

# Investigation analysis and proposed per capita for urban green space (case study): Darab city, Iran

<sup>1</sup>\*Dr. Saeed Maleki, <sup>2</sup>Ali Asghar Rezaee, <sup>3</sup>Davod Hatami, <sup>4</sup>Mahdi Jadidoleslam

<sup>1</sup> Assistant Professor, Department of Geography and Urban Planning, Faculty of Earth Sciences and GIS, Shahid Chamran University of Ahvaz, Golestan St, Ahvaz, Iran.

<sup>2</sup> MA student of Sistan and Bluchestan University, Iran.

<sup>3</sup> Davod Hatami, MA student of Sistan and Bluchestan University, Iran.

<sup>4</sup> Mahdi Jadidoleslam, Islamic Azad University of zahedan, Faculty of Science, Department of Geology, Iran.

## Abstract

Urbanization and city development are phenomena of present time. with respect to daily- based increasing development of urban regions in recent decades, and urbanization, preceding city- building and facing with a lot of problems such as irregular increase of population, non-target body development of cities and increase of environmental pollutions, green spaces have found a considerable role in maintaining and balancing urban environment as well as in reducing air pollutions. Accordingly, analysis and investigation of green space applicability and its per capita in Darab city as well as recommendations on giving balance to city's social and physical structure through creating green spaces can be vitally important. present research, carried out based on analytical- descriptive method, using different information and statistics shows that despite of national and international standards, provided for green space per capita and applicability, distribution of green spaces in Darab city's fourfold areas is not balanced. There are severe shortages in this ground.

**Keywords:** Green space applicability, green space per capita, standard, special distribution, city of Darab.

## 1. Introduction

With its' present characteristics, city is the creature of industrial era duo to its' widespread particular problems and features; city- dwelling is the most problematic shape of human life in various epochs of history (Majnoonyan, 1995:225). People oftenly feel that urban regions are not more longer desirable (Bahraini, 1998:67). rapid growth of cities have some come consequents such as traffic, noise, lead pollution of air, increase of disturbing industrial towns, crimes, population burst, and reduction of social security and welfare (Takano, 2007:52). So that the authorities and planners are forced to find solutions of mentioned problems. They consider the green places and parks as the main solution as they provide social support and ecosystem services for cities (Crane and Kinzig, 2005:42).the parks and green places can raise the quality of social life (Barker, 1968:112). The green open places are not only considerable due to their creational importance, but they are valuable as well, because of their role in maintaining and balancing city environment, modificating air pollution and raising the quality of citizens' physical and mental situation (Akbar poor, Saranskarood and sotoode, 1388 and Dunnet, 2002:4). in this mean, applicability of green places that were constrained by unregular growth of city and by converting the gardens and agricultural lands into city body, was faced by some problems such as incorrect zonation and establishment at city, use of unsuitable spaces and paying little attention to neighbourhoods, per capitals and standards (Esmaeili 2002:2). According to Hataminegad and Omranzade (2010), the green spaces serve as a lung for the body of a city. By investigating the present situation of Drab city's green spaces and by analyzing the resulted conditions, the limitation's and constrains can be identified and a reasonable per capita can be presented based on real methods and defination of a planning system for city green spaces. The main objective of the present research is investing and determing the pattern of distribution of Darab city's green spaces and levels and their relation with citizens needs. Also with respect to vital role of green space in citizens' lives and sustainable development, present research tries to propose a reasonable green space percapita, based on a proper model through utilizing environmental and social indices.

## 2. Back ground of research

Considering the plans and projects about Iranian cities' green space several researches have been carried out, that shed light on the subject in general, but about Darab city's green space no research has been carried out. among the researches on this field, we can mention to those which have been carried out in recent years including: city green space per capita and the effect of city population changes on it (Mahammadi and saboori, 2006), an analysis on spatial distribution of green space applicability (usage) in district-3 of Zahedan manucipality (Ebrahimzade and Ebadijokandan, 2008), investigation, evaluation and recommendation on city urban green space per capita a case study on "Mashhad» metropolis (hataminegad and omranzade, 2010) and city (urban) green space per

capita in Iran and in the world and scrutinizing its' effectiveness or ineffectiveness in cities of the country (Poor Mohammadi, Ghorbani and Behshti, 2011).

### 3. The method of research

Present research has a descriptive- analytical method that is of applied (= applicational) kind. Its theoretic foundations are based on attributional (=documentational) and desk studies and field visits of related organizations (Iran's statistics centre's data and Darab municipality's computerized information and services).

### 4. The hypothesis of research

The main question of the research was whether distribution of Darab city's green spaces have a reasonable relation with citizens' needs. In answering the above question, the following hypothesis was raised: in the pattern of urban green spaces spatial distribution, no rational relation seems to exist between citizens' needs to green spaces and the existence of green spaces in that city.

### 5. The theoretic bases

The term green space appeared in the literature of city- planning from less than half a century ago (Rustam khani and Leghaee, 2006:6). Urban green space is referred to city land with human- made vegetating covering that yields both ecologically and socially. Ecologic yield means beautification of city parts, reduction of environmental temperature, production of oxygen, increase of soil penetration against rainfall, and conservationally green spaces constitute living parts of city's physical structure (Saeednya, 2000:29). Increase of population, growth of cities, birth of metropolis and conversion of traditional and natural body of cities are always driving the need of green spaces. According to Poorahmad (2009), the green spaces cause human mental health and security and in many cases they are the most important factors in mediating environmental pollution burden. Green spaces fulfill aesthetical needs of citizens and they are also important in meeting urban society's health, environmental, psychological and social wishes and expectations' (Poorahmad, 2009:2-3). To set forth the issue of green space is necessary for city- dwelling, because it has a direct role in city beautification and citizens' comfortability, in addition to its' unique environmental values such as air-conditioning and temperature modifying (Khosh namak, 2002:109). These spaces are very important, firstly because of their environmental roles, and secondly because they serve as cultural and recreational places for free times (Lahigani and Shei'e Baigi 2011:1). Standards and per capita of urban green spaces before of every planning on development of urban green spaces, related standards and per capita should be determined. Now, it is necessary, for better introduction of issue, that the criteria should be defined. Standard is a level of implementation that is determined by the measuring criteria, and considered for a given number of residential populations (Chehrzad and Azarpishe, 1992:33). With respect to the importance of green space and the necessity of its' creation in cities for the purpose air-conditioning, people's recreation and beautification of city, it seems that no limit should be considered for creating green spaces because how much the green spaces develop, still will not be enough in other word, the more green space as lung of city, the better the condition of that city. However, the related standards are not as the same relating to climate conditions, ecologic features and availability of water resources on one hand and cleaning air of city in polluted areas on other hand (Abrhimzade and Ebaclijokandan, 2008:6). A single standard for green space cannot be presented, because the quantity of green space exactly depends on ecological conditions especially the bioclimatic of each region. For determining the size or area of needed green space, environmental conditions of given city should be examined, then based on determined needs proper strategy should be provided (Bahram sultani 1983:6). In different references and based on scientists and experts points of view into urban studies all around the world, a green space following international standard has an area about is to 50 m<sup>2</sup>, with an average of 30 m<sup>2</sup>, per an individual residing in a populated city. The amount, recommended by the organization of United Nations is 30 m<sup>2</sup>, too (Bijhanzade, 2001:15-17). Sometimes the standard area of green space is considered variable between 15-60 m<sup>2</sup> due to different ecological conditions of different regions, while in some places it is regarded as 60 m<sup>2</sup> with respect to the increase of city population, these spaces should be considered as being appropriate with the rate of population growth (Azani et al, 2010). Ministry of city-planning and building and housing, estimates the area for green space as 7-12 m<sup>2</sup>, while Tehran municipality recommends 20-25 m<sup>2</sup> area for green space. Bahram sultani and Makhdoom propose an area between 30 and 40, and 15 and 50 m<sup>2</sup> respectively. Moreover, green space per capita vary in different countries. England considers an area of 10 m<sup>2</sup> per an individual as a standard green space. In France and America, considered area for green space is 18 and 50 m<sup>2</sup>, respectively (Mohammad and Saboori, 2006:98). "Clawson" believes that the standard is a general guide, instead of a transparent and absolute guideline, and its' profitability can be evaluated positively only in this concept (Haidari cheyane, 1992:58). Per capita is a quantity which is given to an individual averagely from a total. Green space per capita, for example, is an amount of green space which is available to each person averagely from total usage of green space (Habibi and Masa'ueli, 2009: i). In order to determine

the area or value me of needed green space, firstly environmental conditions of considered city should be investigated, then based on certain needs, in order to modify environmental conditions to an extent that green space is applicable, approaches should be presented (Sa'eedniya, 2006:69). Regarding its' needed conditions, every city has its' own percapita. And presented standards are used merely as a guide (Esmaeili, 2002:24-25). of course, the standards of developing countries are lower than those of Europe and America in "kalkate» metropolis, for example, green space percapita is less than 102 m<sup>2</sup>, and it is 104 m<sup>2</sup> in "Bagdad», while proposed standard for these cities is about 16 m<sup>2</sup> (Poormohammadi, 2010:39). With respect to mentioned cases, despite the fact that they possess favorable weather, developed countries have a higher green space per capita than developing countries like ours. But in addition to low rate of per capita in city planning, the amount of real per capita of green space (stock of general green space per each person) is very lower than global and developed countries' standards. Table I, show the present per capitias and proposed standards for some of cities around the world. About the standards which are applied in to Iranian cities it can be said that first green space per capita is related to Tehran comprehensive plan, sanctioned in 1970, that proposed A per capita of 9-13 m<sup>2</sup> per a person (Esmaeili 2002:25).

*Table 1: Urban green space per capita and determined standards in selected cities*

Name of city	Present green space percapita (m <sup>2</sup> )	Determined standard (m <sup>2</sup> )
Boston	117	50
Stockholm	75	50-60
Losangeles	54	50
Sanfansisco	47	50
Western Berlin	40	50
Chicago	20	30-60

(Resource: Hataminejad and omranzade, 2010)

Green space per capita in some of Iranian cities is shown in the following table:

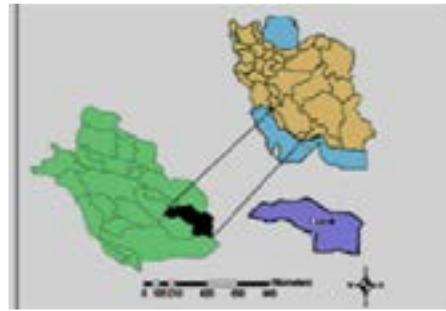
*Table2: green space per capitias of some Iranian cities*

Name of city	Urban green space per capita (m <sup>2</sup> )	Name of city	Urban green space per capita (m <sup>2</sup> )
Esfahan	18.5	Andishe	2.3
Ahvaz	9	Kerman shah	9
Tabriz	6	Zahedan	2.7
Tehran	11.2	Qazvin	3
Yasooj	7	Yazd	10

Resource: keyani et al 2006:11)

## 6. Location and condition of Darab city and its geographic features

Darab city is located in southeastern Fars it is situated at 56° and 33' of eastern longitude, and 28° and 47' of northern latitude, with an altitude of 1180m. Climatically it is semi-arid. The maximum rainfall occurs in winter and early spring. Mean annual rainfall is 2631ml. Mean tempertural degree at weather station of this city is 22°c (web site of weather station of Darab city). According to census in 2006, Darab city has a population of 54513, and in the last census the number of population reached 58000 in 2011.



**Figure 1.** Location of ...Darab province.

## 7. The situation of Darab city green space

This city is divided into four areas, as the following table shows, they are as follows:

*Table3: Green space applicability in different areas of Darab city,*

Title	Total area	Capita	Percent	Areal 1	Areal 2	Areal 3	Areal 4
Population	57716			14732	21240	5220	16494
Park and green space	60460	1.05	0.66	25010	6880	-	28570
Forest park	475690	8.24	5.19	-	-	-	28570
Gardens and farms	2047970	35.48	-	163030	287940	97000	-

(Resource: comparative plan, 2002).

## 8. The situation of Darab city green space

This city is divided into four areas, as the following table shows, they are as follows:

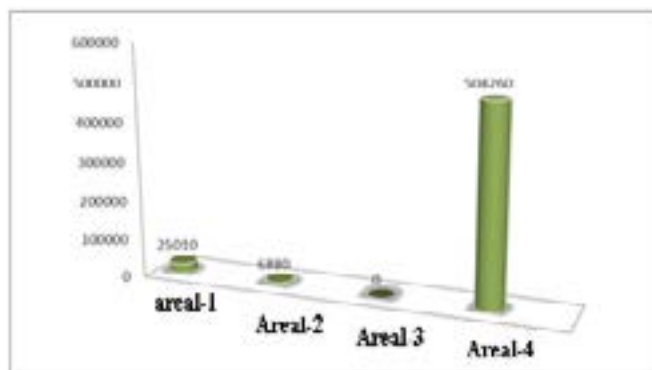
**Area 1:** This area is about 462 hec. The residential part is about 83 hec.

The population, dwelling in this area is 14732 people at present time. Total green spaces amount to 25010 m<sup>2</sup> that is 107 m<sup>2</sup>, per a person. Of course, this area is comprised of gardens and farms as well whose area is 1663030 m<sup>2</sup> with 112.9 m<sup>2</sup> per a person.

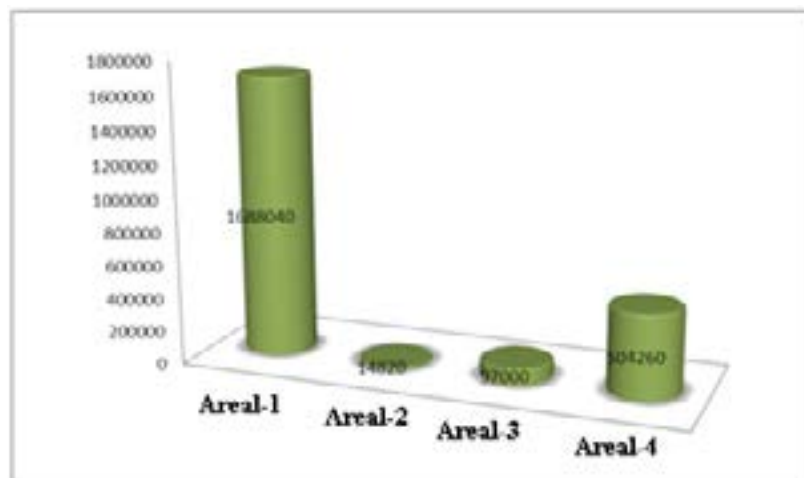
**Area 2:** This area involves central part and early focus of Darab city, and city bazar is located in this area. This area is 268 hec and it covers the most residential parts (40 hec.). The population residing in this area is 21240 people at present situation. The area of park and green space is 6880 m<sup>2</sup> with 0.3 m<sup>2</sup> per a person. The area of gardens and farms is 287940 m<sup>2</sup> with 13.6 m<sup>2</sup> per a person.

**Area 3:** This area mostly is dedicated to service providing usage including educational, health, army and police centres and departments. This area is about 465 hec with a population of 5220 people. No part is assigned to parks or green spaces. However, gardens and farms exist in this area with 97000 m<sup>2</sup> that is, 18.58 m<sup>2</sup> per a person.

**Area 4:** This area involves a big part of land reserved for future development of city. Of 462 hec 300 hec of this area is prepared places of land and 92 hec is residential. The population of area according to the last census was 16496 people. Park and green space of this area cover 28570 m<sup>2</sup>, saying 1.7 m<sup>2</sup> per a person. A forest park exists here with an area of 475690 m<sup>2</sup>, saying 28.8 m<sup>2</sup> per a person. There are not gardens and farms in this area of city. Therefore, with respect to the reports of comparative plan, area 4 has the highest green space per capita (regarding that the gardens, orchards and farms around the city are not considered here) and the lowest per capita belongs to area 3. So, Darab city has 9.2 m<sup>2</sup> green spaces per a person, excluding gardens and farms, while including the gardens and farms this value increases to 44.7 m<sup>2</sup> green space per a person. The point that most gardens and farms are situated on the surrounding belt of the city that belong to area I, is clearly shown by two following figures:



**Figure 1: Green space scattering, considering their areas in Darab city, excluding gardens and farms.**



**Figure 2: Scattering of green space in the areas of Darab city including farms and gardens.**

According to the reports of municipality green space unit, total green spaces of Darab city at present (2011) have an area of 720000 m<sup>2</sup> excluding gardens and farms, of which 500000 m<sup>2</sup> belongs to Shahed forest park in fourth area and 220000 m<sup>2</sup> belongs to three parks of city (koodak park- 20000 m<sup>2</sup>, best park 8000 m<sup>2</sup> forest park. 50000 m<sup>2</sup> and other green space of squares and bovlvars). So at present situation, there are 12.4 m<sup>2</sup> green spaces per a person. Though, regarding the quantity, Darab city green space per capita has a proper status, its distribution and quality is not so good.

*Table4: Present and proposed situations of Darab city's green space*

Year	Population	Green space area	Per capita
1390	58000	720000	12.4
1391	82645	1299300	15.7

Proposed green space per capita of Darab generally, urban green space per capita highly varies in different geographic places. indeed, a given size of green space con not be assigned to all small cities of world and in a smaller scale to all Iranian cities, because natural conditions (topography, ecologic situation, hydrology, soli and so on) and demographic characteristics (population concentration, social culture the amount of urban and industrial pollution, and so on) differ in different cities. consequently it sounds

rational that cities should be classified based on their natural environment features and economic – social structures, and for each class of cities, a certain green space per capita should be recommended by help of some measurable criteria. Proposed method for determining urban green space per capita should possess the feature of flexibility and additionally it should be practicable by local municipalities. One of the methods of calculating urban green space per capita is use of following equation:  $S \text{ per capita} = \frac{\sum Q}{7}$

This formula is proposed by k.Bahram sultani (1995). in fact this proposed method was designed for determining green space per capita, especially per capita of specific green spaces for passing free time, namely the parks and urban green recreational places rather than other public green spaces like green space of squares or the network of streets and bovlvars, because in urban regions, each green element should be evaluated in appropriation with the performance it has been assigned to do. For example, the green space of bovlvars, though may have ecological effects, its' main performance relates to traffic stream. Accordingly, its' other outcomes are less important. So, for urban green elements, as other urban uses, an independent identity should be considered. Here, only the per capita of that green space is evaluated that have social -psychological performance. So, in considered per capitass, the space of children plays is ignored. In this ground, existing data are so marginal on which no per capita space per capita can be determined. for the purpose of green space per capita calculation, several factors can be considered. Accordingly, the more the number of related parameters in calculation, the more precise is the achieved per capita, hence social- psychological needs will be met more properly. However, use of several parameters makes necessary the existence of enough information. Beside, the use of a lot of parameters can result in the potential risk of actional value declining in the calculational method, too. Accordingly, the following method is proposed for estimating urban green space. With production of information during the time, the proposed method can be developed concretely and then, it can be changed into a precise standard method. Four following parameters are used in plotting this calculational method:

- 1) An avarage area needed for growth of a healthy tree
- 2) Local ecologic features
- 3) The quality of environment
- 4) Number of people occupying a single room in residential compounds (=complex).

Mean area needed healthily growing a tree is gained by calculating a circle whose radius is 1.5 and the tree is located on its ' centre. That area would be 7 m<sup>2</sup>. Soil surface should be free from any construction (as phalt, cement and so on) so that the activity of tree roots is protected from happening any kind of disturbance.

Table 6: Classification of average spectrum (=range)

Thermal spectrum(c)	The Coefficient of green space	description
25	1	Highly proper
25-30	2	proper
30-35	3	Acceptable
40	4	improper
+40	5	Too improper

Table 7: The quality of environment and coefficients of green space

The quality of enviroment	The Coefficient of green space	Description
Highly proper	0	There is no pollution of air and noise
proper	1	There is air pollution in some hours of day- night and There is noise pollution in some hours in day
improper	2	There is no pollution in some hours of day and night
Too improper	3	Both kids of pollution exist is some hours of day and night

(Resource: Bahram Sultani)

Table 8: The ratio of people concentration to a single room and the coefficients of green space

Person(s)/room ratio	Coefficient of green space	description
One Person	0	Highly proper
Two Person	1	Acceptable
Three Person	2	Too improper

(Resource: Bbahram Sultani, 1945:96)

Based on statistical report of Darab climate logy station, the hottest month of year in Darab is Tir (first month of summer) with average 29.8° c. so, the coefficient of maximum temperature for determining the green space is 2. Regarding the quality of envi-ronment, there is air pollution in some hours of day and night and also noise pollution exists in some hours of day. So, the coefficient of environment quality is 2.

Regarding people concentrating in a single room, there are considerable differences in four areas of Darab. However, aver-agely, two persons are allocated to a single room, so its coefficient of green space is 1.

Therefore, with respect to these results, the following equation can be true :  $(2+2+1)*7=35m^2$ . Based on the results of above param-eters, and the answer, gained from above formula, desirable per capita of Darab city for a person is 35 m<sup>2</sup> green space, that is not compatible with present and proposed per capitas in the comprehensive and detailed plan of Darab city.

### 9. Conclusion

With respect to rapidly increasing population of cities and occurance of problems resulting from that, such as pollutions, and increase of constructions, maintaining and improving green space as respiratory lung of city body and its' ecological and aesthetical aspects are considered vital necessities. the results of research imply that Darab city green space per caoita is approximately about 12-4m<sup>2</sup> per a person, which stands at a desirable status rampaging the per capitas of other Iranian cities. but there exists an obvious difference between existing green space per capita of darab city and 35 m<sup>2</sup> per capita attained from above mentioned formula. The city has not a desirable situation, concerning the quality and distribution of green space around all areas of city, so that area 4 with 28.8 m<sup>2</sup> green spaces per capita has the most amounts and area 3 with no green space has the least amount of per capita. therefor, there is no

rational relation between citizens needs to green space and the existence of green space and serious effort, proper management and more attention are needed. This problem can be solved and the citizens can be provided with a green beautiful city through proper and scientific approaches, interviews with experts and specialists, attraction of private sector investment and other methods in the shortest possible time.

## 10. Resources

- 1• Bahraini S. Hasan (1998). The procedure of city-planning, Tehran, publications of Tehran university.
- 2• Bahrain, Sayed Hassan, (2007). The urban design process, Tehran, Tehran University Press.
- 3• Bahram Soltani, K. (2004). The proposed calculation method for urban green space per capita, Village Magazine, Year V, No. 1
- 4• Bijan Zad, M., (2001). Recommendations about the location, design, maintenance of parks and green spaces, all articles, Research and environmental education seminar in Tehran, Volume II, Printing, Publishing Green Parks. Bahram sultani. K (1995). Proposing a method for calculation of urban green space per capita, abadi magazine, fifth year, no.17.
- 5• Bizhan zad.m.(2001). Some recommendations on zonation, designing and maintainance of parks and green spaces, articles collection from research and educational convention on Tehran green space second valume, first edition, the publication of the organization of parks and green space.
- 6• BijanZad, M., (1380). Recommendations about the location, design, maintenance of parks and green spaces, all articles, Research and environmental education seminar in Tehran, Volume II, Printing, Publishing Green Parks.
- 7• Chhrzad, Rahim, December Occupations, Nazila, (1371). A Member of Tabriz urban green space, Thesis Master of Urban Planning, University of Tabriz. Ebrahim zade and ebadi jokandan (2008). an analysis on spatial-placial distribution of green space applicability (=usag) in zahedan, magazine of geography and development, no.11, spring and summer
- 8• Ebrahimzadeh, Jvkndan Ebadi, (2008). Analysis of spatial distribution of green space in the user's location, Zahedan, the Journal of Geography and Development, No. 11, spring and summer.
- 9• Habibi, Seyed Mohsen, issues, S., (2008). A member of capital city, Tehran, Office for Studies Land and Housing, Ministry of Housing and Urban Development.
- 10• Heidari, R.,(2008). Member status and importance of green space in urban planning, the city of Tabriz, Department of Urba
- 11• Planning, School of Humanities and Social Sciences, University of Tabriz.
- 12• Hataminejad, Hussain, Mohammad Imran B., (2010). Assessment, evaluation and recommendation of urban green space per capita, Mashhad samples, Journal of Geography, No. 25, summer.
- 13• Ismaili, A., (2002). Location analysis of green space (parks within the city) from the viewpoint of the program Planned urban areas and eight municipalities in a Tabriz, MA thesis, Geography and Urban Planning,University. Journal of Urban Services in Municipalities, No. 25, June.
- 14• Khoshnamak, Z., (2002). Developed a comprehensive plan for green space, the most important priority is polluted cities, Journal. Municipalities, Number 38.
- 15• Khani Rostam 5, meeting (2004). The principles of green space in residential design, printing, Tehran, Publications 0.1 Housing Research Center Building.
- 16• Khani Rostam 5, meeting (2005). The principles of green space in residential design, printing, Tehran, Publications, 0.1 Housing Research Center Building.Kiani, G, et al (1385). Regulations, standards, rules and regulations on green space and urban landscape, the fifth year 0.73 -, No. VIII, Publications of the country's municipalities 78 pp.10 S.
- 17• Nia, A., Lahyjanyan, Akram, Shia Beigi, (2005). Assessment of urban parks, Model (A Case Study of Semnan Park, September 8). And offering tools.
- 18• Majnuyan, Henrik, (1995). Debates over parks, green space, recreation, field deputy Naghizadeh, M., (2009), think green, green environment of the substrate, Journal of GREENS Rx, fourth year.
- 19• Saeidnia, A., (2003). Urban green space, publications, organizations, municipalities and Dhyary country. Pour-Mohammadi, Mohammad Reza, (2003). Urban land use planning, the publisher. Rostam khani and p. lughae (2004): the principles of green space designing in residential places, first edition Tehran, the centre for house and building researches.