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The spatial analysis of the livability of 22 districts of Tehran Metropolis using multi-criteria decision making approaches

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ABSTRACT

In addition to increasing the attractiveness of urban environment, the advancement of living conditions in this environment provides a good basis for achieving the major goals of sustainable development. Nevertheless, the rapid growth of urbanization and other issues related to urban development have raised and augmented problems in these settlements. This situation is well understood in many Iranian cities in which the consequences of rapid urban growth and insufficient financial and human resources in the management process are obviously felt. The purpose of this research is to analyze the livability of Tehran Metropolis in terms of the fulfilment of biological needs with regard to land uses for residential purposes, urban infrastructures, sanitation, green spaces, industry, administration, transportation, military, and commercial purposes. To this end, initially the pattern of distribution of biological services all over Tehran Metropolis was analyzed using the Standard deviational ellipse method; and then, using the SAW technique, the livability of districts in Tehran was measured with respect to the fulfilment of biological needs. The findings of this research show that different districts of Tehran Metropolitan do not have similar conditions of livability regarding their access to biological services and these services have not been distributed among them equitably. The present study introduces the spatial districts which are high on the list of priorities and which require greater attention so as to promote just distribution of biological services in Tehran.

1. Introduction

Urbanization, regarded as a phenomenon that interacts with various essential aspects of modern life and consequently deemed as one of the important factors influencing the personal and social health of citizens, represents a network of complex social relationships and forms many basic challenges in the life of citizens (Pakzad, 2004). Most major cities face problems such as ethnic separation, segregation of land uses, separation of the workplace and habitations, the decay of neighborhoods, increased traffic, social and economic anomalies, and inequality of opportunities and unfair accessibility to resources. In order to address the abovementioned issues, various approaches have been proposed such as sustainability, quality of life, and livability (Ali Akbari & Akbari, 2017). Livability refers to various constructed views regarding the quality of life in any human living environment. The crux of this concept is to optimize the quality and unity of human life (Ellis & Roberts, 2016; Hagerty et al., 2001; Kashef, 2016); In fact, livability is an ensemble concept whose factors include or relate to a number of other complex characteristics or states, including sustainability, quality of both life and place, and healthy communities (Blassingame, 1998; Norris & Pittman, 2000). Livability can be broad or narrow depending on the context, and many studies, organizations and authorities around the world have theirs own definition. However, all place 'quality of life' in the center of the concept, and the measurable indicators tend to vary, though criteria such as density, transportation, security and sustainability remain constant (Perogordo, 2010). The most important similarity between the two concepts of livability and quality of life as well as the most significant distinction between these two concepts and the concept of sustainability is that they are both at the present time and at the same place. Meanwhile, two keywords for having a better understanding of the concepts of quality of life and livability are now and here which can differentiate the scale and perspectives of these two concepts from other similar concepts (van Kamp, Eidelmeijer, Marsman, & Hollander, 2003). Although there is a great similarity between the notions of livability and quality of life; the distinction between these two is the fact that livability refers to the facilities of the built and natural environment and quality of life refers to the users' experience and judgment (good; bad; or indifferent) after using those facilities (VanZerr, Seskin, & Carr, 2011). In other words; quality of life is an abstract (subjective) theme pertaining to the general well-being of

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individuals (Berenger & Verdier Chouchane, 2007); while livability is defined as objective conditions in which social; economic; physical; and environmental requirements are fulfilled to provide the long-term comfort and well-being of the community. This interpretation implies that the two mentioned concepts are closely associated with each other; meaning that; the optimal quality of life would only be realized in the presence of suitable living conditions (livability) in a place.

Accordingly, the conceptual model of the relationship between livability and quality of life can be mapped in a cyclic manner so that a person always seeks for a positive and optimal response to his own mental needs and demands in his outer or peripheral environment. If the current and objective conditions are able to meet his needs in a proper way, this surely leads to mental satisfaction and, ultimately, to a high quality of life. Subsequently, after the fulfillment of a range of needs, new demands come to mind, and this cycle continues. Thus, successful and habitable settlements must be dynamic and be able to satisfy the emerging needs of their inhabitants (Isalou, Bayat, & Bahrami, 2014).

Livability is a multi-dimensional and hierarchical concept which consists of various criteria and sub-criteria and may be formed at different levels. The selection of the indicators of livability is of paramount importance in investigating urban livability. However, the complexity and multi-dimensionality of the livability make it difficult to assess the livability of an area; in other words, the interference of various social, economic, physical and environmental components, on the one hand, and people's various perceptions of the concept of livability, on the other hand, increase the complexity of this issue and make it difficult to understand. Despite such obstacles and problems, the level of the livability of a place can be identified and evaluated by different criteria (See Table 1). The review of the indicators in various studies shows that different dimensions of livability, such as functional, physical, and social environments, that reflect people's common understanding of the quality of the living environment, have attracted numerous attention. Therefore, two main groups of indicators were chosen by most researchers, namely, objective indicators and mental indicators.

In Iran, 'as the results of the census show, the ratio of urbanization increased from 31 percent in 1956–74 percent in 2011, and over the past half-century, the number of urban areas increased by 9 times' (Statistical Centre of Iran, 2011); therefore, the rapid growth of population, especially urban population, the massive migration of people from rural areas to cities, and the inflow of a majority of them to big cities underscore the necessity of fulfilling their needs, including urban services, in order to promote the livability of cities. In Tehran, as the capital of Iran, in addition to demographic differences, there are other differences including the difference in the size of the districts, the difference in access to facilities and services per capita, and the inequality in the distribution of urban opportunities and resources. Tehran metropolis, being the capital of Iran for over two hundred years, has attracted numerous and diverse activities and facilities and has provided great opportunities. As a result, nowadays, Tehran is not only a political center but also an economic and demographic pillar facing numerous issues of centralization and polarization in various social, economic and spatial areas. This city, as the main city of Iran, plays a major role at national, regional and even international levels and faces numerous problems regarding livability indicators. Investigating and analyzing the spatial distribution and inequality of the existing services is of national importance and its results can be effective in increasing the efficiency of city management.

In order to organize an appropriate space for facilities and services, the first step is to identify inequalities and gaps in districts. Reducing inequality between settlements and different districts of a country is one of the most significant concerns of governments and scientific communities who have always been designing and implementing strategies to realize this goal; hence, in recent years, scrutinizing inequalities between areas and their spatial organization have been the main priorities of geographic research in most countries. Because of the increasing concentration of population in Tehran, as the capital city of Iran, and due to the unique status of Tehran as the main place for managing national economy and controlling and managing all affairs of the country based on the current state-centered system, many problems have raised; therefore, considering these problems, the concept of "livability" in the metropolis of Tehran can be studied in terms of several dimensions. In this research, in order to measure the livability of the districts of Tehran metropolis, the basic dimension, namely, access to urban services, is investigated. This dimension consists of residential services, sanitation, green spaces, infrastructure, transportation, military, and administration, industry, and commerce, all of which, as biological and basic human needs, are required for the daily living of every citizen. Therefore, in this study, for the purpose of the fulfillment of these needs, a spatial analysis of the districts of Tehran Metropolis is undertaken in terms of these sub-dimensions.

Table 1
The criteria selected by some researchers and institutions for measuring livability.

Dimensions	Criteria
Social	Education (Lau Leby & Hashim, 2010; Mercer, 2010; OECD, 2014; Oberlink, 2008; Throsby, 2005; Wheeler, 2001) Social interactions (Balsas, 2004; Heylen, 2006; Landry, 2000; Litman, 2004; Lau Leby & Hashim, 2010; Mercer, 2010; Oberlink, 2008; Throsby, 2005; Wheeler, 2001) Participation (Balsas, 2004; Lennard, 1995; Litman, 2004; Oberlink, 2008) Access to everyday needs (Landry, 2000; Lennard & Lennard, 1995; Lau Leby & Hashim, 2010; Liu, Nijkamp, Huang, & Lin, 2017; Southworth, 2003; Throsby, 2005; Wheeler, 2001) Cultural and historical factors (Balsas, 2004; Litman, 2004; Liu et al., 2017; Mercer, 2010; Southworth, 2003) Health (Lau Leby & Hashim, 2010; Liu et al., 2017; Mercer, 2010; OECD, 2014; Throsby, 2005) Security (Appleyard & Gerson, 1982; Balsas, 2004; Heylen, 2006; Howley, Scott, & Redmond, 2009; Lennard, 1995; Landry, 2000; Lau Leby & Hashim, 2010; Liu et al., 2017; OECD, 2014) Sense of place (Balsas, 2004; Heylen, 2006; Litman, 2004; Liu et al., 2017; Throsby, 2005) Public spaces (Appleyard & Gerson, 1982; Lennard & Lennard, 1995; Southworth, 2003; Throsby, 2005; Wheeler, 2001)
Economic	Housing (Lau Leby & Hashim, 2010; Heylen, 2006; Howley et al., 2009; Mercer, 2010; Oberlink, 2008; OECD, 2014; Southworth, 2003; Wheeler, 2001) Employment (Balsas, 2004; Howley et al., 2009; Lau Leby & Hashim, 2010; Omuta, 1988) Urban infrastructure (Balsas, 2004; Litman, 2004; Lau Leby & Hashim, 2010; Song, 2011; Throsby, 2005) Diverse and desirable transportation (Balsas, 2004; Lennard & Lennard, 1995; Lau Leby & Hashim, 2010; Southworth, 2003; Song, 2011; Throsby, 2005; Oberlink, 2008; Wheeler, 2001)
Environmental	Air quality and pollution (Litman, 2004; Lau Leby & Hashim, 2010; Mercer, 2010) Green spaces and parks (Appleyard & Gerson, 1982; Balsas, 2004; Lau Leby & Hashim, 2010; Southworth, 2003; Song, 2011; Wheeler, 2001) Good urban landscape (Balsas, 2004; Holt-Jensen, 2001; Wheeler, 2001)