

EFFECTIVE PUBLIC SPACE: A QUALITY OF LIFE CATALYST FOR DENSE URBAN NEIGHBOURHOODS

Evidences from Bengaluru, India

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Abstract. Effective public space is introduced as a novel concept in this study as a measure of the entire realm of formal and informal public spaces in a neighbourhood, irrespective of ownership and control. The paper looks at co-production of effective public space in 4 high density urban neighbourhoods in the intermediate city areas of Bengaluru. The existing neighbourhoods are gradually transforming from low rise-medium density to mid rise-high density residential zones with unplanned incremental transformations in urban form. The study hypothesizes that densification led crunch in private space gets compensated for as people begin to draw more satisfaction from their experience of the organically produced vibrant public realm. A detailed analysis of various types of public spaces and their relationship with overall quality of life offered by the neighbourhood was carried out using physical mapping, surveys and statistical methods. A pattern based analysis of the effective public spaces was carried out to identify the best practices which enhance the public spaces in these neighbourhoods. The study reveals that such co produced effective public spaces are significant catalysts that enhance the overall quality of life for the residents. The analysis reveals that along with providing much needed relief, recreation and social interaction opportunities to the residents, the threat to quality of life posed by high density urban living can be mitigated through effective public spaces. Finally, the paper suggests pattern based strategies to implement the idea of effective public space in existing neighbourhoods.

Keywords: *Public space, high density neighbourhoods, quality of life.*

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1. Introduction

Research literature has pointed out that availability of public space is one of the major constituents of quality of life in a neighbourhood. The significance of public spaces can be better adjudged in light of the Place theory (Canter, 1977) which suggests that environments are conceived as psychological constructs, composed of physical attributes, activities that happen within them and the evaluation of these activities. Public spaces also add to the image and marketability of a neighbourhood (Madanipour, 2003). Over the years several researchers have categorized and delineated the various types of public spaces that manifest in our cities. Parameters such as ownership, scale, location, accessibility, functionality etc have been used to categorize public spaces and get a better understanding of the value that they add to public life. Research literature also points out that it is the promotion of social interaction that accrues maximum value to public spaces. (Nasution & Zahrah, 2014, Cattell *et al.*, 2008). Cattell *et al.* (2008) further stated that “*it is the ordinary spaces that are a significant resource for both individuals and communities and social interaction in spaces can provide relief from daily routines, sustenance for people's sense of community, opportunities for sustaining bonding ties or making bridges, and can influence tolerance and raise people's spirits*”.

Qawasmeh (2014) suggest the need to explore the interactions between the private and public spaces in the neighbourhood in order to comprehend their impact on quality of life.

Table 1. Types of public spaces

Types of public spaces as quoted by Matthew Carmona (2010)	
Carr et al. (1992)	11 functional types of public space: (1) Public parks (2) Square and plazas (3) Memorials (4) Markets (5) Streets (6) Playgrounds (7) Community open spaces (8) Greenways and parkways (9) Atrium/indoor marketplaces (10) Found spaces/everyday spaces (11) Waterfronts
Gehl & Gemzoe (2001)	39 'new' city spaces categorized into five types: main city square; recreational square; promenade; traffic square; and monumental square
UK's Urban Green Spaces Taskforce (2002)	Types of green spaces and types of (hard) civic spaces
Franck & Stevens (2007)	Typology around the 'looseness' and 'tightness' of space
Varna, G., & Tiesdell, S. (2010)	Ownership, physical configuration, control, animation, civility determine accessibility of a public space

Neighborhood design and characteristics have for long caught the fancy of urban planners. Jacobs (1961) considered the neighborhood as the basic building block of cities upon which most of her critiques of city planning were based. Lynch (1981) emphasized that the physical form of a neighbourhood continues to retain its place, even in complex city systems and described neighbourhoods as both an urban form as well as a social construct. The idea of a Neighbourhood has undergone substantial transformation over the years. Boundaries and Fixed size (5000 persons) stand invalidated in the age of personal choice, changing demography, increased mobility and organised school transportation systems. Though there are contradictions and opposing views on the boundaries, extent and exact constituents of the neighbourhood, the aspirations towards achieving a decent quality of life binds together the varied ideas of a neighbourhood. The multitudes of attributes which determine the character of a neighbourhood have been well documented in literature. An assessment of quality of life at the neighbourhood level necessitates an investigation of the *structural, socio interactive and infrastructural characteristics* of the neighbourhood. Public spaces contribute greatly to the socio interactive characteristics of a neighbourhood. In Indian neighbourhoods, it is quite common to find formal places of social interaction such as community halls, clubhouses, *mela* or festival grounds, public squares etc. as well as informal incidental spaces within the neighbourhood which become meeting grounds for people. These may include vacant lots converted to play areas, local streets which become interactive play spaces etc.

Both place based and people based approaches can be employed to analyze the socio interactive characteristics of a neighbourhood. While the place based approach includes a survey of the quantity and quality of community spaces available, a people

based approach evaluates the social life of the residents through analysis of social contacts and engagements with the community.

The city of Bengaluru, located in the southern part of India, has witnessed a continuous increase in average population density for its wards in the past 3 decades. As per census data, the average ward wise population density has increased from 57.84 ppha in 1991 to 79.21 ppha in 2001 and further to 117.65 ppha in 2011. The Bengaluru masterplan 2015 had divided the city into three concentric rings which are synonymous with the urban growth pattern in these areas. The area beyond the inner core up to the outer ring road may be termed as the intermediate city area. Rising land value and an attractive location in the city structure has pushed up the scope of rental income as well as the sale value of the dwelling units in the intermediate city areas. The neighbourhoods which were designed to be low rise (Maximum G+2) medium density residential zones are slowly transforming into mid rise (More than G+3) high density zones.

One of the first fatalities of urbanization and rapid population growth in an existing urban neighbourhood is the amount of private space available per capita. As the number of people sharing the same resources goes up at the neighbourhood level, the satisfaction drawn from the resource per capita and hence the quality of life on offer is bound to go down. The cultural acceptance of high density in Asian cities finds its roots in the twin theories of proxemics and collectivism. The theory of Proxemics (Hall, 1966) accounts for the preference for “*closer interpersonal distances and proximate personal space in contact cultures as compared to non contact cultures*”. Hall (1966) also proposed that predominantly contact cultures would have a higher degree of tolerance for tolerant of crowding than noncontact cultures. The collectivist theory accounts for frequent and close social interaction (Evans *et al.*, 2000) in collectivist cultures as seen in Asian cities. Space availability in the private domain is fixed and beyond the control of urban planners in an existing neighbourhood. Conversely, it is also observed in traditional Indian neighbourhoods that the dissatisfaction generated due to crunch in private space is often compensated for as people begin to draw more satisfaction from their experience of the vibrant public realm. In this case it is the public space available per capita which becomes a major stakeholder in the quality of life experienced by the residents.

2. Effective Public Space

Effective public space is a novel concept introduced in this study as a measure of the actual public realm. All publicly accessible spaces in a neighbourhood irrespective of ownership are included within effective public space. In a broader sense, this concept denotes the entire public realm which is available to a resident of the neighbourhood. Though the degrees of control and access may vary, these spaces add to the public experience of the neighbourhood. In recent literature the concept of effective public space is partially expressed in the term “Privately owned public space” (Kayden, 1998) where the possibility of public space under private ownership is explored. Nasution & Zahrah, (2017) further elucidate that such spaces give opportunity to diverse community groups to come together becoming true examples of communal spaces. Luk (2009) lists the triad of accessibility, visibility and usability as the necessary features of such privately owned public spaces.

Effective public space is the sum total of the formal designed public realm and the coproduced informal public spaces which spring up organically as a result of social productions of space. Renowned French architectural theoretician Henri Lefebvre conceptualized space as a triad of Lived, Perceived and conceived spaces (Lefebvre & Nicholson-Smith, 1985). His treatise “The social production of Space” further elucidated space in terms of conceptualized, materialized and representational space. As described by Harper (2011), “the first type; ‘conceived space’, is the kind of abstracted model of space used by planners, developers and geographers; it is not real, but forms a representation of selected characteristics of the space considered”. Conceived public space is manifested in the planned and designed public spaces such as civic spaces, public squares, parks and playgrounds in a neighbourhood. Harper (2011) further describe the second type that Lefebvre sets out; ‘lived space’, as “space as it is experienced by those who occupy, use and inhabit it”. The idea of ‘lived space’ holds potential significance in introducing perception as a means of appraising the environment. The third type of space as described by Lefebvre is termed as ‘perceived space’ and draws heavily from the ‘spaces of production’ as Lefebvre describes them. These spaces are delineated by the types of movement and activities that take place within them (Lefebvre & Nicholson-Smith, (1985), as quoted in Harper C., 2011).

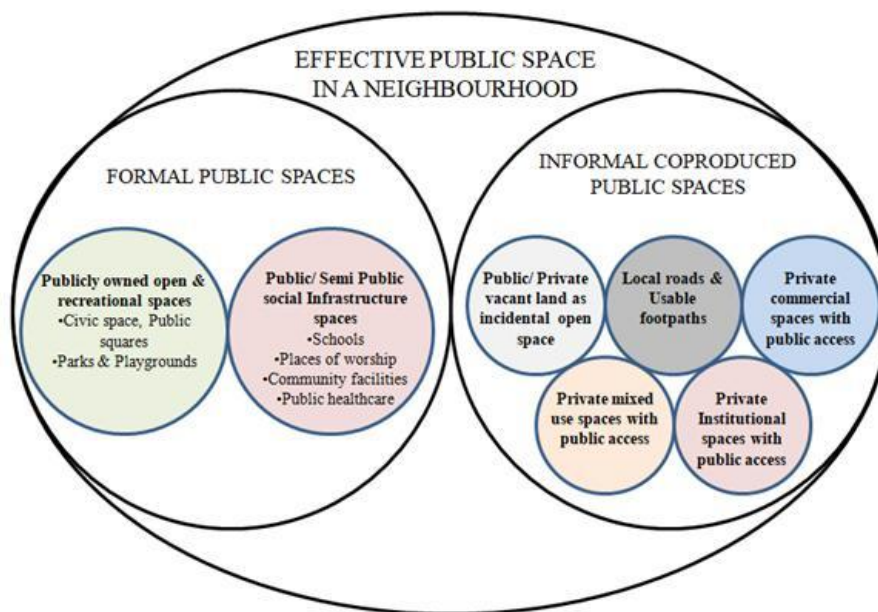


Fig. 1. Effective public space in a neighbourhood

Several spaces in the public realm including retail shops, marketplaces and publicly accessible spaces within commercial and institutional landuse become spaces of social interaction, activities and public movement. Additionally, local roads and footpaths become areas of play, recreation and relief for the neighbourhood residents. In such a case we see both lived and perceived spaces emerging as informal coproduced public spaces. Irrespective of ownership, the level of access and control of usage also determines the engagement of the residents with formal/ informal public spaces. In Bengaluru, it is common to find public parks and playgrounds which are accessible to the general public only during restricted hours through the day. At the same time the

residents have a far larger level of access to privately owned public realm in the form of retail shops, market places, temple grounds etc. Such examples force us to look beyond the definitions of formal public spaces and explore the idea of co produced, organic public spaces in the neighbourhood. The term Effective public space has been devised to encapsulate the vast variety of publicly accessible spaces available to the residents within a neighbourhood where public life in form of social interaction, recreation, play and relief can thrive despite varying levels of access and control.

2.1 A pattern based approach towards effective public space

Lee & Lee, (2015) identified publicity, placeness, connectivity, spatiality, accessibility and amenity as the prime spatial characteristics of a public space. The spatial characteristics are a manifestation of the underlying patterns (Alexander *et al.*, 1977) where each pattern represents an identifiable situation along with possible solutions. Patterns are described as “empirical rules, representing regularities of behaviour” in urban the urban realm (Salingaros, 2000). More recently Mehaffy et al (2020) came up with A New Pattern language enlisting a set of best design practices for growing regions. The informal nature of effective public spaces often transgresses conventional definitions and categorizations such as ownership, area, design etc. The pattern based vocabulary can become an effective way of identifying the spatial characteristics of co produced, organic public spaces in our urban realm. Further analysis can help us device tools for exploring and advancing effective public spaces in our neighbourhoods.

The spatial characteristics of a public space as delineated by Lee & Lee, (2015)-publicity, placeness, connectivity, spatiality, accessibility and amenity were taken as starting points for analysing the spatial characteristics of the effective public spaces in the selected neighbourhoods. The indicators were redefined with a view of the context of the study.

PUBLICNESS is defined as the aggregated manifestation of the ownership, control and civility in a public space.

SENSE OF PLACE is defined as the aggregated manifestation of aesthetics, identity and lived space (Lefebvre & Nicholson-Smith, (1985), as quoted in Harper C., 2011). Spatial features that create and support activity generation enhance the sense of place.

CONNECTEDNESS is defined as the spatial character which allows for users to connect with nature, with others, with themselves (Alves *et al.*, 2022). Connectedness gets reinforced with good access to infrastructure that supports public activity as well as affordances towards a variety of spatial experiences.

The table 2 lists the various patterns which may be deemed to constitute the spatial characteristics of an effective public space.

With this context the study proposes the hypotheses that Effective Public space per capita within the neighborhood bears a strong relationship with the quality of life offered by the neighbourhood. The study seeks to explore whether the threat to neighbourhood quality of life from unplanned transformations can be mitigated by modulation of Effective Public space within the neighborhood.

3. Indicators of effective public space

Based on our conceptualization of Effective public space and its components, we have delineated indicators to measure and quantify the effective public space in a neighbourhood. Table 3 lists the components and indicators. In dense neighbourhoods where the private space per person stands heavily compromised, it will be interesting to note the impacts of effective space per capita on the overall quality of life on offer to the residents. Hence each of the indicators can be further computed on a per capita basis.

Table 2. Patterns identified in of spatial characteristics of effective public spaces

Spatial characteristics to evaluate effective public spaces	Pattern no.	A pattern Language (Alexander, 1977)	Pattern no.	A new pattern language (Mehaffy <i>et al.</i> , 2020)
Publicness	61	Small public squares	4.3	Neighbourhood square
	123	Pedestrian density	2.3	Public space system
	67	Common land	10.3	Layered Zones
Sense of Place	122	Building fronts	4.1	Street as Centre
	164	Street windows	8.1	Street as a room
	30	Activity Pockets	15.4	Complex material
	32	Shopping Street	12.4	Malleability
	89	Corner grocery		
	59	Quiet backs		
Connectedness	120	Paths and goals	3.4	Shared space lanes
	140	Private terrace on the street	6.2	Walkable streetscape
	60	Accessible greens	8.3	Street Trees
	114	Hierarchy of open spaces	4.4	Neighbourhood park
	51	Green streets	2.4	Biophilic urbanism
	68	Connected play		

4. Data Collection and analysis

Based on the 2011 density figures the wards in the city of Bengaluru may be categorized as High, Medium and low population density wards.

Four high density wards from the city of Bengaluru were selected to carry out empirical studies to test the idea of Effective public space and its interaction with Quality of life in the neighbourhood. Care was taken to ensure that the wards were homogeneous in terms of size, location in city structure and level of service provisions. Further, the high density wards were grouped into 2 categories based on their built form characteristics.

Table 3. Indicators of effective public space

Component of Effective public space		
P3	Land under mixed residential usage	Local shops, retail. Marketplaces, small businesses, places of worship, temple squares etc which are accessible to the public
P4	Land under commercial usage	
P6	Land under public/ semi public usage	
P7	Land under open space/ recreational use	Formal parks, playgrounds, urban green spaces
P10	Vacant land as incidental open space	Public land with undesignated use/ Vacant private plots which become sites for informal play, social interaction, festival grounds etc
P11	Local roads	Circulation spaces that can be used for informal play, social interaction etc.
P12	Usable footpath	
Indicators of Effective Public space		
1	Effective land under public usage	P3+P4+P6+P7+ P10+P11+P12
2	built land under public usage	P3+P4+P6
3	open land under public usage	P7+P10+P11+P12
4	Circulation space	P11 +P12

Table 4. Ward categorization as per population density

Category	Population density range	
1	Above 400 ppha	High density
2	399-250 ppha	Medium density
3	249- 120 ppha	Low density

- i. Group 1: High population density- Low density of Buildings more than G+3 (Mattikere & Kammanahalli)
- ii. Group 2: High population density- High density of Buildings more than G+3 (Mahalakshnipuram & Gurappanapalya)

Household and physical surveys were carried out in the selected wards to gather data on the indicators of Effective public space and quality of life. For determination of sample size from the overall population, a confidence interval of 58 at 95% confidence level was adopted. The aim was to capture around 0.6-07% of the populations through sampling. Accordingly, Table-5 given below illustrates the number of samples collected from each study case.

Table 5. Sample design for Household survey

	Confidence level			95%		
	Confidence Interval			5.8		
S.no	Study area	Area (sq.m)	Population density (persons per sq.km)	Population size (Total no. of Households)	Sample size (no. of households)	Percentage of population taken for sampling
1	Gurappanapalya	0.7	699.8	10513	67	0.63
2	Mahalakshnipuram	0.9	495.7	11563	75	0.64
3	Mattikere	0.9	411.5	9592	70	0.73
4	Kammanahalli	1	470.7	11479	73	0.64
	Total			43147	285	0.66

5. Assessment of neighbourhood quality of life

Neighbourhood Quality Index (Sonal & Kumar, 2021) is proposed as a composite index that aggregates the structural, social infrastructural and socio interactive characteristics of the neighbourhood.

$$\text{Neighbourhood Quality Index} = \sum (P_i \times W_i)$$

Where, **P_i**- Normalized value of neighbourhood quality parameter

W_i- Normalized weightage of neighbourhood Quality parameters based on its relative contribution towards overall satisfaction with neighbourhood.

A systematic process involving expert opinion survey followed by statistical analysis for factor identification was carried out to arrive at the parameters which should be included in the formulation of the NQ Index. Household and physical surveys conducted in the 4 neighbourhoods were used to source data on the selected parameters of neighbourhood quality. The normalized parameter values and the weightages generated from Artificial Neural networks analysis on SPSS was utilized to compute Neighbourhood Quality index for each of the selected neighbourhoods. Min – Max normalization method was used to rescale the data for various parameters. The weights were multiplied with the actual parameter values to calculate the overall NQI for each of the selected neighbourhoods. The table below shows the NQI values calculated for the selected neighbourhoods.

Table 6. Calculation of Neighbourhood Quality Index

NQI parameters	Importance through ANN
No of social contacts	0.152
Participation in community activities	0.074
Access to play spaces	0.086
Average ground coverage	0.130
Living space (average floor area per person)	0.090
Perception of neighborhood convenience	0.319
Perception of neighborhood attractiveness	0.151
NQI Computation: $NQI = \sum (p_i \times w_i)$	
Mattikere	0.52
Kammanahalli	0.47
Gurappanapalya	0.41
Mahalakshmpuram	0.66

We can observe from the calculated NQI values that Mahalakshmpuram has the Highest Neighbourhood quality Index followed by Mattikere and Kammanahalli while Gurappanapalya being the lowest amongst the 4 selected neighbourhoods. The graph also makes it amply clear that Neighbourhood quality Index is not necessarily concurrent with population density. It suggests the possibility of the fact that neighbourhoods can show high quality of life despite high physical density and we can further explore the role of effective public spaces in this context.

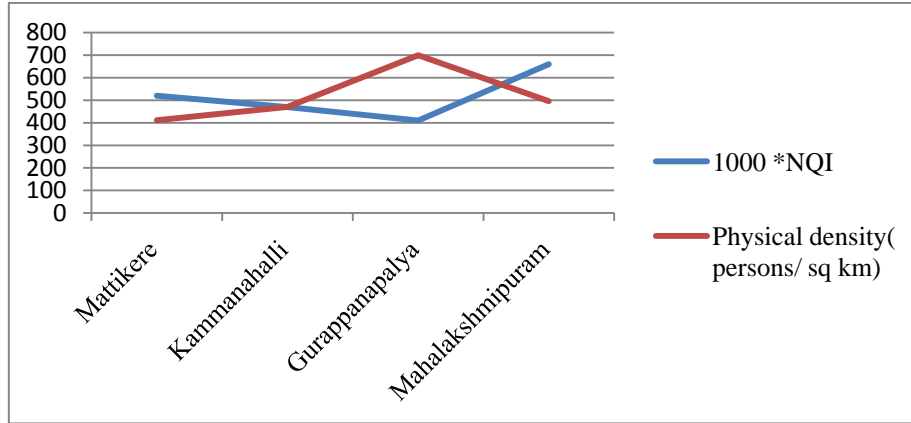


Fig. 2. Population density and Neighbourhood Quality Indices for selected study cases

Table 7. Comparison of Effective public space in selected neighbourhoods

		Area(sq.m)				Source
		Mattikere	Kammanahalli	Gurappanapalya	Mahalaxmi puram	
P3	Land under mixed residential usage	5023.84	5484.207	2760	5940	census 2011
P4	Land under commercial usage	35892	50960	79000	101700	landuse
P6	Land under public/ semi public usage	22357	3362	15960	12600	landuse
P7	Land under open space/ recreational use	2065	10817	5500	7200	landuse
P8	Land under vacant usage used for public activities	70200	94045.1	3700	4500	landuse
P10	Vacant land as incidental open space	14040	4702.255	1850	450	survey
P11	Local roads	87000	117000	66000	87000	Janagraha WPR
P12	Usable footpath	5280	11100	1560	8280	Janagraha WPR
<i>Indicators of Effective public space</i>	Effective land under public usage (P3+P4+P6+P7+P10+P11+P12)	171657.8	163051.2	172630	223170	Computations by author based on data collected
	Per capita land under effective public usage	4.63	4.402506	3.52370844	5.002129	
	public built land (P3+P4+P6)	63272.84	24134.21	97720	120240	
	public built space	189818.5	84469.73	293160	240480	
	public open land (P7+P10+P11+P12)	108385	138917	74910	102930	
	effective public built space per capita	5.12	1.794403	5.98395624	5.390115	
	effective public open space per capita	2.92	2.951035	1.52905636	2.307072	
	Circulation space per capita	3.47	0.934699	2.85766773	4.034518	

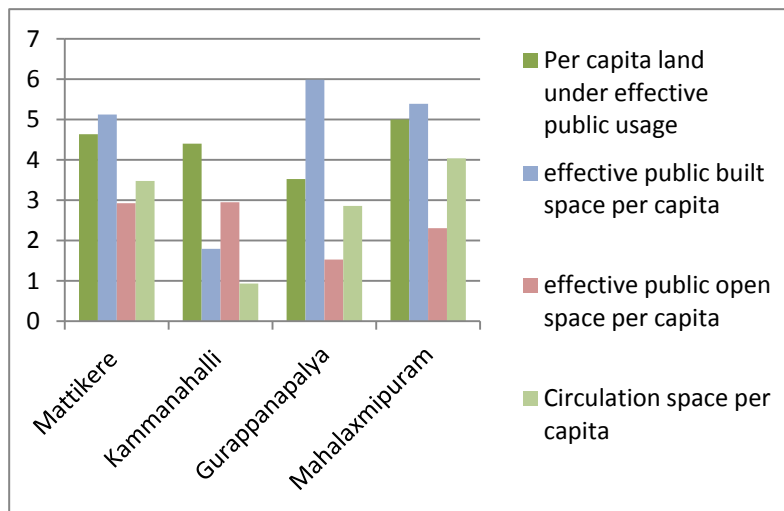


Fig. 3. Effective public spaces in selected neighbourhoods

Table 8. Spearman’s correlation analysis Between NQI and Effective public space indicators

		L1	L2	L3	L4
		Per capita land under effective public usage	Effective public built space per capita	Effective public open space per capita	Circulation space per capita
Neighbourhood Quality Index	Correlation Coefficient	1.000**	-.200	.200	.800
	Sig. (1-tailed)	.	.400	.400	.100
	N	4	4	4	4

6. Assessment of Effective public space in selected neighbourhoods

Indicators of effective public space for the 4 selected neighbourhoods were computed through compilation of data collected through extensive landuse survey in the neighbourhoods. Table 7 gives a comprehensive overview of the metrics used for calculation of effective public space in the study.

6a. Observations from statistical analysis: Spearman’s correlation analysis in SPSS was employed to measure of the strength of association between the indicators of effective public space and Neighbourhood Quality index for the selected wards. Statistically significant strong correlation was reported between NQI and Per capita land under effective Public Usage (L1). We also observe a moderate positive correlation between NQI and Circulation space per capita (L4).

6b. Observation from pattern based analysis of effective public space in selected neighbourhoods:

Physical surveys were carried out to identify and map these patterns in the selected neighbourhoods. The roads in Mattikere are well maintained and relatively free from traffic. Low vehicular ownership may be one of the prime reasons for this. The local roads are often used as public spaces as evident in the activity patterns in the neighbourhood. It is not unusual to see children playing on the local roads and women

and elderly interacting with each other during the late afternoon and evenings. The same local roads become active public spaces during local festivals.

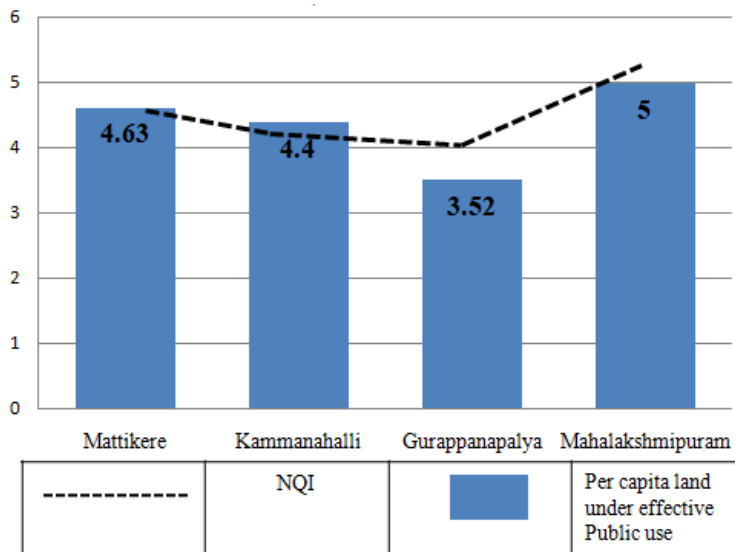


Fig. 4. NQI versus Per capita land under effective public use

The streets actively imbibe patterns such as SHARED SPACE LANES, CONNECTED PLAY, LAYERED ZONES AND STREET AS A ROOM. In addition to this a large number of vacant plots and street clearings are also being used as incidental open spaces which in turn reflect the pattern of ACTIVITY POCKETS. A high level of maintenance, better community linkage and acceptable level of general cleanliness may be attributed as the factors behind this phenomenon.

The streets of Kammanahalli present a very different character from Mattikere. Lack of trees, ill maintained roads strewn with construction material, large number of bikes and cars parked along the local roads make the neighbourhood feel perceptibly different from Mattikere. High share of residential incompatible mixed use makes the streets unfit for casual play and social interaction. Though children were observed playing in the street ends and road clearings the cramped and garbage littered streets were highly inadequate to provide a congenial environment to the residents.

The presence of a large number of temples differentiates Mahalakshmpuram from other selected neighbourhoods. These temples coupled with wide well maintained streets become the nodes of socio cultural activity in the area. They become strong ACTIVITY POCKETS and form a PUBLIC SPACE SYSTEM. Data suggests that even though both the selected neighbourhoods match each other in the public built space per capita, Mahalakshmpuram triumphs over Gurappanapalya when we look at the open space and circulation space per capita. There is a major tilt towards Mahalakshmpuram when we look at the private built space as well as residential floor space per capita. Needless to say, in actual terms it is Gurappanapalya which would feel perceptibly more crowded than Mahalakshmpuram.

Mattikere and Kammanahalli have more land under open space/ recreational use as compared to Mahalakshmpuram and Gurappanapalya. However, the same is not reflected in the experience of the neighbourhoods as Mahalakshmpuram has better maintained and well developed parks and open spaces which add to the quality of life of

the residents. These NEIGHBOURHOOD PARKS, CONNECTED PLAY SPACES, GREEN STREETS coupled with a layout which supports the idea of PATHS AND GOALS adds to the public experience in Mahalakshmiipuram.



Fig. 5. Instances of Effective public spaces in Mattikere and Mahalakshmiipuram

While Mahalakshmiipuram and Mattikere had large number of small retail shops and vegetable vendors Kammanahalli and Gurappanapalya had more office establishments and commercial activities unrelated to residential living. Even through the main streets of Kammanahalli and Gurappanapalya act as SHOPPING STREETS, the mismatch in type of shops and commercial establishments prohibit their conversion into active public spaces. The streets of Kammanahalli house a large number of workshops while Gurappanapalya had large number of residents who have home run businesses dealing in old furniture and scrap. Even though quantitative figures reflect parity in mixed use amongst the selected neighbourhoods, Mahalakshmiipuram and Mattikere displayed a better visual character and environment due to the nature of mixed use.

6c. Observations through mapping led spatial analysis: An analysis of spatial distribution of various types of public spaces was carried out for the selected neighbourhoods. Mattikere has a greater variety of public spaces available including Netaji Circle as a well defined Civic space. The public spaces are placed at regular intervals throughout the ward. These SMALL PUBLIC SQUARES link to each other to form a PUBLIC SPACE SYSTEM. Even though the number of parks and open spaces are limited it is observed that the local roads begin to act as centers of public activity due to spatial layout, optimal sense of enclosure and good maintenance. On the other hand, we observe that Kammanahalli has its maximum public spaces in form of privately owned semi controlled spaces such as retail and commercial establishments which may not be always compatible with residential living. The central presence of Kammanahalli Main road restricts walkable access to parks from one side of the ward to

another. Though Nehru circle forms a small civic space, its location on one end of the wards restricts access for a large part of the ward.



Fig. 6. Instances of Effective public spaces in Kammanahalli and Gurappanapalya

Similarly we observe that spatial allocation of parks and other open spaces ensures that over 80% of Mattikere ward has moderate level of access and choice for parks and playgrounds. In Kammanahalli around 50% of the ward has limited access to parks and playgrounds whereas around 30% of the areas seem to have easy access to a wide range of options of open spaces.

Table 9. Patterns of effective public space observed in selected neighborhoods

Neighbourhood	PUBLICNESS						SENSE OF PLACE								CONNECTEDNESS												
	Small public squares	Pedestrian density	Common land	Neighbourhood square	Public space system	Layered Zones	Building fronts	Street windows	Activity Pockets	Shopping Street	Corner grocery	Quiet backs	Street as Centre	Street as a room	Complex material	Malleability	Paths and goals	Private terrace on the street	Accessible greens	Hierarchy of open spaces	Green streets	Connected play	Shared space lanes	Walkable streetscape	Street Trees	Neighbourhood park	Biophilic urbanism
1	•	•	•	•	•	•	•		•		•	•	•	•	•	•			•			•	•	•	•	•	•
2		•				•			•	•	•	•	•										•				
3	•	•	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
4		•				•	•	•	•	•	•		•		•					•			•			•	

Legend

1	<i>Mattikere</i>	3	<i>Mahalakshmpuram</i>
2	<i>Kammanahalli</i>	4	<i>Gurappanapalya</i>

Mahalakshmpuram displays a better spatial distribution of public spaces which are placed at regular intervals through the ward. There is more reliance on parks and privately owned semi controlled public spaces such as temples and religious places.

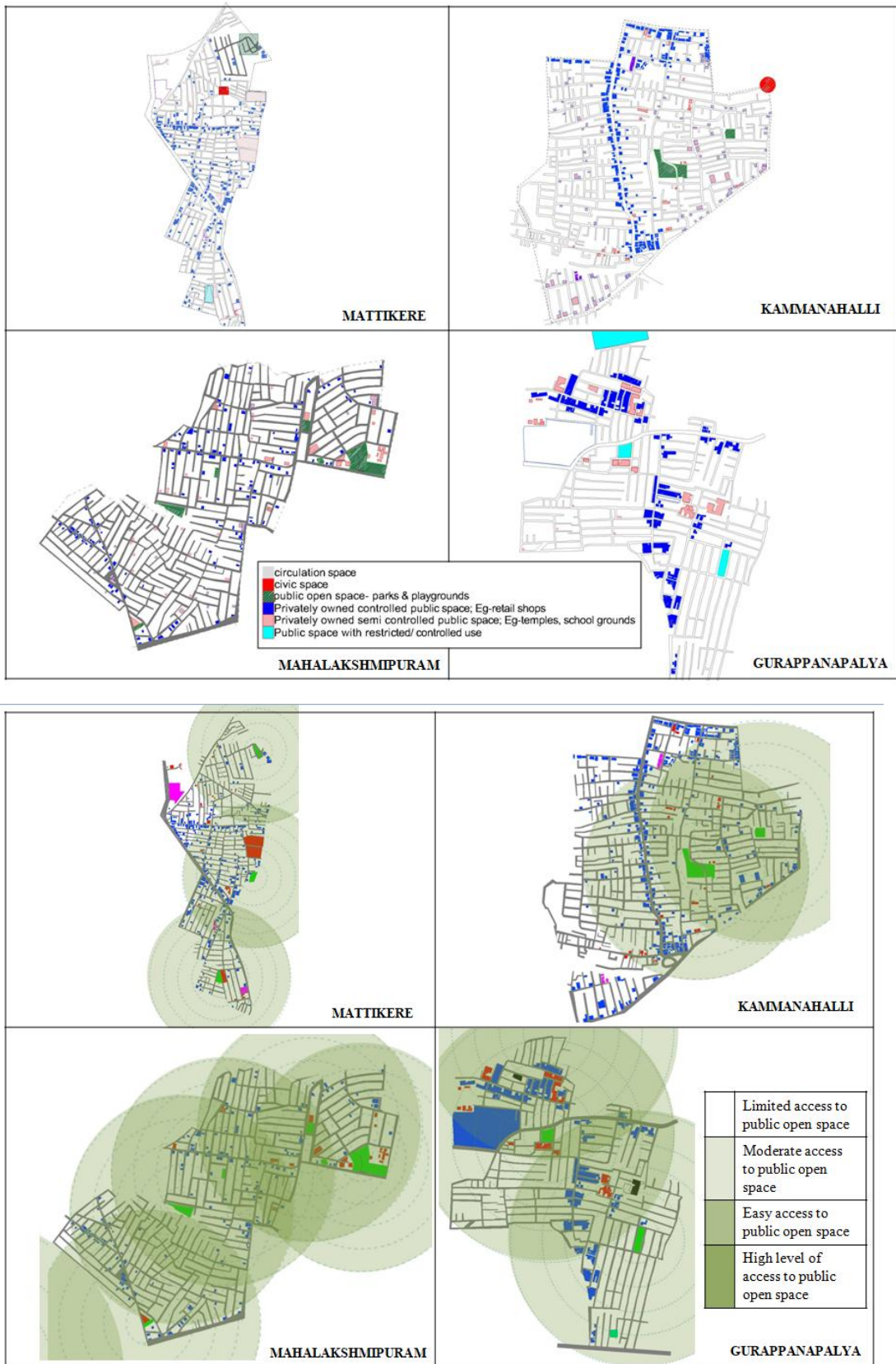


Fig. 7. Maps showing (a) Effective public space (b) access levels to public open space in selected study cases

Furthermore over 80% of the ward areas have easy to high level of access and choice of open spaces. Presence of STREET TREES, GREEN STREETS, and a general disposition towards BIOPHILIC URBANISM becomes one of the major draws for Mahalakshipuram as a high quality neighbourhood. On the other hand most of the public space available in Gurappanapalya lies in form of privately owned controlled spaces such as retail shops and commercial establishments. The axial location of these sets of public spaces and lack of any well defined civic space deprives a large part of Gurappanapalya from access to spaces for public activity and engagement. The public parks present within and close to the ward also seem to have highly restricted and controlled access making them out of reach for a large part of the ward's population. This clearly shows a chasm between the availability and accessibility to social infrastructure which is a prime issue in Indian urban neighbourhoods.

A comprehensive exercise in identifying the patterns for Publicness, Sense of Place and connectedness was carried out to support our quantitative comprehension of effective public spaces in the selected neighbourhoods. As evident in the Table 8, Mahalakshipuram and Mattikere show presence of several public space patterns which helps them acquire spatial characteristics more conducive to public use and relief.

7. Results and discussions

Spatial analysis of distribution of public spaces in the 4 wards clearly indicates that availability as well as accessibility plays a major role in enhancing neighbourhood quality of life. Amongst the various categories of public spaces observed, those that offer unrestricted or semi controlled public usage irrespective of ownership form the best options for the neighbourhood. Access to a great variety of open spaces including spaces for play as well as visual relief add to a positive experience in the neighbourhood. Peripheral location and barriers such as Major roads prevent easy access to public spaces even though the distance may be favorable to walking. Furthermore, the pattern based analysis also revealed that certain spatial characteristics enhance the publicness, connectedness and sense of place, hence ensuring better public usage of effective public spaces within the neighbourhoods.

From our case studies we have seen that despite high population density, a fairly acceptable level of quality of life can be maintained with easy accessibility and availability of the effective public space. This may be pointed out as the single most important factor in existing neighbourhoods for moderation of high density environments into liveable and vibrant spaces, confirming our initial hypotheses. Public space in residential neighbourhoods tends to have an amorphous character where it tends to flow and occupy local streets, vacant lots, street clearings, shopping streets etc. Formal landuse boundaries are erased as the public realm begins to expand into spaces which are otherwise strictly designated as transportation or private use areas. In existing neighbourhoods it is often difficult to implement prescriptive density or spatial layout norms. Physical studies within the neighbourhoods also suggest that perceived characteristics of the neighbourhood rather than the actual characteristics which have a greater bearing on the quality of life offered to the residents. Effective public space metrics, specifically the per capita land under effective public usage and per capita circulation space can become handy tools for tempering the perception of neighbourhood structural characteristics. Alongside, a pattern based analysis and design

strategies can help planners move beyond number crunching into actual design solutions.

The following pattern based strategies may be recommended for extension of public space into hitherto unexplored avenues, hence expanding the effective public spaces in the neighbourhood.

1. An orientation towards Biophilic urbanism can help neighbourhoods get more out of their already existing effective public spaces. Low traffic streets, neighbourhood parks, playgrounds, public squares etc which are already present in a neighbourhood can be made more effective using biophilic design strategies such as STREET TREES, FRACTAL PATTERN, HUMAN-SCALE DETAIL, CONSTRUCTION ORNAMENT (Mehaffy *et al.*, 2020). Traffic Islands and ROW left after carriageway may be turned into green strips for visual relief. Residents may be incentivized to encourage maintenance of their homes and front yards as well maintained front yards with landscape elements as a source of visual relief on neighbourhood streets.

Private organizations/ developers may be offered extra square footage in private development ventures in exchange for development/ maintenance of biophilic public spaces within their premises.

2. Carving out public spaces within the private realm is the other significant idea embedded in the concept of effective public space. Public School grounds and sports facilities can be shared with the neighbourhood during off school hours thereby expanding the available space for play and recreation in the neighbourhood. Private institutions such as schools and hospitals incentivized to allow the public to use their open spaces and sports facilities in a controlled manner. Premises of public offices such as municipal office, local health centre etc may be occasionally used for community gatherings, especially during holidays or after hours. Privately owned office and commercial establishments incentivized to allow public use of their ground floor and /or terrace. This can ensure better usage of value real estate in the neighbourhood. Furthermore, maintenance and cleanliness on vacant lots can allow for their usage as lower order play spaces. The pattern of PUBLIC SPACE SYSTEM composed of SMALL PUBLIC SPACES which become ACTIVITY NODES arranged as identifiable PATHS AND GOALS in the neighbourhood can be achieved by some of the strategies given here. The idea of COMMON LAND where LAYERED ZONES can extend the public realm onto privately owned land can revolutionize the idea of public spaces.

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