

# Urban Sprawl to Compact City

## An approach to sustainable urban development

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**Abstract** - India has many problems with urban expansion, and urban sprawl is one of them. Rapid urbanization brings uncontrolled expansion, incompatible land uses, and population movement toward cities are the prime factors for **Urban Sprawl**. For cities to be livable, planners must solve this problem. Compact planning for sustainable development is required to handle these problems without threatening prospects for future generations. The "Compact City" idea is one of several sustainable urban development strategies to limit the effects of urban expansion on the environment. High-density, mixed-use and with distinct (i.e., non-sprawling) borders characterize this metropolis. A compact city can support social sustainability, socioeconomic viability, sustainable land use, and sustainable transportation.

This study examines energy-saving, livable, productive, and sustainable urban planning strategies for Indian cities. It looks at urbanization trends, obstacles, and potential remedies for promoting the environment and the ecosystem. Options include dense metropolitan areas, mixed-use development, reducing urban sprawl, and raising density. The compact city idea is examined in the study, along with its application in the Indian context.

**Key Words:** Urban Sprawl, Compact city, Sustainable development, environment, metropolitan planning

### 1. INTRODUCTION

Urbanization poses a significant challenge in the twenty-first century, particularly in Indian cities. Rapid growth, economic restructuring, and population density have led to challenges such as sprawl, uncontrolled expansion, and incompatible land use. Conventional urban planning and strategies have led to unsustainable development, requiring new ideas for city planning and urban development. Research suggests that low-density regions near urban centers can be fully developed through urban regeneration procedures. Sustainable urban, environmental, social, and economic development is crucial for trade, governance, transportation, and innovation.

Urban sprawl and environmental damage contribute to global warming, climate change, and energy consumption. The compact city concept aims to address these issues by

increasing density, redistributing density, implementing transit-oriented development schemes, and utilizing land resources in mixed practices.

This study evaluates the compact city concept in periphery areas, focusing on urban sprawl, lifestyles, and living standards. It examines new urbanism, smart growth, and compact cities as anti-sprawling models.

### 2. Sustainable Development

In every aspect of human life, sustainable development is of utmost importance. It is a general phrase used in many disciplines, including economics, finance, health, and industrial output. Sustainable Development is defined in a variety of ways.

A sustainable development is one that meets the demands of its inhabitants, such as a high quality of life, while adhering to principles of lower levels of natural resource consumption, waste minimization, and pollution reduction as reduced levels of output.

According to the report of the Brundtland Commission from 1987, the term "sustainable development" was first defined as "meeting the requirements of the present without sacrificing the ability of future generations to satisfy their own needs. Given their roles as sources of resource use, centers of population expansion, and engines of economic growth, sustainable cities are essential to sustainable development.

### 3. Urban Sprawl, causing factors, characteristics, and adverse impact on the city

Urban sprawl can be described from a variety of angles, including specific land use models, land development procedures, justifications for land use behaviors, and the outcomes of such behaviors in urban settings. metropolitan sprawl is the result of unplanned and uncontrolled growth brought on by the expansion of metropolitan areas. Because it hinders regional sustainable development and eliminates areas of infrastructural services and essential amenities like health and education, this unchecked expansion is unsuitable for urban or rural surroundings. Urban sprawl and urban

expansion have become serious issues in many cities throughout the world since the 1960s, especially in metropolitan regions.

According to Bruckner, sprawl results from inhabitants' propensity to construct more infrastructure and larger structures as well as rising income levels and population.

### 3.1 Causes of Urban Sprawl

According to numerous studies on the causes of urban sprawl, the most significant ones are population and income growth, low land prices, access to affordable housing, and benefits like affordable transportation, a network that encourages commuting, new job centers in the suburbs, and the use of infrastructure, subsidies, and public services. These elements will stimulate utility promotion and urban sprawl among inhabitants. Factors are categorized in Table 1.

**Table -1:** Causes of Urban Sprawl

Factors	Causes
Economic	Economic growth and increasing income.
	Prices of land
Housing	More space per person
	Variety of choices
Transportation	Private car ownership
	Availability of road
Inner city problem	Damaged infrastructure
	Lack of green spaces
	Social problems
	Small residential units

### 3.2 Characteristics of urban sprawl-

Urban sprawl, which is frequently characterized by low-density development and insufficient planning control, is the haphazard and unpleasant extension of an urban or industrial region into the countryside. It is at the forefront of urban expansion and can result in rising wealth disparity, employment instability, the decline of major cities, expensive housing, lengthy commutes, environmental issues, the extinction of animals, the loss of agriculture, and a feeling of isolation.(Table-2)

Few characteristics of urban sprawl that are unique to India

**Table -2:** Characteristics of Urban Sprawl

Characteristics	
Peri-Urban Growth	Urban sprawl in India frequently takes the form of peri-urban growth, as cities spread out into rural areas. Conflicts between traditional farming operations and urban growth may result from this.
Informal Settlements	On the fringes of Indian cities, informal settlements are expanding in tandem with urban expansion. These communities frequently form because of rural-to-urban migration and frequently lack basic infrastructure and amenities.
Mixed Land Use	Unlike global urban sprawl, which typically separates land uses, Indian towns frequently display mixed land use in the form of integrated commercial and residential neighborhoods
Density gradients	Urban sprawl in India can cause density gradients inside the city, with the core of the metropolis being dense and the periphery being characterized by low-density residential construction.
Transit Issues	Poor public transit infrastructure contributes to traffic congestion and air pollution in India's expanding cities, which increases the use of cars.
High-Rise Sprawl	While low-rise suburban sprawl is typical, high-rise sprawl is also present in many Indian cities, with vertical growth taking the shape of taller homes and businesses.
Infrastructure Disparities	Some expansive areas may not have enough access to essential amenities like water, sewage, and power because of uneven infrastructure development.
Rapid urbanization	India is experiencing rapid urbanization, which is causing unplanned and spontaneous urban expansion on the outskirts of existing cities.

Economic Inequalities	As wealthier people relocate to the suburbs, urban expansion can exacerbate socio-economic inequalities by fracturing social classes
Agriculture land conversion	Urban sprawl frequently leads in the conversion of productive agricultural land into built-up regions, which has an influence on regional food production and rural lives.

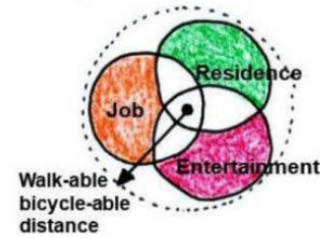


Fig -1: Compact city concept

#### 4.1 Characteristics of Compact City

Table -3: Characteristics of Compact City

Urban form	vertical	High-rise structures and vertical growth are common in compact cities to allow for a higher number of residents in a smaller area.
	High density	Compact cities are more densely populated than expansive places because of focused development and effective utilization of the available land.
Sustainability	Transportation	To decrease reliance on personal vehicles and traffic congestion, compact towns give priority to public transit, bike facilities, and pedestrian-friendly streets. Compact city planning places a strong emphasis on walkability, enabling inhabitants to easily reach attractions, services, and transit alternatives on foot.
	Energy	Lower environmental effect is a result of resource efficiency, less reliance on personal transportation, and the inclusion of green areas.

#### 3.3 Impact of urban sprawl-

Urban sprawl has negative effects on urban areas, the environment, and society, including increased traffic, longer commutes, air and noise pollution, loss of green space and agricultural land, stress on infrastructure, increased energy consumption, resource waste, social isolation, loss of agricultural land, health effects, economic disparities, stormwater management issues, loss of cultural heritage, dependence on automobiles, higher infrastructure costs, and fragment communities. These effects may result in higher energy usage, greater social isolation, and decreased community cohesiveness.

#### 4. Compact city

The creators of the compact city idea, Dantzing and Saaty, identified three key traits of a compact city: high residential density, reduced reliance on automobiles, distinct boundaries with neighboring regions, mixed land use, and social functions like social equality, self-sufficiency, and independent regional management.

A compact city provides affordable infrastructure, a threshold population for sustaining enterprises, efficient land use, sustainable transportation, and social and economic viability. This idea, which is common in industrialized countries and emphasizes high urban density, open space preservation, mixed land uses, revitalizing downtowns, and making heavy use of public transit. In these high densities, public transit has attracted a lot of interest

According to Rod Burgess, the compact city approach involves "increasing built area and residential population densities; enhancing urban financial, social, and cultural activities; and altering urban size, form, and structure, as well as settlement systems, in pursuit of the environmental, social, and global sustainability benefits derived from the concentration of urban functions."

		Compact cities prioritize the preservation of green spaces, parks, and urban greenery in addition to using land more intensively, to enhance the quality of the air and the quality of life.
Urban life	<b>Housing</b>	Compact cities encourage mixed-income neighborhoods, making it possible for individuals from many socioeconomic strata to live harmoniously close by. Budget-friendly houses
	<b>Equitable access</b>	Compact cities encourage fair access for all citizens to facilities, services, healthcare, and employment opportunities.
	<b>Infrastructure Efficiency</b>	Compact cities maximize the use of their infrastructure by concentrating development, making utilities like water, electricity, and sewage more effective and affordable.

additional encroachment on natural and agricultural lands, it aids in addressing the expanding urban population.

**Affordable Housing Solutions-** To solve India's housing scarcity and provide inexpensive living alternatives for all income levels, the compact city concept offers mixed-income neighborhoods and multiple housing options.

**Social inclusion-** Mixed-use communities in compact cities encourage social integration and lessen urban segregation by allowing residents of various backgrounds to live close to one another.

**Reduction in Traffic Congestion-** Compact communities encourage effective transportation systems, such as public transportation, bicycle lanes, and pedestrian-friendly streets, which may greatly cut down on traffic congestion and commute times.

**Increased Public Transportation-** Smaller cities provide an atmosphere that is favorable for the growth and expansion of effective public transportation networks, increasing accessibility, and lowering the demand for private car ownership.

**Sustainable Transportation-** There are serious health problems associated with traffic and air pollution in India. The usage of public transit, cycling, and walking are all encouraged by compact city planning, which boosts both public health and air quality.

**Reduced Carbon Emissions-** Compact city planning promotes environmentally friendly modes of travel, which helps to reduce carbon emissions and is in line with India's goals for combating climate change.

**Preservation of Green Spaces-** Green spaces and parks are given priority in compact cities, which reduces urban density, improves the quality of life for people, and promotes biodiversity in highly populated places.

**Improved public health-** Reduced air pollution, alternatives for active mobility, and access to green areas all help to enhance the results and general well-being of the general population.

**Reduced Energy Consumption-** Due to shorter travel distances and energy-efficient building designs, compact communities often consume less energy for heating/cooling and transportation.

**Long-term Sustainability-** Changing to a compact city model is consistent with sustainable urban development principles, which enhances the resilience and sustainability of cities over the long run.

In the end, the shift from sprawling cities to compact ones can result in warmer and more welcoming, resilient, and

#### 4.2 The benefit of the Compact city model

Given India's quick urbanization, dense population, and wide range of urban difficulties, the compact city concept offers several advantages that are especially pertinent to the Indian setting. In India, the compact city model has the following main benefits:

**Less Urban Sprawl-** Moving towards a compact city model aids in reducing urban sprawl, and protecting important agricultural land, natural ecosystems, and open spaces.

**Effective Land Utilization-** Compact city design, which maximizes land utilization, allows for high population densities and vertical design. This is important in a nation where there is a shortage of available land. By preventing

ecologically friendly urban settings that can accommodate the needs of both the current and next generations.

Here are some examples of how the compact city concept is being applied in India

India is implementing the compact city concept in various ways, such as Transit-Oriented Development (TOD) in cities like Delhi and Bangalore, revitalizing inner-city areas through high-rise residential and commercial complexes, prioritizing green and open spaces in Mumbai, implementing inclusive housing policies, and promoting pedestrianization and non-motorized transport in cities like Chennai. These initiatives aim to reduce traffic congestion, and carbon emissions, and improve the overall urban experience.

### 4.3 Challenges of the Compact City

Despite their many benefits, compact cities provide unique obstacles for planners, architects, and administrators to make them sustainable. These difficulties might be listed in terms of problems with accessibility to capital, the environment, traffic and transit, heat islands, etc. The following are some major obstacles to implementing the idea of compact cities in India:

**Informal Settlements-** A sizeable number of informal settlements are found in Indian cities. There are several obstacles to overcome to integrate these communities into the compact city framework and improve living conditions.

**Population expansion-** Due to India's rapid urbanization and population expansion, housing and infrastructure are under more stress, making it difficult to tolerate increasing densities without good planning.

**Property Ownership and Fragmented Land Parcels-** The requirement for land consolidation for compact development can be hampered by fragmented land ownership and unregulated property markets, which makes it difficult to find land for redevelopment.

**Inadequate public transport infrastructure-** Changing from relying on private vehicles to public transit is difficult since many Indian cities have undeveloped or insufficient public transport networks.

**Affordability-**The demand for cheap housing must be balanced with the growth of places with higher densities, however, this may be difficult because higher density areas may result in higher land values and property prices.

**Inadequate Infrastructure Services-** It is difficult for many Indian cities to provide the most basic infrastructure services, such as waste management, sewage, and water supply, which must be enhanced for compact growth.

**Regulations & Zoning-** Many Indian cities have out-of-date zoning laws that favor single-use areas and forbid mixed

land uses. It might be a challenging bureaucratic procedure to update these rules so that they adhere to compact city concepts.

**Political and governance considerations-** Effective governance and strong political will are frequently needed for the implementation of compact city ideals.

**Cultural and Social Context-** The adoption of compact city designs may be impacted by India's diverse cultural and social landscape.

**Public Awareness and Community Involvement -** To overcome opposition and misunderstandings, it is essential to raise public awareness of the advantages of a compact city and to include the public in the planning process. Local support is essential for the establishment of compact cities. For their wants and concerns to be considered, people and stakeholders must be actively involved in the planning process.

**Lack of Data-** Planning and implementing compact city ideas can be difficult when there is a lack of accurate and current data on land use, population trends, and infrastructure.

## 5. Comparative study between urban sprawl and compact city with two examples Gurgaon Haryana and GIFT (Gujrat International Finance Tec) City Gandhinagar Gujrat

### 5.1 Urban Sprawl Gurgaon

Gurgaon, is an Indian city in the urban footprint of Delhi, in terms of its population expansion and land use changes. From 57 thousand people in 1971 to 15.14 lakh in 2011, Gurgaon has seen a population increase. Additionally, the growth rate has shown a rising tendency. The structure of the town and its surrounding neighborhood is also altering because of the strain from the metropolis' continued growth.

This study examines the impact of urban population expansion on agricultural land in Gurgaon, a satellite town of the Delhi metropolis. Gurgaon, near Delhi, has experienced rapid land use changes and population growth due to its proximity to an international airport and strong infrastructure. As a hub of industrial growth, Gurgaon town and its surroundings are experiencing rapid industrial growth.

According to this case study, a major change in agricultural land from 1971 to 2019 was a reduction from 80 % to 14% of the total area. The built-up area was 8% of the total area in 1971 and increased to 78% of the total area in 2019. It shows the Significant conversion of agricultural land to commercial, residential, and other urban purposes. This can be attributed to the rapid outsourcing of economic activities and the increase in the demand for residential and commercial purposes. The villages in the Gurgaon region can

broadly be classified into three categories based on the process of their transformation: Rural - dominated with agricultural land and primary activities; transitional semi-rural to semi-urban dominated with built-up land and territory activities. The process of urban sprawl can be clearly understood as the urbanization of Gurugram.

### Characteristics

- Having a low population density and considerable real estate development.
- Residential, commercial, and industrial districts are divided because of single-use zoning.
- Dependence on personal autos because there are few public transit choices.
- loss of agricultural land and fragmented green places.
- Invasion of rural regions and rapid suburbanization.

### Result

- Longer commutes and traffic jams.
- Contamination of the air and rising carbon emissions.
- loss of biodiversity and agricultural land.
- Problems with the infrastructure and rising prices.
- Public places that are scarce and social cohesiveness.

### Planning methodology

Gurgaon's growth grew with insufficient integrated planning, resulting in uneven land use, gridlock in traffic, and insufficient infrastructure.

### 5.2 GIFT City, Gujrat

GIFT is located halfway between Ahmedabad and Gandhinagar. With a concentration on financial and technical businesses. It has skyscrapers, efficient transit networks, walkable streets, and green areas. the primary features of a Gift City are sustainable architecture, energy efficiency, simple access to essential utilities, an effective transit system and planning, telecommunication facilities, and general safety. GIFT City has all these characteristics, as well as the designation of a Central Business District.

GIFT City is divided into two parts: (1) a Smart City and (2) a Global Financial Hub. The city will most likely have two financial zones, one domestic and one international.

An attractive feature of GIFT City's 24-hour drinking water supply. For 15-day storage, Samruddhi Sarovar, a man-made water reservoir, is used together with the Narmada Main Canal and rainwater collection systems. For toilet flushing and gardening, produced wastewater is handled according to the Zero Liquid Discharge philosophy.

GIFT City aims to achieve zero accident rates by implementing transit-oriented development, proper road design, and segregating vehicular traffic from pedestrians. The community includes housing, office, retail, and multilevel parking, with a 10:90 modal split, reducing carbon emissions. The city is well-connected to BRTS and MRTS.

GIFT City has a projected 488 TPD waste volume, aiming to minimize environmental impact, human intervention, space requirements, and health hazards. It uses automatic collection and transportation systems and Plasma Gasification Technology for waste treatment.

### Characteristics

- Greater population density achieved by focused development.
- Mixed-use land with residential, commercial, and financial operations.
- Public transit, walkability, and green infrastructure are prioritized.
- Land and resource use that is efficient.
- Vertical development and high-rise structures.

### Result

- Shorter commutes and less traffic congestion.
- Environmental sustainability and improved air quality.
- Land usage and resource efficiency have been optimized.
- Improvements to public transport and walkability.
- Green places that are integrated with high-quality public facilities.

### Planning methodology

GIFT City (Gujarat International Finance Tec-City) is a master-planned community with an emphasis on sustainable urban architecture, smart infrastructure, and efficient land use.

### 6. Result

Finally, Gurgaon's urban development has created issues with traffic, pollution, and inadequate infrastructure. Gift City's small city idea, on the other hand, emphasizes sustainability, effective land use, and high-quality urban architecture. The two instances demonstrate the distinctions between these two methods and their consequences for urban development.

### 7. Conclusion

Cities and towns are crucial for India's development, but issues like informal settlements, subpar services, climate

change, inequality, poverty, insecurity, migration, and increased carbon emissions hinder their growth. A new agenda promoting ecologically sustainable, socially inclusive, and economically productive human settlements is needed to address these challenges. Compact cities offer sustainable urban intensification, but proper planning, development, and management frameworks are needed.

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