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## A Synoptic Review of Urban Green Space Distribution in Major Indian Cities

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### Abstract

Urban green spaces (UGS) provide social, health, and environmental advantages and are essential in making cities more liveable. But these areas' accessibility and spatial distribution are frequently uneven, especially in India's fast urbanizing cities. In eight Indian cities—Bengaluru, Delhi, Ahmedabad, Mumbai, Kolkata, Chandigarh, Pune, Hyderabad, and Jaipur—this study looks at the accessibility and distribution of UGS, pointing out notable differences. The study analyzes the consequences for urban planning and policy and identifies socioeconomic disparities in green space accessibility using secondary data sources, literature studies, and qualitative assessments. The results highlight the necessity of more inclusive urban design techniques to provide fair access to green spaces, especially in marginalized communities. The proposal suggests governmental changes and community-based programs to improve UGS accessibility and availability, which will aid in the creation of sustainable and livable urban settings in India.

**Keywords:** Urban Green Spaces; Spatial Distribution; Accessibility; Urban Planning; Indian Cities

### 1 Introduction

Parks, gardens, and leisure places are examples of urban green spaces, which are crucial elements of urban settings. They uplift aesthetic values, support ecological equilibrium, and boost the standard of living for locals. The distribution and availability of green spaces in India have been greatly impacted by the country's fast urbanization. The spatial distribution of UGS in Indian cities is examined in this research, with an emphasis on concerns of equity and accessibility.

Urban green spaces offer a number of critical advantages that are necessary

to the well-being and efficiency of cities. By providing habitats for a variety of species, they promote urban biodiversity, improve air quality, and lessen the impact of the urban heat island effect on the environment. In terms of health, having access to these areas is linked to less stressors, enhanced mental health, and more chances for physical activity, all of which are beneficial to general physical health. Socially, green spaces are essential to a healthy and vibrant urban environment because they operate as gathering places for people to socialize, connect with one another, and engage in leisure activities.

India's urban population has grown dramatically as a result of both natural population growth and migration from rural to urban areas. Due to the tremendous strain this quick urban growth has placed on land use and infrastructure, green spaces are frequently being developed into residential and commercial buildings. The problem of maintaining and growing urban green spaces gets more difficult as cities grow taller and wider. There are fewer and lower-quality urban parks and recreational spaces available as a result of the unrelenting need for housing and commercial space, which usually puts built environments ahead of green spaces. This tendency restricts people's access to the social and health advantages that come from open places while exacerbating environmental problems like rising temperatures and pollution. Developing effective urban planning strategies that strike a balance between development needs and the preservation of green spaces requires an understanding of these dynamics of urbanization. In light of continuous population expansion and urban development, it is imperative that green space concerns be incorporated into urban planning procedures in order to provide sustainable and liveable urban settings.

Significant trends and discrepancies are revealed by research on urban green spaces (UGS) in Indian cities. Bengaluru's green spaces have significantly decreased, as reported by Reddy and Reddy (2017)<sup>(1)</sup>, who blamed the loss on unregulated urban sprawl that has a negative impact on the city's liveability. In a similar vein, Patel et al. (2019)<sup>(2)</sup> discovered that Delhi's distribution of green spaces is noticeably unequal, emphasizing socioeconomic gaps as wealthy neighbourhoods have better access to green spaces than impoverished areas. In order to address these disparities and guarantee fair access, Sharma and Kumar (2021)<sup>(3)</sup> emphasized the critical necessity of incorporating green space considerations into urban development regulations. Taken together, these studies highlight the urgent need for a thorough investigation into the accessibility and distribution of urban green space (UGS) in Indian cities. They also highlight the significance of addressing the qualitative as well as the quantitative aspects of green space provision in the context of rapidly developing urban areas.

### 1.1 Objectives

- To identify disparities in green space availability and accessibility among different socioeconomic groups.
- To evaluate the implications of green space distribution for urban planning and policy.
- To propose strategies for improving equitable access to green spaces.

### 1.2 Study Area

Eight Indian cities were chosen based on their differing levels of urbanization, population density, and current urban green

space policies in order to investigate the spatial distribution and accessibility of urban green spaces (UGS).

The cities that were chosen are:

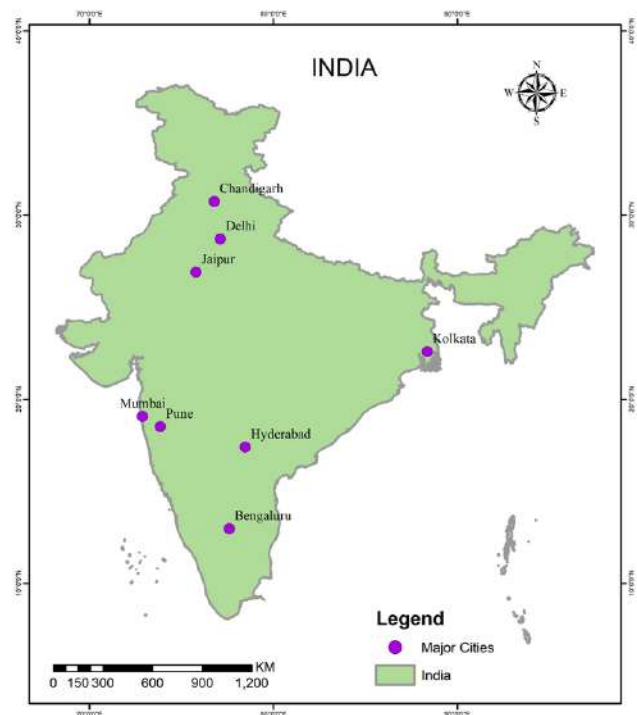


Fig. 1. Location Map of Study Area

- **Bengaluru:** Once dubbed the "Garden City," Bengaluru's green spaces have been negatively impacted by the city's fast development. The city is a perfect illustration of the difficulties experienced by quickly expanding metropolitan communities.



(Source: Google Maps: Imagery ©2024 Landsat / Copernicus, Imagery ©2024 TerraMetrics, Map data ©2024 10 km)

- **Delhi:** The nation's capital, with its sizable population and varied areas, exhibits a striking disparity in the amount of green space allocated to various socioeconomic classes<sup>(4)</sup>.



(Source: Google Maps: Imagery ©2024 TerraMetrics, Map data ©2024, 5 km)

- **Mumbai:** Despite severe restrictions on land usage, Mumbai—India's financial hub—is home to a number of sizable green areas, including the Mahalaxmi Racecourse and the Sanjay Gandhi National Park. But there are noticeable differences in how these green areas are distributed throughout the city, making them unequal.



(Source: Google Maps: Imagery ©2024 Landsat / Copernicus, TerraMetrics, Data SIO, NOAA, U.S. Navy, NGA, GEBCO, Imagery ©2024 TerraMetrics, 10 km)

- **Kolkata:** Known for its historic parks and gardens, like the Botanical Gardens and Maidan, Kolkata has a small amount of green space in its densely populated metropolitan center, especially in its older neighbourhoods. There are often too few green spaces in some parts of the city, leaving other areas neglected<sup>(5)</sup>.



(Source: Google Maps: Imagery ©2024 Airbus, Imagery ©2024 TerraMetrics, Map data ©2024, 2 km)

- **Chandigarh:** One of India's most planned towns, Chandigarh was created by architect Le Corbusier and features a lot of green areas, such as parks, gardens, and tree-lined roads. Green spaces have been given priority in the city's urban planning, which makes it imperative to investigate the distribution of planned urban green areas<sup>(6)</sup>.



(Source: Google Maps: Imagery ©2024 Airbus, Imagery ©2024 TerraMetrics, Map data ©2024, 2 km)

- **Pune:** Pune has experienced tremendous urban expansion and is well-known for its nice environment and historical significance. There are a few well-kept green areas in the city, like Saras Baug and Osho Teerth Park, but as urbanization increases, it becomes harder to preserve green space<sup>(7)</sup>.



(Source: Google Maps: Imagery ©2024 Airbus, Imagery ©2024 TerraMetrics, Map data ©2024, 5 km)

- **Hyderabad:** Hyderabad is a city that is continuously expanding and has both new and historic parts. Though there are a number of noteworthy green places in the city, such as Hussain Sagar Lake and KBR National Park, their distribution is unequal, especially in recently constructed regions<sup>(8)</sup>.





(Source: Google Maps: Imagery ©2024 Landsat / Copernicus, Imagery ©2024 TerraMetrics, Map data ©2024 Google, 10km)

- **Jaipur:** Known as the Pink City, Jaipur is renowned for its planned green areas and historical gardens. A rising problem as the city grows is striking a balance between urban growth and green places<sup>(9)</sup>.



(Source: Google Maps: Imagery ©2024 Landsat / Copernicus, Imagery ©2024 TerraMetrics, Map data ©2024, 5 km)

### 1.3 Geographical and Demographic Factors

The availability and accessibility of green spaces are influenced by distinct geographical elements and demographic profiles found in each of these cities:

Bengaluru enjoys a temperate temperature and is situated in the southern region of India. Significant changes in land use have resulted from its fast urbanization, frequently at the expense of green places. Delhi is a city with a blend of old and new urban development, located in the northern plains. Due to the great diversity of the city's population, there are differing needs for green spaces. Mumbai has a tropical climate and is situated on the western coast. The supply of green space is difficult in the city due to its high population density and limited land, especially in the heavily populated southern and central regions. Kolkata is located beside the Hooghly River in the eastern lowlands. The majority of the city's green spaces are located in its ancient districts; there is not enough green space in the contemporary constructions. In northern India, in the foothills of the Himalayas, sits

Chandigarh. The city is a unique example of urban planning in India because of its planned structure, which includes broad roadways, lots of parks, and green belts. Pune is situated on the Deccan Plateau in western India. Its blend of modern construction and historic communities makes it difficult to preserve green areas in the face of explosive urban growth. Hyderabad is located on the Deccan Plateau in southern India. The city's green spaces, especially those on the periphery, are under threat due to its rapid expansion, particularly in the IT sector. Rajasthan's dry region is home to Jaipur, a city with a historic design that features numerous planned parks and green areas. The city's growth into the adjacent arid regions creates particular difficulties for the preservation of open space.

## 2 Methodology

### • Data Gathering

This study examines the prevalence and accessibility of urban green spaces (UGS) in the chosen cities using secondary data sources, literature reviews, and qualitative evaluations. Government Publications, City Planning Documents, and Municipal Reports: Information about the locations, sizes, and usage of the green spaces that are currently in place was obtained from these sources. Data from the most current Indian Census and associated government surveys were used to compile the population density and socioeconomic indicators. These statistics were used to evaluate the differences in accessibility to green spaces between various social and economic groups<sup>(10)</sup>.

**Literature Review:** To set the scene and bolster the analysis, earlier research on urban green areas in the chosen cities was examined. Studies on social equality, environmental effects, and urban planning fall under this category.

Google Maps was used to generate location maps for each selected city, providing a clear visual reference for the study areas.

### • Assessment of Qualitative Data

The assessment of the distribution and accessibility of green areas was conducted using a qualitative methodology.

**Analysis of Urban Planning Policies:** In order to determine how each city's current policies affect the creation and upkeep of green spaces, an analysis of those policies was conducted. This involved going over land-use plans, zoning laws, and mandates for green space.

**Case Studies and Field Reports:** To evaluate the actual difficulties and achievements in managing urban green areas, case studies from earlier research and field reports were consulted. These case studies shed light on locals' actual experiences with accessibility to green spaces.

**Views from Stakeholders:** To comprehend the diverse viewpoints on the distribution and accessibility of green

space, insights from a range of stakeholders were taken into consideration, including community organizations, environmental activists, and urban planners.

### 3 Results

#### • Urban Green Space Distribution

There are notable differences in the distribution of green spaces across the chosen cities, as evidenced by the examination of government reports and literature:

The number of green spaces in Bengaluru has decreased, especially on the city's outskirts where fast urban growth has resulted in the conversion of green spaces into residential and commercial projects. Bengaluru has a mix of areas with varying levels of green spaces. Neighbourhoods like Jayanagar, Basavanagudi, Malleswaram, and HSR Layout are known for their tree-lined streets and numerous parks, while central areas like Cubbon Park offer major green lungs for the city. In contrast, areas like Majestic, Chickpet, Electronic City, KR Puram, and Yeshwanthpur have less greenery, mainly due to dense commercial and industrial development. Overall, older residential neighbourhoods tend to have more green spaces, while newer, more commercialized areas have fewer. Rapid urbanization has led to a decline in green cover, prompting efforts to preserve and enhance the city's green spaces.

Delhi's distribution of green spaces shows a clear disparity: In New Delhi, the distribution of green spaces varies significantly across different parts of the city. Central Delhi is known for its extensive green areas, including Lodhi Gardens, Nehru Park, and the lawns surrounding India Gate, as well as the Mughal Gardens at Rashtrapati Bhavan. South Delhi also boasts several green spaces, such as Deer Park in Hauz Khas and the Garden of Five Senses near Saket, along with tree-lined residential neighbourhoods. North Delhi features the Delhi Ridge Forest, which contributes to the city's green belt. In contrast, East and West Delhi have fewer large parks and green areas, as these regions are more densely populated and urbanized, with limited space for green development. Old Delhi, with its historic, densely packed markets and narrow lanes, also lacks significant green spaces. While Central and South Delhi enjoy relatively more greenery, areas like East, West, and parts of North Delhi have less green cover. Efforts are underway by municipal bodies to enhance the green cover in these less verdant areas by developing new parks and green belts. richer neighbourhoods, such as South Delhi, have more and better-maintained parks, whereas impoverished districts, notably those on the outskirts, have less access to green spaces.

Ahmedabad provides a mixed scenario; there are fewer parks in the older, less thoughtfully planned areas of the city. Better green space is provided in newer, planned communities, although lower-class residents frequently cannot access this.

Mumbai, a densely populated city, exhibits a varying distribution of green spaces across its different areas. South Mumbai, including Colaba, Marine Drive, and Malabar Hill, has notable green areas like the Hanging Gardens and Kamala Nehru Park, thanks to older urban planning that incorporated such spaces. The western suburbs, such as Borivali and Goregaon, are richer in greenery due to the presence of the Sanjay Gandhi National Park and Aarey Colony. Similarly, parts of the central suburbs like Powai and Mulund have more green spaces, including Powai Lake and the Yeoor Hills. In contrast, densely urbanized areas like Dadar, Byculla, and Parel, as well as the eastern suburbs of Chembur, Kurla, and Ghatkopar, have fewer green spaces due to extensive residential and industrial development. Some parts of South Mumbai, like Crawford Market and Kalbadevi, are also congested with limited greenery. Generally, the northern and western suburbs of Mumbai have more green spaces compared to the central and eastern parts of the city. There are a few sizable green areas in Mumbai, however they are mainly located in particular regions. Conversely, areas with high population densities, especially those in the southern districts of the city, do not have enough green space, which results in uneven access.

While green spaces are concentrated in some historical sections of Kolkata, such as the Maidan, there are few green spaces in older, densely populated regions and modern developments, which contributes to large discrepancies. In Kolkata, the distribution of green spaces varies across the city. South Kolkata generally boasts more green areas, with neighborhoods like Ballygunge, Alambazar, and Jodhpur Park enjoying relatively abundant greenery. The Maidan, a large urban park in central Kolkata, is a prominent example, along with other parks and gardens in this region. North Kolkata also has notable green spaces, particularly in Lake Town and Salt Lake, with Salt Lake Sector V featuring significant greenery. In contrast, central Kolkata, including areas like Dalhousie, Chandni Chowk, and Bowbazar, has fewer green spaces due to its dense urban development and commercial focus. Similarly, East Kolkata, with areas such as Beliaghata and parts of Kasba, tends to have fewer green spaces compared to the more residential and planned areas of the city.

As Chandigarh is a planned city, the allocation of green spaces is well thought out. Chandigarh, known for its thoughtful urban planning and green spaces, showcases varying degrees of greenery across its sectors. Areas with abundant green spaces include Sector 1, which houses the Capitol Complex and is close to the expansive Sukhna Lake, and Sector 8, home to several parks and adjacent to the Zakir Hussain Rose Garden in Sector 16, one of the city's largest and most celebrated gardens. Additionally, Sector 31 and 32 feature ample parks and playgrounds, while the Sukhna Lake area itself offers a major green space with a scenic lake and

landscaped promenade. In contrast, sectors like 17 and 22, primarily commercial hubs, have less focus on greenery due to their dense development and business activity. Sector 35 and Sector 43 also reflect this trend, with high-density residential and commercial spaces resulting in fewer green areas. While Chandigarh's overall design includes significant green spaces, the distribution and extent of greenery vary based on the sector's function and development priorities. Nonetheless, differences in accessibility persist across various sectors, especially between residential and commercial locations.

Pune's oldest areas have a fair distribution of green spaces, while the newer, faster-growing districts have experienced uneven urbanization, making the outside zones less accessible to people. In Pune, the distribution of green spaces varies notably across different areas. Koregaon Park and Aundh stand out for their abundance of lush greenery and numerous parks, contributing to their verdant environment. Viman Nagar also offers a good amount of green spaces, reflecting its well-planned nature. In contrast, areas like Pimpri-Chinchwad and Hadapsar have less emphasis on greenery. Pimpri-Chinchwad, being more industrial and residential, features fewer green areas, while Hadapsar, with its dense population, similarly lacks extensive green spaces.

While older neighborhoods in Hyderabad have comparatively superior green cover, newly built regions confront issues in sustaining green spaces. In Hyderabad, the distribution of green spaces varies significantly across different areas. Areas like Banjara Hills and Jubilee Hills are known for their lush greenery and numerous parks, contributing to a higher amount of green space. Hitec City also features several green zones and parks around its business hubs. A notable green space in the city is KBR National Park, located in Banjara Hills. Conversely, areas such as the Old City and Secunderabad have fewer green spaces. The Old City is more densely populated with commercial and residential developments, leading to a scarcity of parks. Secunderabad, while having some parks, is generally more industrialized. Malkajgiri also has limited green spaces, with a focus on residential development rather than parkland. Green spaces in surrounding areas are being more and more encroached upon due to the city's fast growth.

While Jaipur has kept many of its old parks and gardens, the availability of green space has decreased as a result of the city's growth, particularly in the more recent, less planned regions. Areas such as Raja Park, Rambagh, and Sardar Patel Marg are known for their abundant green spaces, featuring numerous parks, gardens, and tree-lined streets. In contrast, the Old City and heavily urbanized zones like M.I. Road and Station Road generally have less greenery, as these areas are more densely built-up with commercial and residential developments.

#### • Accessibility of Urban Green Spaces

Based on the qualitative evaluation and literature review, accessibility analysis brought to light a number of important issues:

**Socioeconomic Disparities:** Richer neighborhoods have better access to green spaces in all of the cities that were chosen, both in terms of quality and proximity. Insufficient green spaces in lower-income communities can result in unequal access to the advantages these spaces offer.

**Difficulties in Periphery Areas:** Access to green spaces is severely restricted for residents in these cities' peripheries, especially in fast developing areas and informal settlements. There is frequently little public infrastructure in these places, such as parks and recreational spaces.

**Effect on Well-Being and Health:** In particular regions, the dearth of easily accessible green spaces has a direct impact on the physical and emotional health of locals as well as their social well-being. Living in densely crowded places presents additional issues due to the scarcity of green spaces.

## 4 Discussion

### • Implications for Urban Planning

The results imply that the requirement for an equitable distribution of green areas is not being sufficiently addressed by current urban planning techniques in Indian towns. Planning that is more inclusive and gives priority to the supply of green space is obviously needed, especially in underprivileged regions.

### • Challenges and Limitations

The study encountered difficulties since it relied primarily on secondary data, which could not necessarily represent the most accurate or current condition on the ground. The precision of the spatial analysis is limited by the lack of remote sensing and GIS data.

### • Recommendations

Based on the findings, the following recommendations are made:

**Reform Urban Planning Policies:** In particular, for new developments and redevelopment projects, explicit demands for the supply of green space should be included in urban planning policies. Ensuring fair access to green spaces for all socioeconomic levels ought to be a priority.

**Initiatives for Community-Led Green Spaces:** Promote community participation in the design and upkeep of green spaces. In order to make sure that green areas serve the requirements of the community, locals can play a critical role.

**Government and NGO Collaboration:** To address the gaps in the availability of green space, enhance cooperation between local communities, NGOs, and government organizations. New green spaces could be developed and funded



in underprivileged communities through the use of public-private partnerships.

## 5 Conclusion

Significant differences in the availability and distribution of urban green spaces in Indian cities are brought to light by this study, underscoring the need for more inclusive and equitable urban design. Sustainable and liveable urban ecosystems require guaranteeing access to green spaces for all inhabitants, irrespective of their socioeconomic level. Subsequent studies ought to concentrate on investigating community-based strategies for managing green spaces and the part that legislative changes play in improving accessibility to green spaces.

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