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RESEARCH PAPER

Assessment of Spatial Equity of Public Urban Parks Distribution in Peshawar, Pakistan

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ABSTRACT

To flourish, cities must have enough open green space and parks. Public urban parks distribution, their size, accessibility and equity are the key elements in fostering the city sustainability. Peshawar a provincial capital of Khyber Pakhtunkhwa Province is one of the rapidly expanding urban centers of Pakistan. To cater the needs of growing population large numbers of residential colonies are emerging on the cost of open spaces and green patches. This study is aimed to analyze the distribution and spatial equity of existing parks of Peshawar using field surveys, visual observations, mapping and buffering satellite imageries through computer added design methods. The results revealed that presently 209.89 ha land is covered by parks which is only 1.89% of the total urban area. The study also explored the inequitable distribution of parks in city and emphasizing the development of new accessible parks on equity basis especially in the deprived areas.

Keywords: Accessibility, Buffering, Public Urban Parks, Spatial Equity

Introduction

Parks play a vital role in the well-being and life quality of citizens by making the environment more habitable where they can experience nature and have quality leisure time ((Zhang et al., 2021; Coolen & Meester, 2014). It is now an established fact that besides contributing to life and promoting the well-being of urban residents, public urban parks are providing many social, economic, cultural and psychological benefits to different population groups (Probstl, 2015, Wang, 2015; Larson et al., 2016). One of the important aspects regarding the public parks and open recreational facilities is the access, which can be used to assess service levels of urban parks (Lindsey et al., 2001; Nicholl, 2001). Access to parks and their equal distribution are the major features necessary for the well-being of communities (Sakip et al, 2015). Park resources in most cities are hardly meeting the needs of rapid urbanization and population expansion. Thus phenomenon of the uneven distribution of park has received particular attention recently (Dai, 2011, Tan et al., 2019). During the past three decades, the theme of spatial equity, which includes distribution, availability, and access to public resources, has received much attention in urban planning and urban design contexts (Mushkani & Ono, 2021). The development of Geographic Information System (GIS) technology has further facilitated the researchers (Feng et al., 2019). In terms of accessibility and distribution within the wider city area, each resident must have equitable access (Coombes et al., 2010; Thomson et al., 2012; Guo et al., 2020; Sampson, 2017; Buhangin, 2013; Dai, 2011). With the above mentioned research progress in mind, this study was devised with the aim of exploring and assessing the spatial equity of public parks in the context of an expanding city. Hence, the main goal of this study is to ascertain the inequalities related to the accessibility and provision of urban public parks in Peshawar; specifically; (1) to categorize public urban parks of Peshawar on the basis of size

and to analyze their service area; (2) to examine the distribution patterns of parks at a city level, and determines the ratio of urban land allocated to parks per capita.

Literature Review

Urban communities are dependent on public urban parks for their life longevity with mobility and leisure and hence access to park is one of the major factors affecting the wellbeing of communities (Sakip et al; 2014). Mertes and Hall (1995) in their book; Park, Recreation, Open Space and Greenway Guidelines termed parks as 'the main recreational area.' According to them "Any land selected, obtained, or acquired by the city officials to be used as a public park, or recreation or playground area, and any building or facility thereon, owned and maintained by the city as a public park, or recreation or playground area, whether or not such areas have been formally dedicated to such purpose.

Parks are mostly characterized by the perception of the person identifying it. A park can be categorized by its relationship to human or by its relationship to nature as well. It is a significant fact that every community is unique in terms of its geography, culture and socioeconomic make up. So each community or park agency should develop its own standards for recreation, Parks and open spaces, with the help of NRPA (National Recreation and Park Association) definitions of different categories of parks. According to NRPA, parks are classified into eight types based on their size (NRPA, 2014). In 1990s, the London Planning Advisory Committee (LPAC) recommended a revised park hierarchy along with quality of urban public parks (Turner, 1992). Table.1 shows a hierarchal classification based on standards of size and services followed by the authorities of London and other cities of UK.

Table 1
Standards used for Classification of Urban Parks in European Cities

Type	Size	Catchment Area	Characteristics
Principal/City/Metropolitan Parks	More than 8.0 hectares	Up to whole city	A varied physical resource and a wide range of facilities, which would generally be recognized as a visitor attraction
District Parks	Up to 8.0 hectares	1,500 to 2,000 meters	With a mixture of landscape features and a variety of facilities such as sports field/playing fields and play areas
Community Parks		1,000 to 1,500 meters	With both landscape features and a variety of facilities like sports play
Local Parks	Up to 1.2 hectares	500 to 1,000 meters	With play area and informal green area and landscape features but lacking other facilities

Source: (Dunnett, Swanwick, & Woolley, 2002).

Physical size of parks not only describes detail characteristics of parks but also help to identify the service area within a city. Therefore it is critical that such resources should be considered in locations where they maximize equal access of individuals (Kaczynski &Henderson, 2007). In recognition of the benefit of human-nature interaction for improved life quality, English Nature (now Natural England), a government agency for promotion and conservation of nature, trusts that local authorities should consider the provision of natural areas as part of a balanced policy to ensure that local communities have access to an appropriate mix of green spaces for their recreational needs. For this purpose, it has given

a model that comprises of a set of standards for evaluating the provision and access to natural places, known as 'Accessible Natural Green-space Standards (ANGSt).

The ANGSt model specifies following guidelines for green space access provision;

1. No person should live more than 300 meters from their nearest area of natural green space of at least 2 ha in size

2. There should be at least one accessible site within 2km from home of at least 20 ha

3. There should be one accessible site within 5km of at least 100 ha

4. There should be one accessible site within 10km of at least 500 ha

The ANGSt model therefore specifies the provision of certain sizes of green spaces within specified distances. These are very famous and highly acceptable standards which are used in number of researches all over the world (Barbosa et al., 2007; Comber et al., 2008; Pauleit et al., 2003).

People visit to parks from near and distant areas. In cities with more parks for population, distance to parks may be a barrier to park use (NRPA, 2015). Many studies over the past few decades have focused on the provision of parks in city centers, whereas more recent investigations have explored and examined spatial inequalities between city centers and metropolitan areas in terms of the availability of and access to parks (Comber et al., 2008; Hoang et al 2019; Le et al, 2018).Since open spaces such as parks have numerous health benefits, improving access to them and their spatial distribution within cites is very important. Accessibility to urban parks is adequate when the spatial distribution of population is in harmony with parks (Fashi, 2016; Liu, 2021; Zhang et al., 2021) that is, whether densely or sparsely populated areas in city, residents demands can be satisfied with suitable parks provision. For this reason more attention is paid to Urban Park planning which focus on urban residents whether they can conveniently and equally enjoy all functions and services provided by parks namely the accessibility and equality of a urban park services (Liu, 2021).

Materials and Methods

Study Area

Peshawar, the largest urban center of Khyber Pakhtunkhwa (KP) Province, stretches between the latitudes of 33° 44' and 34° 15' N and longitudes of 71° 22' and 71° 42' E with total area of 1257 km^2. It is situated at an average altitude of 347m above sea level. The climate of Peshawar is semi-arid with hot summers and mild winters. The rainfall is received in both winter and summer. The population of Peshawar City District was over 4.26 million (4269811) according to 2017 census with 1.97 million urban population and 2.29 million rural population. Administratively, Peshawar is divided into five units; four towns and cantonment. Cantonment area along with Town-I is covers the city center, eastern part while in the northern region of Peshawar District, Town-II is located. In southern part of district Town-IV and towards the west Town-III areas are located. All the five units were considered for the assessment of spatial distribution and equity of Public Urban Parks. In Peshawar the parks and other urban open spaces are basically protected landscapes which have also remained the source of transferring history and culture from generation to generation. Peshawar is among those few cities which have public places particularly of all ages starting from Mughal era (Wazir Bagh, Shahi Bagh) to British time (Company Bagh). However, declining number of Public Urban Parks, their uneven distribution and lack of management has become critical issue of Peshawar like many other cities of the world.

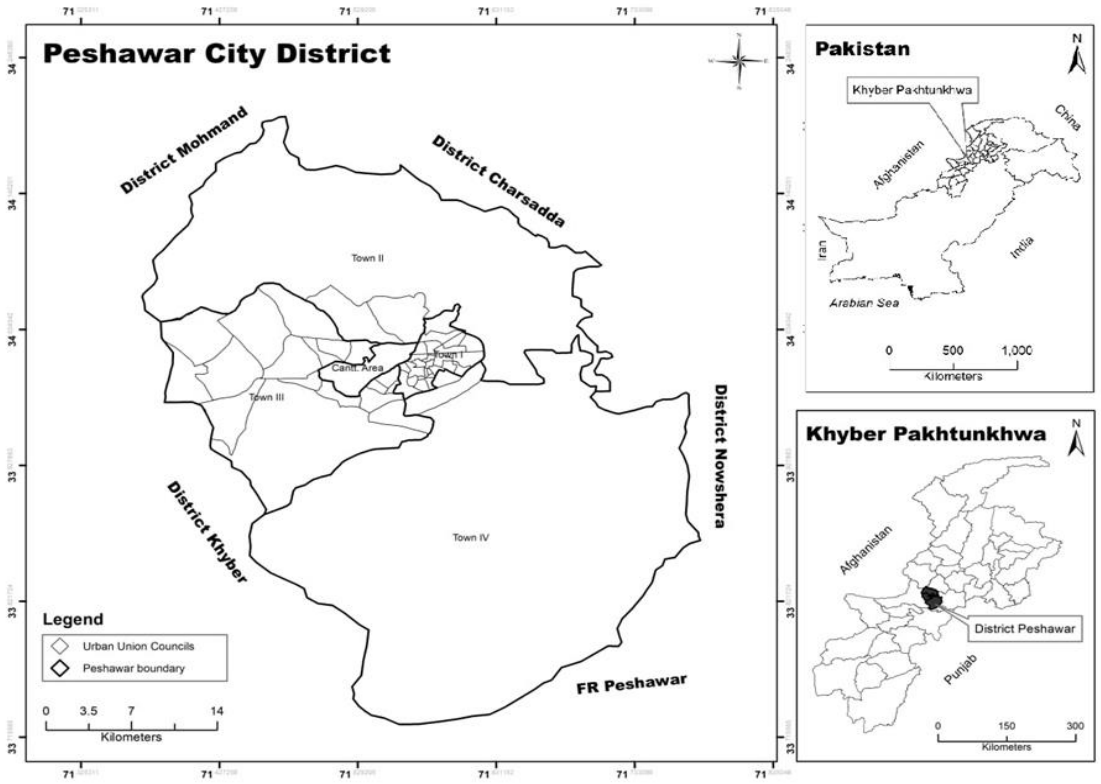

Figure 1.2: Location of Peshawar City District(Modified from the map produced by Planning and Development Department).

Data Collection and Analysis

The data was collected through field surveys and observations, focus group discussions, base maps, satellite images and official reports of Peshawar. An extensive field survey was carried for mapping the Urban Park distribution in Peshawar. Visualization with the help of base maps (taken from survey of Pakistan) and Google Earth was also done during the field surveys. A size-based classification of parks was done for the measurement of accessibility. The methodology devised by Saika Ummeh and Kikuchi Toshio (2017) was adopted with slight modification to accommodate all the parks of Peshawar. The classes devised include large parks, medium parks, small parks and very small parks located in different areas of Peshawar.. From the buffer maps of parks, service-area and served population analysis was carried out and per capita park area was calculated Service-area ratio is the percentage of service-area within the total built up area, excluding park areas. By the Eq. 1 given below, the Service-area ratio was calculated.

$$Sr = \frac{Sa \times 100}{Bt - Ap} \qquad \text{……Eq. 1}$$

Where Sr = Service-area ratio (%), Sa = Service-area by parks, Bt = Total built-up area, Ap = Total parks area. Served population ratio is the percentage of served population by parks among the total population. Served population by parks was found out through the GIS overlay analysis. Block-wise population data was displayed with polygons so that each polygon i.e. Block unit assumed evenly distributed population. It was then intersected with the parks service-area buffer map with the nearest distance of 300 meters for all the parks according to ANGst Model. The resultant polygons have a proportionate population in the service-area. The population was summed up to get the served population.

Served population ratio was calculated by the following Equation: 2

$$Pr = \frac{Sp \times 100}{Pt} \qquad \text{……Eq. 2}$$

Where *Pr* = Served population ratio (%), *Sp* = Served population by parks and *Pt* = Total population. Population density map was developed from the polygon map having Block-wise population figures through the kernel density spatial analyst tool. The unserved areas within city boundary were also identified with multiple buffering technique and the radii of the buffers were taken with respect to size of parks such as 300 meters for very small and small sized parks, 1000 meters for medium sized parks and 3000 meters for large sized parks from the prepared maps according to NRPA standards. From the finding a the research some recommendations have been made which can help policy makers to improve overall conditions of existing parks and pave way to develop new parks for the wellbeing of people of Peshawar and future sustainability of the city.

Results and Discussion

According to the field survey conducted and information collected through base map of Peshawar and Google Earth, there are 75 public urban parks in Peshawar shown in table 2, figure 2. Though the public urban parks are unevenly distributed all over the city, however, two distinct clusters of parks can be seen. One of the clusters of parks can be observed on the south western part of the city in Town-III area where Hayatabad Township is located while the second cluster of parks can be seen around city centre consisting of Town-I and cantonment area (Figure 2). In first cluster majority of the new parks are located in Hayatabad while the second cluster consists of almost all the old parks of the city. Out of 75 public urban parks, 14 are located in Cantonment, 20 in Town-I, 40 parks in Town-III and only 01 park in Town-II area.

Table 2
Public Urban Parks and their Coverage area in Peshawar

Sr. No	Parks Names	Area (ha)	Sr. No	Parks Names	Area (ha)
Cantonment Area			37.	Bagh E Naran	8.25
1.	Cantonment Defence Park	3.02	38.	Torangzae Park Hayatabad	0.33
2.	Khalid Bin Waleed Park	2.43	39.	Badaber Park	1.07
3.	PAFWA Park	0.39	40.	Recreational Park	0.23
4.	Garrison Park	16.28	41.	Phase 7 Park 2 Hayatabad	0.65
5.	Qayyum Sports Complex	9.35	42.	Phase 7 Park Hayatabad	0.85
6.	Peshawar Golf Club	58.59	43.	Fatima Jinnah Family Park	0.72
7.	Children park Cantonment	0.03	44.	Phase 1 Park	0.25
8.	Cantonment Park	0.59	45.	Phase 3 Park Hayatabad	0.90
9.	(Army Stadium)	8.34	46.	Khattak Market Park Hayatabad	0.64
10	Rahim Park	0.78	47.	N-1 Phase 4 Park	0.52
11	PTCL colony Family Park	0.11	48.	Madina Ladies Park Hayatabad	0.40
12	Warsak Park	0.26	49.	Phase 4 Park Hayatabad	3.01
13	Shaheed Tahira Qazi Ladies Park	0.35	50.	Super Market Park Hayatabad	0.29
14	Park	0.65	51.	People Market Park	0.36
	Town-I		52.	Sector E-2 Park	0.53
15	Sheikhabad Park 2	0.41	53.	Khyber Park Hayatabad	2.42
16	Shuhda-e-APS Park 1	0.15	54.	Tatara Park	5.49
17	Shuhda-e-APS Park 2	0.15	55.	University Town Park	0.11
18	Sheikhabad Park	0.44	56.	Hayatabad Park	0.58
19	Insaaf Park	0.62	57.	University Town Club	0.82
20	Asia Park (Dabgari Garden Park)	0.84	58.	Peshawar Zoo	9.83
21	Jinnah Park	2.20	59.	Ghani Bagh	2.15
22	Tehsil Park (Gor Khatri)	2.49	60.	Local Park Hayatabad	0.16
23	Parda Bagh	1.13	61.	Children Park Hayatabad	0.16
24	Shahi Bagh	12.28	62.	Ladies Park, Hayatabad	0.93
25	Wazir Bagh	5.54	63.	F-8 Park Hayatabad	1.85
26	Walking Park Peshawar	1.74	64.	Shalman Park HayatAbad	3.82
27	Arbab Niaz Stadium	2.66	65.	F-3 Park Hayatabad	0.97

28	Chacha Younis Park	1.40	66.	F-5 Park Hayatabad	0.99
29	Inayatabad Park	0.22	67.	Behram market Park, Hayatabad	0.31
30	Fidabad Colony Park	1.41	68.	University Ladies Park	1.11
31	Gulbahar Park 2	0.15	69.	Hayatabad Sports Complex	5.46
32	Park	0.20	70.	Park	0.06
33	Allahdad Park	0.26	71.	Asif Baghi Park	0.26
34	Pari Chahara Park	0.06	72.	Regi Model Town Central Park	13.26
Town-II			73.	Pakistan Forest Institute Park	0.89
35	Khushal Bagh	1.80	74.	Public Park	0.53
Town-III			75.	Phase 3 Ladies Park	0.13
36	Hayatabad Park	0.42			

Total Coverage area of Parks in Peshawar = 209.64 (1.87) Hectares

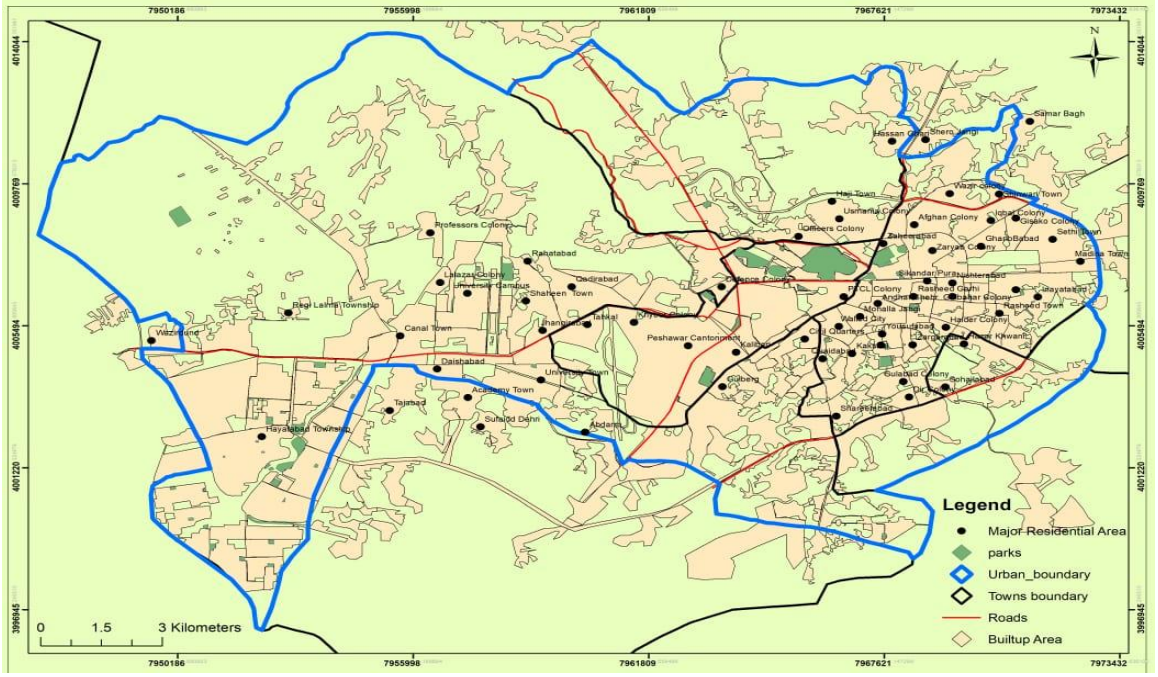

Figure 2: Spatial Distribution of Public Urban parks and Major residential colonies in Peshawar City

The size of a park determines its capacity as well other important attributes of accessibility. Therefore, public urban parks of the study area were classified on the basis of size into four types Large Parks, Medium Parks, Small Parks and Very Small Parks (Table 3).

There are two out of 75 (2.6%) Large Parks in Peshawar, located in Cantonment area, while 18 (24.0%) medium sized parks are scattered in rest of the urban Peshawar. Among these large parks: Peshawar Golf Club, also known as PAF Golf Course, is restricted for the general public and selective members have access to such a big open green space while Garrison Park is open for the General Public. The medium sized parks are not only used by the people of neighboring areas for recreational purposes but people from distant rural areas of Peshawar also come to visit these parks. Majority of medium sized parks are amusement parks which attract people of all ages. Some of these are Defense Park, Khalid Bin Waleed Park, Jinnah Park, Tehsil Park, Wazir Bagh, Chacha Younis Park, Khushal Bagh, Bagh e Naran, Tatara Park, Ghani Bagh, Shalman Park are most frequently visited.

Large majority of the parks 55 (73.3%) are of either small or very small size. They are mainly situated close to the residential areas having smaller service-area and hence serve a smaller number of neighborhood residents. In some of these parks common swings are installed which are used by the children of respective neighborhoods. These small parks are more concentrated on the western side of the city.

Table 3
Classification of Public Urban Parks by size in Peshawar City

No.	Type of Parks	Size	No. of Parks
1.	Very Small Parks	Less than 1 hectare	47
2.	Small Parks	1 to 2 hectares	08
3.	Medium Parks	2 to 15 hectares	18
4.	Large Parks	More than 15 hectares	02
Total Parks = 75			

(Criteria modified from Saika and Kikuchi, 2017)

The range of service-area for small, medium and large sized parks is shown in figure 3 in accordance with the NRPA standards.

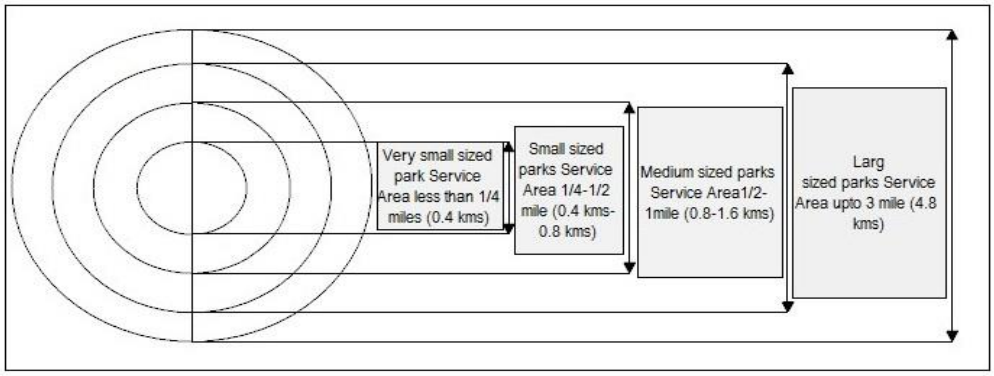

Figure 3: Range of Service-area of Different Sized Parks (based on NPRA Standards for service-areas)

Service-area ratio by parks

The served area ratio for parks within the city was calculated to be 24.89% (Table 4). Peshawar City has the total built up area 11,220 hectares in 2020 of which the total park area of Peshawar was 209.64 hectares while after making buffer the area within the buffer was 2,740 hectares of the total park area. The percentage of the total park area out of the total built up area was 1.89% which is a very less area if it is compared with the built-up area. According to the PEPAC Standard, the area which is reserved for parks would be 18% but the actual value is very less as compared to the total built up area.

Table 4
Results of Service-area analysis of Parks in Peshawar City

Total area (built-up (hectares)	Total Area of Parks (hectares)	Percentage of the park area in built-up area	Total service-area of parks (hectares)	Ratio of the service-area
11,220	212.76	1.89%	2740	24.89%

Served Population Ratio by parks

It is depicted from the Table 5 below that the population served by the parks within the service-area was only 18.5% out of the total population of the urban area. The remaining 82% is that population which resides outside service-area. It shows that no parks are available to the population of peripheral area.

Table 5
Served population ratio of parks in Peshawar city

Total urban population of city in 2020 (persons)	Population served by the parks (persons) in 2020	Proportion of the population served by the parks	Per capita Park area (ha)

2,273,000	420,825	18.5%	0.000093 (9.3×10^{-5})

An attempt has been made to show the distribution of public urban parks in relation to population density in the study area (Figure 6).

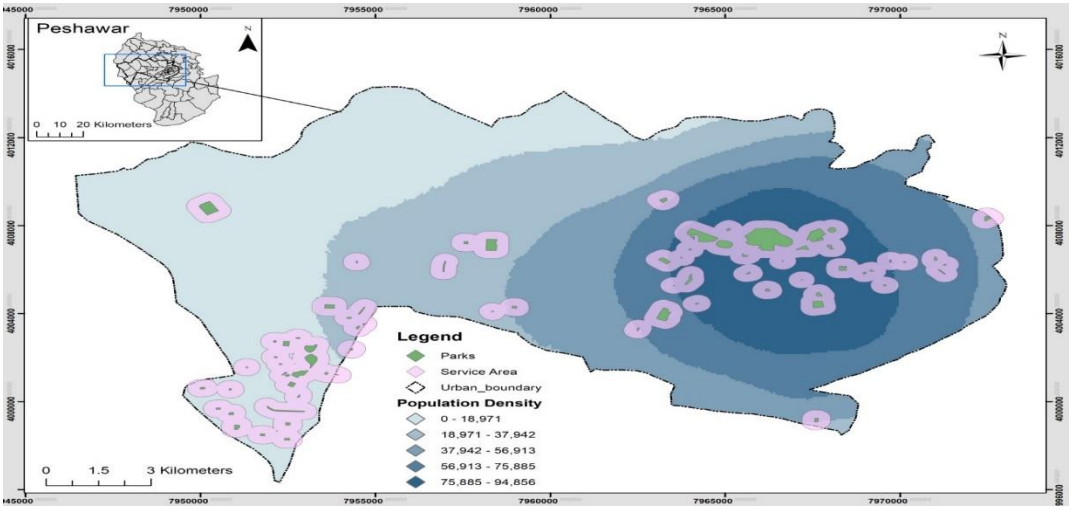

Figure 6: Public Urban Parks along with buffers in relation to population density

The availability of parks and their distribution within a city also play important role in the provision and accessibility of services to the residents. There are intracity variations in terms of area, number, distribution of parks and accessibility. It is seen that the government colonies and housing schemes which are built up by the government show a large proportion of parks than the corresponding private residential areas (Figure 7).

There are some areas in Peshawar which are seriously lacking park facility and not even a single small public park is situated in the nearby area. Five such zones can be identified (Figure 7, Table 6).

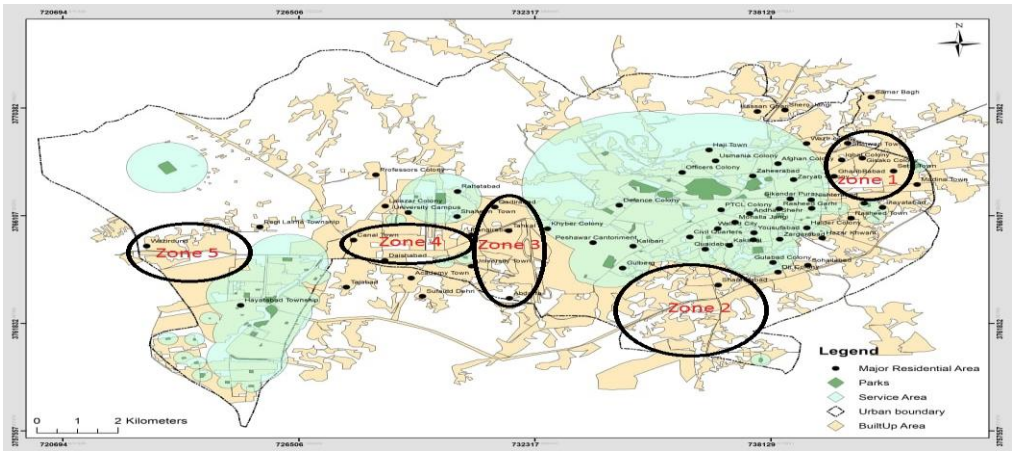

Figure 7: Peshawar Park Deficient Areas

Table 6
Peshawar – Zones of Park Deprived areas

No. of zones	Location in the cities	Residential areas in the zone	Current Status
Zone 1	Eastern side of city	Madina Town, Iqbal Colony, Sethi Town, Gisako colony, Gharibabad	No park is available

Zone 2	South eastern part of city	Hazarkhwani, Quaidabad, Sharifabad, Kakshal	No park is available
Zone 3	Central part of city	Shaheen Town, Tehkal, Jahangirabad, Khyber Colony	No park is available
Zone 4	South western part of city	University Town, Academy Town Danishabad, Sufaid Dheri.	No park is available
Zone 5	Western part of city	Regi Lalma, Wazirdund	No park is available

Source: Field observations and guide maps of Peshawar

Conclusion

The assessment of spatial equity of public urban parks distribution in Peshawar revealed that there are visible differences in residential areas in terms of provision of recreational facilities. The number of parks, their size, type and distribution are not according to the international standards. The study also reached to the conclusion that a large number of population of Peshawar City lack parks with the standards defined for the basic park that cater the needs of the individuals of that area. Most of the parks in Peshawar are passive parks or simple grassy parklands only. There is a need to develop such parks which are more active and vibrant. Development of new parks is necessary to increase the per capita park area and population to be served by parks. Vacant spaces in residential areas can be transformed into small pocket parks to ensure leisure in small piece of land. Town IV is totally neglected in this regard having no Public Park and Town II has only one Park. FGDs in the unprivileged UCs revealed that people are in dire need of accessible parks in their areas for their families. In this regard people have shown willingness to offer their land for the construction and development of new parks. During field surveys it was found out that most of the parks have illegal encroachments and are not managed properly. There is a strong need to take action for preserving and restoring old parks along with developing new parks.

Recommendations

Following recommendations are made to improve overall conditions of existing parks and pave way to develop new parks on equity basis for the wellbeing of people of Peshawar.

- The authorities must ensure that the pre-existing rules for urban development regarding the green spaces and parks are implemented. The legislative authorities must do concrete legislation regarding the parks and recreational places.

- A sufficient amount of budget must be allocated every year for the parks alone and the same must not be used for any other purposes.

- All sorts of encroachments in public parks and recreational places should be removed immediately to restore the already created parks to their original condition.

- There is an urgent need to develop new parks and green spaces in park deficient areas. The more congested inner city cannot accommodate parks. For this, the left over plots can be taken over by the government and be converted to small parks and recreational areas.

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