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Urban Sprawl - Spatial Qualities and Effect of Density – CASE OF PUNE

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ABSTRACT: One of the contemporary issues in metropolitan cities like Pune is horizontal and vertical expansion due to the rapid urbanization and the development of dense settlements on periphery of the city. Due to this the spatial quality of those settlements are not mentionable due to the high percentage of land coverage. Similarly there is a knowledge gap associated with the concept and theory to achieve standard densities like standard floor area ratio and percentage of land coverage which can provide good spatial qualities and can combat urban sprawl.

This project aims to analyze the densities and spatial qualities of settlements as well as investigate their relationship to the urban sprawl. As a part of this study Narhe and Ambegaon Bk. has been selected as the case study area. The densities have been explored by primary survey where the spatial qualities have been analyzed by using photographs. The different blocks of settlements have been selected to analyze the densities and spatial qualities in detail. The floor area ratio and percentage of land coverage by buildings inside the block have been considered as the variables of density where the space usability, cross ventilation and presence of day light has been considered as the variables of spatial quality.

The study shows that the floor area ratio of settlements is very high and the percentage of land coverage by houses is also very high. On the other hand the floor area ratio of complexes by developers is as per development norms and the percentage of land coverage is medium. The efficiency of the space inside the block of settlements is not good and as a result there is a shortage of the variables of spatial quality.

KEYWORDS: Urban Sprawl, Spatial qualities, Land coverage, Floor area ratio, Housing Density.

I. INTRODUCTION

In India, with an unprecedented population growth and migration, an increased urban population and urbanization is unplanned. More and more towns and cities are blooming with a change in the land use along the highways and in the immediate vicinity of the city. This dispersed development outside of compact urban and village centers along highways and in rural countryside is defined as 'sprawl'. Some of the causes of the sprawl include - population growth, economy, patterns of infrastructure, initiatives like the construction of roads and the provision of infrastructure using public money encouraging development. The direct implication of such urban sprawl is the change in land use and land cover of the region.

Sprawl generally assumes to some type of development with impacts such as loss of agricultural land, open space and ecologically sensitive habitats. Also, sometimes sprawl is equated with growth of town or city. In simpler words, as population increases in an area or a city, the boundary of the city expands to accommodate the growth; this expansion is considered as sprawl. Usually sprawls take place on the urban fringe, at the edge of an urban area or along the highways.

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II. NEED OF STUDY

The exceptional growth of many urban agglomerations in many developing countries is the result of a threefold structural change process: the transition away from agricultural employment, high population growth and increasing urbanization rates. Sprawl is seen as one of the potential threats for such development.

Normally, when rural pockets are connected to a city by a road in the initial stages, development in the form of service centers such as shops, cafeteria etc. is seen on the roadside, which eventually become the hub of economic activities leading to sprawl. Eventually a significant amount of upsurge could be observed along these roads. This type of upsurge caused by a road network between urban / semi-urban / rural centers is very much prevalent and persistent in most places in India. These regions are devoid of any infrastructure facilities, since planners are unable to visualize this type of growth patterns. This growth is normally left out in all government surveys (even in national population census), as this cannot be grouped under either urban or rural center. The investigation of patterns of this kind of growth is very crucial from regional planning point of view to provide basic amenities in these regions. The study of this kind reveals the type, extent and nature of sprawl taking place in a region and the drivers responsible for the growth. This would help developers and town planners to project growth patterns and facilitate various infrastructure facilities.

Also there is a lack of knowledge on the systematic analyses of densities of housing settlements and their impact on urban sprawl. Pune is the seventh largest city in India and second largest city in Maharashtra after Mumbai. The city expanded explosively after the post-independence period. During the 180 yrs. period (1817-1997), the Pune urban area has grown from a 5sq.km to 700sq.km which is 140 times the original area. Between 1901 & 2001 Pune's urban population has grown from 1.64 lakh to about 42 lakh which is 25 times the original figure. The density of population of Pune city was 8672 persons per sq. km (1981), whereas it was about 5000 persons per sq. km for urban area. (Source:PMC, CDP 2006-12). The main drivers of economy in this region are:

- Higher educational centers
- Auto and auto ancillary industries
- Strong development of the IT industry
- Growing agro and food processing industry
- Potential to emerge as the bio-technology (BT) hub
- Selection of Pune by UNIDO in 2003 as a Dynamic City Region
- Listing of Pune by Forbes as the third most Favored World Corporate Destination

If urban sprawl in Pune is to be addressed, housing solution that can accommodate the increasing population and with good spatial qualities is very important.

III. AIM OF STUDY

The aim of the study is to explore the relationship between density, spatial qualities and urban sprawl within the context of Pune Metropolitan Region in relation to Narhe gaon and Ambegaon Bk.

IV. CHARACTERISTICS OF STUDY AREA

1) Narhegaon

Location aspect

Narhegaon village is located on the southern side of Pune city at a distance of 10 Km. from municipal corporation limits. It is on the transport corridor Pune-Mumbai NH4. Narhegaon is surrounded by villages, on the north –Wadgaon Bk., south-Ambegaon Kh., east-Ambegaon Bk. And on the west-Dhayari. It is fully excluded from the Pune Municipal Corporation in 2001. In the year 1961 according to census data the village population was 472, till 1971 the population growth was gradual. In the year 1991 the population goes to 2065. That means the population in 1991 has increase 4 times than that of in the 1961.

- Area of Narhe: 1,42,13,22,500 sq.m or 1421 hect. or 14 sq.km

Local authority: Narhegaon Grampanchayat

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2) Ambegaon Bk.

Location aspect

Ambegaon Bk.village is located on the southern side of Pune city at a distance of 10 Km.from municipal corporation limits. It is on the transport corridor Pune-Mumbai NH 4. Ambegaon Bk. Is surrounded by villages, on the north – Wadgaon Bk., south-Ambegaon Kh. east-Katraj And on the west-Narhegaon. It is partly excluded from the Pune Municipal Corporation in 2001

- Area of Ambegaon Bk.:44, 62,810.10 sq.m or 450 hect. Or 4.5 sq.km
- Local authority: Ambegaon Bk.Grampanhayat

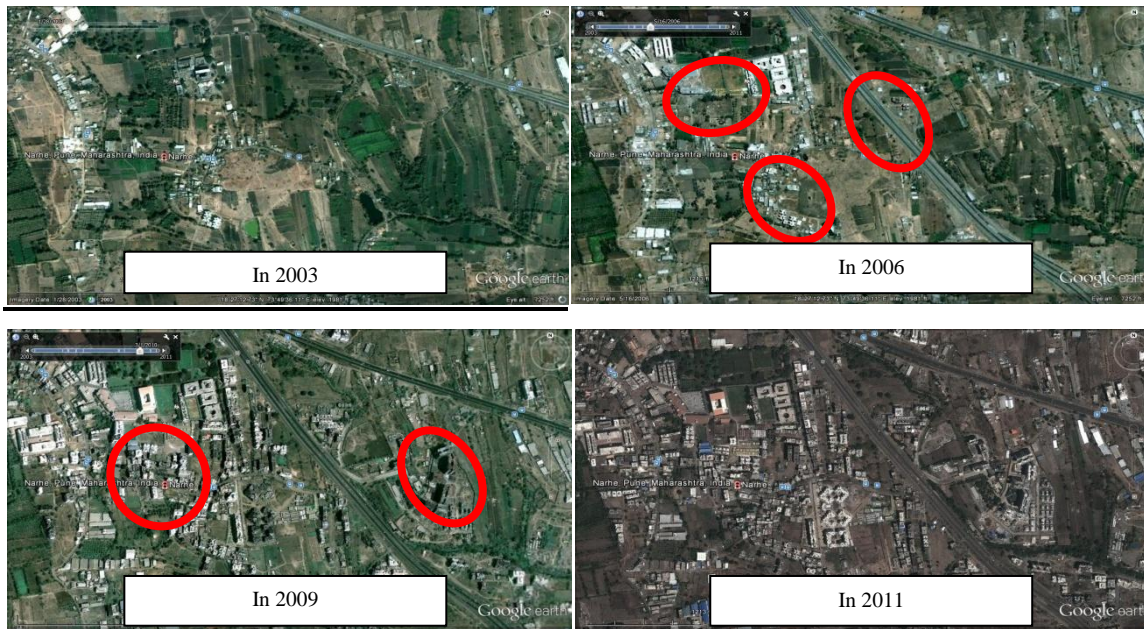
Reasons behind development of suburban area

- Less travel distance from city area.
- Accessibility to major commercial & office places of Pune city.
- Availability of land for the development.
- Comparatively low prices of housing and land as compared to city areas
- Availability of good quality of housing with fewer prices.
- Connectivity of Mumbai-Bangalore highway.
- Development of educational institutes.

(Source: CDP 2006-12, Pune Regional Plan Report 2011)

Sequence of development

1) Narhegaon



(Source: Google Earth)

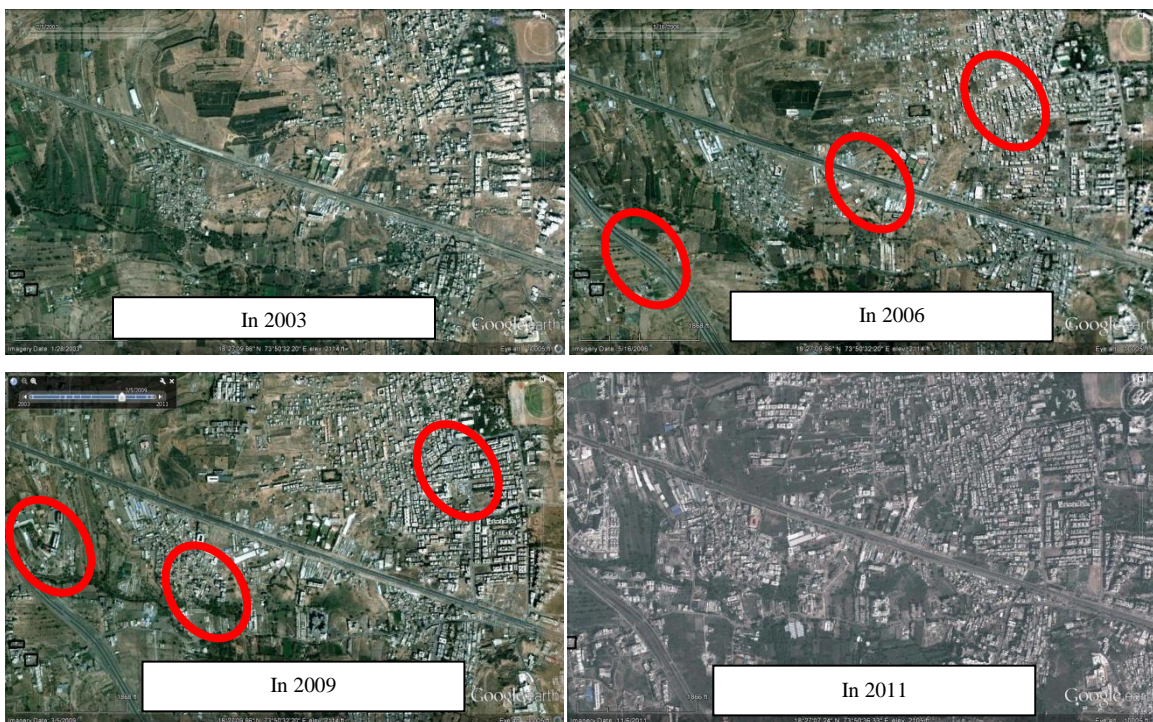
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2) Ambegaon Bk.



(Source: Google Earth)

V. DATA COLLECTION ASPECTS

1) Existing Land use



(Source: Primary Survey)

2) Road Network and Transportation

3) Infrastructure facilities

- a. Sewage and Storm water drain
- b. Solid waste management

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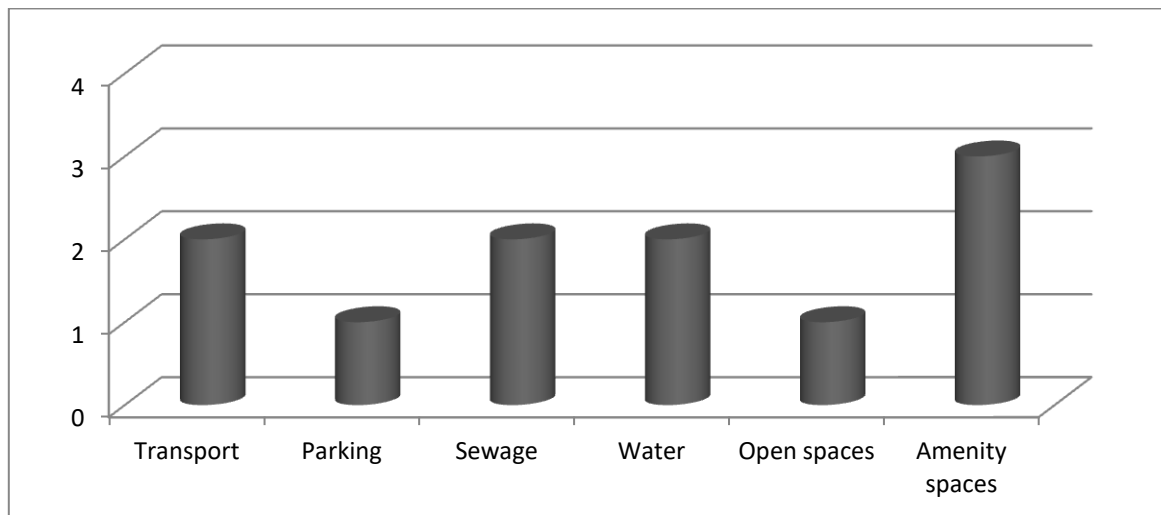


Fig. No: Bar chart showing rating for infrastructural facilities. (Source: Primary survey)

- 4) **Housing and Population Density Calculation**
- 5) **Density and Spatial quality Observations**
- 6) **Spatial Qualities**

Observations from Survey

- Mixed type of land use is present.
- Unplanned and uncontrolled growth with high density.
- Large numbers of illegal constructions are found.
- Encroachment of built up areas on the agricultural land.
- Development on hill slopes & hilltops is major issue from environment point of view.
- Natural features such as nallas are cleared of by builders.
- Poor quality of public/infrastructural facilities serving the areas like transportation, water supply, garbage disposal etc.
- Lack of recreational spaces. (0.05% in Narhegaon)
- Roads of 10 to 15 foot (3-5m) are found.
- Building height to road width ratio is not followed properly.
- Poor connectivity is between houses.
- Land resources are also wasted because the land is divided in small parcels which are difficult to utilize efficiently.
- Development control rules are not followed in these areas.
- Population density about 250persons / ha. is occurring.
- Tenement density is 63 units/ha.
- Generally 4 to 5 storey houses are found.
- Gross density is 175 persons / ha. And net density is 272 persons / ha.

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- Comparison of density

Area	Population density/ha.
Pune city	140
Outside	250-300

(Source: CDP 2006-12, Pune Regional Plan Report)

- FSI and plot coverage used by buildings is very high this leads in shortage of space to provide infrastructure facilities and maintain good spatial qualities.
- The houses are very close to each other and the narrow strip of roads adjoining them.
- There are no private open spaces /marginal spaces due to the high percentage of land coverage by buildings.

VI. PROPOSALS AND RECOMMENDATIONS

Policies formation regarding following aspects

1. Existing land use/Urban sprawl

- To stop the sprawl, restrict the further growth by treating agricultural area as No Development Zone.
- Restrict the future development by allowing standard population density as 100 persons / ha. i.e. 20 units/ha.
- Provide basic infrastructural facilities for existing and upcoming population.

2. Transportation facilities

- Increase the width of existing roads up to 12-15 m, to improve the traffic conditions.
- Provide proper access to all houses so that the motorized vehicles or fire brigade vehicles can enter easily.
- Building height and road width ratio should be followed.

3. Physical infrastructural facilities

- Provide the basic amenities such as community hall, post office, bus stops, fire station etc.
- Provide basic services like water supply, drainage facilities, sewage treatment plant, garbage disposal plant, transformer etc.
- Garbage pits should be provided.

4. Recreational facilities

- Provide public open spaces and parks as these act as lungs of the city.
- Play grounds should be provided.
- Open court yard and terrace can be provided for individual dwelling unit. These can be used as a private space.
- Marginal spaces should be provided.

5. Preservation of natural landscapes

- Preserve the natural landscapes i.e. nalla, hill slopes by restricting upcoming constructions.
- Restriction on diversion of prime agricultural land for other purposes.
- Treat the agriculture zone as No Development Zone.

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6. Density and spatial quality

- The FAR/FSI value should be kept very low to reduce density.
- Restrict the building height up to 1 to 2 storey for getting privacy and sunlight.
- Percentage of land coverage should be kept medium to increase the efficiency of space.
- Within the cluster housing some area (plot) should be kept free, which act as semiprivate communal open space.
- Internal roads of standard width should be provided.
- Development control rules should be strictly followed.

7. Proposed values of FSI and Ground coverage

Table: Proposed values for FSI and Ground coverage

Component	Existing	DCR		Proposed	
		Congested	Non congested	Congested	Non congested
	Congested + Non congested	Congested	Non congested	Congested	Non congested
FSI	2.5 – 3	1.5	0.75+0.15	1.5	1.0+0.2
Ground coverage	80% of net plot area(for block) 95% (for individual)	60% of net plot area	50% of net plot area	70% of net plot area	60% of net plot area

In present situation, the ground coverage used by the plot holders is 100 % and the FSI consumed is more than the development rules. Due to this condition the blocks are lack in spatial qualities. By the use of provided values for the FSI and ground coverage, the upcoming development gets the spatial qualities properly.

VII. CONCLUSION

In terms of the growth pattern, the difference cannot be found between Urban and urban sprawl area but in terms of administration the situation is distinct. There is proper framework for the development of urban area in the city. On the other side in the sprawl area, haphazard development occurs. Hence proper planning framework is needed in these areas. Haphazard development is more because of the lack of knowledge of the people in these areas and also due to the co-ordination of the Village panchayat for unauthorized constructions.

Most of the problems can be solved with a proper planning and development monitoring agency in the initial stages and integration of these sprawl areas within the mother city within proper time. Zilla Parishad, Village Panchayat and the infrastructure providing agencies and town planning department which are responsible for development permission needs to coordinate and periodically prepare infrastructure plans and keep watch on the density regulations and should take timely review of these developing areas. As per MRTP Act 1966, detail planning of such areas should be prepared by the use of Area Level Plan. Such planning methods can be used for the development of sprawl villages.

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