

## **Analysis of Urban Growth Pattern in Tehran City by Landscape Ecology Approach**

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Received: 11 November 2015    Accepted: 29 December 2015

### **Extended abstract**

#### **Introduction**

Developed world and developing countries are different in urbanization process and the proportion of people living in cities. But population growth rate is a global trend. Diagnosis and understanding the changing urban growth pattern is very critical and necessary. Results of different studies show that spatial temporal metrics are useful method for description, quantification and understanding of the spatial patterns of urban growth and association of the spatial patterns with population growth and socio-economic processes. On this basis, the main purpose of the current study is to determine the spatial-temporal growth of Tehran megapolis between 1973-2014, using Landsat images and spatial metrics.

#### **Methodology**

Urban growth maps were extracted for different time periods using landsat satellite images (TM, +ETM, OLI). To extract urban areas from the satellite images, we used object oriented classification and visual image interpretation method. Spatial-temporal analysis of urban growth patterns in Tehran megapolis was performed for 41 years (1973-2014) using spatial metrics. The metrics were selected on the basis of literature review (Dietza et al., 2005; Augilera, 2011; Jain et al., 2011; Herold et al., 2003; Herold et al., 2005; Seifoddini and Mansourian, 2014) and calculated using “Fragstats” software. The metrics describe four dimensions: absolute size, relative size, complexity of urban form and spatial distribution of patches.

#### **Results and Discussion**

Tehran urban land areas have constantly been increasing from 1973 to 2014. The growth was fast in 1973-1985. But it was faster in 1985-2000. This shows very rapid urban growth of urban

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land area in this time period. After 2000, urban growth curve shows less steep grade and gradually has turned into almost flat shape. It shows the stable urban growth rate. But population increase continues to grow. Urban population growth, despite relative saturation show vertical urban growth instead of horizontal growth.

Diagram showing the percentage of urban patches, for the years 1973-2014, is an ascending curve. The diagrams showing the mean patch size and largest urban patch for the years 1973-2014, is a U shaped curve. The diagrams showing the urban patch density, the number of urban patches and shape of the landscape for the years 1973-2014, are also U shaped curve.

### Conclusion

The spatial- temporal analysis of the metrics in Tehran megapole proved a number of the deductive generalizations. First, urban growth in Tehran can be divided in three time periods. The first period was 1970s. Urban physical expansion was rapid, but urban growth rate was consistent. Most important reasons for urban growth are industrial investment, concentration of political and economic activities in Tehran and also rural-urban migration. Second period, 1973-2000, represented very rapid urban growth in Tehran. The important reasons are Islamic Revolution, lack of implementation and supervision of the master plan. In the third period, 2000-2014, urban growth rate declined and then reached relatively stable condition. The reasons are socio-economic and environmental problems of Tehran city. Formulation and approval of the various plans were to control Tehran physical growth and transfer the growth to surrounding areas of Tehran.

The second point is that Tehran urban growth pattern shows the process of urban growth in three stages: 1. development of city core, 2. dispersion and 3. coalescence. Results of these spatial metric indicated this process. For example, numbers of patches show its increasing value until 2000 and then a stable trend. It is expected that with more infill development and attachment of individual patches to each other for more convergence and coalescence of patches. The value of AWMPFD shows that the forms of patches have been more irregular until 2000. Since 2000, with attachment of the patches, more regularity is observed.

The third point is the approval of tidal wave urban growth pattern for Tehran city. With the decrease of urban growth in one zone in a concentric pattern, the tidal wave pattern of urban growth was observed in the next zone. The high peak of urban growth moves like a wave to outer zones.

The urban growth pattern in different zones follows the same pattern happening for the whole city, i.e., formation of city core, dispersion and coalescence. The values extracted for the following metrics including number of patches, fractural dimension, mean size, contiguity and mean geometric distance to nearest neighbor shows that in each zone, the same pattern is happening in different time periods. For example, AWMPFD shows an increasing trend and increasing and then decreasing trend in all zones over time. This shows dispersion of individual patches, expansion of central core and then coalescence of patches over time.

Comparison of the results of this study with other studies (Li et al., 2006; Zhang et al., 2001; Yu et al., 2007; Yu et al., 2006; Yang et al., 2003; Xu et al., 2007; Luck et al., 2002; Ji et al., 2006; Aguilera 2011; Seifolddini and Mansourian, 2014) indicates that urban growth process in majority of cities follows the tidal wave pattern, but this process is also affected by social, topography, transportation network, socio-economic condition, and creates different pattern in different countries. For example, in case of Tehran city, existence of the mountains in the northern part of Tehran prevents growth in that area. Understanding the patterns and processes of urban growth can provide better understanding of urban growth. Quantifying urban growth by using spatial metrics can be used as an important instrument.

**Keywords:** landscape ecology, remote sensing, spatial metrics, Tehran Metropolitan, Urban growth.

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## Evaluation and Prediction of the Optimal Path for Urban Development of Sanandaj Using CA Markov

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Received: 12 January 2016 Accepted: 7 March 2016

### Extended Abstract

#### Introduction

We consider the city as a dynamic system, this system will develop physically as a result of internal and external changes which can be effective factors in urban development. The physical development of the cities is interpreted as the model of physical development. As we need appropriate planning and management, urban planners have persuaded to combine temporal and spatial information to detect suitable developmental and predictive models. Therefore, optimal planning and site selection for different directions of spatial development are important for the future expansion of cities. Sanandaj is located in the northwestern Iran as the capital of Kurdistan province. The population of Sanandaj was changed a lot during the four decades due to immigration and its centrality. Its population was 95870 in 1976 which increased to 204384 in 1986 and experienced the growth of 7.8%. Although its rate decreased in the next two decades, it has been an important target for immigrants and its population was 375280 in 2011.

#### Methodology

Like the other cities of Iran, the physical development of Sanandaj has experienced great changes during the recent decades. These changes have been purposeless both in rate and in direction of development. Population change after the Islamic revolution has caused to an increase in physical textures of cities as well as the physical changes of the villages. These changes have changed Sanandaj so that it is now one of the cities in Iran where has a high proportion of informal settlement and the nearby villages have had extreme changes in their function. Immigration, national centralization and so on are among the main reasons of this disintegration. The main purpose of this study is data based modeling by spatial and temporal information using GIS and RS. Urban development simulation in urban and nonurban areas was conducted by employing CA-Markov model to determine the optimal path of development. Infill development of urban areas and using internal potential are among the outstanding criteria. This kind of development uses the inside areas of the territories not surrounding for the purpose

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of redevelopment. This development causes both economizing in using lands and optimal using of infrastructures. It also causes using barren land like development in brownfields which, in turn, leads to the economic use of urban lands and the promotion of neighborhood social and physical qualities.

### Results and Discussion

In this study, the researchers used a combination of automatic cells models of Markov chaining and logistic regression for the simulation and prediction of the development of the city. Based on the data gathered 1998 and 2006 and satellite photos, the researchers simulated the development of the city for 2022. They have predicted the development based on Markov model and other factors like farming lands. The results of the study show that in the simulation of the current development of Sanandaj up to 2014, more barren and mountainous land (655 hectares) have been changed into urban lands. For prediction of the required lands of sprawl development, infill development was the first choice and then the outskirts lands were taken into consideration. In this study 1. urban old textures; 2. urban unsuitable lands (Brownfield); 3. barren lands of Sanandaj are the main choices of infill development. Based on the last amendment of old texture map in 2014, Sanandaj has got 689.5 hectares of old texture. It has been divided into the historic old texture (central) archaic old texture which has no historic value (middle) and marginal old texture (informal settlement). The area of barren lands for infill development is 791 hectares which include the considerable bulk of sprawl development in Sanandaj. Brownfield lands are not adaptable to the nature of city and urban life. For an optimal interaction and adaptability among urban activities based on the law of the great council of Iran architecture, people should go out from the city territory. The limitation of unsuitable lands of Sanandaj was in 159.4 hectares. In accordance with the data of 2006 and 2014 and the CA-Markov simulation model, internal and sprawl development of Sanandaj has been predicted. Accordingly, 62.6 hectares of the lands with planned cover, 998.8 hectares of barren and mountainous lands will be changed into urban territory in 2022.

### Conclusion

Since this area is mountainous and there are a lot of barren lands in urban territory, more barren and mountainous lands have changed into urban areas. It is predicted that the urban territory of Sanandaj will be 5154 hectares in 2022. In fact, with the required law and applying restriction map, about 329 hectares of old texture lands have been taken into account for urban development and consequently this number of farming lands cannot join to urban territory. By giving priority to the barren lands inside the city in restriction map, the changes of lands has been prevented. It is predicted that most of the sprawl development has been in northwest and south west. In 2022, urban and mountainous lands will change into urban lands to a large degree. Based on the results of the study, Markov automatic-chaining cells model has a high productivity in urban development and prediction.

**Keywords:** CA Markov, CA model, Sanandaj, urban development.

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## Assessment of Housing Sustainability in Social Housing Policies (Case study: Hezar Dastgah Rental Housing of Khorramabad City)

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Received: 14 November 2015 Accepted: 27 February 2016

### Extended Abstract

#### Introduction

Population statistics indicate many problems for future of urban areas of Iran. The middle of population age pyramid of Iran is wide. This indicates that planners and policy-makers are faced with many problems including unemployment, social issues and housing. Housing is of great importance, because it is one of the basic needs of humans. Today, in the world literature, housing does not only refer to a roof over one's head, but it implies a physical location, residential environment, required services for a family welfare, employment plans, education facilities, and etc.

Along this, one of the main problems of housing sector in Iran is the vast majority of young people with the age of marriage. Since an annual increase of marriage may indicate an increasing need in housing. Therefore, young couples are always one of the target groups in housing policies for low-income classes. Construction of rental or lease-purchase housing is an example of such policies. Some objectives of this policy are housing for those with low and moderate income, to reduction of the construction cost in residential units, use of the facilities, small apartments modeling, taking advantage of modern methods of industrial production, and housing mass production.

Today, after two decades of development and implementation of this policy, assessment of the sustainability indicators of rental housing must be considered as a necessity. Therefore, understanding the strengths and weaknesses of a rental housing can improve the inhabitants' current status. Thus, this study aims to assess the rental housing policy of Hezar Dastgah in Khorramabad according to sustainability housing indices.

#### Methodology

This research is a descriptive- analytical study; and the data were collected by survey and library method. With respect to the objective, the research population includes all Hezar Dastgah rental housing households in Khorramabad City. In this neighborhood, 848 units of rental housing have been constructed in the Third Development Plan after the Revolution, so the population included 848 households. Thus, a sample selection method was used for small

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communities. The sample size was estimated up to 88 subjects who were increased to 120 subjects to achieve better results.

Due to the relative homogeneity of statistical population, simple random sampling method was used. Data were analyzed by SPSS; and the multiple and linear regression models, T-test, and Pearson correlation coefficient were used.

### Results and Discussion

The results showed that in the fourth level, sub-indices of a sense of belonging to a place (2.1) and social relations were of the least value among others; and quantitative dimensions and accessibility indices were equal to the average. The sustainability housing index (a combination of four dimensions), was lower than the average in the first level of the model. In addition, the results of the regression analysis showed that housing sustainability and its sub-criteria greatly affected the rental housing performance indicators. In the fourth level, social relations indicator (0.67) had the most important effect on the efficiency of housing. Meanwhile, among two sub-dimensions of the social and cultural aspects, cultural aspects (0.47) had played more important role in increasing the efficiency of housing. Among the two indices of qualitative and quantitative, qualitative aspects (0.31) had the highest impact on the performance. According to Pearson correlation coefficient, the correlations between the two variables of performance and sense of belonging to a place and social dimensions and efficiency were 0.57 and 0.50, respectively. In general, rental housing has failed to provide sustainable housing to the residents. Similarly, the efficiency of these residential units was low.

Based on the results of statistical models, among all levels of the model, only accessibility and quantitative indicators were rated at a moderate level. All other indicators were reported at a very low level. Multiple linear regression analysis also indicated that, housing sustainability had an important impact on an increase in the efficiency of housing. Thus, such factors as sense of belonging to a place and socio-cultural and ecological dimensions had the highest role in the housing efficiency.

### Conclusion

The results of this study confirm the results of previous studies and the theories of housing sustainability. The performance of this type of housing (rental housing) has been reported at a low level, due to forgetfulness of the multiple dimensions of housing (because of low sustainability index of housing). Thus, assessment of Hezar Dastgah rental housing in Khorramabad city confirms the modern concepts of housing sustainability. Furthermore, among the sustainable housing indices, social and cultural dimensions have had the most important role in the increase in the efficiency of housing, and as mentioned above, these indices were of greater priority for the residents. In this line, the obtained results prove the role of housing sustainability in housing performance and acceptance. The results show that the quantitative attitudes to housing were dominant in this policy, and finally suggest that this policy failed to meet the actual needs of the target groups.

**Keywords:** Khorramabad, rental or lease-purchase housing, social housing, sustainability.

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## Strategic Spatial Planning of Small Size Towns using Meta-SWOT Model (Case Study: Taft City, Yazd Province)

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Received: 2 January 2016 Accepted: 9 March 2016

### Expanded Abstract

#### Introduction

Attempts to stabilize small and medium-size cities involve appropriate strategic planning. A range of local challenges hampers the efforts to achieve such stabilization processes in medium and small sized towns. These challenges are widely known. They have been explored in many case studies. Though the challenges differ from town to town, a few generalizations can be made, independent of the shortcomings related to geographic location, environmental circumstances and local economic history, or present and past politico-administrative conditions. Strategic planning as a useful tool for management is used to help an organization to better conduct works and ensure that our organization is acting along with our purposes. Hence, one of the most common models of strategic planning for urban development is SWOT model. However, nowadays, experts after many years of using this model concluded that SWOT is based on intellectual inspiration and that it was non-systematic. On the other hand, it avoided quantification and do not have predictive power.

#### Methodology

This research with the aim of strategic development of Taft city, for the first time attempts to introduce strategic model of Meta SWOT in urban and regional studies. To do this, we have used descriptive and analytical approach and also documentary and survey and field methods for data collection and analysis of data. Meta-SWOT model is used to provide strategy.

The location of this research is the town of Taft in Yazd province. Taft is located in a valley bounded by mountains on three sides. The area of this town is about 15 square kilometers, and most of the spaces in that are occupied by old neighborhoods and gardens. Generally, the town is formed by two sections, the northern part and the southern part that are named 'Garmsir' (i.e. hot area) and 'Sardsir' (i.e. cold area), respectively. The current town has 24 large and small neighborhoods. The people of the town tended toward Zoroastrianism before the arrival of Islam in Iran, but today most of the people are Muslims. Nevertheless, Zoroastrians are seen in some sporadic parts of the town (AFGO, 2002).

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### Results and Discussion

According to the results of this research, attention of the authorities to development, particularly in the distribution of funds and the elimination of sanctions and inflation is a priority issue. It is necessary to develop an integrated planning for many problems such as a drought, water crisis, and intensified migration. This requires the integration of planning. The correct use of the potential of the agricultural sector involves establishment of factories processing agricultural products, encouragement of farmers to use modern methods of agriculture and irrigation. These factors can be instrumental in economic dynamism of Taft.

### Conclusion

As it was argued in this research, the findings indicated that urban development is necessary for the residents of the area. It can be concluded that:

- distribution of authority and responsibility to Taft development funding or removing the sanctions and inflation is a priority issue. Development of city planning is essential because sanction problems such as drought destroys gardens, water crisis, and intensified migration require consistency in planning.
- Correct use of the potential of the agricultural sector are including the establishment of factories for processing agricultural products, encouragement of farmers to use modern methods of agriculture and irrigation. This factor can be successful in economic dynamism in Taft.
- Use of public administrators and local authorities is required to encourage participation and collaboration.
- In both urban and economic planning, housing is important and should be coordinated with a planned housing problems in the city. The high volatility of future housing can be prevented.

**Keywords:** Meta-SWOT, small and medium size cities, strategic spatial planning, Taft City, Yazd Province.

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## Strategy Study of Urban Management for Sustainable Development in the Historical Texture (Case Study: Historic Texture of Yazd City)

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Received: 2 July 2015 Accepted: 19 December 2015

### Extended Abstract

#### Introduction

Since the early 1990s the use of indicators to measure and evaluate the performance of programs and projects of government agencies have increased and urban management is not deprived of this wave. Since urban management attempts to raise the citizen's welfare and achieve sustainable development in neighborhoods, in fact, assess performance is one of the basic principles of management tools for achieving the goals, strategies and programs. It is also one way to evaluate performance and satisfaction of people. Creation of a sense of satisfaction and participation of citizens in the city administration requires a regular and comprehensive planning. The planning should enable urban management to present a desired image and create effective interactive and more hopeful citizens. The first step in this regards is to design an appropriate mechanism to identify and understand people's attitudes for the performance of urban management. Measurement of citizen satisfaction from municipal services can evaluate the performance of urban management from citizen's viewpoint. It can be considered as one of the best mechanisms to achieve this. Accordingly, this study is seeking to answer the following questions:

1. How is satisfaction rate of urban management performance in the neighborhoods of historic texture of Yazd city?
2. What is the optimal strategy for management of historic texture of Yazd city?

#### Methodology

This study was conducted through a survey method and the required Information was also collected by the library and through a survey method. The statistical population is citizens living in the historic city of Yazd. As it was not possible to refer to all of them, we selected a group as sample. At the beginning, with the use of Cochran formula, 380 samples were selected and the share of each neighborhood was estimated according to their population. Then, Cronbach alpha was calculated. Since calculated alpha coefficient was 0.725, the validity and reliability of the

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questionnaire is approved. Research operating model from the Michael Walker's model, satisfaction / importance matrix, is implemented.

In this present research, questionnaire was designed according to urban management tasks for the neighborhoods sustainability and the distribution and survey of citizens. In this questionnaire satisfaction and the importance of services provided by the urban management were determined from the perspective of citizens. Finally, based on the importance of each of the indicators and the degree of satisfaction of services provided and inspired by the model proposed by the Institute of advisers Berkshire, the optimal strategy has been set for each of the indicators.

### Results and Discussion

The results of the citizens' satisfaction level in performance of urban management studied in four dimensions of socio-cultural, environmental, economic and physical. This has indicated that in all neighborhoods of the historic texture of Yazd city, the urban management from citizen's viewpoint is not acceptable. It is essential that urban management with promoting Strategy try to improve sustainability and concentration of the programs, resources and activities to provide better services for citizens.

The results of the study show that the facts are as follows:

- Comparison of the performance of urban management in the socio-cultural dimension in the current situation indicates that the situation in satisfaction of all neighborhoods is lower than average.
- In terms of the environmental statements, except Fahadan and Godale-Mosalla neighborhoods, other neighborhoods have a statistically average satisfaction with the performance of urban management that is lower than average.
- In terms of economic dimension, all neighborhoods are lower than average. This indicates that respondents negatively assessed the performance of urban management in this item and not satisfied with the performance of managers.
- According to the physical dimension, only in the Fahadan neighborhood the situation is suitable and in other neighborhoods of historical texture urban management performance is weak and lower than average. In Gazargah neighborhood, with 2.258- difference from average, we see most dissatisfaction with the performance of urban management.

### Conclusion

Poor performance of urban management has created dissatisfaction and instability in the historical texture. We can see its appearance in reluctance for residence in this area, with poor people. Although in our country due to lack of integrated urban management, we cannot say that urban management is solely responsible for sustainable development; but look at the services provided by urban management, can be seen as an important criterion. Therefore, urban management should make attempt to provide better performance indicators, especially indicators of neighborhood sustainability and concentration on the programs, resources and activities. Promotion of strategy in all neighborhoods can provide better services for citizens.

In fact, the offers are moved from the current capacity towards ideal capacity to achieve goals and objectives. In this study, the results and assumptions in planning and executive management (strategic) are offered as below:

- Trying to persuade local residents and increase the sense of belonging to stay in the neighborhood in order to combat the negative growth of the population;
- Trying for collection and disposing of waste in order to increase citizens' health and improve the quality and visual appeal;
- Protection of historical buildings in order to increase the identity and legibility of the neighborhood;

- Trying to increase the ecological desirability and environmental sustainability through green spaces and increase in the per capita of green space in neighborhoods;
- Walking-base in the Mesjed-Jame streets for the maintenance of mosque as well as the security of residents and tourists;
- Establishment of councils at local level as a link between the management / council and citizens;
- Promotion of citizenship culture and in particular the historical context through education.

**Keywords:** historic texture of YAZD City, neighborhood sustainability, optimal strategy, satisfaction / importance matrix, strategy study, urban management.

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## Evaluation of Community Management in Tehran Ararat Quarter, Based on the Indicators of Good Urban Governance

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Received: 15 December 2015 Accepted: 9 March 2016

### Extended Abstract

#### Introduction

Two factors of unplanned physical growth and development of cities and their over-increased population, especially in the third world large cities, have resulted in various challenges and problems for their urban management. Therefore, large cities of the world are recently encountered with many challenges including urban management challenges, especially those of top-down management. This qualification and situation is more intensive in Iran large cities and Tehran metropolis in particular. Eradication of these problems and challenges as burden on Tehran urban management is out of management ability of Tehran. In other words, centralized top-down management system of Tehran is unable to take them away. Around urban management system in Iran and Tehran, a large number of critics have been made. In this way, urban management in Iran has a deep gap with urban governance and this management is more and more an organization or system for administration and keeping the city or giving services. Therefore, in the last two decades, a large number of organizations and agents related to urban management and planning have focused on participatory approach and management of cities by private sector and civil society based on a model of down-top management and planning.

Accordingly, based on experiences of urban local managements in the other metropolises of the world, especially community management by the indices of good urban governance, we could have hopeful to establish community management in the Tehran local communities. Hence, urban management of Tehran, after establishment of the Quarter council (Shorayari), decided to launch the plan of community management with new pattern. The pattern is with the approach of good urban governance and has been more applied in metropolises to bring about a better, non-concentrated and democratic management. By the way, this paper has surveyed and analyzed the qualification of good urban governance indicators in Ararat quarter in the region 3 of Tehran municipality. This was to discover the ratio and situation in each of these indicators.

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### Methodology

This research has a descriptive-analytical method and questionnaire was used as a tool for measurement. Statistical population of the research includes specialized experts in the field of urban management or planning. Accordingly, after the items were extracted, using Likert scale, the questioning trend was began by questioning from the quarters selected experts on the subject of urban management and planning. In this investigation, sample size is 20 people, sampling mode is nonprobability sampling and research type is applied method. Thus, the researches in which the statistical population includes experts, when this population has no known framework, the research can be by selective method. However, the achieved data were analyzed by T test for the first hypothesis and Friedman test for the second one by the SPSS software.

### Results and Discussion

In this paper, after examination of the related studies and surveys based on modes and patterns of urban management and community management in Iran and based on the theoretical literature, 8 indices of good urban governance were chosen to analyze community management. These indices are including 1. participation, 2. Answering, 3. Responsibility, 4. Regularity, 5. Unity, 6. Equity, 7. Transparency, and 8. Effectiveness. Among the 8 indices of the research in the study area of this research, the function of 5 indices is non-proper in the field of community management. In other words, except 3 indices of participation, answering and effectiveness, function average of 5 other indices is lower than the score of the tests numerical optimality, i.e., score 3. For the first hypothesis, according to the results, there is a significant difference between data mean for all 8 indicators of the research. The under-studied quarter has thoroughly a relatively-good state with significance level of less than error rate of 0.001 with the function of good urban governance indicators, but in detail, 5 out of 8 indicators have a mean lower than the total average (i.e. 3) which is a non-good or poor state. In the second hypothesis, because participation and answering indicators belong to primate indicators with a mean more than the mediocre mean, consequently, this hypothesis was confirmed by confidence level of 99 percent.

### Conclusion

It should be mentioned that, community management of the studied quarter is non-proper and poor. Along these lines, the function of indices of good urban governance in the study area, i. e. Ararat quarter of the region 3 on the extent of Tehran municipality is very poor and all the indices have generally less impact on the community management of the above-mentioned quarter. The basic result is that, the answering index has the most function and the equity index has the least function in the community management of the study area. If we decide to give a score to the indices of good urban governance in the study area (Ararat Quarter) and the top score is 8, the score of the area will be 3 out of 8. This shows a poor function for overall indices of good urban governance. Therefore, the agents of community management in the quarter must try to develop all these indices to achieve better community management.

**Keywords:** Ararat Quarter, good urban management, Tehran Metropolis, urban management.

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## Analysis of Spatial Distribution and Access to Urban Parks (Case Study: Shiraz)

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Received: 12 March 2015

Accepted: 22 February 2016

### Expanded Abstract

#### Introduction

Urban parks are part of the green spaces that have been designed and built within city boundaries. Besides, the urban parks create a permanent relationship between people. They are regarded as the main element of urban structure. Urban parks and open green spaces have strategic importance for the quality of life in our increasingly urbanized society. They also play an important role in urban sustainability.

Urban parks provide ideal open spaces for leisure-time physical activity. They are considered as a desirable environment for raising children and comfort. Furthermore, they are an indicator for quality of life, and the development of community. Moreover, urban parks are the most important factors to shape social sustainability and social interaction and solidarity. They also play an important role to strengthen the mind and the body and form the bases of the cities and neighbors. Therefore, the distribution and suitable location of urban parks in the cities and their access are the essential need in every city. They have an important role to achieve equality, social and location justice in the society.

#### Methodology

In order to analyze the distribution of urban land uses, e.g., green space and parks, there are numerous mathematical and statistical methods. In this study, we have used some various geo-processing tools including buffer, union, erase and also the nearest neighbor analysis and K function. The mathematical methods such as Entropy Index, Lorenz curve, Gini Coefficient, Location quotient (LQ), distribution coefficient and concentration measurement have been used to measure the concentration and spatial equilibrium of parks in different areas of the city. To analyze the spatial distribution of the urban parks, we used the Iranian park classification system to classify them into five classes according to their size, facilities available and functional radius such as neighborhood, community, regional, and district (Table 1). We studied 169 parks in 5 categories in Shiraz (Table 2).

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**Table 1. Classification of urban parks in Iran**

Type of park	Area (Hectare)	Functional radius (Meter)
neighborhood	Less than half a hectare	100-200
community	0.5 -2	400-600
regional	2-4	800-1200
district	4-10	1500-2500
Urban	More than ten hectares	3500-4000

**Table 2. The number of urban parks in Shiraz (Based on Iranian classification system)**

Municipal district	Neighborhood park	Community park	Regional park	District park	Urban Park
1	11	4	1	0	2
2	10	3	1	3	0
3	5	9	0	0	0
4	9	12	1	1	1
5	15	6	2	1	0
6	8	9	0	0	0
7	22	2	1	1	0
8	13	1	0	0	0
9	10	5	1	0	0
Total	103	50	7	6	3

### Results and Discussion

In order to assess the distribution of parks in Shiraz, we used two methods: “the nearest neighbor analysis” and “K function”. The results of these two methods indicate that the spatial distribution of parks is clustered. Then, the spatial distribution of the urban parks was measured by two methods: “Entropy Index” and “concentration measurement”. The findings indicate that the level of concentration of parks in Shiraz is very low. The distribution coefficients of parks in each of the nine regions have been calculated by LQ method and distribution coefficients. The results of both methods indicate that the parks are more concentrated in 5 and 7 municipal districts. According to the findings, it can be concluded that the distribution of parks are semi-balanced in Shiraz and there are little difference among municipal districts, although there is more equilibrium in the distribution of neighborhood and community.

We used the buffer tool in GIS so as to measure access rate to urban parks. At first, the buffer radius (Meters) was determined for the five categories of urban parks and then buffer map was created for each category (Table 3).

**Table 3. The Buffer Radius to Urban Parks in Shiraz (Meter)**

Type of Park	neighborhood	community	regional	district	Urban
Buffer Radius (meter)	200	600	1200	2500	4000

The results of this method indicated that despite the lack of access to different parks in the most municipal districts of the city, 6 municipal districts are the most deprived in terms of access to the parks. The regions 2, 4 and 8 had the best access situation. Based on the total surface of buffer around the parks, 74% of the city is covered by parks and only 26% of the total area of the city is suffered from insufficient access to the parks.

### Conclusion

The planning of urban parks is considered to be as one of the most challenging tasks of managers and urban planners. Spatial distribution and access to urban parks have great importance in planning and urban development. Planners and policy makers should not only increase the number of parks, but they should also improve the spatial distribution pattern. The access and the spatial distribution of urban parks have a mutual impact on each other. Use of appropriate methods to measure the access and spatial distribution pattern of urban parks are essential to achieve spatial and social justice. To achieve this aim, changes in criteria and standards for site selection study of urban parks is necessary. The results of this research can be effective in the field of spatial distribution of urban parks in Shiraz.

**Keywords:** access, Shiraz, spatial distribution, urban park.

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