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Impact of High Density Housing on Urban Open Spaces

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ABSTRACT

Cities in developing nations and especially in India are undergoing several infrastructure up-gradation and transformation. Congested living environments and extremely high land premiums have prompted an intensive form of vertical development.

More than half of the world's population now lives in urban areas. The rapid pace of urbanization has led to increasingly highly dense cities. In Cities, high–density urban areas are developed to maximize urban land use. Urban Open spaces are vital in high-density high-rise living and compact apartments in current Urban Scenario.

Urban open space is a statutory land use area that provides open area and recreational facilities for the general public and promotes active living. The benefits of urban open space can be summarized as Ecological benefits, Psychological functions, Physical benefits and Social contact.

The government of India formulated UDPFI (Urban Development Plan Formulation and Implementation) guidelines in 1996. As the cities grew rapidly and the guidelines were revised in 2014. As per URDPFI (Urban and Regional Development Plan Formulation and Implementation) guidelines there should be minimum 9-10$m^2$of urban open space per person, but it is far lesser in the Indian cities. In India, Delhi has the highest urban open space per person of about 4 m^2/ person.

The rise of urban redevelopment and re-densification projects with higher far, has impacted the population of such areas. This drastic increase has led to huge reduction in urban open area per person as per Urdpfi guidelines. The study addresses this issue.

INTRODUCTION

1. Urbanisation (htt26) has become a global phenomenon. As per the UN Department of Economic and Social Affairs 2018 report, it is projected that India will have added 416 million **urban dwellers** by 2050. This will make India the most populous country.
Therefore, for such a large number of city dwellers, a sustainable urban environment has become very important in the daily life of the people.

2. Cities reshape and alter natural landscapes as they expand, creating microclimates in which Temperature, Rainfall and Winds differ from those of the surrounding countryside.

3. The main reason of urban growth is India is due to spurt in migration of people from rural to urban areas. This rise in urban population has resulted in Urban Sprawl and need for High Density housing.(htt27)

4. This rapid urbanisation, has led to drastic change in the urban environment. This has been predominantly affected by concrete High rise housing and traffic. Undergoing such drastic changes, urban planning is crucial due to the growing population and the need for efficient land use.

5. High density housing refers to housing developments with a higher population density than average. High density buildings, such as condominiums and high-rise apartments, houses more people on less land. There are both various advantages and Disadvantages of High Density Housing.(htt28)

6. Advantages of High Density Housing: When residents live in primarily high density buildings, the area covered by public services is more compact. It increases the property values and reduces urban decay. Urban decay is reduced because many high density developments repurpose unused or abandoned buildings. The lifestyle benefits provided by high density communities directly drive up market value.

7. The main disadvantages of high density housing are that as the population increases there are more chances for the exploitation of natural resources and environmental degradation. Poor air and water quality, insufficient water availability, waste-disposal problems, and high energy consumption are exacerbated by the increasing population density and demands of urban environments. Strong city planning is essential in managing these and other difficulties as the world's urban areas swell.

Understanding Urban Open Spaces (UOS)

Cities are centre of power, the image of the place, city and country are hence very important. Thus the city planning principles and the structure of the city plays a big role in creating this image. One of the critical aspects in this image building is the Urban Open Spaces (UOS).

Reduction of population stress: Every day, people who live in towns are confronted with stressful situations such as Noise, traffic jams, social density, frantic life rhythms, densely-packed public transport, etc. This leads to stressful situations which can cause mental and physical health problems. In this scenario the Urban Open Spaces (UOS) play a key and crucial role. The degeneration of living environment in urban areas has disrupted most of natural vegetation.

The Urban Open Spaces impact a place's social, economic, and environmental settings. Play areas, active and passive recreational areas, community cultural parks, and centers provide social opportunities and health benefits. These also influence property values, probable tourism, and employment prospects and bring extra-economic profits.

Urban Open spaces(htt25) provide opportunities to explore and experience nature, socialize, and participate in health-boosting recreational activities, especially in dense urban areas. They provide an opportunity to integrate Green in urban areas with Grey Infrastructure.

Urban Open spaces are necessary to improve the climate of urban areas and reduce urban heat islands. They are generally covered with vegetation and create an eco-system that helps in better air-circulation, thereby reducing heat.

They help in creating dense vegetation. Also helps in screening noise, improving storm water management and creating habitation for flora and fauna. Thus, the integration of ecological considerations into economic development is vital and valuable to ensure long-term well-being of people in the cities.

Amid real challenge of climate crisis, developing urban open spaces have become CENTRAL to the built environment. Hence, the greening of urban open spaces is one of the most important measures to mitigate some of the problems of urbanisation.

DENSITY PERSPECTIVE

Density in its various perspective forms has been studied extensively including – social, physical, environmental and psychological.

Density Dynamics: desirable high density environments should be (a) Be Physically Compact; (b) Support Urbanity; and (c) Offer Livability and (d) provide Sense of Place.

Main aspect of high-density environments should ensure that they are not just about increasing dwelling units but also about creating meaningful and sustainable living spaces.

According to Cheng (htt29)physical density is a numerical measure of the concentration of individuals or physical structures within a given geographical unit.
Physical density in its measurable form is divided broadly into two categories: people density and building density.

People density is expressed as the number of people or households per given area, while building density is defined as the ratio of building structures to an area unit. Common measures of people and building densities are outlined as follows:

Measures of People Density:

Regional Density - Regional density is the ratio of a population to the land area of a region. It is frequently used as an indicator in national planning policy.(htt30)

Residential Density - Residential density is the ratio of a population to residential land area. This measure can be further classified in terms of net and gross residential densities. As per the Model Building Byelaws 2016 of the Town and Country Planning Organisation (TCPO), Ministry of Urban Development, Govt. of India, the residential density is expressed in terms of the number of dwelling units per hectare.

Measures of Building Density:

Plot Ratio (Floor Area Ratio) – It is the ratio of total gross floor area of a development to its site area. It is extensively adopted for the regulation of land-use zoning and development control. Also, maximum plot ratio is often controlled in order to govern the extent of build-up and prevent overdevelopment.

Plot Coverage – It represents the ratio of the building footprint area to its plot area. Plot coverage of individual developments is controlled to regulate the built-up and to preserve areas for greenery and landscaping.

Building density has an intricate relationship with urban morphology; it plays an important role in the shaping of urban form. Different combinations of plot ratio and plot coverage take the form of a variety of built forms. They describe the image of an area and help in determining the patterns of land use and buildings.

Measures of Spatial Density: Spatial density refers to the perception of density with respect to the relationship among spatial elements such as height of buildings to street width ratio, spacing and juxtaposition. High spatial density is related to environmental qualities, such as high degree of enclosure, intricacy of spaces and high activity levels.

Rules, Regulations, Norms

As per the census of India urban areas need to match the following four characteristics to be considered an urban area

– Population should be above 5,000.
– The density should be 400 people per square kilometre
– More than 75% of working male population should be working in non-agrarian sector.
– The area should have a local body like Panchayat, Nagar Palika, municipality etc.

The government of India formulated UDPFI (Urban Development Plan Formulation and Implementation) guidelines in 1996. As per the UDPFI guidelines there should be minimum **9-10m^2** of urban open space per person, but it is far lesser in the Indian cities.(htt31)

The Urban Regional Development Plans Formulation and Implementation (URDPFI) guidelines, 2014 recommend **10 to 12 sq.mt. of open space per person.** State/ Union Territories Urban Development Authorities/ Urban Local Bodies are expected to adopt URDPFI guidelines in accordance with prevailing local conditions which may vary from city to city. While preparing or revising the Master Plans, cities may prescribe norms based on the URDPFI guidelines.

(PART 3 DEVELOPMENT CONTROL RULES AND GENERAL BUILDING REQUIRMENTS)

Table 3 : Floor Area Ratio and Coverage for Group Housing

NATIONAL BUILDING CODE OF INDIA (NBC)

PART 3: DCR/C-2.4 Density_(Pg-43)

The density norms for plotted development and mixed develoment shall be as follows:

	Types of Development	Range of Densities (Gross)
a)	Plotted development	65-120 plots per hectare
b)	Mixed development	
	i) Small towns	75-100 dwelling units per hectare
	ii) Cities	100-125 dwelling units per hectare
	iii) Metropolitan Cities	125-150 dwelling units per hectare

Urban Open Spaces (UOS): International Scenario

Internationally, the United Nations (UN) and the European Union (EU) have set the limits as 30 sq.m. and 26 sq. m. of per capita green spaces, respectively.

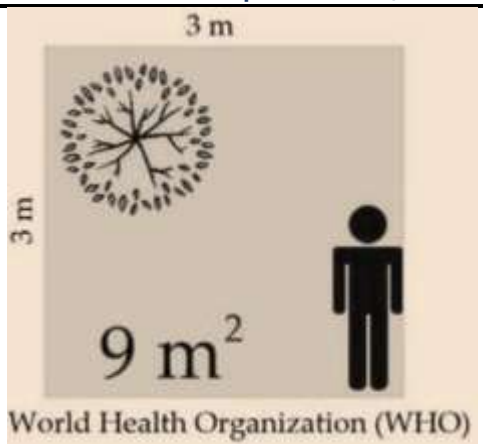
On the other hand, the Leadership in Energy and Environment Design Neighbourhood Development (LEED-ND) recommends that the open area per capita be more than 20 sq. m.

Also, LEED-ND recommends maintaining a minimum of:

1.25 ha of open space per 1000 residents, i.e., around 12.5 sq. m. per person,

and specifies that access to open space is within 250 m of residential areas in the form of smaller parks.

(https://www.mdpi.com/2412-3811/3/3/40)



World Health Organization (WHO)

Optimal per Capita Green Space	Acts Policies by Indian Government at National, Regional, Municipal levels	Fundamental Right (India)	Challenges
WHO Guidelines: **9 to 12 SQ.M** per inhabitant in cities.	•SMART Cities 2015 •AMRUT Mission 2015 •JnNURM 2005 •Energy Conservation Act 2001 •Environmental Protection Act 1986 •Air Act 1981 •Forest Conservation Act 1980 •Water Act 1974 •Wild Life Protection Act 1972	The Right to a Clean Environment is one of the implied Fundamental Rights under Fundamental Rights (Part-III) as established by the judiciary using Articles 14, 19, 21, and 32. Article 14 implicitly imposes an obligation on the state to exercise fairness in its environmental protection measures.	Research on urban open spaces has never been approached in reference to the population density of the area Rarely has the focus been on the plot-level potentials and management of open spaces. The study looks into this to stipulate the percentage of open space for neighborhood development , specificities for open spaces are unclear.

Cities	Geographical area (hectares)	Population in LAKH (Census,2011)	Per capita open space (sqm./person)
Dehli	43500	163.1	0.56
Bangalore	22600	84.3	1.78
Mumbai	73500	184.8	0.66
Hyderabad	17200	77.4	0.05
Ahmedabad	46900	63.5	0.34
Chennai	17400	86.9	0.1
Kolkata	18623	141.1	0
Surat	39500	45.8	0.26
Jaipur	48464	30.7	2
Gandhinagar	7500	2	15.38
Chandigarh	11400	10.5	1.6

Cities	Geographical area (hectares)	Target Population	Per capita open space (sqm./person)
Greater London	4	1000 residents	40
Edinburgh	2.9	1000 residents	29
Cambridge	4.6	1000 residents	46
Washington	3.8	1000 residents	38
Minneapolis	2	1000 residents	20
Los Angeles	4.85	1000 residents	48.5
Kansas City	3.85	1000 residents	36.4
Bristol	1	1000 residents	10

CONCLUSION:

The literature review brings forth the key issue of high density areas.

The findings suggest that strategic planning and design interventions aimed at optimizing housing densities housing densities can play a crucial role in creating livable, vibrant, and environmentally friendly communities.

The study has highlighted the importance of considering the balance between population density, land use patterns, and transportation infrastructure to promote sustainable urban development.

- For Large townships **Population Density** should be displayed on drawings for sanction, along with Percentage of Ground Floor Coverage, Open Areas, Community Space, Roads
- **Policy matter** regarding density should be made for high density residential developments
- For townships with high population density the norm of 10% Open Spaces **should be increased** to achieve URDPFI & WHO Guideline (9-12 sq.m open area per person)
- Raising awareness amongst Dwellers, Developers, Designers and Builders before planning and implementation stages,
- Open space and **Open Green space** should be mentioned.
- A simple **landscape plan** should be provided for large scale townships,
- Urban Open spaces should be well Integrated and developed them into Urban Planning at plot level for "TREE SENSITIVE DESIGN"
- Native trees as per Soil Conditions and quantity should be mentioned. A more sustainable model for **integrating trees** into open spaces of high density housing, should be made by use of Native Trees and as per site and climate specific soil conditions.
- **Site specific solution** corresponding to the Population density of the Area,
- Grey-Green Integration,

Guidelines for Urban Trees and Landscape in High Density Residential Areas

- Setting Minimum realistic target for Urban Forest of average Tree density (30 Trees per Hectare).
- (Gandhinagar is considered as the Greenest City of India with density of 152 Trees/ Hectare)
- Filtering effect of Evergreen Trees is better than Deciduous Trees.
- Medium growing, ecologically more suitable, pest and disease resistant, less maintenance species are preferred.
- Leaves with complex shapes and large circumference area are efficient.
- Insect Pollinated Trees with short Flowering period and less Pollen Productivity shall be selected.
- Stickier Leaves are better for collecting particles because more particles would stick to their surface.

For Noise Screen Plantation – Considerations are as follows:

a. Trees having thick and fleshy Leaves.
b. Trees having heavier Branches and Trunks.
c. Combination of Trees and Shrubs is considered as the best system.

Parameters to be considered for Urban Tres: Canopy size, height of Tree, spacing between Trees, growthspeed, season, girth, availability and adaptability with local Climate, Normalized Difference Vegetation Index (NDVI) etc.

Species primarily considered for plantation:

1. **Noise screen plantation –** Copper pod, Ashoka, Arjun, Kadam etc.
2. **Pollutant absorbing Species –** Neem, Peepal, Bamboo, Silk cotton etc.
3. **Carbon storage Species-** Amaltas, Siris, Gulmohar etc.
4. **High Oxygen producing plants-** Weeping fig, Mahogany, Red sandalwood etc.
5. **Fruit Bearing Species-** Guava, Tamarind, Mango etc.
6. **Shrubs-** Champa, Apta/ Bauhinia, Powder-puff, Queen's/ Icecream flower etc.
7. **Hedges-** Golden duranta, Bougainvillea etc.
8. **Lawn-** Natural Grass.

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