

Sustainable Development with the Help of Compact City Planning

Ar. Garima Parihar¹, Dr. Sanjay S. Jadon²

¹Student, MUP, Madhav Institute of Technology and Science, Gwalior, (M.P.)

²Professor, Dept. of Architecture, M.I.T.S., Gwalior, (M.P.)

Abstract - Geographic spread/urban sprawl is reduced due to the high intensity of development. Land consumption is reduced, and higher residential densities accommodate more people in the same space, resulting in increased social connections. Trips are becoming shorter on average, resulting in lower fuel use and hazardous emissions. Urban compaction is required to address extension and related challenges such as land availability for housing and agricultural land loss, needing compact development. Sustainable urbanism is the study of cities, as well as the practice and strategies used to design and develop them, with the purpose of enhancing their long-term resilience and viability, lowering energy consumption, mitigating pollution, and reduce wastage, and enhancing social equity and well-being. The compact city is the sustainable urbanism's primary paradigm. This research aims to determine what are the indicators of a compact city and how we can determine whether or not a city is compact.

Key Words: Compact city, urban Sustainability, mixed landuse, neighbourhood.

1. INTRODUCTION

With the rise in people's aspirations and changes in their lifestyles and living patterns, there has been a huge demand for the implementation of various sustainable urban development concepts and models. The notion of sustainable development, as well as proposals for a set of observable indicators related to sustainable urban development, are also worth highlighting. The goal of this research study is to use compact city planning to promote sustainable development. The following are the primary goals of this study paper:

- i) To understanding the compact city concept and how it contributes to urban sustainability.
- ii) To have a better understanding of several indicators of compact city growth.
- iii) To investigate compact city models for sustainable development.
- iv) To identify compact city planning indicators through sustainable development.

1.1 Compact City

The term "compact city" refers to a mixed-use, somewhat high-density neighborhood with an efficient public transportation infrastructure and dimensions that encourage walking and cycling. The basic facility of the compact city is the local community or neighborhoods, which is being planned at a wider scale by conventional urban planning models that rely heavily on automotive transport. Human scale factors should be given greater focus in order to have a better quality of life in a compact city and so consideration of the effects of the local environment helps to the primary components in such design.

1.2 Characteristics based on three elements:

- i) The urban form
- ii) The space, and
- iii) The social functions

1.3 Urban Sustainability

Sustainable development includes more than environmental protection, it also emphasises the importance of equity. Both intra-generational equities, which address the needs of society's most vulnerable members, and inter-generational equity, which ensures that future generations are treated fairly, must be considered. The compact city's key sustainability benefits include:

- i) Environmental sustainability
- ii) Economic sustainability
- iii) Social sustainability

1.4 Principles of sustainable development

- i) High density
- ii) Mixed land-use
- iii) Social mix
- iv) Adequate space for streets and an efficient street network
- v) Limited land-use specialization

1.5 The Indicators of compact city

The OECD estimates that A set of indicators for evaluating cities against the compact city concept was also developed in the publication "compact City Policies." A Comparative Assessment " was issued by the OCED". The report was the result of a three year research study focused on the concept of a compact metropolis. The OECD provided a total of 18

metrics, as well as case studies for five metro areas, for tracking and evaluating compact city performance. The measurement were divided into two categories.

Compactness indicators and indicators measuring the influence of compact city initiatives on ecological, social, and economic domains are divided into two categories.

For the first category, indicators were proposed related to:

1. Neighborhood and density.
2. Public transport system
3. Accessibility to local services and jobs

However a total of five indicators showing the effectiveness of compact city policies on specific issues have been presented in the second category.

4. Environmental
5. Social
6. Economic

2. Case study of Nagpur city

The idea is to quantify the urban form so that the benefits of compactness can be maximized.

- 1) Density distribution measures the distribution of residents in an urban region.
- 2) Within the town, the distribution of commercial and recreational activities, services, employment, and so on in relation to where people live accessibility, composition, size, and shape are all factors that are taken into consideration.
- 3) The transportation network's structure and the modes of transportation that people uses
- 4) The constructed form's design quality encourages or discourages specific activities. As a result, urban form is frequently analysed and evaluated based on the analysis of data related to the factors mentioned.

2.1 Analysing the form of the city

- i) Nagpur has a 300 year history, and the city has expanded from historic centre.
- ii) It is discovered that the Nagpur city model is a composite model, i.e. a mono polycentric model.
- iii) The identified Heart of Gravity is Sitabuldi, which is located in the town's centre, along the main interchange node, and includes a inter-city and intra city transit terminals, as well as a railway station. It serves as a vital link between the East and West areas of the city.

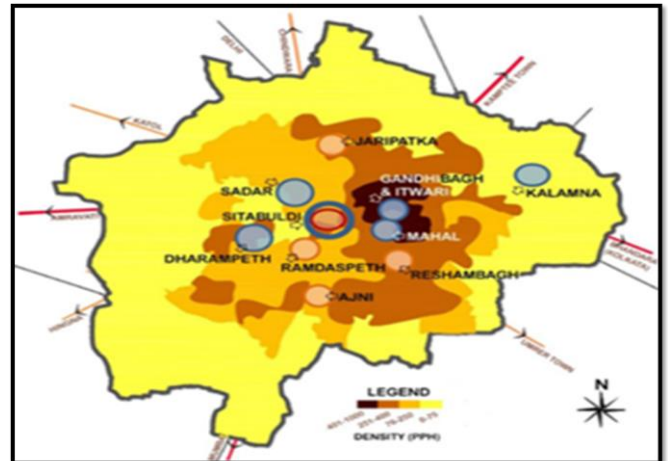


Fig: 1 Nagpur's composite spatial organization model includes the following elements, density distribution, traffic flow, sub centers, and the sitabuldi area as the center of gravity.

2.2 A set of indicators derived from a case study

The set of indicators for land composition and mixed use features are mapped and evaluated at the ward level in order to measure the town's spatial structure/urban form, as they may not be mapped at the city level.

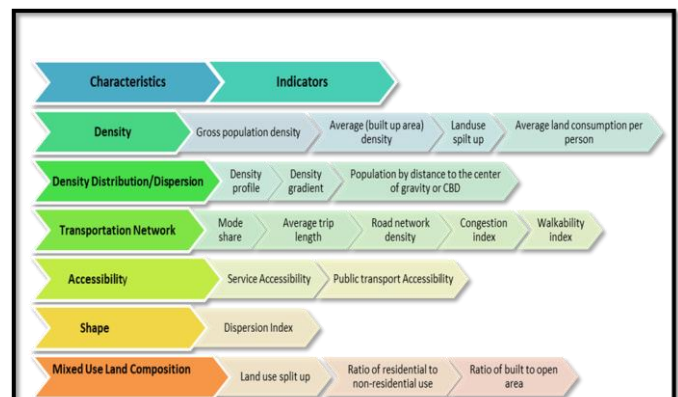


Figure 2: Derived Set of Indicators

2.3 Data Interpretation

Density: Calculations for density should be made using the built-up area. Measures the amount of land utilised by urban activity across administrative boundaries within a metropolitan area. Large parks (>4 ha), airports, agricultural land, undeveloped unoccupied land, and water bodies are excluded. To determine the density pattern inside the city, three indicators are used:

- Gross population density
- Average (built-up area) density; and
- Average land consumption per person

Density Distribution/Dispersion: within a city's boundaries (developed urban area or urbanized area), population is spread or dispersed with varied densities. Three indicators are commonly used to understand a city's density distribution pattern:

- Density profile,
- Density gradient.
- Population distribution by distance from the CBD

Transportation Network: Transportation networks and urban forms have a close link. Improved intra-urban communication and accessibility may be necessary to maintain a compact urban form. As a result, At the most basic geographical scale, such as

- Average trip length
- Road network
- Mode share
- Walking index
- Congestion index

Accessibility (Proximity): a services, places, or intended activity accessibility or proximity can be defined as how quickly and efficiently a person can get there with less time and travel distance. It can be measured in terms of the distance between the nearest site or activity and the number of locations or activities within that distance. As part of the research, Wilber smith associates established two types of accessibility indices.:

- Public Transportation Accessibility Index
- Service Accessibility Index.

Shape Performance: The compactness of a city can be determined by its shape, as the more compact and circular cities should have lower travel distance, according to the organisation .

2.4 Discussion

Nagpur is mostly a monocentric city, with major commercial districts in the city core and a few subcenters dispersed about.

Central areas have relatively high population densities, whereas the periphery has very low densities.

Density is less than 100 PPh in 25% of wards and 50%of zones.

Low density ward take about 60%of the land area; large expanses of land are assigned for outlying wards, enhancing the potential for low density sprawl.

Nagpur's east side has a larger population density than the city's west, and East Nagpur is under more pressure.

The city's current density profile indicates that the majority of the population is located near the city centre, but that it is currently migrating from the centre to the outskirts.

Despite the fact that automobile ownership is modest and progressively expanding, Nagpur already has a high share (58) of non motorized modes of transportation,. In terms of

accessibility/proximity, it is noted that public transit is inconvenient and its share is low.

Within the city, open space, recreational area, and public/ semi public landuses are unevenly distributed.

It is necessary to enhance the FSI in order to improve density and minimise travel distance, as well as to address important issues such as overpopulation in constructed spaces, increased city size, and expensive building unit prices.

Nagpur has all of the characteristics of a compact city; it is currently on the edge between compactness and dispersion; and the compact city concept may be the most appropriate approach for accomplishing nagpur's long term urban growth.

Inclusive planning meets social and economic needs by involving and involving more people in the planning process. The large informal sector must be taken into account in planning, as ignoring it could stymie compact city development. When designing urban planning rules, the compact city concept refers to the environment, social, and economic benefits that must be prioritised. In the concept, poverty and social inequity must be tackled. Though the compact city model's claims for achieving sustainability are still being debated, If the required steps are taken, this model will surely provide the benefits that it promises top indian cities.

2.5 Conclusion

Currently, the city is compact, but it is scattering. Based on the findings of this study's analysis, it's possible to say that Nagpur is currently straddling the line between compactness and dispersion. Shorter travel distance, mixed land use predominance, higher densities in core and intermediate areas with compact urban fabric, and a large percentage of non motorized travel modes, and so on were all assisted by the city's compact urban form characteristics, which had been present for decades. If timely intervention to restructure the urban form is made, the city's compact urban form may be preserved in the future.

There's a good chance that barriers to achieving sustainable urban growth will be in place. Overcrowding and environmental degradation can result from a lack of suitable legislation and institutional structure for meeting the increasing demand for compact and high density-built regions. Furthermore, the city will be burdened by pollution, noise, a lack of privacy, separation, and a loss of identity, among other things. Informal growth is prevalent in developing country cities, which may be a barrier to the effectiveness of compact city strategies. The heat island effect and disaster risk may be exacerbated by high densities and greater developed area.

REFERENCES

- i) Compact city planning and development: Emerging practices and strategies for achieving the goals of sustainability Simon Elias Bibri a,b,*, John Krogstie c, Mattias K€arrholme
- ii) PhD Eng.; Faculty of Civil Engineering and Environmental Sciences, Bialystok University of Technology, Wiejska, INDICATORS OF THE COMPACT CITY CONCEPT – NECESSARY DATA AND THE POSSIBILITY OF APPLICATION, Karolina OGRODNIK
- iii) OECD Green Growth Studies Compact City Policies: A Comparative Assessment
- iv) Measuring Compact Urban Form: A Case of Nagpur City, India Rajashree Kotharkar 1,†, Pankaj Bahadure 1,†, *and Neha Sarda 2,