



## Original article

# The relationship between the distribution and use patterns of parks and their spatial accessibility at the city level: A case study from Tehran, Iran



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## ABSTRACT

Parks are recognised as important elements of urban green infrastructure and for providing many benefits to city residents. In countries where urban growth is unplanned and sprawling, green space provision falls behind, inadequate amounts are provided or spaces are not located in the most effective places. Tehran, the capital of Iran, has experienced huge growth in population and corresponding sprawl in recent years. There has been no study of the effectiveness of parks as part of the range of green spaces in the city – their location, accessibility within the urban structure, relationship to the socio-demographic character of the population, amount per capita or quality and condition. Using a combination of existing data supplemented by new data from site surveys, this study firstly looked at the citywide scale of public open space in relation to population and socio-economic patterns. Second, a representative sample of 16 parks was examined in terms of their accessibility within the urban street structure using space syntax. The syntactical results were correlated with several different aspects of each park collected and rated on a 1–5 scale. The results showed a wide range of availability of parks with no specific pattern related to whether the district is better off or poor. The data on green space per district was often heavily biased by the presence of large areas of forest park or non-recreational land which gives a false picture. Many of the best parks are poorly integrated into the street network and found in the better off districts yet are very popular because they are “destination” parks in cooler, hilly areas. Poorly integrated parks in the inner city districts tended to show lower levels of maintenance, were often little used and had vandalism. Much more attention is needed to provide green space in an equitable way.

## 1. Introduction

### 1.1. The value and importance of parks

Parks and urban green spaces have long been important for the quality of life in urban areas and are now accepted as vital parts of the urban green infrastructure, with important environmental, recreational, aesthetic, economic and health advantages (Chiesura, 2004; Mohsen, 2006; Gehl and Gemzoe, 2001; Peters, 2010; Rosenberger et al., 2009). They offer appealing views, can help to clean the air, to reduce noise, to control pollution and have positive microclimate effects (Escobedo et al., 2011; Groenewegen et al., 2006). They also increasingly play a role in mental health (Hartig et al., 1991; Michie and de Rozarieux, 2001), physical health, health recovery and stress reduction (Rostami et al., 2015; Ulrich, 1983).

Urban green spaces also have a significant role in providing cultural ecosystem services and for supporting urban biodiversity (Crane and Kinzig, 2005). They are the main points of contact with the ‘natural’

environment for many (Jorgensen et al., 2002). The presence of parks and public space also increases potential for social interaction and community activities (Michie and De Rozarieux, 2001).

### 1.2. Urban development and green space: environmental equity

Over half of the global population lives in urban areas and this proportion is continually increasing (United Nations, 2005). While cities in western countries are often reasonably stable in population or are planned for controlled expansion, even here there is a tendency for sprawl to occur (Pauleit et al., 2010). Elsewhere is common to find an unplanned and uncontrolled or uncontrollable expansion taking place. This expansion is driven by a number of factors, especially the in-migration of people from rural areas or from other countries and it often results in poorer neighbourhoods becoming overcrowded (Bell et al., 2010). Poor housing, inadequate sanitation and high levels of crime are linked to a lack of green areas (Kuo and Sullivan, 2001). People living in such places also tend to be economically disadvantaged, with low-status

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jobs and generally poorer physical and mental health (Lindheim and Syme, 1983; Lavin et al., 2006; Ormel and Neeleman, 2000).

Several health benefits are associated with living near green space. In Swedish and Danish studies the chance of reporting good health was greater among people who used urban green spaces frequently than for non-users (Grahn and Stigsdotter, 2003; Nielsen and Hansen, 2007). Within cities, greenspace is often inequitably distributed and access can be highly stratified based on income, ethnicity, age, gender or disability (Byrne et al., 2009).

### 1.3. The role of parks in Iranian cities

In countries with hot and arid climates, such as Iran, gardens have historically played a very important role within urban areas. There is a long tradition of parks and gardens being part of a city plan, with water playing a major role as a cooling element. Urban life for several centuries has included use of public and private gardens, making life bearable in the hot summer. Persian gardens achieved an intimate connection with city layout in the 11th century and became public places for citizens to stroll, meet and relax (Rostami et al., 2015; Moradi et al., 2012). Popular times to visit parks are in the evening and at night, when it is cooler and social activities are very common.

The fact that the Persian garden had become so efficient and effective for Iranian cities was ignored, as imitations of European gardens became fashionable (Rostami et al., 2015). According to recent research, Iranians do not tend to like such parks, preferring to visit natural settings; non-traditional Iranian urban parks often suffer from vandalism (Hami et al., 2011). However, urban residents still actively use historic Persian gardens.

Developing modern urban green spaces in Iran began in the 1950s when Bagh Melli,<sup>1</sup> which was later renamed Shahr Park,<sup>2</sup> was laid out in Tehran. It was not until the 1970s that building parks, gardens and villas like those in European countries came into vogue (Hekmati, 1994).

### 1.4. Green space in the city of Tehran

Tehran, the capital of Iran, covers some 700 km<sup>2</sup> with a population of almost 12 million in the city and surrounding province. While being Iran's administrative, economic, and cultural centre Tehran exhibits many social and environmental problems (Madanipour, 1999). As the city has expanded, the provision of facilities and greenspaces has not been able to keep pace. Over the past three decades, immigration has led to the development of large squatter settlements in the urban fringe (Azimi, 2004), containing more than 40% of Tehran's population. These have many social, environmental and economic problems (Andalib, 2007). Recent developments of public green space and parks have been unable to re-establish an ecological network fragmented by uncontrolled and unplanned growth (Bahrami and Aiyanna, 2012).

The Department of Environment of the UN recommends 20–25 m<sup>2</sup> green space per capita (Tavahon, 2004). The official target green space per capita in Iran is only 7–12 m<sup>2</sup> (Asgari, 2001). Even though there is evidence that the ratio of green space per capita may be up to 17 m<sup>2</sup>, this includes all the city green spaces, many of which are not parks or publicly accessible areas.

Another problem in Tehran is the uneven distribution of green space. In some parts it is less than the urban standard and in others it is more. Districts of the city differ in climatic and physical conditions such as slope, elevation and water availability. Jalili and Khosravi (2009) noted that while the Tehran master plan proposes to increase green space per capita, it does not address the gap between different districts. Fig. 1 shows a map of Tehran with its topography, water courses, main

roads and all parks and incidental green spaces.

As well as the amount and distribution of parks and green spaces, accessibility and quality are also important factors. In order to help improve the quality of life of its citizens more focus should be given to the development of the park and green spaces system for Tehran and for this more analysis of the existing situation is needed, especially concerning the distribution, accessibility and use patterns of its existing parks.

### 1.5. Research objective and questions

The objective of the research was to examine the distribution of green spaces in general and parks in particular, at the scale of the entire city, in terms of their accessibility, the demographic character of their catchment and their current usage. The specific research questions were:

- 1) How are the green spaces and parks distributed in relation to the urban structure and how does this affect their accessibility?
- 2) Is there a relationship between the degree of accessibility of parks, their quality and level of use?
- 3) How equitably are the parks distributed in relation to the socio-economic and demographic structure of the city?

## 2. Methods

### 2.1. Research strategy

We selected the Tehran Metropolitan Area as the study unit and firstly we analysed the amount of green space per capita at city district level in order to get an idea of how much there is according to population densities and socio-economic levels.

As the task of evaluating every park in the city was outside the scope of available resources, we decided to examine a sample of 16 officially designated “city parks” representative of almost every city district (some districts have no city parks at all). Then, in order to test their accessibility, we tested their degree of integration into the street structure using Space Syntax (Hillier et al., 1993). We also assessed each park on site for their level of use, range of activities, quality of maintenance, evidence of anti-social activities and the demographic character of their catchment, which we correlated with the degree of syntactical integration. We took the statistically significant correlations and looked for explanations of the patterns they revealed.

### 2.2. City-level assessment of green spaces

We took the population data and socio-economic status for each city district and the map layer of all green areas including parks of all kinds and other green areas (a mixed category including agricultural land, green strips along roads and open unbuild land with no specific uses). Using ArcGIS 9.3 we took the population in each district and its density and calculated the amount of green space per inhabitant. This gave us a picture of the overall pattern and distribution of green areas as well as an indication of the degree of environmental equity.

### 2.3. Selection of sample parks

To select the sample parks, we consulted the most recent (2007) Master Plan for the city of Tehran (Municipality of Tehran). We excluded the incidental green spaces, focusing on the official “city parks”.

The “Typology (Clustering) of Neighbourhoods in Tehran” (Department of Social and Cultural Studies, 2011) divided the city into socio-economic clusters based on three variables: economy, literacy, and proportion of the immigrant population living there. Neighbourhoods with similar conditions were grouped into ten classes and we selected the sample parks to ensure that they were well-distributed across all socio-economic clusters. The numbering system for the

<sup>1</sup> Literally “National Park”.

<sup>2</sup> Literally “City Park”.

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