

# Assessment and Strategies for Urban Green Spaces: Case of Hyderabad

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**Abstract**— The last few decades witnessed India's rapid socio- economic growth on the positive side. But it also witnessed increasing urban populations and expanding urban areas, that have put pressure on existing urban green and open spaces. Current scenario clearly depicts that the environment is often being sacrificed to benefit urban development, resulting in a widespread loss which is of global concern. In this context, the study investigates the dynamics of green space system in a city by effectively analyzing their qualitative and quantitative aspects at hierarchical levels. The methodology involves assessment of existing green spaces by examining inputs and preferences from users, experts and design audits for an effective multi criteria analysis for the city of Hyderabad in India. The criteria considered are quantity, quality, accessibility and utility values of green spaces with multiple sub criteria. Furthermore, on this basis, proposals, management and policy recommendations are made to protect and enhance the functionality of existing green spaces while exploring the opportunity potential to make provisions for new ones. This approach was found to have practical significance and thus can serve as a useful tool for planners to assess the functioning of green spaces of a city and identify opportunities to protect and enhance deficit areas.

**Index Terms**—accessibility to green spaces, quality of green spaces, quantity of green spaces, urban green spaces, user perception, utility value of green spaces



## 1 INTRODUCTION

With the ever-increasing patterns of urbanization, the population jostling for space, resources and opportunities has grown tremendously. This scenario has impacted spatial planning in a manner that it is faced with conflicts between pro-development approaches and pro-environment approaches. It has been observed that the environment is often sacrificed in order to benefit urban development, mainly because green-spaces are seen as a luxury, a visual attribute of the city, and not a necessity [1].

The last few decades have witnessed rapidly changing growth dynamics of urban settings in developing nations like India, reflected in the increased burden on the urban environment and health of urban dwellers, bringing in complex changes in the ecosystem. Although urban green and open spaces are essential for quality of life, this necessity is often overlooked in the land development process. As growth pressures intensify, undeveloped land is converted to other uses, often with little regard for parcels that are better suited for green and open space preservation [2].

Research depicts that green spaces are indicative of social health of citizens and can impact the city in terms of social cohesion, economic value and ecological sustainability. There is therefore a wide consensus about the importance and value of urban green spaces in cities of 21st century [3]. Also, to meet social and psychological needs of citizens satisfactorily, green spaces in the city should be easily accessible and optimal in quality and quantity. Green spaces need to be uniformly distributed throughout the city area, and the total area occupied by green spaces in the city should be large enough to accommodate the city population needs [3].

India has recently witnessed the emergence of more than 35 cities having million-plus population [4], with Hyderabad being expected to exceed the 10 million population threshold by

2025 [5]. This increase in urban population which was noted to be 6.7 million in the 619.36 sq.km. region of Hyderabad [6] has adversely affected the quantum of green spaces to a meagre 3.68% green cover and 4.26 sq.m. per capita against the benchmark of 20% green cover by URDPFI and 9 sq.m. per capita by WHO, respectively. In such an era of multifaceted changes, need for protection of urban green systems is critically required as 50% people are now living in less than 3% of the earth's urbanized terrestrial surface [7]. Without careful assessment of knowledge, and pragmatic investments to link this knowledge to action, cities will be overwhelmed with environmental challenges.

Today parks face challenges ranging from underutilization by the public to diminishing resources, such as funding for functioning, maintenance, and staff [8]. This emphasizes the necessity for a suitable framework to assess the existing scenario of green space system in the city of Hyderabad to arrive at pragmatic and effective solutions for the identified issues and concerns. The methodology was developed such that it could be effectively adopted in similar other cities by the governing bodies and planners with due focus on user groups.

The study objectives are,

Study the existing quantum of green spaces and their qualitative aspects.

Evaluation and development of green spaces at regional, city, neighbourhood and cluster levels.

Identification of developable green spaces through the various levels of hierarchy and subzones as classified in the region, so as to improve the existing gap.

Propose physical planning guidelines and policy recommendations through the identified hierarchical levels.

## 2 STUDY AREA

The city of Hyderabad, one of the fastest growing metro cities is the capital of Telangana state in India, located 17.3850° N, 78.4867° E. It spreads diagonally for 36 km from North-West to South-East and over 35 km in North-East to South West direction, placed at about 505m above sea level. The climate of Hyderabad oscillates between monsoon- influenced subtropical and semi-arid. Greater Hyderabad Municipal Corporation (GHMC) is the local administrative body established during 2007. The region is divided into 5 zones, 18 circles and 150 wards as in Fig 1. The central zone being the most densely populated, has dispersed residential pockets of various income groups, while the north zone majorly industrial in character is experiencing rapid developmental changes with new residential pockets coming up. The south zone is experiencing densification, post the relocation of the international airport in its vicinity while the west zone has major job locations and industrial facilities resulting in new residential developments. The east zone however is at its nascent stage of residential densification post the development of metro rail, with industrial facilities in its northern region. With the recent development of metro rail network in the city, increased rate of urban sprawl has been observed, which could further threaten the quantum of green spaces in the region. The zone wise green space provision is as given in Table I.

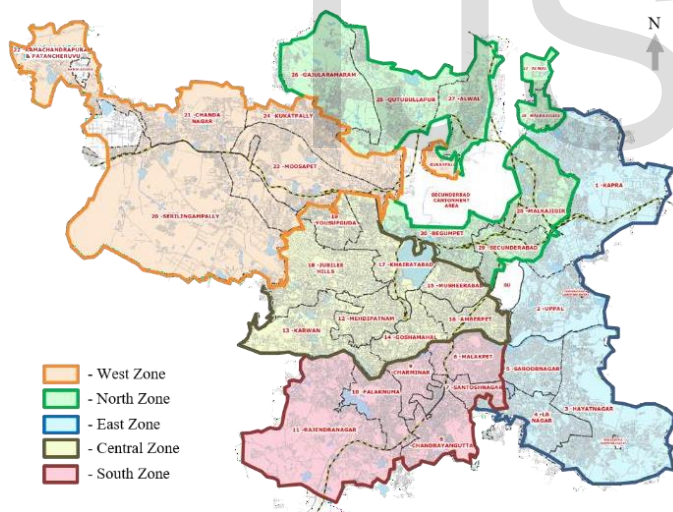


Fig. 1 Map of Hyderabad with zonal division

TABLE I

ZONWISE GREEN SPACE PROVISIONS IN HYDERABAD

Resources (area in hectares)	Central Zone	North Zone	South Zone	West Zone	East Zone
Regional level Parks	157.83	0	153.78	1520.81	1941.68
City level parks	94.7	37.23	5.06	0	0
Neighbourhood level parks	12.44	4.45	441.11	15.02	25.86
Residential area parks	57.65	18.72	36.37	28.17	15.77

% of green spaces	3.53%	0.50%	6.20%	0.87%	11.86%
green space/capita	1.78	0.64	4.14	2.86	26.42

## 3 METHODOLOGY

The study focuses on the analysis of existing public green spaces in the city. For ease of working and existing scenario in the city, green spaces were classified into four hierarchical levels, i.e. regional level parks, city level parks, neighbourhood level parks and residential area parks. The criteria for assessment were identified considering the multifaceted benefits of green spaces and easy of computation of qualitative attributes. The criteria thus chosen were quantity, quality, accessibility and utility value of green spaces. These aspects were further assessed based on multiple sub criteria for each as depicted in Fig. 3.

The sub criteria for quantity attribute were catchment area of green spaces, percentage of green space area and green space area in sq.mt per capita, while those of qualitative attribute are facilities, safety and security, welcoming nature, maintenance and landscape quality. Accessibility attribute was assessed based on distance travelled to reach the green space and the corresponding linkage quality. Utility value was attributed to level of use, benefits and visit frequency.

Users were asked to give their opinion regarding these criteria of assessment for each green space on a five-point Likert scale where, one represents lowest score and five represents highest score. In this manner, five users per green space were surveyed and the corresponding scores were tabulated. Experts in the field were surveyed to get an insight on the local context and aspirations for existing and new green spaces. Also, for the purposes of sub criteria weights, Delphi technique was adopted where experts were asked to rank them in order of priority for assessment. Three to five rounds of iterations are conducted until inputs from all of them could be aggregated to arrive at weights that are agreeable by all of them. In order to test the relevance of responses by individual experts for aggregation, Kendall's W test was adopted.

### 3.1 Kendall's W Test

The test is a measure of agreement among raters. It is given by the formulae,

$$W = \frac{12S}{m^2(n^3 - n)} \quad (1)$$

$$\text{where, } S = \sum_{i=1}^n (R_i - \bar{R})^2 \quad (2)$$

$$\bar{R} = \frac{1}{n} \sum_{i=1}^n R_i \quad (3)$$

$$R_i = \sum_{j=1}^m r_{ij} \quad (4)$$

where entity i is given rank  $r_{ij}$  by expert j and there are n entities and m experts, then  $R_i$  is the total rank of the object i and  $\bar{R}$  is the mean value of total ranks. S gives the sum of squared

deviations which is used to arrive at  $W$  value, which ranges between 0 and 1, where '0' implies no overall trend of agreement among experts and '1' implies that expert opinion has been unanimous. Thus,  $W$  value is preferable being closer to 1 as seen in Table II.

TABLE II  
 KENDALL'S  $W$  VALUE INTERPRETATION

$W$	Interpretation
$W \leq 0.3$	weak agreement
$0.3 < W \leq 0.5$	moderate agreement
$0.5 < W \leq 0.7$	good agreement
$W > 0.7$	strong agreement

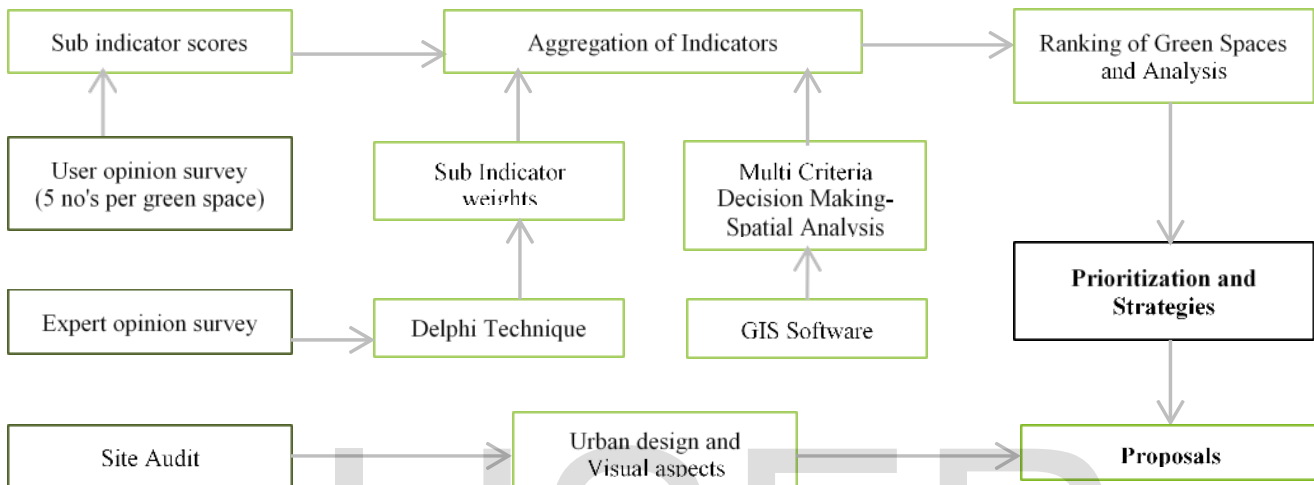


Fig. 2. Methodology chart

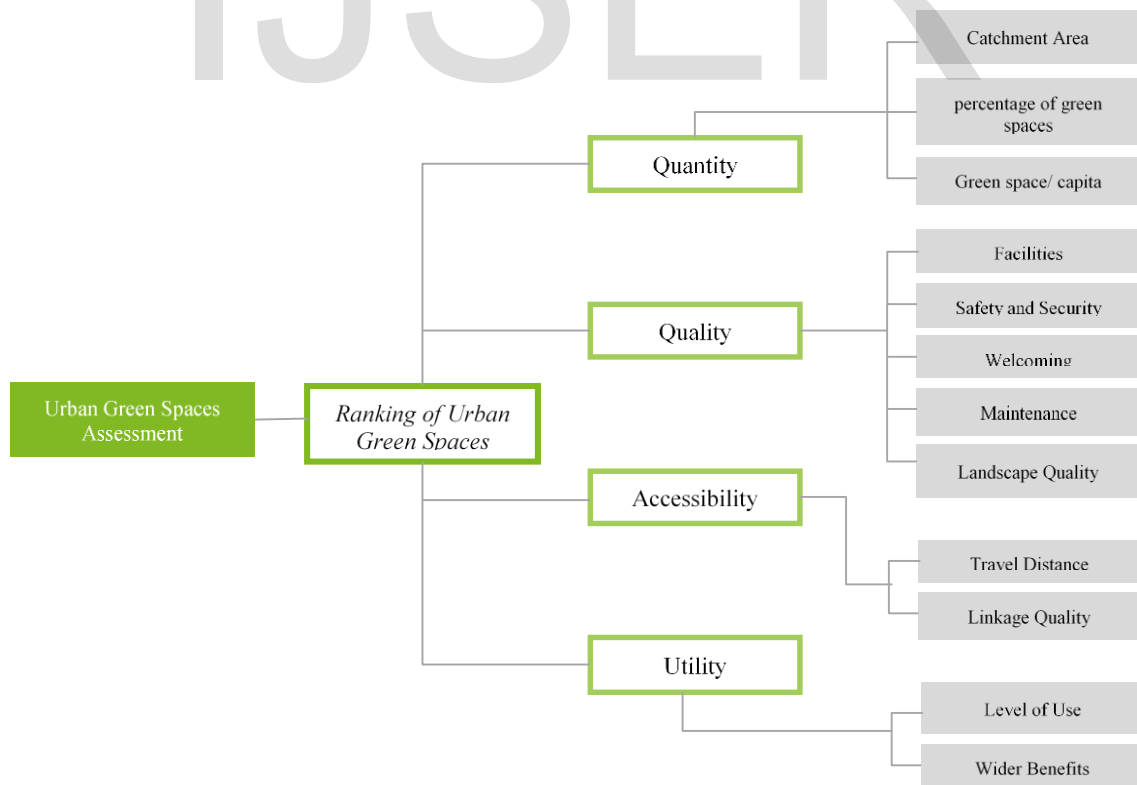


Fig. 3 Criteria and Sub criteria for assessment of green spaces

### 3.2 Determining Weights using Rank Order Centroid (ROC) Weight Method

The Rank order centroid weight method is one of the popular methods to determine weights in multi criteria models. This approach produces an estimate of the weights that minimizes the maximum error of each weight by identifying the centroid of all possible weights, especially in cases where there are a greater number of criteria. It is calculated by the formula,

$$w_j = \frac{1}{n} \sum_{k=j}^n \frac{1}{r_k} \quad (5)$$

Where,  $w_j$  is weight of entity  $j$ ,  $n$  is number of experts and  $r_k$  is the rank given by  $k^{\text{th}}$  expert.

### 3.3 Multi Criteria Decision Making(MCDM)

Multi criteria decision making methods are used for structuring and solving problems to make decisions involving multiple criteria. The weighted sum model was used in this case to compute final scores, considering the wider number of sub criteria. The scores are computed using the formula ,

$$A_{wsm} = \sum_{j=1}^n q_{ij} w_j \quad (6)$$

where  $A_{wsm}$  is the score of alternatives,  $n$  is the number of decision criteria,  $q_{ij}$  is the value of  $i^{\text{th}}$  alternative in terms of  $j^{\text{th}}$  criterion and  $w_j$  the weight of  $j^{\text{th}}$  criterion.

Sub criteria weights obtained for each attribute are multiplied with the corresponding rating given by users of a certain green space and aggregated to arrive at the final scores under each criterion, which are further summed up to arrive at overall ranking at each of the hierarchical levels. Based on this a matrix, as seen in Table IV is arrived at with scores for each green space pertaining to each of the criteria. Based on their weightages further action is taken. The matrix can then be studied across rows and columns to identify aspects of shortfalls in the city and also the overall state of individual green spaces. Furthermore, issues pertaining to each hierarchical level are identified from the survey and tabulated in a matrix and the degree of importance if existing is highlighted for each of the green spaces. Based on this matrix poorly ranked green spaces are identified for immediate strategies and spatial planning proposals while prevalent issues are identified to arrive at policy recommendations. It is recommended that this process be adapted in a GIS based software for flexibility of documenting changes and further analysis as and when required by the local body. This is the framework for assessment of existing green spaces in the study area.

### 3.4 Identifying Opportunity Potential for New Green Spaces

In case of identifying the opportunity potential for develop-

ment of new green spaces, the land bank details from local bodies is obtained and relevant land parcels are identified and updated on GIS data base. Existing green spaces that have ranked poorly in terms of quantity criteria imply that the corresponding localities have lower quantum of green spaces or are inadequate for development. These two aspects are overlaid on a map to identify the areas that need immediate attention and the available opportunity potential in those areas. Further proposals and policy framework could be arrived at from this analysis.

A conceptual model of the entire framework of study is as shown in Fig.2.

## 4 RESULTS AND DISCUSSION

In this study, the survey conducted was restricted to regional, city and neighbourhood level parks. Green spaces falling within these three levels were identified and surveyed accordingly. However, user opinions were sought to identify issues and concerns pertaining to residential level parks, to arrive at relevant strategies and umbrella policy recommendations.

Expert opinion from four individuals (Planner, Horticulturist, Landscape Architect, Civic Entrepreneur) were considered for the Delphi method adopted. The ranking was arrived at, in the third round where the  $W$  value was 0.87 implying strong agreement among experts. The weights thus obtained were used to derive scores of green spaces, when computed with the user perception data from survey.

The aspects considered for the sub criteria under quality are as listed below

- Facilities: furniture design and location, sufficiency, distinctive features, drinking water, toilets, pathways, parking, lighting
- Safety and Security: sense of personal security, vandalism, anti-social behavior, extent of self-surveillance
- Welcoming: location and access of entries, welcoming ambience, disable friendliness, signages
- Maintenance: free of litter and dog fouling, fabric- furniture and buildings, plantations, turf areas, wildlife habitat value
- Landscape Quality: richness of environment, attractiveness of boundaries, focal and orienting features

The aspects considered for the sub criteria under utility are as listed below

- Level of use: type of use, frequency of visit
- Wider benefits: structural or landscape value, ecological value, educational value, social inclusion and health, cultural and heritage value, sense of place, economic value

Based on these aspects, the Likert scale ratings are noted from green space users and the scores are aggregated to arrive at criteria and overall rankings, tabulated in Table III. This gives an understanding of the functioning of various green spaces in the city and identifies the ones that are in a poor state. Based on this and the urban design audit conducted, the issues are identified and tabulated to arrive at the matrix as shown in Fig. 4, which illustrates the prevalent issues at the hierarchical levels and their importance in various green spaces. This ma-

trix is studied along rows and columns. The analysis along columns gives an understanding of the recurring aspects and supports policy recommendations, while the study along rows helps identify poor cases and determines the areas where immediate action and strategies are to be directed.

The results show that at the regional level green spaces, Vanasthalipuram national park and KBR national park require immediate action and the probable strategies that could be implemented at this level are as follows.

- Provision of walk trails, bird watching and other relevant sightseeing activities to promote educational and environmental values
- Appropriately positioned and well-maintained toilets and drinking water facilities.
- Restriction of private vehicle entry, with appropriate cycling facilities and electric vehicles.
- Creation of multipurpose zones, civic spaces and cultural activity areas.

TABLE III  
DELHPI METHOD FINAL ROUND OUTPUT WITH COMPUTED CRITERIA WEIGHTS

Criteria	Expert 1	Expert 2	Expert 3	Expert 4	mean value	final ranks	ROC weights
Catchment area	6	6	9	4	3	6	<b>0.068</b>
% of green spaces	9	10	7	8	4.75	9	<b>0.032</b>
green space/ capita	7	8	8	9	3.75	8	<b>0.043</b>
Facilities	1	4	4	7	1	5	<b>0.085</b>
Safety & Security	4	5	2	5	2	4	<b>0.106</b>
Welcoming	8	7	5	6	3.75	7	<b>0.054</b>
Maintenance	3	1	3	3	1	2	<b>0.175</b>
Landscape quality	5	3	6	1	2	3	<b>0.134</b>
Travel Distance	2	2	1	2	1	1	<b>0.259</b>
Linkage Quality	12	12	10	10	6	11	<b>0.015</b>
Level of Use	10	9	11	11	4.75	10	<b>0.023</b>
Wider Benefits	11	11	12	12	5.5	12	<b>0.007</b>

TABLE IV  
CRITERIA WISE SCORES AND RANKING OF GREEN SPACES IN HYDERABAD

Code	Name of Green Space	Area (Hc)	Zone	Quality	Accessibility	Quantity	Utility	Total Score	Rank (overall)
<b>Regional Level Parks</b>									
C	Nehru Zoo Park	153.78	South	51.536	4.399	2.37245	1.261	78.21645	2
D	KVBR Botanical Garden	109.27	West	45.16	5.953	2.03245	1.458	60.68995	3
A	Mahavir Harina Vanasthalipuram National Park	1520.81	East	44.631	3.881	2.37245	1.266	78.56845	1
B	KBR National Park	157.83	Central	40.574	4.962	2.03245	1.402	58.68295	4
<b>City Level Parks</b>									
9	Herbal Garden	4.86	Central	55.098	6.805	1.69245	1.472	66.23295	3
14	Laxminarayan Yadav Park	3.24	Central	54.525	6.82	1.6049	1.495	65.51975	4
3	NTR Gardens	14.57	Central	52.704	5.465	2.03245	1.096	66.99545	1
5	Sanjeeviah Garden	37.23	North	52.584	6.302	2.03245	1.461	65.04715	5
6	Lotus Pond Theme Park	6.07	Central	49.813	6.546	1.69245	1.5	61.39035	7
4	Krishnakanth Park	8.9	Central	48.467	6.272	1.69245	1.427	61.74345	6
1	Lumbini Park	3.04	Central	46.372	5.221	2.03245	1.249	66.52945	2
2	Indira Park	28.09	Central	43.289	6.257	2.03245	1.358	55.78545	8
30	Imlibun Park	3.64	South	41.352	6.805	1.4965	1.461	52.4095	12

10	Butterfly Garden	3.44	Central	41.345	6.576	1.69245	1.132	52.89515	9
8	Ficus Garden	7.28	Central	40.99	6.591	1.35245	1.237	52.88995	10
13	Jalgam Vengalrao Park	3.99	Central	39.732	6.212	1.9449	1.213	52.7279	11
12	Chacha Nehru Park	5.16	Central	39.239	6.775	1.6049	1.154	50.4046	13
7	Rainbow Garden	6.07	Central	29.14	6.272	1.69245	0.869	41.46995	14
<b>Neighbourhood Level Parks</b>									
a	GS Melkote Park	7.5	Central	56.202	6.835	1.6049	1.513	67.0614	1
34	Gulmohar Park	1.29	West	55.742	6.835	1.4889	1.502	66.04765	2
17	Japanese garden	0.61	Central	52.792	6.576	1.6049	1.255	63.9891	4
b	Priyadarshini Park	5	East	51.421	5.998	2.895	1.535	65.0865	3
c	Rajiv Gandhi Park	5.5	East	51.286	6.805	2.895	1.267	62.96525	5
f	Patelkunta Park	6	West	49.932	6.805	1.1489	1.43	60.2742	7
42	Pragathi Enclave Park	0.65	West	49.76	6.76	1.1489	1.403	60.6777	6
32	Telecom Nagar Park	1.01	West	48.476	6.546	1.1489	1.326	59.1027	8
15	Sundaraiah Park	1.62	Central	48.27	6.85	1.6049	1.409	58.9627	9
33	Deepthi Srinagar Park	1.13	West	47.207	6.79	1.4889	1.419	57.9668	10
37	KKP Phase 9 Park	0.24	West	46.225	6.79	1.1489	1.24	56.2586	15
45	HUDA Trade Center Park	0.69	West	46.186	6.775	1.1489	1.369	56.1005	16
g	Vanasthalipuram HMDA Park	5	East	46.098	6.745	2.555	1.581	57.873	11
48	BHEL MIG Vivekananda Park	0.61	West	45.537	6.835	1.1489	1.36	55.8392	17
d	Langer Houz Lake Park	3	Central	45.323	6.805	1.6049	1.376	56.2744	14
50	Sainikpuri E Sector Park	0.81	East	44.885	6.775	2.895	1.27	56.5502	12
47	BHEL MIG F Park	0.49	West	44.868	6.775	1.1489	1.392	54.8055	22
51	NGO Colony Park	0.81	East	44.843	6.82	2.555	1.272	56.526	13
31	Palmetum Park	0.4	South	44.798	6.835	1.4965	1.389	55.28255	19
44	Jayaprakash Nagar Colony Park	0.81	West	44.766	6.775	1.1489	1.339	54.8059	21
21	Redhills Park	0.62	Central	44.568	6.76	1.6049	1.392	54.9983	20
27	Minakshi Estate Park	0.41	North	44.116	6.805	1.055	1.413	54.4768	23
25	Gun Park	0.4	Central	44.013	6.82	1.2649	1.362	54.3664	24
49	A.S.Rao Nagar Park	0.81	East	43.744	6.82	2.895	1.367	55.4476	18
39	KKP HIG Park	0.81	West	42.902	6.85	1.1489	1.453	52.9496	26
52	Sachivalaya Nagar Park	0.81	East	42.543	6.775	2.555	1.136	53.7342	25
43	Mayuri Nagar Park	0.61	West	42.422	6.79	1.1489	1.36	52.14825	28
38	KKP Phase 7 Park	0.85	West	41.814	6.805	1.1489	1.321	51.8659	29
24	Feroz Gandhi Park	0.24	Central	41.318	6.73	1.2649	1.32	51.2804	30
h	Safilguda Lake Park	5	North	40.838	6.456	1.395	1.16	52.18	27
46	BHEL old MIG Navabharath Park	0.53	West	39.093	6.745	1.1489	1.257	49.0727	31
26	SR Naik Nagar Park	0.49	North	37.374	6.82	1.395	1.278	47.644	32
e	Chintalkunta Park	2.5	East	35.832	6.835	2.555	1.047	46.6575	33
36	Prashanth Nagar Colony Park	0.25	West	34.393	6.805	1.1489	1.064	44.0325	34
19	Kamalapuri Park	0.77	Central	33.6	6.82	1.6049	1.128	43.55435	35
28	Ushodaya Park	0.81	North	32.086	6.805	1.055	1.101	41.6686	36

very poor  very good

In case of city level parks, Rainbow garden, Chacha Nehru

park and Jalgam Vengal Rao park require immediate action and the probable strategies that could be implemented at this level are as follows.

- Provision for informal fairs, vendors and food courts.
- Appropriate ticketing system with fixed opening and closing hours.
- Provision of drinking water and toilet facilities with sign-ages
- Provision of sports facilities, flexible to changing needs such as skating rinks, badminton and tennis courts.
- Multitude of activity areas and recreational facilities to suit different user and age groups with high quality vegetation.
- Appropriate management model in collaboration with private stakeholders.

In case of neighbourhood level parks, Ushodaua colony park, Kamalapuri park, Prashanth Nagar colony park and Chint-alkunta park require immediate action, while the probable strategies that could be implemented are as follows:

- Group activities and training programs compatible with neighbourhood's character.
- Check for the presence of informal recreational nodes, shade areas, play areas, group activity zones.
- Incentives for residents willing to take part in the management of these spaces.
- Improve physical linkages wherever necessary, focusing on areas with higher footfalls.

Code	Zone	EXISTING ISSUES													
<b>REGIONAL LEVEL PARKS</b>		Vegetation	Drinking water	Toilets	Signages	Activities	Landscape value	Walk trails	Sports	Cycling facilities	Parking	Environment friendly practices	Quantity	Accessibi lity	Utility value
C	South														
D	West														
A	East														
B	Central														
<b>CITY LEVEL PARKS</b>		Signages	Drinking water	Toilets	Outdoor gym	Tot lot	Landscape value	Group activity/ cultural spaces	Sports	Maintenance	Café/ Canteens	Ticketing	Quantity	Accessibi lity	Utility value
9	Central														
14	Central														
3	Central														
5	North														
6	Central														
4	Central														
1	Central														
2	Central														
30	South														
10	Central														
8	Central														
13	Central														
12	Central														
7	Central														
<b>NEIGHBOURHOOD LEVEL PARKS</b>		Cleanliness	Totlot equipment	Furniture, facilities	Pathway	Plantation, turf areas	Toilets	Lighting	Ambience	Group activity/ cultural spaces	Timings	Maintenance	Quantity	Accessibi lity	Utility value
a	Central														
34	West														
17	Central														
b	East														
c	East														
f	West														
42	West														
32	West														
15	Central														
33	West														
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38	West														
24	Central														
h	North														
46	West														
26	North														
e	East														
36	West														
19	Central														
28	North														



Fig. 4 Extract of interpretations from conducted analysis showing level of importance of identified issues at the hierarchical levels of green spaces, darker shade of a colour indicates higher level of importance.

No green spaces at the level of residential area parks were surveyed. However, feedback from users surveyed in other higher-level parks was used to understand the scenario. Based on this, the probable strategies could be implemented are as follows.

- Unused playgrounds could be converted to parks on approval from local residents and thereby prevent encroachment.
- Nurseries that have replaced prior green spaces are to be relocated to other government and institutional plots.
- Bring in local vendors for informal activity generation to improve footfalls and social cohesion.
- Incentives for residents willing to involve in maintenance and management of these spaces.
- Programs to improve activities and social cohesion, fund pooling.
- Outdoor gym equipment could be considered where feasible with the community.

In case of quantity of green spaces, land parcels suitable for future proposals at regional, city and neighbourhood levels were identified and demarcated on GIS software. These were overlapped with the existing green spaces to give a snapshot of the opportunity potential in the city, depicted in Fig.5. It was observed that the current potential permits the percentage of green spaces to improve from 3.68% to 4.28%. Residential area parks were not considered in this study due to time constraints. However, the user survey was so conducted to gain feedback regarding availability of land and cases of

encroachment in their vicinity, so as to identify areas that need focus. From these observations, and available land parcels, regions of Madhapur, Kondapur, Gajularamaram, Quthbullapur, Rajendranagar and Malkajgiri areas are to be given higher priority for quantitative improvement.

Also, based on this understanding a checklist as seen in Table V, was developed as a benchmark tool to improve the overall green space system.

## 5 CONCLUSIONS

In highly urbanized cities, especially in developing nations like India, the dynamics of development pose a constant threat to green spaces, though they act as lung spaces for the public amid increasing pollution levels. Hence, the focus on protecting and improvising the existing facilities to prevent any further deterioration is necessary. This methodology could be adapted by any such similar cities, so as to make provisions for an appropriate data base on GIS, for long term analysis and action determination by planners, advocates, architects etc. The process being majorly supported by user perception, has better scope for involving the local community into the various levels of decision making and implementation. The need to tap potential starting at the grassroot level i.e., residential level for improving the quantum of green spaces is necessary, as it is clearly impossible to reach the prescribed standards with the increasing levels of population growth and urbanization.

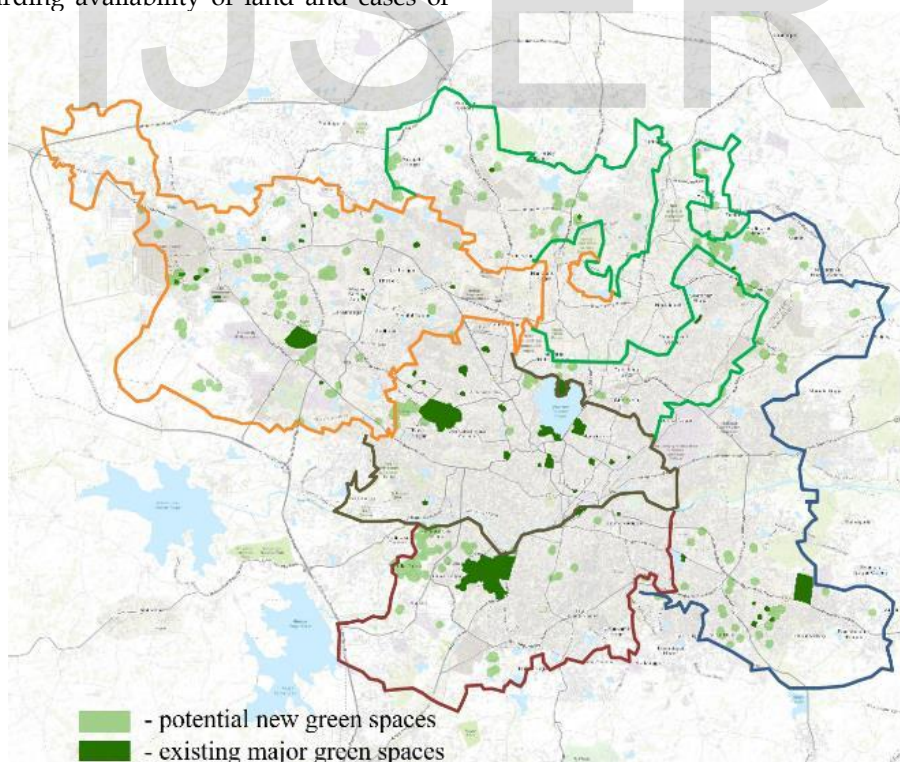


Fig. 5 Map of Hyderabad showing the opportunity potential for new green spaces



TABLE V  
 Checklist of elements for the hierarchical levels of green spaces

Checklist of Elements/ Features	Regional level parks	City level parks	Neighbourhood level parks	Residential area parks
Informal spaces				
Formal spaces				
Natural areas				
Sporting facilities				
Tot lot for kids				
Outdoor gym for adults				
Civic spaces				
Community gardens				
Public toilet facilities				
Drinking water facilities				
Café/ Canteen				
Major linkages				
Minor linkages				
Private partnerships				
Local Community involvement				

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