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Emerging Trends in Reduction of Open Spaces & their Impacts: A Case Study of Neighbourhood in Jaipur.

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Abstract:

Open spaces are essential for the comfort of human beings in the absence of which multi-dimensional environmental problems are likely to be observed. As per the WHO norm, the minimum open space should be 9 sqm per person but on the contrary ideal requirement should be of order 50 sqm per person. In the absence of required open spaces, the concreting is going to be increased which results in an unbalanced albedo effect thereby the emergence of the UHI effect. An attempt has therefore been made to select Malviya Nagar as one of the areas in Jaipur which is a 3.284 sqkm area with a present population of 29033. An effort has also been made to predict the emerging trend of the population up to 2050 and assess the open spaces per person on a time scale. The study reveals the fact that by the year 2050, the open space would be brought down below the bare minimum requirement of 9 sqm per person and may reach 6 sqm by the year 2050.

1.0 INTRODUCTION:

Open Space is a widely studied issue, it is not surprising that academics have proposed a variety of definitions and classifications related to this topic.(Ramaiah & Avtar, 2019) Open space is a term used to describe any green, accessible place that is also open to the sky. The Metropolitan Open Space Act passed in 1877 in London, Britain, has the first definition for open space. Then the 1906 amendment to the Open Space Act's 20th clause defined "open space" as any enclosed or unenclosed land on which there are no buildings of any kind or only 5% of the land is covered by buildings, with the remaining land being used for other entertainment venues, waste storage, or just being left undeveloped. There are essentially two ways to understand this idea: in specific and broad senses. In its broadest definition, it refers to all or almost all of a city's land and sea areas that are devoid of artificial structures; in its more specific sense, it refers to the city's public green spaces. In general, a city's urban open space consists of city squares, neighbourhood parks, minor parks, and pocket parks, as well as the outdoor areas of campuses, senior living facilities, child care centres, and hospitals (Wang & Gao, 2012). Open spaces are regions that are not only accessible and open to the sky but also green. Urban studies refer to "urban open and green spaces" using a wide range of formal terms and delineations, including "green space," "urban green," "open space," "public space," "public amphitheatre's" and "ground." As a result, it is well known that maintaining public open spaces has long been valued as a crucial component of domestic development in land use planning. ("Assessing Urban Open Spaces in Township Planning," n.d.)Ironically, open space is a type of space that is continuously altered by urban expansion (Dutta et al., 2023). "open spaces" are defined as undeveloped land, which includes things like parks, playgrounds, gardens, green areas, graveyards, vacant land, idle farmland, etc (Verma, 1985).

2.0 LITERATURE REVIEW:

Open Spaces serve as a vital hub for interpersonal contact and communication. A city's green spaces are viewed as the embodiment and emblem of its vibrant growth(Wang & Gao, 2012).Due to increasing densification, open spaces and green areas are disappearing and in some cases being encroached upon as a result of India's urbanisation, which has resulted in urban sprawl in the cities and the loss of green cover in both the peripheral and the core areas. As the second most populous nation in the world, India's ever-growing population has had a negative impact on urban green areas. Metro cities are the most severely impacted. (Yadav, 2020) The UN recommends 9 m² of green space per person, however Chennai and Mumbai only have 0.46 m² and 0.12 m² of green space per person, respectively (Srivathsan 2013 and FAO 1998). The abundance of open spaces that are characteristic of the world's most habitable cities is a major issue in Indian towns, particularly in the central districts like Jaipur's walled city. Metropolitan heat island effect is happening owing to the shortage of green spaces and construction of concrete jungle, which is altering the climate and further affecting the individual's mental and physical well-being. Lack of green space has also caused air pollution in metropolitan

In both circumstances, where the new development is on agricultural or forested land, the amount of trees is drastically reduced.

The total amount of forest cover in India is already low, and these changes in land use and land cover endanger the longterm viability of the environment.

Cities get hotter and more oppressive as a result of the heat island effect being accentuated by the growing built-up area.

To maintain the balance of the environment, green spaces are crucial in metropolitan environments (Bajaj & Kumar, 2017).

Table 8.52: Hierarchy of Organised Green

S. No.	Planning Unit	Number of Organised green spaces
1	Housing Cluster	3 - 4 local parks and playgrounds
2	Neighbourhood	3 - 4 local parks and playgrounds
3	Community	2-3 community level park and open space
4	District/ Zone	1 district level park and sports centre, maidan
5	Sub city centre	1 city level park, sports complex, botanical / zoological garden, maidan

Source: UDPFI Guidelines, 1996.

3.0 NORMS FOR GREEN SPACES:

In urban system, the issue of per capita open green space requirement has always been controversial. Experts in countries as Japan and Germany and various others, in the 20th century had proposed 40sqm as standard open space requirement per person, while many developed countries at the same time were adopting 20 sqm park area per person as a general standard for green space. (Wang et al 2009).

In this paper international minimum standard suggested by World Health Organization (WHO) and adopted by the publications of United Nations Food and Agriculture Organization (FAO) is a minimum availability of 9 sq. m. green open space per city dweller.(Yadav, 2020).According to URDPFI 2014 Guidelines by MoUD, open and green

spaces must be calculated with respect to the normative of 12 sqm/person, which provides the minimum necessary space for every inhabitant. (Dutta et al., 2023)

As urbanization is growing by leaps and bounds, the rate of growth is not equal across the globe. Continents of Africa and Asia have a faster urbanization growth, and by 2050 are expected to reach a mark of 64% and 56% respectively. It shall be observed that by 2050, the urbanization of rural population shall reach its peak while for the rest of the world population, 68% will be urbanized. (Dutta et al., 2023)

WHO recommends Open Space of a minimum of 9 sqm and ideally 50 sqm per person.

Guidelines	Min Recommended Open Area(sqm/person)
WHO	9
UN	30
Europe	26
URDPFI	10 to 12

Table 01: Guidelines for Open Spaces
(V. S. Singh et al., n.d.)

4.0 SIGNIFICANCE OF OPEN SPACES:

Green Spaces have always remained indispensable for the physical and mental wellbeing of mankind, while playing a vital role in reduction of physiological stress as well. To make cities sustainable, it's important to have adequate green open spaces as backyards, courtyards, parks etc. Urban parks and gardens play a critical role in cooling the cities. Green vegetation has been shown to lower wall surface temperatures by 17°C, which led to a reduced air conditioning load by an average of 50%. They improve the urban micro climate and maintain the balance of the city's natural urban environment. (Yadav, 2020). It is the open spaces that help in making cities healthy, sustainable and energy efficient. The open spaces keep a check on the CO₂ levels and thus help to improve the quality of air and water. It also helps in reduction of air pollution and in ground water recharge. Urban forests act as temperature buffers. The open spaces, if managed well, in all contexts, act as social interactive spaces for all age groups. Open spaces offer multi-dimensional benefits in terms of ecological benefits, physical benefits, social benefits & economic benefits. A holistic approach towards the provision of Open spaces, surely, will help to create a high quality environment, specially in the urban setups (V. Singh, 2015). Urbanization offers several opportunities for the growth of economic, social, and technology sectors, offering benefits to society in terms of better living and healthcare facilities, as well as employment opportunities. However, some major downsides of urbanization are overcrowding and environmental degradation (Ramaiah & Avtar, 2019). Thus, open spaces if not designed in a proper manner considering the right pace of population growth, shall soon shun to meet the criteria of quantity of per capita open space (Yadav, 2020).

City	Open Area(sqm/person)
Mumbai	1.24
Chennai	0.81
Delhi	21.52
Bangalore	17.32
Jaipur	1.6

Table 02: Scenario of Open Spaces for Indian Metro Cities
(V. S. Singh et al., n.d.)

5.0 STUDY AREA:

Jaipur is amongst few of the first planned cities of Modern India. The southern region of the city has neighbourhood named Malviya Nagar after the freedom fighter Madan Mohan Malviya. Currently, it's one of the poshest and most upmarket locations in Jaipur city. Its house to numerous government housing scheme while also caters to large number of private developers too. It has amenities as schools, universities, hospitals, Techno hub, restaurants, malls, showrooms and many other attractions. The neighbourhood is well connected with all the prime locations of the city, while the airport also being just 5-10 minutes away. The total area for Malviya Nagar is 3.284 sqkm (Source: Jaipur Development Authority) housing a population of 29033 persons (Source: Census Report 2011)



Figure 1: Google Imagery for Malviya Nagar, Jaipur.

Malviya Nagar is a transitional neighborhood. It shows a mixed pattern in its developments. The neighborhood comprises LIG, MIG, HIG, Commercial complex, educational institutes, etc.

6.0 METHODOLOGY:

The JDA Land use Plan was collected. The area calculation was done for the open spaces (non-concreting) and concreting using the GIS mapping software.

The population data was collected from the Census Department Govt. of India for the decadal years 1951 – 2011 & 3 following forecasting methods were used for the projection of population for the years 2021, 2031, 2041, 2051. The projection has been done with a view to access the futuristic scenario relating to UHI. (The population projection was done using the Arithmetic Mean Method, Geometric Mean & Incremental Method.)

The data so collected has been analyzed and diversified.

Co-relations were established with a view to understand the trend in the reduction of open spaces based on the data so collected.

7.0 RESULTS AND DISCUSSIONS / ANALYSIS:

The WHO norms prescribe a bare minimum of 9 sqm per person and should be maintained under all conditions in the urban area. It is also suggested that the most desirable norm of 50 sqm per person would be an ideal for any planned urban area. An attempt has been made to graphically present the open area requirement in hectares for the urban population of Malviya Nagar-2011.

In the present research work, Malviya Nagar has been taken as a case study area for critical analysis with respect to open area requirement for the projected population 2011-2051.

As has been reflected in the fig.no.2 & presented in fig no.3 it would reveal the fact that with the present population, & the available open area, the per person open area comes to 22.62sqm while it predicted to go below the bare minimum of 9 sqm by the year 2034 with the present growth trend & developmental activities. Let further be observed that in the year 2034 it may reach to a level of 8.26 sqm which appears to be highly critical & pose multi-dimensional & diversified problems.

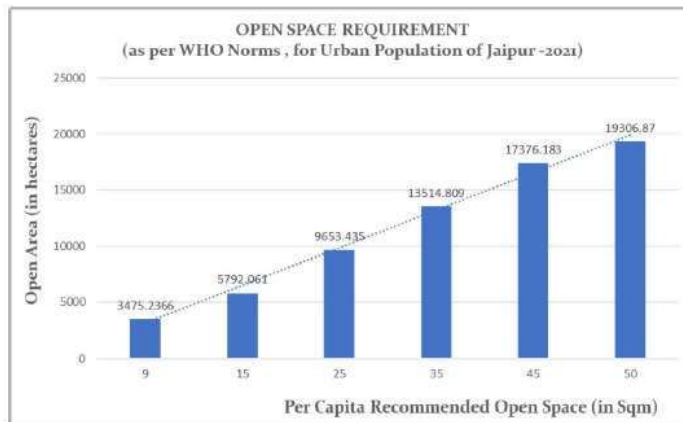


Figure 2: Open Space required for the population of 2011

Open Space required for the current population based on min. of 9 sqm to ideal 50 sqm open space required per person.

Area of Malviya Nagar (sqm)	The population of Malviya Nagar	Existing Open Area (sqm)	Per Person Open Area (existing) (sqm)
3284000	29033	656800	22.62

Table 3: Statistics for Malviya Nagar

Years	Projected Population	Open Area	Per Person Open Space
2011	29,033	656800	22.62
2021	43,550	656800	15.08
2031	65,324	656800	10.05
2032	68,590	656800	9.58
2033	72,020	656800	9.12
2034	75,621	656800	8.69
2035	79,402	656800	8.27
2036	83,372	656800	7.88
2037	87,541	656800	7.50
2038	91,918	656800	7.15
2039	96,514	656800	6.81
2040	1,01,339	656800	6.48
2041	1,06,406	656800	6.17

Table 4: Decrease in Open Space with population escalation.

(Considering the annual Urban Population growth rate is 40% While the Open Area staying constant)

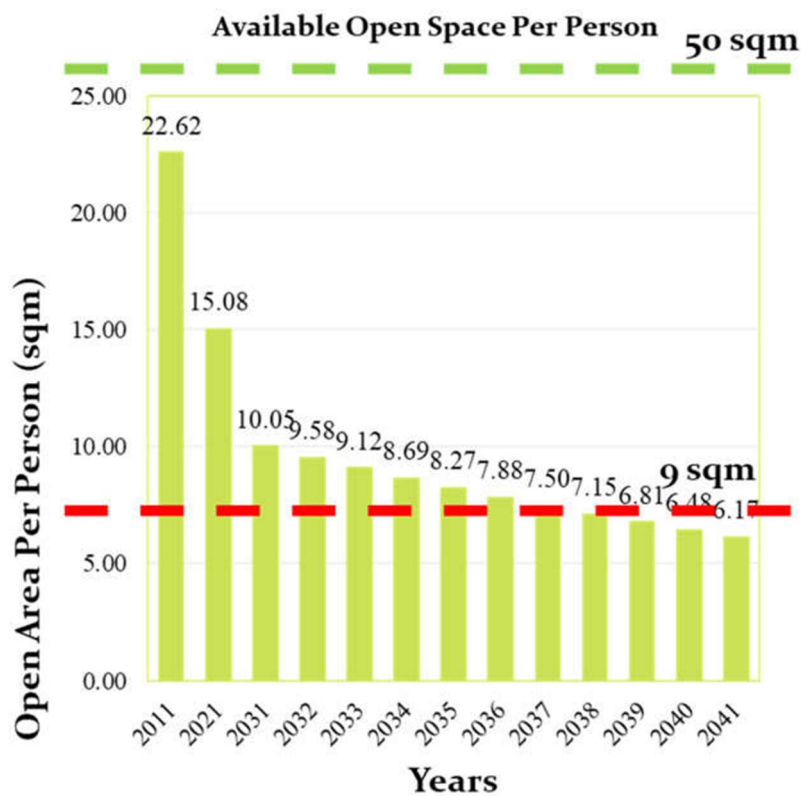


Figure 3: Assessment of Open Space in Malviya Nagar

Based on this the assessment done for the present scenario as well as the future calculations Guidelines may be provided for concreting vs open spaces.

CONCLUSIONS:

The above study clearly states the rate at which the densification of the study area is happening, thereby resulting in reduced green space per person as per the norms. If this continues, time is not far when the entire city will soon turn to a slum like development. Provision of green pockets being scattered through the city is not an optimal solution to the problem rather we require more uniformity for the green spaces. The concreting is arising the UHI, the UHI if witnessed on a significant scale is likely to have more energy and water consumption coupled with adverse health effects. An earlier study conducted by the author has revealed that for every 1° rise in UHI, there is an increase of 5.8% in electricity consumption. Such an emerging trend with respect to UHI would evolve economic loss along with the contribution of more carbon footprint. Thus, in order to strike an ecological balance and also to achieve health benefits for the human race, the suggestive guideline is not just to follow the norms but to provision more than the required green space per capita, so that as the development increases, it can still enable adequate open spaces for the dwellers in the neighbourhood.

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