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Integration of GIS and perception assessment in the creation of needs-based urban parks in Ramallah, Palestine

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In Palestinian cities, urban parks are rare and their size is limited, comprising roughly 0.5 m² per person in Palestine's fastest growing city, Ramallah. Prior studies indicate that conventional planning, zoning, and standards-based approaches do not fully meet people's needs for parks in urban settings. Hence, a needs-based approach was implemented in this study. A survey instrument was administered to a representative stratified sample composed of planners, professionals, and academics. The questionnaire was successfully administered to more than six hundred respondents (n= 650) and the results divulged a number of important points that will aid in future park and green space location, creation, and park utility. These findings included (a) overwhelming (perceived) need for more parks provided with facilities like playgrounds, water features, and relaxing areas; (b) a perception of uneven distribution of parks and facilities in urban settings; and (c) an increase in accessibility via roads and walking paths.

Keywords: urban parks; GIS; needs-based assessment; perception; Palestine

Introduction

Over the centuries in developing countries across the Mediterranean Basin, North Africa, and the Levant, urban development and planning has been dramatically influenced by early colonial administrators and policy-makers. Planning regulations, policies, requirements, and legislation were often exported from the 'mother' countries to those under colonial rule, resulting in the development of long-term 'blueprints' that depended on building codes and zoning ([Rakodi 2001](#)).

Nowadays, after years of this imprinted policy style and imposition, post-colonial administrations are facing complex difficulties in rectifying these embedded policies, while attempting to locate scarce funding, all the while constrained in spending their limited budgets on environmentally related assets such as the creation of new parks and maintenance of existing gardens ([Chaudhry and Tewari 2010](#)). In these countries, the problem of open space in urban areas was predominantly a product of zoning ordinances in conventional planning schemes, where zoning deals with built-up percentages and minimum setbacks and does little to protect open space or preserve/conserve a rural character ([Ewing 1994](#); [Hadly 2000](#); [Johnson 2001](#)). The reason that many Palestinian communities and urban subdivisions consist of nothing more than house lots, structures, and streets was because zoning does not require more than that ([Thompson 2002](#)). Conventional zoning plans and policies assign land use to every plot, lot, and area of land – usually as residential, commercial, or industrial. This kind of planning has been described as

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'planned sprawl' because every piece of land was converted to a front yard, a back yard, streets, sidewalks, and/or buildings (Hadly 2000; Thompson 2002).

The need for these open spaces became increasingly urgent in developing countries as cities became further condensed and congested. These spaces serve several social goals: (1) provision of recreational areas, green areas, and parks for environmental and health concerns; (2) protection of agricultural lands and preservation for economic benefit; and/or (3) efficient urban layout and smart-growth policies towards the creation and maintenance of higher qualities of life (Freeman 2001; Arnberger and Haider 2005; Benton 2008).

The mechanism of incorporating open space into plans has allowed planners to use such spaces to address social concerns and also to meet socioeconomic needs for the changing demographic patterns over time. Planners utilized open space in the past to address urban concerns of health and sanitation through park provision, and a general improvement in the perceived quality of life. At one time the integration of green spaces into the urban fabric was used as a linkage tool between cities and growing suburban areas. Moreover, nowadays open spaces are being preserved to protect ecologically sensitive areas and to guide urban development and expansion (Chiesura 2004). Early planners and civic reformers incorporated open space and the urban fabric in the form of urban parks and suburban development. Urban parks were introduced to gain more exposure to nature as a means of improving quality of life. These parks acted as the 'lungs of the city' as clean areas when compared with slums and crowded lots. Zoning was subsequently introduced to provide some space for public use but it was in need of comprehensive planning in order to accomplish a plan that incorporates all aspects of development, environment, and socio-economic considerations (Burby et al. 2001; Bo-sin Tang and Siu-wai Wong 2008). Following the mid-19th-century's era of environmentalism and the city beautiful movements (Kostof 1999) the focus shifted from 'not where to build, but where not to build' (Rome 2001).

An urban park is a space accessible to all citizens, regardless of age, race, ethnicity, socio-economic level, or gender (Burby et al. 2001). This kind of space was needed in order to achieve the integration of building and paved areas within the natural landscape in order to produce unified and pleasing landscape environments (Veal 2006). These spaces are essential to create an enjoyable community life and a greater sense of connection between people and their environment (Bo-sin Tang and Siu-wai Wong 2008).

Community perception about open spaces and natural areas, on the one hand, and urban settings, on the other hand, must be assessed in the process of environmental and spatial planning. Previous research indicates that people overwhelmingly prefer natural areas to be integrated with the urban landscape for a more healthier environments (Herzog et al. 1982; Ulrich 1986; Smardon 1988; Ribe 1989, Parsons and Daniel 2002). This means that people favor trees and green spaces, parks, or pastoral landscapes to be integrated within the urban fabric to escape from confined spaces, socialize, play with their children, and get fresh air. Wilson (1993) argued that there was a human need, not preference, for a 'deep and intimate associations with natural environment, particularly its living biota.' Benevolo (1980) explained that effective urban planning and design was about improving productivity, a sense of security, well-being, and an overall quality of life.

This paper focuses on a case study of Ramallah City in Palestine where urban parks and open space planning depends on conventional planning and is not primarily driven by community needs. In this study, two groups were targeted: professionals working in the field of urban planning, higher education, and city planners as interviewees, in order to come up with a consensus towards terms, areas, and standards for urban parks and their vitality for cities and dwellers. The second group was the inhabitants of the study area,

who were targeted for community involvement in the assessment process of urban parks perception and needs. The findings of this comprehensive survey instrumentation were crucial in providing planners with the needed guidelines for better urban parks and their related distribution (catchment area), services (children playgrounds, water features, relaxing places), size and accessibility (roads, walking paths).

Study area

Most Palestinian cities were originally agricultural communities, with a rural and vernacular fabric, often defined by, or related to, ancient- and classical-period occupation and/or routes. They started to grow and attract immigrants in the 19th century (Algube and Bisharah 2002). During the Ottoman era these communities witnessed noticeable growth within their cores (old city). During the British Mandate period that followed after World War I these communities began to grow beyond their old city walls, gates, barbicans, or occupational boundaries (Thawaba 2009). Ramallah grew along the main road extending and expanding towards the city of Al-Bireh, bringing the two localities closer together. After 1948 most of the Palestinian cities accommodated the flux of Palestinians who were expelled from their homes within the boundaries of the Mandated Palestine. Following the Six-Day War (1967), the West Bank and Gaza came under Israeli control. Since that time, all Israeli governments (regional and national) have attempted to annex as much land as possible under their sovereignty (Al-Rimmawi 2009). During this era, the Israeli authority did its utmost to restrict building by Palestinians outside municipal boundaries. Building restrictions were achieved through many means: refraining from preparing updated regional outline plans for the West Bank, confiscating and annexing lands, and declaring areas as military zones (ARIJ 1998). Due to these restrictions cities and towns became compacted, and compressed, with an increasing population and structural density, with most building activities filling the empty areas within these city boundaries.

After the Oslo Accords in 1994, Palestinian cities started to grow and expand in order to encourage investment and developmental projects. Unfortunately Palestinian lands were divided into: A zones (covering major Palestinian cities with no Israeli presence; they constitute 17% of the West Bank and hold about 55% of its population); B zones (which represent 24% of the West Bank and holding 41% of its Palestinian population; the Palestinian Authority has civilian control on this area but Israel has total security control); and C zones (which constitute 59% of the West Bank and include 4% of its population). These zones played, and continue actively to play, a major role in restricting urban growth of Palestinian communities; this resulted in raising land prices within municipal boundaries. In addition, Israel commenced constructing the Wall around and within many border cities in 2002, which added more constraints on municipal growth boundaries (PCBS 2007).

Since the British Mandate for Palestine in 1923, Ramallah began to grow and expand beyond the old city boundaries. Until the 1960s, Ramallah was a small locality growing slowly. Rapid population growth in the last three decades has been the main reason behind municipal boundary expansion. This was needed to accommodate the flux of people working in the newly established institutions (Khamaisi 2005).

Ramallah, the governorate seat, is located in the middle part of the West Bank (Figure 1), with a population of 44,658 persons (Ramallah Municipality 2009). The built-up area of Ramallah expanded during 1989–94 by 16.1% (379 *dunums*, or 36.9 hectares, or 91 acres) per year, and in 1994–2000 the built up area grew by 24.5% (585 *dunums* per year). This accelerating urbanization impacted the urban fabric of the city center (Abu Sada and Thawaba 2011). In the 1960s the built-up area for the city was 3.7 km², and it



Figure 1. The study area.

expanded during the periods 1983, 1997, 2004, and 2009 to 11.3, 12.5, 13.8, and 17 km² respectively.

Ramallah is considered as the most expensive city in the West Bank as a result of the high demand on services, jobs, and residences. Land prices are escalating as a result of fast population growth (mostly in-migration). The average price of a *dunum* within the city center has reached US\$3 million, if available (Ramallah Municipality 2009). Due to high land prices, the possibility of establishing new parks within the city center is prohibitive.

Methodology

Understanding citizens' needs and their perception of urban parks has an important role in planning and providing public services in/to different parts of a city (Ite 1996; Antrop 2004; Gadd 2005; Bryant 2006). Parks that fail to meet public needs require restoration and regeneration (DeGrove 1992; Bauer 2003). Some approaches have been taken with the aim of trying to understand the social context of residents visiting public open spaces (Coley, Kuo, and Sullivan 1997) in order to optimize the benefit and improve residents' quality of life in cities.

The approach of using conventional urban parks/open space standards dates back to the early 20th century when planners and landscape architects proposed to increase parks

numbers and areas as related to the distance of pedestrians pathways. This notion soon came under criticism ([Hindley 2007](#); [Veal 2008](#); [Jason and Neil 2010](#)). This approach depended on zoning regulations, and was conducted through calculations and percentages that were assigned for different uses regardless of social context.

According to Loukaitou-Sideris ([1995](#)), the park standards approach has been under criticism since the 1970s for being unable to provide for people's needs (services provided) and for producing beautiful open spaces that are not used since they are beyond most people's typical walking distances.

Nowadays, a 'needs based' assessment has been adopted by researchers and planners to meet the needs of diverse groups benefiting from public spaces like urban parks and green open spaces. This represents an alternative to a standards approach, which considers the socio-demographic characteristics for which parks are needed ([Smoyer-Tomic, Hewko, and Hodgson 2004](#)). This approach assumes that the spatial distribution of both people and resources within a given area will be uneven. Needs-based assessment assumes that the inhabitants benefiting from urban parks are satisfied because a calculation and planning decision was based on their needs which will minimize travel costs (such as time, fuel costs, energy). This approach takes into consideration not only the people within a given geographic area, but also counts their socio-demographic composition and recreation preferences ([Smith 1980](#)).

Many researchers suggested that geographic information systems (GIS) analysis could help in assessing the diverse needs of potential park users by evaluating the socio-demographic composition of park catchments. This technological implementation may help in examining whether or not residents within a particular locality have equal access to parks and open spaces ([Gobster 1995](#); [Sister et al. 2007](#)). GIS is considered as an efficient tool to compare spatial relationships between resource distribution (parks) and resident use. [Nicholla \(2001\)](#) used GIS to examine the distribution of public parks in Bryan, Texas. She employed needs-based assessment of green spaces to identify groups most in need of access to parks and open space and found that park distribution in the study area was equitable, but access to parks was not.

This research used both spatial and attribute data in order to link community perception to its spatial structure using GIS technologies. Spatial data were gathered for the study area and different shape files were prepared. Attribute data were developed using GIS analysis tools, and questionnaires' output were used to map people's perception. Data analysis was conducted using GIS and Excel. Different maps were prepared to represent residents' perceptions regarding urban parks: accessibility, availability, services/facilities provided, and park size (Figure 2).

Since prior research in perception-based needs assessment in urban planning, the thrust of this work required interviews with city planners, academics, and professionals that were conducted to understand any consensus regarding area/size needed for parks and catchment area dimensions. Calculations (i.e. areas, densities, catchment areas) were made to discover if the existing parks (size) satisfy city dwellers. Catchment area was assigned for each park by creating a buffer zone with a radius of 500 m to find out areas served; this helped in allocating unserved inhabitants. In order to achieve 'needs based' assessments, in addition to planning professionals, residents were approached to incorporate their perception regarding park size, service and facilities, availability, and accessibility. The city was divided into 13 zones based on municipality neighborhoods' divisions, then attribute data were linked to spatial data (i.e. areas, population density, distances). In order to conduct needs-based assessment, analysis was made on a zonal scale to show each zone's inhabitants perception.

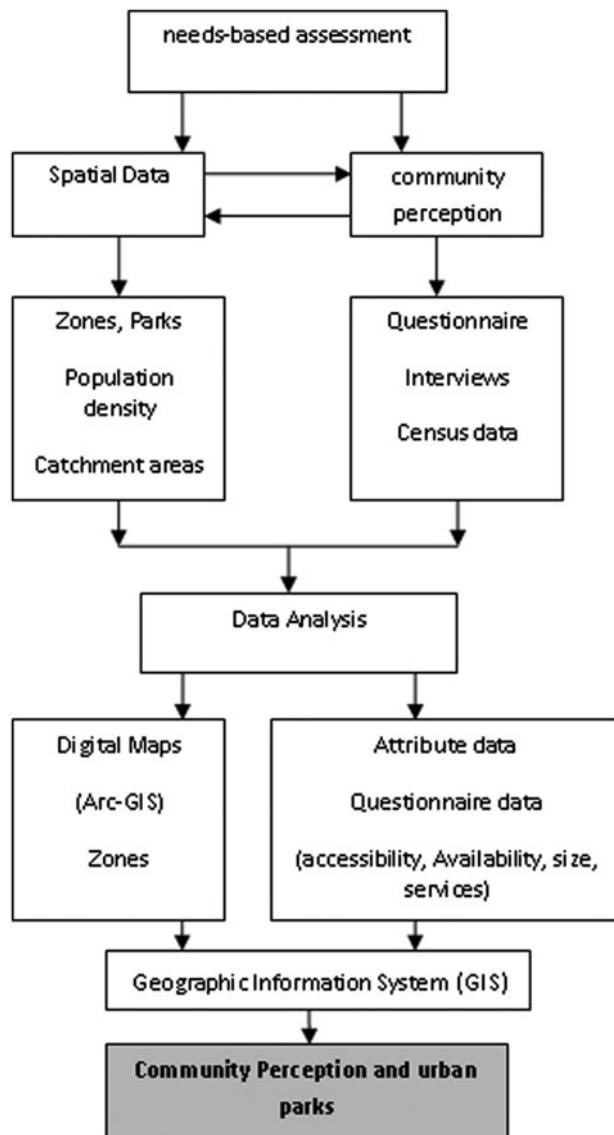


Figure 2. The methodology.

In this study, GIS was used to create a base map for the study area, including existing parks, and to allocate the catchment areas (served versus unserved). Analyses included ArcGIS-10.3 to map residents' perceptions within each zone in order to show resident levels of satisfaction regarding accessibility, service and facilities, park size, and availability within their own zones.

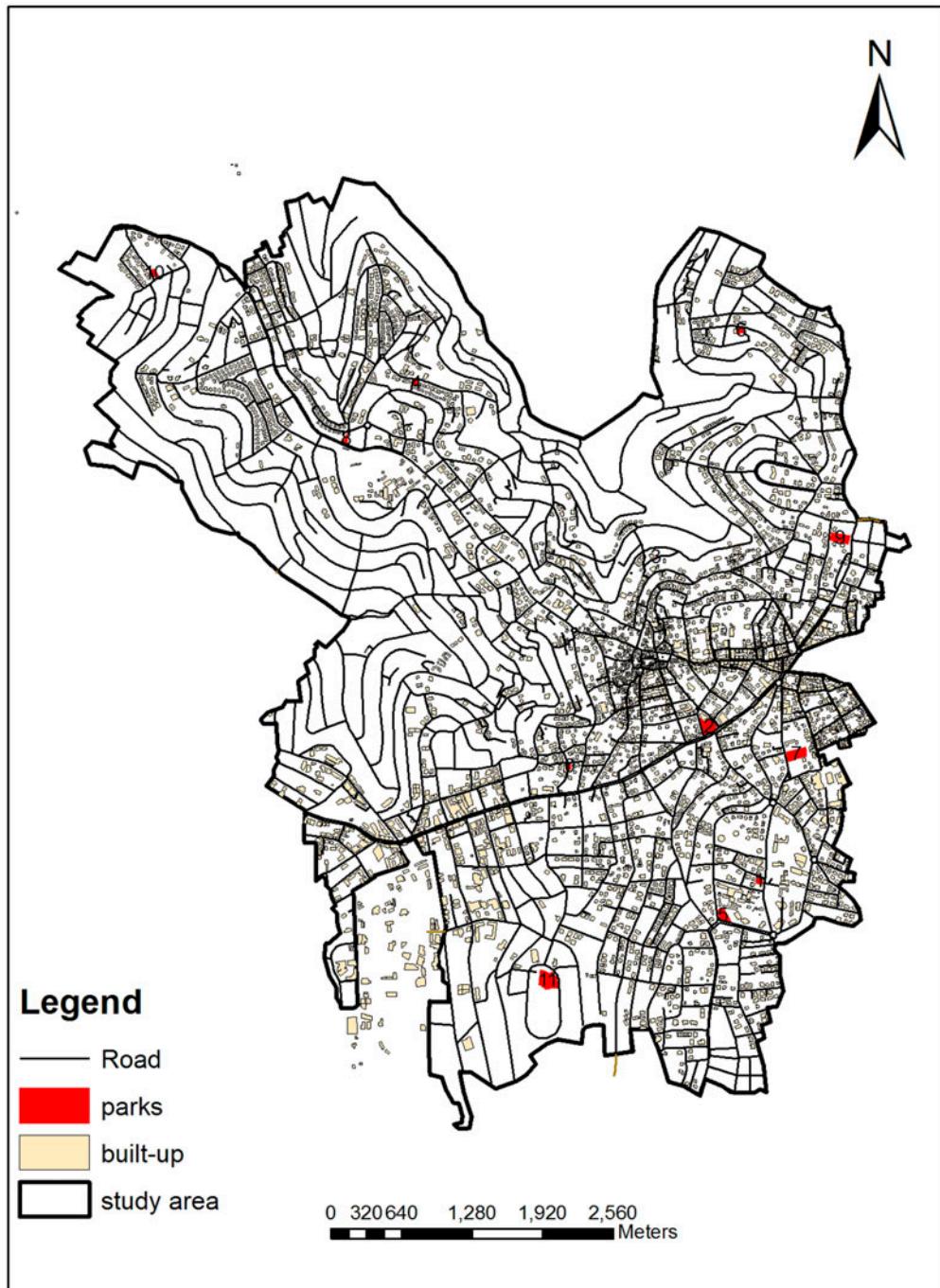


Figure 3. Parks location.

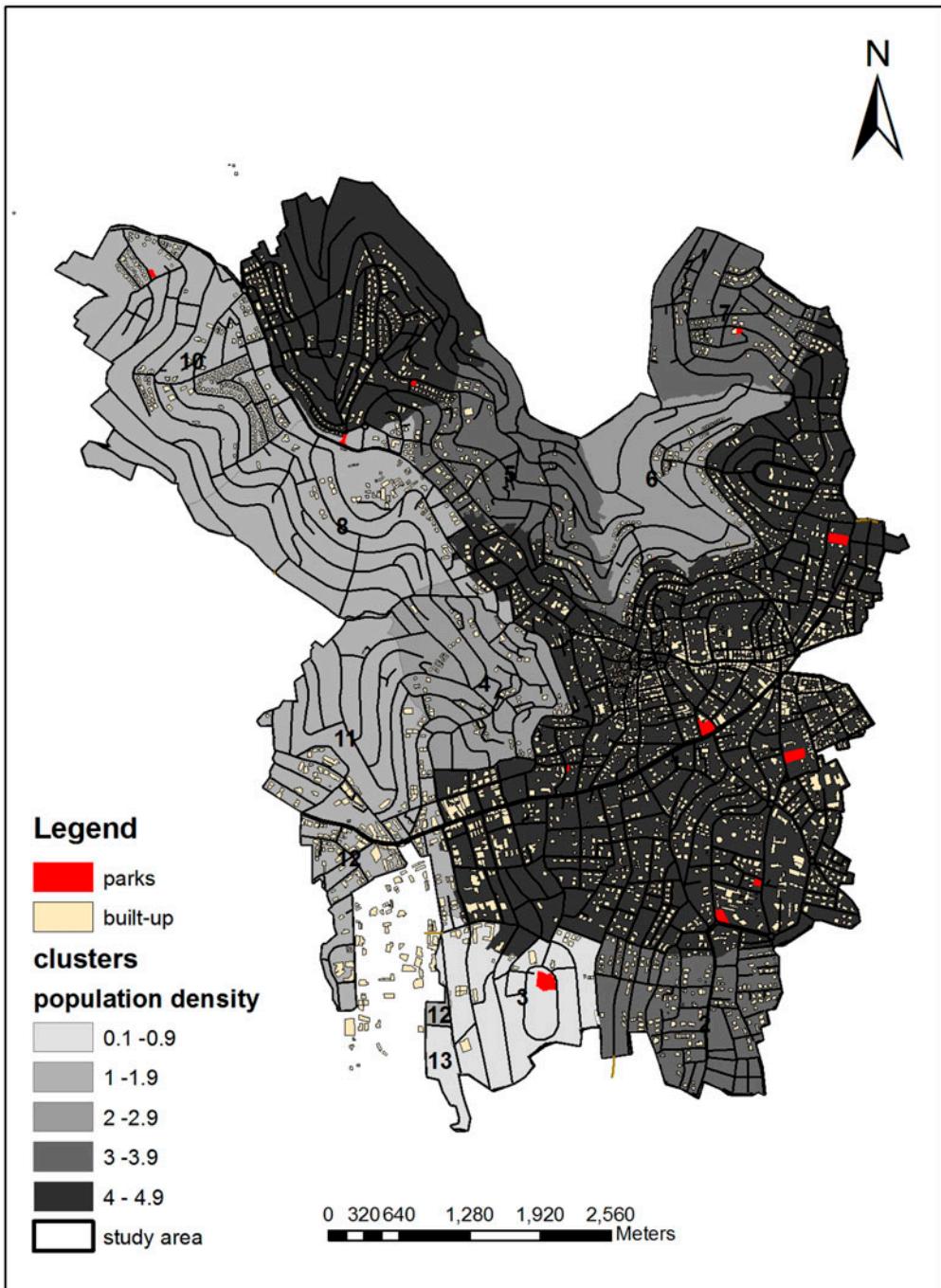


Figure 4. Population density, persons/dunum (where 1 dunum = 1000 m², or 0.25 acre).

Results and discussion

Spatial assessment

The spatial study was conducted using Arc GIS 9.3 in order to map parks, roads, and catchment areas. Public areas and public buildings (courts, schools, cemeteries, etc.) (650 *dunums*) comprise 3.8% of land use in the study area; this includes urban parks which comprises (0.001%). In the master plan, residential area (6707 *dunums*) represents (39.3%).

A map showing the existing urban parks within the study area was prepared; each park was given an identifying code, and areas (m^2) were calculated for each (Figure 3). The city has 12 parks with a total area of 24,180 m^2 ; six of them are concentrated in the city center with different sizes, while on the peripheries parks are rare. Park size does not follow standards or formulas; it depends on land ownership (private/public). All parks in the city lack playgrounds and sports facilities; most are passive spaces with seats and greenery. Also, the municipality park was provided with a restaurant, but others not (Ramallah Municipality 2009).

The city's master plan was divided into 13 zones/clusters (according to city neighborhoods' plan); each zone was given an identify number (as a primary key) in order to link attribute data extracted from community perception (survey) with its correspondent zone. This also helped in calculating residents served in different zones. In addition, a map (Figure 4) was prepared to show population density for each zone (Ramallah Municipality 2009). Later, this helped in calculating the number of residents served within each of the 13 zones, and the number of residents lacking this service. The core issue was to project peoples' perception within each zone and to understand how people evaluate parks within their zones in terms of availability, accessibility, size, and available services/facilities.

It was important to understand the density of population to understand better real versus perceived accessibility, so a map was created that illustrated higher population densities in the city center, while it was low in the peripheral neighborhoods (zones) (Figure 4). Parks are scattered in the central zones where population densities were greatest, while they were found to be rare in the outer zones. Overall, however, few zones are lacking such spaces.

According to interviews conducted with professionals, university experts, and city planners¹, it was found that a ratio could be derived for the number of residents to park area. It was found that 3.2 m^2 per person was the best optimal ratio of space to density to serve as an urban park, while 500 m was perceived as the best walking distance to reach the closest park². In order to ascertain the people being served by these parks, a buffer zone with radius of 500 m was created around each park, and the population density and distribution were calculated in each buffer zone. A map was prepared in order to delineate the resident catchment areas for the existing parks with a radius of 500 m (Figure 5). The map shows areas where people need to walk more than 500 m (out of the catchment area/unserved areas) in order to reach the closest park.

The total existing parks area was 24,221 m^2 in total park space in the 13 zones. However, based on the assessment of 3.2 m^2 of park space per resident (as determined as being optimal), the total optimal area should be 142,906 m^2 . This leaves a shortfall of 118,685 m^2 . Therefore, the lacking area represents an absence of green spaces across the 13 zones in this study of roughly 83%, while the existing parks represent a mere 13% of the perceived green space needs (24,000/143,000 m^2). Most of the existing parks were established on public land owned by the municipality, while two of them were established on donated parcels (Ramallah Municipality 2009). Depending on the population density in

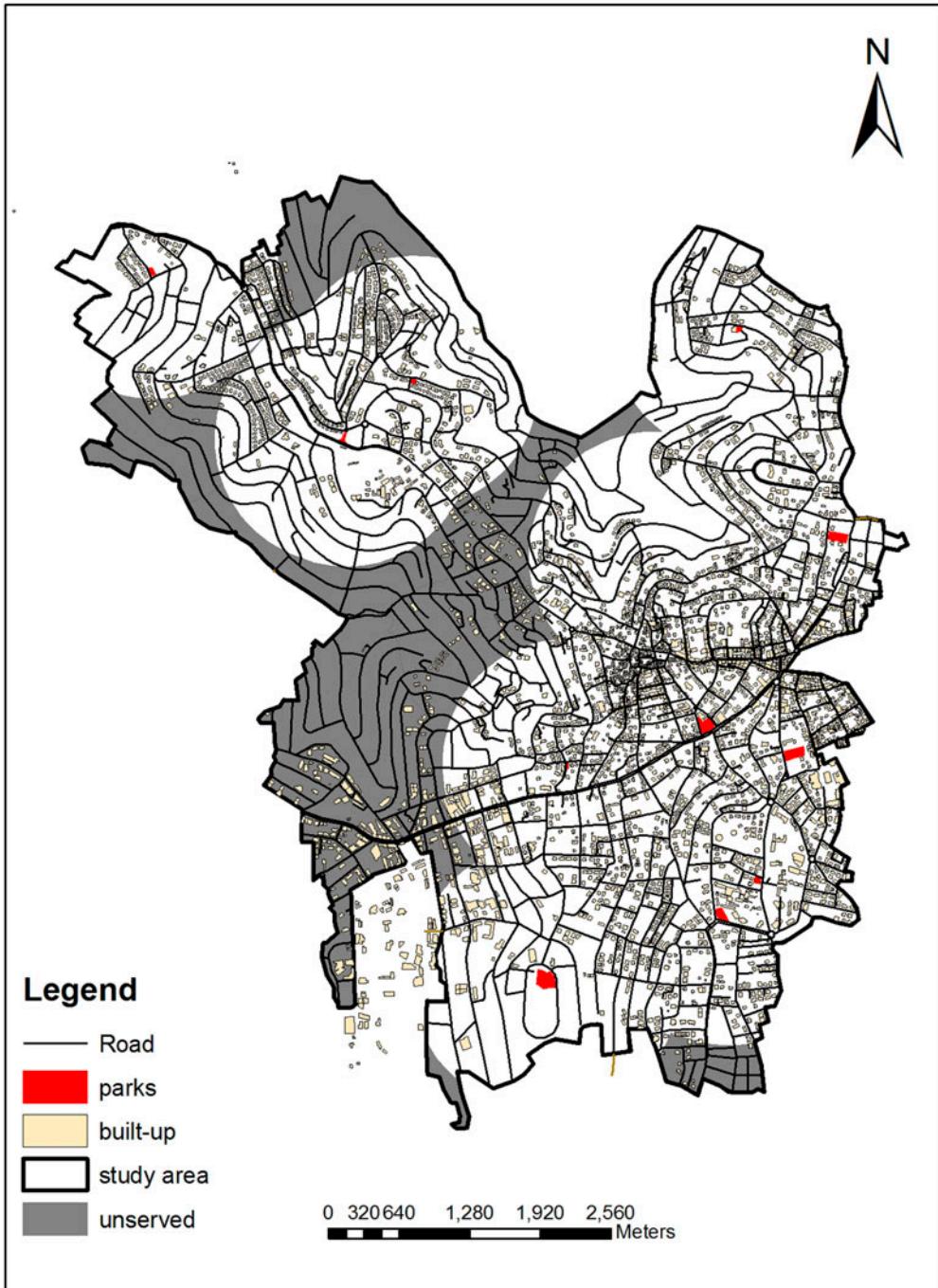


Figure 5. Unserved areas.

each zone (Figure 4), calculations were then made to find out how much park space was perceived as needed for each zone.

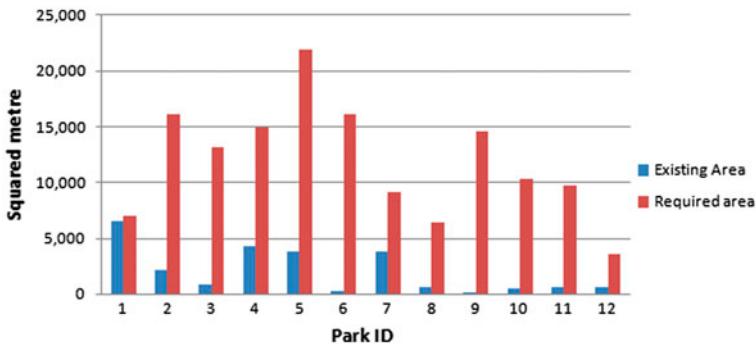


Figure 6. Existing versus required park areas.

Calculations were made for the existing park areas ($24,221\text{ m}^2$), and the areas perceived as required the better to serve residents in the 13 zones: $142,906\text{ m}^2$. This means that accumulated park areas of $118,685\text{ m}^2$ are needed. Figure 6 illustrates the difference between the existing areas used and/or allocated for parks, and the areas perceived as required park areas (determined for each resident catchment area and population density for each zone/neighborhood).

Community perception

As previously discussed, a survey instrument (questionnaire) was designed to assess peoples' perception towards urban parks in Ramallah. The questionnaire included (1) socio-demographic data (gender, income, level of education, age, marital status); and (2) perception assessment of park accessibility, park size, availability, facilities, and services). Fifty questionnaires were administered in each zone, in a stratified sampling scheme that targeted planning professionals. Ramallah city was divided into 13 zones according to the master plan, with each zone having a different character (densely populated ones in the center and scattered populated on the peripheries). Each center was typically comprised of apartment buildings, while in the peripheries most people live in single houses with yards. The questionnaire covers both.

Multi-stage sampling was used. First cluster sampling was used (each zone represented a cluster), then a simple random sampling technique was used within each zone. This process was conducted in each zone until 50 questionnaires were completed for each.

Questionnaires and interviews were administered during April, May, and June 2011. University students in community architecture and GIS classes assisted in data collection. Data were organized using MS Excel software, giving each questionnaire a code number starting with the same code number of the cluster. Data were transferred into compatible formatting (*.csv) to be used as attribute data for GIS analysis.

Interviews were conducted with professionals, city planners, and university experts in order to obtain their consensus regarding urban parks planning in terms of practice, regulations, and standards.

Tabular data were collected in each zone and then linked to the map, depending on the same ID coding as a primary key. Study analysis was conducted on zonal scale in order to project a zone's inhabitants' perception and preference.

Table 1. Community perception.

Zone ID	Accessibility		Size		Facilities/services		Availability	
	Scale average	Rank weight	Scale average	Rank weight	Scale average	Rank weight	Scale average	Rank weight
1	2.6	Low	2.8	Low	5.4	Medium	5.6	Medium
2	1.8	Low	1.2	Low	1.2	Low	1.1	Low
3	6.3	Medium	6.3	Medium	6.0	Medium	6.2	Medium
4	1.3	Low	1.6	Low	1.3	Low	1.3	Low
5	1.6	Low	1.3	Low	1.2	Low	1.6	Low
6	1.7	Low	2.5	Low	1.3	Low	4.2	Medium
7	6.2	Medium	2.7	Low	2.2	Low	4.0	Medium
8	5.0	Medium	4.2	Medium	2.3	Low	5.3	Medium
9	5.2	Medium	2.1	Low	2.0	Low	2.0	Low
10	5.4	Medium	2.0	Low	1.9	Low	2.1	Low
11	1.2	Low	1.9	Low	1.3	Low	1.2	Low
12	1.3	Low	1.7	Low	1.2	Low	1.0	Low
13	1.4	Low	1.2	Low	1.2	Low	1.0	Low

A scale of 1–10 was used to assess the residents' degrees of perception towards: (1) accessibility (roads, walking paths); (2) the level of convenience regarding parks size/area; (3) the facilities/services provided to visitors (e.g. playgrounds, toilets, seating, games); and (4) the availability of parks within each neighborhood. In the analyses numbers were assigned for each category: 1 was the least and 10 was the highest. Numeric values were then transferred into text (weight) as low, medium, and high – 1–3 represented low, 4–7 medium, and 7–10 high (Table 1).

Tabular data were then linked to spatial data (zones) to project peoples' perception against corresponding zones in order to map community cognition regarding the four assigned categories related to urban parks. Color ranges were then assigned to the range-graded values to show the difference in agreement (Figure 7).

It was found that there was a consensus by all inhabitants of the city that park services, availability, accessibility, and size do not reach the level of 'high' (Figure 7). People living in the center were the least 'pleased' with the status quo regarding parks giving 'low' values for all categories. This has been attributed to urban crowdedness in the center and poor accessibility (roads are automobile oriented), in addition to small park size. People in the urban centers live in apartments and high-rise buildings (five to 10 floors), and these buildings are not provided with the required services for the residents such as yards and playgrounds. Additionally, most of these buildings are not provided with parking spaces for cars. People in the peripheral neighborhoods gave 'medium' for most of the category responses. The majority of the respondents living in these areas have their own yards and open spaces within their properties, wider roads, and well-designed streets with parking spaces for cars.

Demographic implications

On the city scale, targeted respondents were distributed between the ages of 12 and 65 years; 55% were female; 53% were between the ages of 16 and 25 years; 78% were married with an average of three children; and 51% had attained higher education (with high-school matriculation and some university studies and/or degrees); average monthly

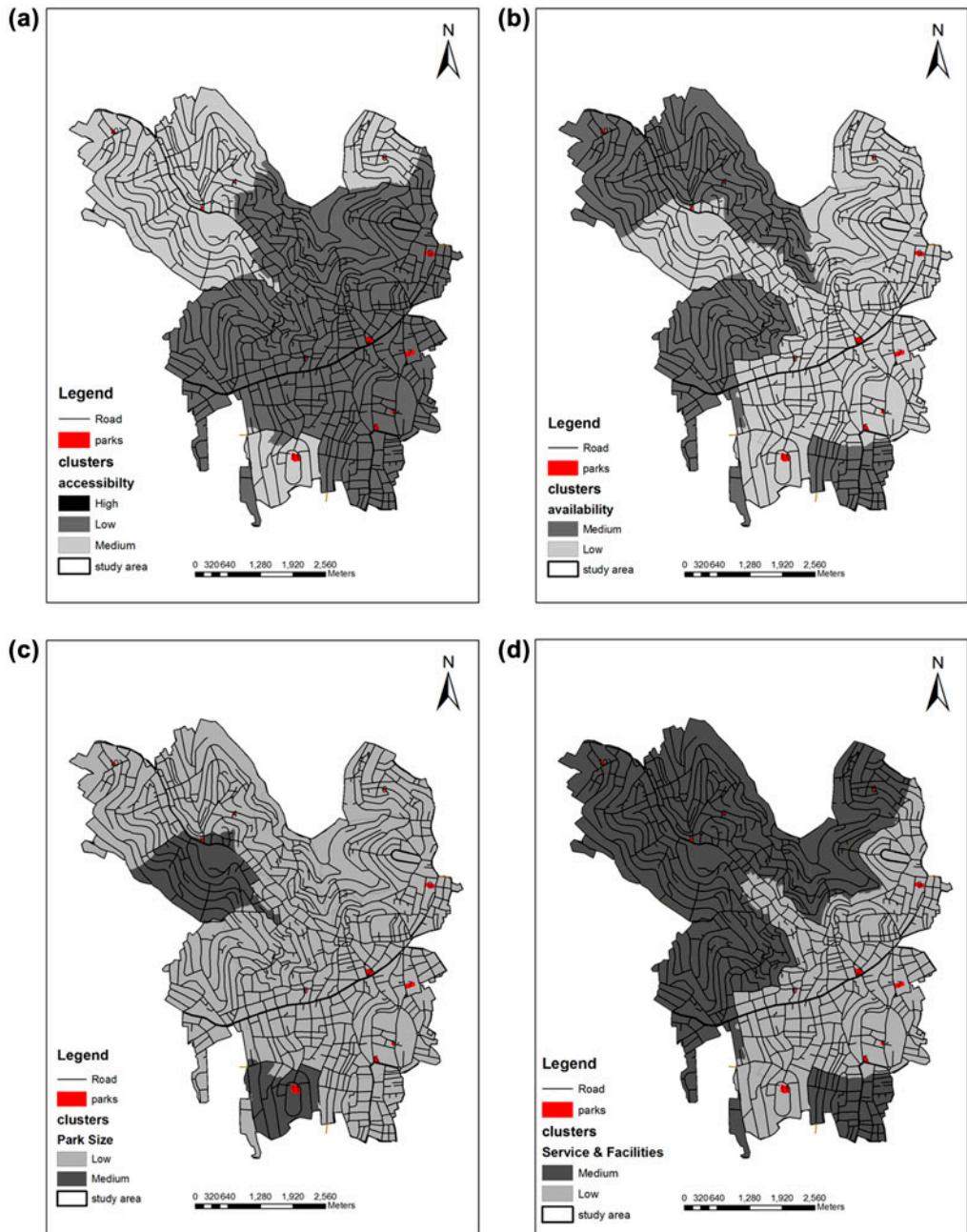


Figure 7. Community perception.

salary was US\$1200; 36.6% visited urban parks once a month and 52% twice a month; 42% travel to the parks by car; and 55% prefer playing areas rather than seating areas.

On a broader scale, data analysis showed that in the urban core average income was less than US\$1000; the average number of children for each family was 5.2; people in these zones visited the closest parks twice a week; and 65% preferred playing areas to sitting areas

(active recreation rather than passive). In these zones 47% travel to parks by car; and 66% live in apartments. In these zones 45% of the cohort had a higher education degree.

In the peripheral communities, the average income was found to be more than US \$1700; the average number of children was 3.2; people visited the closest park twice a month; 55% preferred sitting areas; 57% reached the closest park on foot; 42% lived in separate houses with a small garden; and 65% had attained a higher education degree.

The urban fabric in Ramallah is still suffering from the inherited poor planning systems (since the British Mandate), which have affected the quality of life, made worse a positive city image, and diminished livable spaces within its boundaries. Ramallah was lacking urban open space; this was due to a shortage of land, ineffective and antiquated planning priorities, unbalanced socio-economic factors, a lukewarm public awareness, misunderstood community needs, and weak and rarely enforced planning regulations.

In this study both professionals and planners and residents agreed that there was a shortage of urban parks in the city and region. It was speculated that this was due to outdated regulations, limited access to land due to tight municipal boundaries, and unfocused priorities for both residents and the government.

Spatial analyses in this study showed that the spatial distribution of existing parks was uneven, the size of these green spaces was insufficient, and in most zones the facilities provided are minimal. The city was unprepared for pedestrian access with most of the core areas consisting of streets lacking sidewalks, and an automobile-focused design and facilities plan.

Conclusion

The study presents a general understanding of community perception regarding urban open space, green space, and more importantly parks in one of the fastest growing Palestinian cities. Previous research explains that conventional planning (zoning) and a standards-based approach cannot fully meet people's needs and satisfaction at all levels of the social unit: individual, family, clan, neighborhood, city, and region. A needs-based approach was implemented and combined with spatial (GIS) assessments in order to link perception to place and need.

Respondents showed a keen interest in the issues and needs of urban and regional parks. They were eager to have good facilities distributed evenly throughout the city neighborhoods, mainly in the core urban areas where building typology was diverse and often supported increased density (e.g. apartments). The survey and interviews divulged the demand by citizens for improvements in terms of both the quality and quantity of urban parks within their neighborhood and city.

The study showed that incorporating a needs-based approach was a vital component in preparing developmental plans. Such an approach will lead to a fair distribution of parks, provide appropriate facilities, and enhance accessibility in certain areas. In some zones park areas are required to be increased in size (areas were calculated); in others it was found that services needed to be enhanced in terms of accessibility (pedestrian paths) and facilities (e.g. playgrounds, toilets, water features). In this study each neighborhood's resident perceptions were mapped for their needs and their criticism regarding urban parks within their context.

In conclusion, this study represents an effective and relatively rapid assessment for the 'status quo' of urban public space in Palestine, but also a model for similar assessment of resident needs in other urban, suburban, and exurban areas of rapid growth. The outcome of the study will provide planners in the Ramallah Municipality with guidelines for better

park allocation, location, and design within their city. It revealed many issues in need of improvement, which were highlighted by the residents and respondents in this study, and it provides guidance based on perceived community needs for an appropriate vision by city planners for park distribution, size, services, and accessibility.

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Notes

1. A total of 16 m^2 was needed per person in the United States, 10 m^2 in the UK, 12 m^2 in Australia, and 16 m^2 in Queensland (Jason and Neil 2010).
2. A total of 400 m was needed in the United States and 500 in the UK (Jason and Neil 2010).

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