<td>+315.28</td>
</tr>
<tr>
<td>Scattered built up area</td>
<td>5.15</td>
<td>2.34</td>
<td>-54.56</td>
</tr>
<tr>
<td>Open land</td>
<td>43.62</td>
<td>38.91</td>
<td>-10.80</td>
</tr>
<tr>
<td>Open scrub</td>
<td>3.95</td>
<td>3.46</td>
<td>-12.40</td>
</tr>
<tr>
<td>Road</td>
<td>0.18</td>
<td>0.18</td>
<td>-</td>
</tr>
</tbody>
</table>

5.2 Analyze the change in the agricultural land area from 2004 to 2011 in the study area

There is noticeable shift in the area of agricultural land from 2004 to 2011 as is evident from Table 1. The fringing areas of the built up land becomes easy prey for land grabbers for commercial development of the same. Apart from the fringing areas, there has been a deep inroad within the agricultural tracts transforming pockets of erstwhile agricultural land into built up area and open space to be later converted into built up as is evident from Fig 2 and 3. The region has alluvial, fertile, riverine black cotton soil. However the one time exorbitant price for the lands by the real estate agents proves to be the reason for land use shift. The shrinkage in agricultural land in 2011 from 2004 has been 36.65 %.

5.3 Comparative study of the available urban infrastructural factors in the study area as against the demographic factors

Urban infrastructure is an indicator of quality of urbanization. During the past decades, adequate provision of urban infrastructures has become an increasingly important agenda in public discourse (Green Technologies: Concepts, 2011). Infrastructure is an important
determinant in urban areas, … promote their urban areas by providing infrastructures (Gupta, K.R, 2001). If the rate of urbanization is proportional to the available infrastructural facilities then there is satisfaction in the urban life lead by the inhabitants. However if it is the other way, there arises numerous urban social problems.

To understand the quality of urbanization in the study area certain urban infrastructural facilities available in the study area were selected.

(i). total electricity meters, (ii) total government hospitals, (iii) total private nursing homes, (iv) total higher secondary schools, (v) total senior colleges, (vi) total street lights, (vii) total number of metalled roads.

Table 2: Indicators of urban infrastructural facilities

<table>
<thead>
<tr>
<th>Indicators</th>
<th>2004</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population (above the age of 18)</td>
<td>67066</td>
<td>70566</td>
</tr>
<tr>
<td>Electricity meters</td>
<td>9977</td>
<td>14947</td>
</tr>
<tr>
<td>Government hospitals</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Private nursing homes &amp; clinics</td>
<td>18</td>
<td>35</td>
</tr>
<tr>
<td>H.S schools</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Senior colleges</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total street lights</td>
<td>1100</td>
<td>1400</td>
</tr>
<tr>
<td>Total number of roads</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main metalled</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Medium metalled</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Small unmetalled</td>
<td>135</td>
<td>135</td>
</tr>
</tbody>
</table>

Source: Municipal office and survey

The population as mentioned in Table 2 indicates the population in the electoral roll of the study area. Through various non-government sources like school record & college records the under 18 population in 2004 was estimated at 5,782 which in 2011 jumped up to 17,233. Apart from this there is a large number of floating populations as well mainly working as skilled & unskilled labourers in the study area whose population data is not available. Along with the increase in population the increase in the number of household is evident from the electricity connection data of 2004 & 2011. Apart from metered connection there are about 1203 households at present, as against 703 in 2004, which do not have metered connection.

There is only 1 government health centre at present in the study area as was the case in 2004. The term ‘Hospital’ can not be applied to this since it is unable to perform any surgical function. It operates with an Out patient department. Full fledged government hospital is available at a distance of 11-12 kms in the city proper. It is seen that there is no development
in this social tertiary sector in 7 years against the background of such a huge population. As such the populations along with the population of the surrounding villages have to avail the service of private nursing homes at exorbitant rates. It is for this reason that this private sector industry is booming.

The number of schools in 2011 has increased from 2004. Students not only from the study area but also from the neighbouring areas avail educational service from these 4 schools. There has been no increase in the number of senior colleges. There is only 1 college in the area having UG courses only in BA & B.Sc. For other courses students have to travel 12 kms into the city proper. It is for this reason that the rate of college drop outs is steadily increasing in this area. The student-school ratio definitely seems to be lopsided. Administrative effort can be initiated towards maintaining a healthier student-school ratio.

As regards to the number of street lights, the study area has a total of 1660 electricity poles. However as is evident from Table 2 Street light is not available in all of these. It is evident from table 2 & Fig 2 & 3 there has been a vast increase in the number of households and area of urbanization. However when it comes to street lightning there has not been any major increase in the sampled time span. The problem is more acute towards the south of the study area. Of the total recorded FIR against stealing & various anti-social activities in Nanded Gramin Police station (the sampled area falls under its jurisdiction) 65% belongs to south Hudco (average of 2004 till date).

Metalled roads are an important indicator of urban infrastructure. From the GIS figures and table 2 it is evident that there has not been any improvement in the number and total length of the metalled roads. Although urbanization has made deep inroads into the study area, however it is basically unmetalled/cart tracks which serve the present study area wherever metalled road is not available.

**CONCLUSION**

In general Sprawl- like phenomena can arise from three factors: declining transport costs & increasing cost of living in the city main, high standard of living in the city & increasing income, and increases in total population. Through the present study urban sprawl of HUDCO township of Nanded district was studied. Comparative study of urban sprawl was done for 2004 & 2011. The objectives undertaken for the present study include; analyze the change in the built up area in the study area, analyze the change in the agricultural land area
in the study area and comparative study of the available urban infrastructural factors in the study area as against the demographic factors.

The study area has seen major increase in the built up area. Built up area has spread throughout the study area in 2011 which in 2004 was nucleated in the central part of the study area only. Simultaneously aggradations in built up area means degradation in agricultural area. There has been decrease in open scrub, open land also to make way for built up area. Urban infrastructure is an indicator of urban life. To understand the quality of urbanization in the study area certain urban infrastructural facilities available in the study area were selected. The research yielded that although there has been major strides towards the urbanization of the study area through rapid urban sprawl, however the quality of urban life in the study area is quite low since there has been not much development in the available facilities in 2011 as was in 2004.

REFERENCES