Evaluating and Land-use locating of City Parks Using Network Analysis (Case Study: Mashhad Metropolis, Iran)

Dr. Farzaneh Razzaghian
Academic staff of Iranian Academic Center for Education Culture & Research (ACECR), Khorasan Razavi Branch
PhD on Geography and Urban Planning

Hossein Aghajani
Academic staff of Iranian Academic Center for Education Culture & Research (ACECR), Khorasan Razavi Branch
PhD Student in Geography and Urban Planning

Abstract

This paper identifies effective criteria in locating urban parks land use in district 9 of Mashhad metropolis of Iran. This recognition is in three scale of neighborhood, local and regional parks by principles of minimum distance and sustainable development criteria. The main purpose is to surveying the potential of building new parks. Therefore, by descriptive-analytical research method, first we survey the lack of existing status of the parks and then six criteria for building new parks are selected. To this end, Spatial Decision Support Systems (SDSS) was used and, for the purpose of managing optimal land-use location finding, data analysis along with overlaying and combining the data layers was conducted through Network Analysis in GIS. The results show that urban park land use is 1.3 m^2 per capita so for achieving the proposed standard of master plan (2.62 m^2) about 52.8 hectares should be added to parks area.

Keywords: District 9, GIS, Locating, Parks.

1. Introduction

Urban green space is one of the land uses whose distribution and dispersion throughout cities is of paramount importance and constitutes an inextricable part of city structure **(Razavian, 2002)**. Urban green spaces, especially in big industrial cities, have different functions **(Ahmadieh, 2006)**. The function of urban green space is divided generally into three main groups of city structure, ecological function and social performance **(Mackey, 2001)**. Therefore, urban green spaces are valuable not only for environmental reasons, but also for its role in the development of spiritual and physical relations of inhabitants of the city **(Bonnes, 1999)**. Thus city green space is a sort of urban land use covered with manmade vegetation, boasting both social and ecological outputs **(Saeednia, 2004)**.So the meaning of green space in this article is only urban parks and other green spaces such as squares, boulevards and green belt are removed from this definition because the lack of social outputs**(Ghodusi, 2002)**.
In addition, the parks as the basic elements of city landscape are the symbols of urban life and environmental health **(Razzaghian & Rahnama, 2012)**. So the best time to access the park is 10-minute walk, about 400 to 500 meters away from residential areas **(Krimzadegan, 2003)**.City parks should be geographically distributed in ways that are easily accessible **(Rahmani, 2003)**.

Moreover, along with the rapid growth of urbanization and constructions in recent decades, the appearance of the city of Mashhad, as the second metropolis in Iran, has changed such that a dire dearth in terms of city parks' land-use is noticeable. Casting a quick look at the status of parks in Mashhad, one can realize that the city, with a total number of 193 parks spanning an area of 605058 square meters, has a per-capita ratio of 2.01 square meters, which is smaller than the number suggested in the city master plan (2.62 square meters) (Mashhad Municipality, 2011). Therefore, it explicates the necessity of creating local green spaces neighboring citizens' residential abodes. To this end, of the 13 districts in the city of Mashhad, district 9 of the municipality was chosen as the area under study, owing to its rapid economic growth, high price of land, population density, having apartments in most residential units and a younger population.

According to the 2011 population, 329760 people are living in district 9 of the municipality. The area of green spaces in district 9 is 13911211 square meters that most of which belong to the squares, boulevards and green belt and only 1057402 square meters belong to parks as the only location for social relations. So data show that, in district 9, 1.3 square meters of green space is available per capita, a figure which is a far cry from the standards provided in the city master plan, indicating a need for creating new parks in district 9.

2. Theoretical Framework of the Research

The question that needs to be answered is that in which locations and close to what kinds of land-use should parks and green spaces be created and in fact which places are more suitable for creating parks and what factors are important in their location finding. Therefore, the present study aims to identify the influential factors in locating parks in district 9 of Mashhad municipality in three neighborhood, local, and regional scales, emphasizing the principles of minimum distance allocation and, consequently, to evaluate the district's potential for creation of such parks. To this end, the hypotheses of the research are as follow:

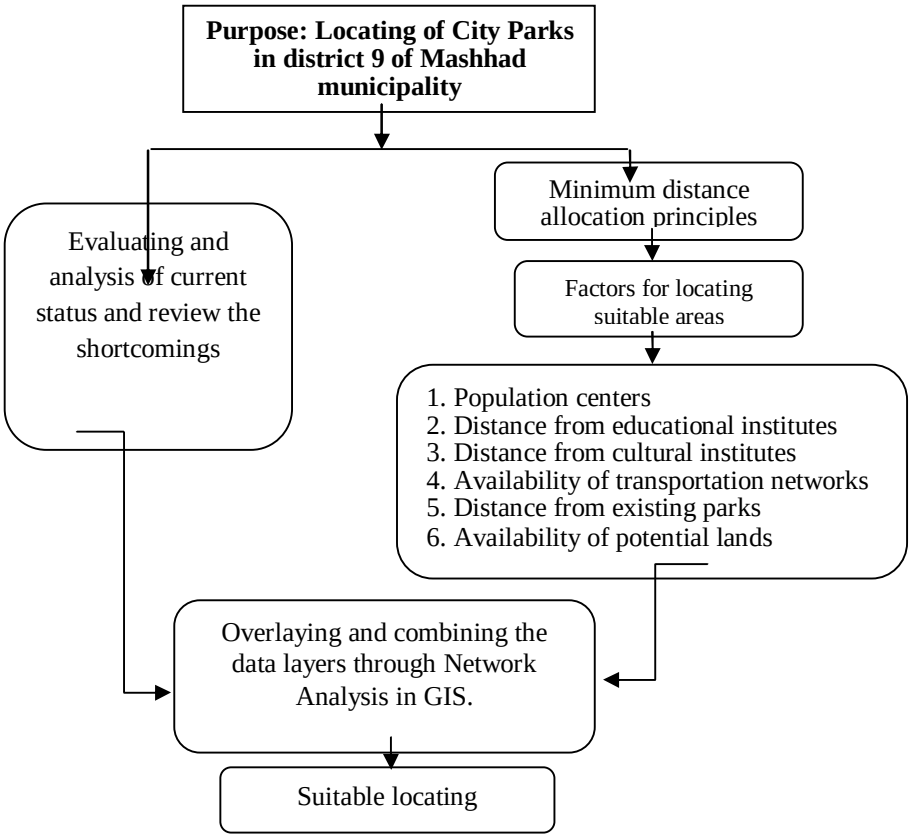
1. Considering the potential of undeveloped lands in the district, locations proposed by the study seem to be located in these areas, eliminating the districts' need for green spaces.
2. It seems that in choosing the location of present parks, in terms of land use, principles and standards of locating and land-use compatibility are not observed.

3. Materials and Methods

The present research is a descriptive-analytical one. The required data, based on theoretical and exploratory principles, was gathered through document analysis and field study considering the distance of the land from adjacent land-uses and its compatibility with and dependency on them along with interviews conducted with green space experts and specialists in the municipality of district 9 and 6 factors were identified for locating suitable areas including: population center, distance from educational institutes, distance from cultural institutes, availability of transportation networks, distance from existing parks and availability of potential lands **(Alimohammadi & Almaspour, 2002)**.

In analyzing the data, mixed methods comprising qualitative and quantitative methods were used and taking into account the principle of minimum distance allocation, as a method for finding the location of parks in the vicinity of other types of land-use was done. To this end, Spatial Decision Support Systems (SDSS) was used and, for the purpose of managing optimal land-use location finding, data analysis along with overlaying and combining the data layers was conducted through Network Analysis in GIS. In this pattern we try to decrease the distance to parks and the main purpose is locating new parks to response the lack of city parks. In district 9 of Mashhad municipality. Figure 1 illustrates the process of study.

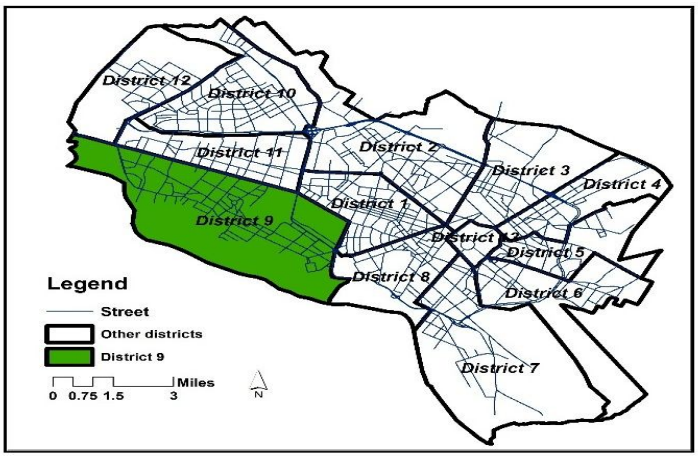
Figure 1: The process of study (Source: writers)



3.1. Case study zone

According to the 2011 statistical yearbook, Mashhad metropolis is divided into 13 districts. The area of Mashhad is 25675.6 hectares and the area dedicated to district 9 is 3498 hectares, which is roughly equivalent to 15.77 percent of the whole area of Mashhad. Also 329760 people (about 11.7% of Mashhad population) are living in district 9 of the municipality **(Rahnama. et al., 2012)**. This zone is located on the southwestern sides of Mashhad.

Figure 2 shows the case study zone in Mashhad metropolitan. (Source: writers)



District 9 is one of the highest prosperous economy and the land prices have the first rank in Mahhhad city. But urban parks are in unfavorable conditions and vast area with high density population is not close to urban parks. According to these characteristics and the specific topography, this zone is one of the rich zones in desirable life standards. But urban parks in there, as one of the indicators of desirable life standards, are not in good condition, so locating the future parks in the district 9 is so important. And this is the reason for choosing this district as the case study zone.

4. Results and Discussion

Since the valuation and codification of criteria are those of the most important steps in location analysis, recognition of criteria in relation to the intended purpose is so important **(Etemad, 2008)**. From the perspective of urban planning, land-uses that are within one another's sphere of influence should be consistent in terms of their activity and be compatible, not impeding each other's activities **(Ziari. 2011)**. Thus the factors that were considered for locating city parks in the present study, in line with land-use compatibility of green spaces with other sorts of land use, are as follow: population center, distance from educational institutes, distance from cultural institutes, availability of transportation networks, distance from existing parks and availability of potential lands (undeveloped lands) **(Bahram Soltani, 2008)**. It should be noted that available documents and also the opinions of experts and specialists has been used in above factors. Figures 3 to 8 illustrate each factor in case study zone.

Figure 3: Population centers in district9(Source: writers)

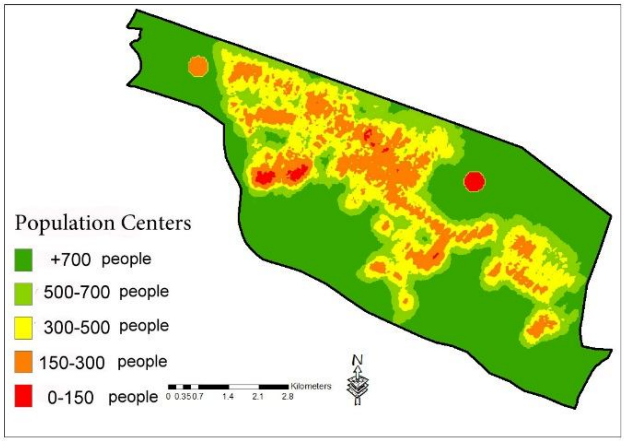


Figure 4: Distance from educational institutes(Source: writers)

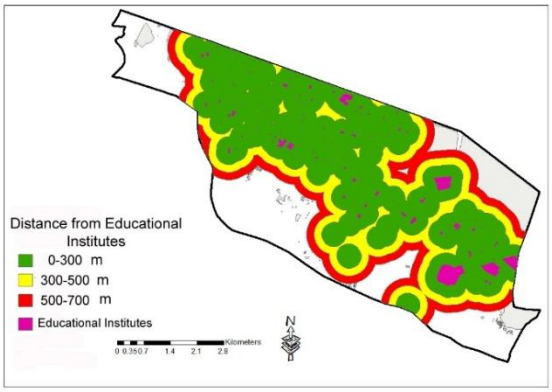


Figure 5: Distance from cultural institutes (Source: writers)

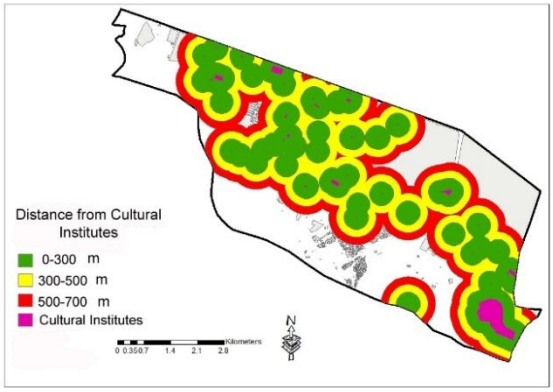


Figure 6: Availability of transportation networks (Source: writers)

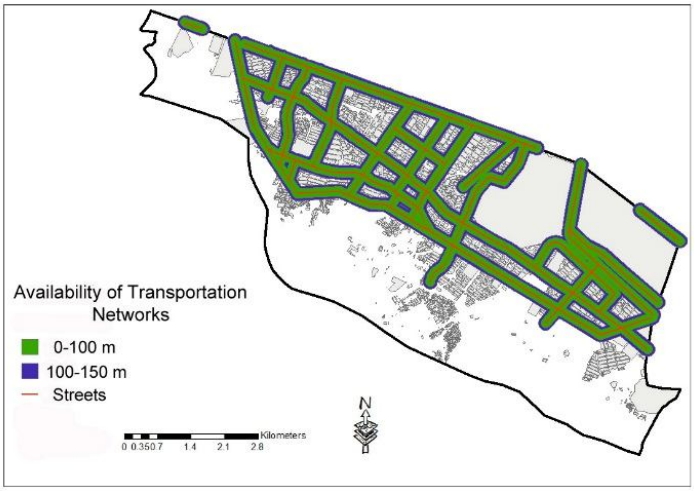


Figure 7: Distance from existing parks (Source: writers)

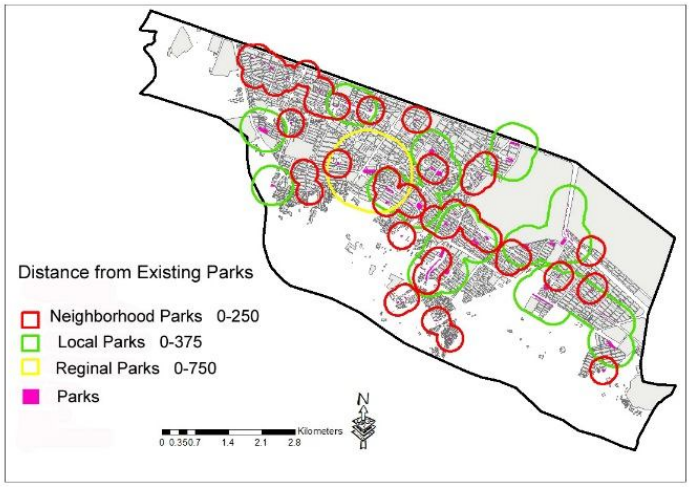


Figure 8: Availability of potential lands (Source: writers)

Figure 9: Priority regions for future parks (Source: writers)

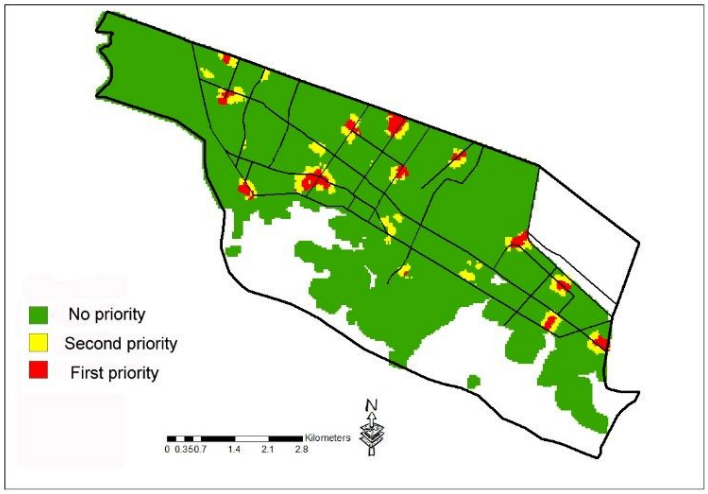
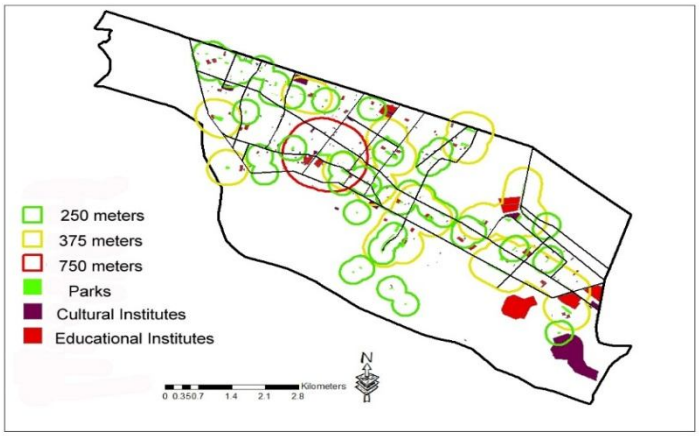


Figure 10: Compatibility of land-uses (Source: writers)



According to the investigations undertaken in this study and through identifying optimum spots using network analysis in GIS, the minimum radius of action was delimited to be 300 meters for educational and cultural institutes, 100 meters for transportation networks and 250, 375 and 750 for neighboring, regional and local parks, respectively.

Consequently, regions which did not have proper access to parks and were in need of planning were identified. New parks should be added to green spaces of the identified regions considering their per capita ratio and required green space areas. In the end, suggested locations for creating parks, taking into account such factors as vicinity to population centers, educational land use, cultural land use, urban streets, being located at a proper distance from existing parks and being currently undeveloped, were identified using network analysis in GIS. These regions were identified in two levels of priority for the region: first and second.Figure9 shows first and second priority regions.

5. Conclusions and Suggestions

The surface area of identified lands for creating new parks amounts to 615146 square meters, or 61 Acers, and in case eighty five percent of this area is turned into parks, the region's shortage which amounts to 52.8 acres will be met. Thus the first hypothesis of the research regarding the placement of all the suggested locations in undeveloped lands to meet the shortage of green spaces is confirmed. With respect to the second hypothesis, regarding the possibility of not incorporating the principles and factors of locating and land use compatibility in choosing the locations of the existing parks, the findings reveal that vast swathes of educational and cultural land uses are not in the vicinity of parks, confirming the second hypothesis as well. (Figure 10)

References

Ahmadieh, M. (2006). The city, green space, beauty. *Journal of Issue in Urban Planning, 5*(17-18), 86-93.

Alimohammadi, A., & Almaspour, F. (2002). The application of GIS for the analysis of the network, spatial distribution and locating pharmacies: A case study of the region 6 of Tehran. *Geographical Research, 17*(4), 50-62.

Bahram Soltani, K. (2008). *A collection of debates and methods about urban planning, environment*. Tehran, Iran: Center for Research and Study on Iran's Urban Planning and Architecture.

Bonnes, M. et al. (1999). Inhabitants of urban green areas in the city of Rome edited by university of Rome, progress report No.4

Bugliarello, G. (2006). Urban sustainability: Dilemmas, challenges and paradigms. *Technology in Society, 28*(1–2), 19-26.

Etemad, G., Behzadfar, M., & Salehi Milani, S. (2008). *Places and place building, design standards and urban planning*. Tehran, Iran: Iranian Society of Consulting Engineering.

Ghodusi, M. (2002). Urban parks of yesterday, today and tomorrow. *Municipalities Publication, 2*(21), 55-70.

Khalilnezhad, M. (2005). Religion and system of environment. *Payam Sabz Magazine, 4*(31), 65-85.

Krimzadegan, H. (2003). *The foundation of environment economy*. Tehran, Iran: Naghsh Mehr.

Mackey, E. C. (2001). *Natural heritage trends*. London, England: Scottish Natural Heritage Publication.

Majnounian, H. (1995). *Debates about parks, green spaces and outdoor recreations* Tehran, Iran: Tehran Parks and Green Space Organization.

Management and Planning Organization of Iran (2001). *Criteria for urban green space planning*. Tehran, Iran: Management and Planning Organization of Iran Press.

Mashhad Municipality (2011a). *Office of environment and urban services of Mashhad municipality*. Mashhad, Iran: Mashhad Municipality.

Mashhad Municipality (2011b). *The statistical yearbook*. Mashhad, Iran: Mashhad Office of Planning and Development Municipality.

Rahmani, M. J. (2003). Investigating the process of decision making in locating parks and general green spaces and its effects on their safety. *Journal of Cultivation of the Orient 3*(6), 12-17.

Rahnama, M. R., Razaghian, F., Tavangar, M., & Aghajani, H. (2009). A research on urban eco parks. Mashhad, Iran: Iranian Academic Center for Education, Culture and Research, Urban Planning Department.

Rahnama, M. R., Razaghian, F., & Aghajani, H. (2012). A feasibility study of creation and management of spatial databases in the region 8 of Mashhad municipality. Mashhad, Iran: Iranian Academic Center for Education, Culture and Research, Urban Planning Department.

Razaghian, F. (2010). *The role of urban management in physical-spatial identification of Mashhad's Pirouzi Boulevard.* (Unpublished master's dissertation), International University of Chabahar, Chabahar, Iran.

Razzaghian, F., & Rahnama, M. R. (2012). Ecological analysis of urban parks: (Case study: Mashhad Metropolitan). *International Journal of Applied Science and Technology, 2*(7), 261-267.

Razaghian, F., Rahnama, M. R., Tavangar, M., & Aghajani, H. (2012). An ecological analysis of urban parks: A case study of Mashhad. *Journal of Environmental Studies 38*(4), 155-168.

Rezavian, M. T. (2002). *Urban land use planning*. Tehran, Iran: Monshi.

Saeednia, A. (2004a). *Municipality green book: Urban furniture and spaces* (Vol. 12). Tehran, Iran: Iranian Municipalities and Rural Municipalities Organization.

Saeednia, A. (2004b). *Municipality green book: Urban green space* (Vol. 9). Tehran, Iran: Iranian Municipalities and Rural Municipalities Organization.

Ziari, K. A. (2011). *Urban land use planning*. Tehran, Iran: University of Tehran Press.