

Analysis of Urban Green Space Distribution; Case Study: Izeh City, Khuzestan Province, Iran

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ABSTRACT: Basically, the proper green space promotes to increase health, relaxation, high efficiency and high quality in life. It has been studied on region 1 of Izeh city where there is unequal and improper distribution of green spaces in threefold region. According to population (65193) of Region 1 in 2009, per capita of green space is 15.70 m² on the basis of our findings totally that it is very unequal and improper distribution than per capita of green space that is 12 m² proposed by House and Urban Planning Ministry. As per capita of green space is ranged between 14.003 m² in region 3 and 74% m² in region 1. This research has been performed on the basis of descriptive and analyzed method by using various statistics and information and finally, a proper per capita of green space has been proposed for Izeh city by using a proper model. The need to review legislation to preserve land and planting trees with green space and interest they were one of the factors used by management for planning urban green space Izeh city is and the need for urban management in the form of a master plan with specified requirements and insufficient guarantees that the current problems encountered during the implementation to be worked out and support systems legislative, judicial and executive authority to apply for the preservation of green space in Izeh city.

Keywords: Application of Green Space, Green Space Per Capita, Standards, Spatial Distribution, Izeh City, Khuzestan province, Iran.

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INTRODUCTION

Currently, technologic evolutions and industrialized cities have played important role in environment. In fact, pollutions as a result from fuels of industrial centers and its residues and wasting chemicals in industry have caused to ruin environment and influenced on communities unpleasantly. Development of green space is the most important and easiest way to modify destructive effects of these environmental damages.

It can't be imagined a city without effective green space in various forms. As results of urban development and environmental complexes, it is unavoidable to present green space and its development. It is necessary for cities as a focuses of human actions to accept a structure and function affected by natural system to be able to guarantee their stability. Then, green space as an inherent component of cities has played important role for their metabolism that their lake can promote to serious disorders in life of cities. Generally, green space as lungs of cities doesn't indicate exaggerated definition for its application but the simile indicates its minimum function in aspect of urban ecology (Majnounian, 1995). Because of that, application of green space in the cities and its per capita has been considered as a one of the fundamental subjects in Urban Planning and Management.

Theoretical Basics

Planning of green space problem is one of the urban implications because it provides not only non-substituted environmental values such as air purification, modifying temperature but it influences on aesthetic, citizen's relaxation and freshness directly (Khoshnamak, 2002). Urban Green Space means a kind of applied ground surface with a vegetable covers where constructed by men that possessed "ecological efficiency". It means that aesthetic, decrease ambient temperature, produce oxygen, and increase soil permeability against any kinds of falling. From Environmental Conservation view, urban green space is a living section of a city (Saeednia, 2004). From Conserver and owner's view, urban green space can be categorized in three forms:

- 1- Public green spaces;
- 2- Semi-public green spaces;
- 3- Private green spaces

Public Green Spaces: It is Urban Green Spaces that possessed Social Efficiency. People use to spend leisure time, sport, fun, social and cultural festivals. Then, The mentioned spaces has been equipped and designed fundamentally. They are social green components including bench, light, drinking water, lavatory and passages. This space is called Park. In fact, Public Green

Space includes all public green space equipped with services and facilities.

Semi-Public Green Space: Green Space where ecological efficiency has, then they have fewer users than Public Spaces, therefore they don't possess social efficiency completely such as hospitals, organizations, garrisons, etc. (Saeednia, 2004).

Private Green Spaces: Green Spaces that increases ecological efficiency of city but they don't have social efficiency such as internal green space of residential units (Esmaeili, 2002).

Standards and per capita of Urban Green Space:

Before any planning to develop urban green space, It should be specified its standards and per capita. Now, it is necessary to definite these criteria to explain these problems well. Standards means a level of performing that specified by measurement criteria and considered for definite numbers (Chehrzad & Azarpisheh, 1992). Regarding the importance of Green Space and its necessity in the cities in order to filtration and amusement and aesthetic, green spaces shouldn't be limited externally, because whatever green spaces are extended in the cities, it isn't enough again. It means that it is better to extend green space as a lung to breath. Clawson believes that standard is only a general guide not an explicit instruction, and it is benefit when it is evaluated in this meaning positively (Heydari Chiane, 2002).

Per capita is a quantity amount that divided between each person from total averagely. For example, amount of a green space that each person can use from total application (Habibi & Masayeli, 2009).

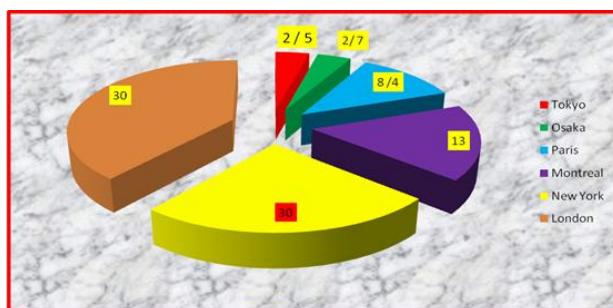


Figure 1. The per capita of green space in various cities all over the world (Resource: Dalalpour Mohammadi, 2005).

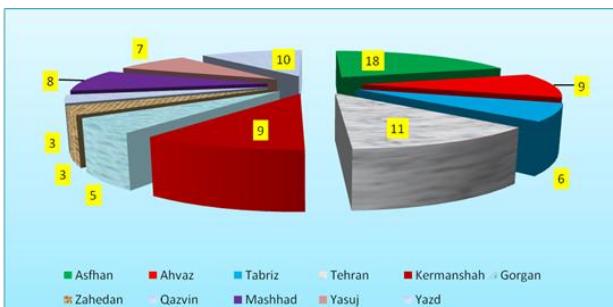


Figure 2. Per capita of green space in cities of Iran (Resource= Kiani et al., 2006)

MATERIAL AND METHODS

It is an applied research and has been done in proving method. Generally, information and data have been gathered in documentary method and on the basis of information of Interior Statistics Center, municipality and MaAb Consulting Engineering Co. Also, some Information was gathered by measurement method and field study. Research Method is on the basis of positivist method. Then, data has been gathered, categorized and analyzed and concluded, respectively.

Case Study

Izeh city, 2329.1km² is placed on elliptical plain where located on northeastern of Khoozestan Province. Izeh city is located between Cheharmahal Bakhtiari and Kohkilouyeh Boyerahmad Provinces and Masjed Soleyman and Baghmelk cities. It is divided into two sections: Izeh city and Dehdaz and 10 villages. Izeh city is center of Izeh city and it is the biggest cities of all. Izeh city where is political center of this city has been located on 49° 52' of eastern longitude and 31° 50' of northern latitude.

In the field of demography and physical development of Izeh city, it can be said that Izeh city is one of cities that experienced increasing population. Its population has been 59.83 times as much and its region has been equal to 22times during 53 years ago. Izeh city Population has been 1896 in 1954 that reached to 113456 in 2009 and its region has been 76Hect in 1956 and reached to 1673Hect in 2009. On the basis of Review of MaAb Consulting Engineering Co., Population Growth will be 154229 people in 2021.

According to General Plan that provided in 2009, Izeh city is divided into 2 regions and five regions. Green Space of Region 1 has been studied in this research. This region has following specifications: (Population: 65193-Region: 986.6 Hect-Total green spaces: 287950m²). This region has 3 area. Sub-Specification of threefold region has mentioned in following table.

Table 1. Regions, population and green space of Izeh city

Regions	Population	Area	Area of Green Space
1	23068	367. 7	17169
2	24502	264. 7	23780
3	17623	354. 2	246778

Resources: General Plan of Izeh city, MaAb Consulting Engineering Co.



Figure 3. Population Development of Izeh city from 1957 to 2021

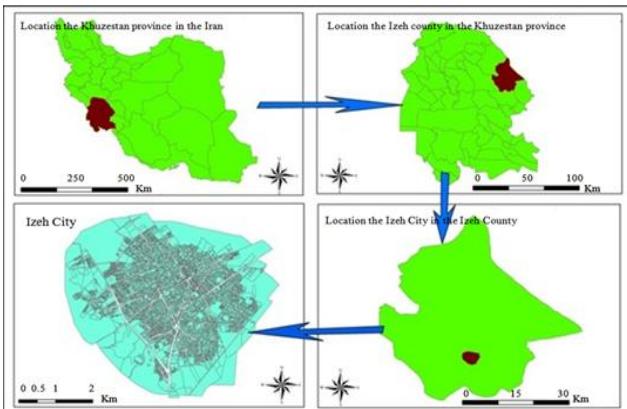


Figure 4. Maps of Iran, Khuzestan Province and Izeh city

DISCUSSION

According to general plan provided in 2009, Izeh city has been divided into two regions and five regions that total regions of urban green space (Tables 2 and 3).

Proposed Green Space Per Capita for Izeh city

Generally, per capita of urban green space is different in various geofigural spaces. In fact, it can't be defined a definite amount green space per capita for all cities of world and cities of Iran. Because natural conditions (topography, climates, hydrology, soil, etc.)

and human specifications (population density, social culture, industrial and urban pollution etc.) are different in various cities. It can be concluded logically that cities are categorized on the basis of specifications of natural environment and their socio-economical structure and proposed per capita of urban green space for each category by using calculable and evaluating criteria. The proposal to determine per capita of urban green space should be flexible and also be administrable by local municipalities. Per capita of urban green space can be calculating by one of the equations as following:

$$M^2 \text{ per capita} = \sum Q \times 7$$

It has been proposed by Mr. Kambiz Bahran Soltani (Bahram Soltani, 1995). Four parameters have been used to design this equation as following:

1. Required average Region for safe growth of one tree
2. Specifications of local Climate
3. Environment Quality
4. Density of person/room in residential unite

From technical and environmental point of view, it has been considered that average of required region for safe growth of a tree is obtained by calculating region of a circle (radius = 1.5m) that this tree located in its center. This region is 7m. In this region, soil shouldn't cover with any constructs (asphalts, cements, paving, etc.) to grow the roots freely and safely (Saeednia, 2004).

Table 2. Level and per capita of the present green space in Izeh city in 2009

Applied group of whole city		Level and per capita of the present green space in Izeh city in 2009			
		Region (m ²)	Population	Per capita (m ²)	Percent
1	Landscape conservation	136647	113456	1. 20	0. 85
2	Parks and public green space	163595	113456	1. 44	1. 02
3	Private gardens and green spaces	74583	113456	0. 66	0. 46
4	The sum of all three groups mentioned above	374825	113456	3. 30	2. 33
5	Total 4 groups named above	2552910	113456	22. 50	15. 86

Table 3. Distribution of public green space and park and conserved green space in region 1 of Izeh city, farms and fields

Distribution of public green space and park and conserved green space in region 1 of Izeh city, without calculating private green space, farms and fields

Region	Region	Population	Total Region/hect	Region of green space/m ²	Per capita of green space	Deficit or plus regarding standard per capita 12 Meter/person, House and Urban Planning Ministry	Percent of green space allocated to various regions than total conserved & public green space	Percent of residents in region and region than whole city	Percent of city space allocated to region or region
Region 1	1	23068	367. 7	17169	0.74	-259647	5.71	20.33	22.65
	2	24502	264. 7	23780	0.96	-270244	7.92	21.59	16.30
	3	17623	354. 2	246778	14.003	+35302	82.19	15.53	21.82
Total region 1		65193	986. 6	287950	15.70	-494336	95.90	57.46	60.77

Table 4. Thermal Spectrum and Green Space Coefficient

Thermal Spectrum	Green Space Coefficient	Comments
25	1	Very well
25-30	2	Good
30-35	3	Acceptable
35-40	4	Bad
+40	5	Very

Table 6: Categorization of average spectrum of maximum temperature in the hottest month equal to Green Space Coefficients (Resource: Bahram Soltani, 2005).

According to derived statistical letters from Climatological Station, maximum and minimum temperature in Izeh city Station from 1993 to 2005 has been 36.1°C in June and 10°C in January. Then, its maximum temperature coefficient to definite green space coefficient is 4.

Table 5. Quality of Environment and Green Space Coefficient

Quality of Environment	Green Space Coefficient	Comments
Very well	0	There aren't any air and sonic pollutions.
Good	1	There is air pollution and sonic pollutions in some hours.
Bad	2	There is sonic pollution in some pollution.
Very bad	3	There aren't any air and sonic pollutions.

Resource: Pourahmad et al. (2009).

Table 6. Density of person/room and Green Space Coefficients

Density of person/room	Green Space Coefficient	Comments
One person	0	Very well
Two persons	1	Acceptable
Three persons	2	Very bad

Resource: Kiani and Soleymani Farsani, (2006).

Air Pollution

When every material enters to air, it can cause to change its physical, chemical and biological properties that called polluted air. Air pollution consists of presenting one or some polluted materials in the air in amount and time that can change air quality as it is dangerous for men, animals and plants (Bahram Soltani, 1995). Air Pollution is introduced on human health and life, different diseases and economical values of constructions, decreasing solar energy on the earth and decreasing and increasing temperature. On the other hand, building faces and their deterioration are affected by air pollutions (Shieh, 2005). Human action, industrial factories, agriculture, urban planning, heaters, stations, vehicles, etc are factors of air pollution.

Sonic Pollution

Generally, anything that men wouldn't like to listen it is sonic pollution. It is one of signs of urban development. This factor isn't fatal for men and animal directly but it can cause to affect weakness of auditory system, deaf, nerve disorders, stress, blood pressure, etc. if it is extended (that it is 70° dc according to sonic measurement scales), it will construct an uncomfortable space. Currently, all sounds from vehicles and airplane are detrimental to good health in the cities (Shieh, 2005). Sounds that emitted by industrial applications (factories, carpentry workshops, turnery, metal works), business, air and land traffics, constructional operations are some of the sonic pollutant (Esmaeili, 2002). In 2009, Izeh city has had 3350 active workshops in different economical sections. After evaluating number of automobiles in this city, sounds from citizens' actions and some trades where near to residential units, it is concluded that there are air and sonic pollutions in some hours, and then environment quality coefficient is 1.

Density of person/room

This index indicates number of person in each room that a smaller number indicates more autonomy of family member in residential units (Maleki & Ahmadi, 2011). According to some experts, this index should be called average room for each person, but because of deficit of this index in our country and special life records, it is considered as a person/room. The expected limit of this index that also called congestion index is a room for each person (Khosh Far, 1995). According to the mentioned table that provided by Consulting Engineers' studies, per capita of each person/room is 2 people in one room averagely. So, its Green Space Coefficient will be equal to 1.

$$\text{Therefore, } (4+1+1) \times 7 = 42\text{m}^2$$

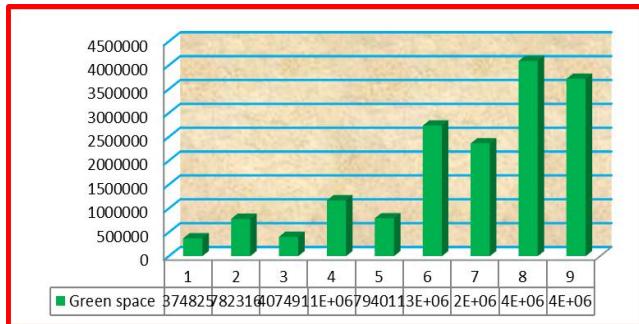
Where, the desired green space per capita is 42m² for each person in Izeh city. It is different from available per capita and the proposed per capita of Izeh city general plan. These results is listed in detail in following table; it is necessary to note that the number 1-9 is to guide and better understand.

Table 7. Green space of Izeh city since 2009-2021

1-Available green space region(m ²) in Izeh city to 2009 including public , private and protective green space	2-Necessary green space region(m ²) on the basis of per capita 12 m ² of House and Urban Planning Ministry for 2009 with population (65193 people)	3-Amount of deficit than per capita 12 m ² to 2009	4-Necessary green space region(m ²) on the basis of per capita 12 m ² of House and Urban Planning Ministry for 2021 with population (97403 people)	5-Amount of deficit than per capita 12 m ² to 2021	6-Necessary green space region (m ²) on the basis of per capita 42 m ² . It is proposed for 2009 with population (65193 people)	7-Amount of deficit than per capita 42 m ² to 2009	8-Necessary green space region (m ²) on the basis of per capita 42 m ² . It is proposed for 2021 with population (97403 people)	9-Amount of deficit than per capita 42 m ² to 2021
374825	782316	407491	1168836	794011	2738106	2363281	4090926	3716101

Figure of available green space, deficits and proposals is provided by on the basis of per capita of House and Urban Planning Ministry and results from threefold region, Region 1, Izeh city (Resource : the authors' studies).

Figure 5. Green space of region 1 in Izeh city



CONCLUSION

In urban planning literature, green space has been considered as a one of applications and apparent facilities of body. Urban green Space is called as a main index and also technical tools to conserve environment. Cities and towns as a focus to act and live men should accept structure and application affected by the natural systems to guarantee their stability. Then, green space as a necessary and inherent component of cities has been played the important role in their metabolism. From environment point of view, Green Space forms the living section of a city that it is very important not only to meet citizens' aesthetic needs but also health, environmental, mental and social needs. When developing cities understand the necessity of presenting green spaces, it is logical to establish equilibrium between livings and things in the city. Increasing population has been caused to transform applications of green space, garden and forest to residential, industrial and business applications seriously. Izeh city has been exposed to this danger more than others. Deterioration and transforming application of lands have promoted improper environmental results in this city and disordered ecological balance in cities. On the other hand, Urban Management hasn't considered making green spaces and General Park and it has been caused to present bad and irreparable effects. It is found that green space per capita including public, private and preserved is about $3.30m^2$ in Izeh city. There is $374825 m^2$ green space in Izeh city where $287950 m^2$ (96%) is located on region 1 and $12536 m^2$ (4%) is located on region 2 and green space per capita is equal to $15.70 m^2$ in region 1. it is proper that per capita $12m^2$ that proposed by House and Urban Planning Ministry. But its distribution isn't proper in quality and it has been distributed in this region unfairly. As green space per capita in region 1 of region 1 is equal to $74\% m^2$ and green space per capita in region 2 of the region is equal to $96\% m^2$, green space per capita of

region 3 of region 1 is equal to $14.003 m^2$ that mentioned in this paper in details. Regarding to this theory, it is found that green space per capita more than green space per capita proposed by House and Urban Planning Ministry in region 1 of Izeh city that has been distributed unfairly and illogically. As there isn't any proportion between population of Izeh city and green spaces. Therefore, in patent of local distribution of urban green space in region 1 of Izeh city, there isn't any logical relation between green space and citizens' needs. Finally, the proper green space has been proposed for Izeh city by using a desired model.

-The strengthening, development and support of private green space, especially in the areas of green space shortage will ultimately lead to an increase in per capita urban green space.

-Most municipalities in monitoring the implementation of urban development plans and programs implemented green space and pressures on land use changes resulting from the decision of some organs of green land to other land uses prevent.

-Positive look for planting trees on unused public land according to the capacity of existing potential.

-Create a backup of green by the people for the development of green space and beauty of the Izeh city.

-Further investigation is consensus in order to achieve optimal per capita number specified for each area and an appropriate plan for achieving the sustainable development of the city Izeh it to be provided.

-Urban green scape planning experts should be sought and by applying management techniques for balancing the more vital areas in the city to optimize the efficiency of the most of them take effective steps to improve environmental conditions and social Izeh city.

Competing interests

The authors declare that they have no competing interests.

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