



## Investigating Urban Growth and Destruction of Urban Gardens with an Ecological Approach- A Case of Gardens in Shiraz, Iran

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### ABSTRACT

*Constructing in the cities can be considered as an important part of environment. It affects the environment as well as deconstructing it, destroying the nature, and creating an unsafe and infected environment for people. Applying an ecological approach and choosing Mansourabad gardens located in Shiraz, Iran, this article examined the urbanization, its growth and its effects on the destruction of urban gardens. The results indicated that, with a population growth of about 5.9% between 1996 and 2011, more than 124 hectares of gardens and over 24 hectares of agricultural lands destroyed in MansourAbad region to be able to increase about 42 hectares of lands to urban construction. Furthermore, the amount of pollution caused by urban space and the amount of oxygen lost due to the destruction of gardens were estimated.*

**Keywords:** Urbanization, Urban Gardens, Deconstruction of the Environment, Shiraz.

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### INTRODUCTION

Gilbert introduces urbanization and increasing urban population as features of our time, and mentions the development of towns and cities as the consequences of it. By 1900, only one out of every eight people lived in the cities. But in the twentieth century, more than half of the world's population live in urban areas, among them about two-thirds live in the Third World [14].

Usha (2002) defines urbanization as the urban development, increase in the number of population and area size during the time. Desani (2007) also states that generally the main reason for an increase in urbanization, especially in developing countries, is migration from rural to urban areas. About two centuries ago there were only two cities with population of one million- London and Beijing; however, today, there are 293 cities with the population of more than one million which most of them are in developing countries [4]. Urbanization is a process or phenomenon that the urban population increases while rural population decreases. But urbanization ultimately leads to reduced population growth over time [8]. Urban growth results in changing land use in the case of gardens. Productive or even non-productive gardens are a very essential part of a city. It can be seen in combination with other components or as a series of intensive gardens [23].

This article aims at investigating the process of urbanization in Shiraz between 1996 and 2011, and then analyzes the impact of it on the pollution caused by urban space and the oxygen lost due to the destruction of gardens in Mansourabad region.

### Literature Review

About 4000 BC, there had been only a few cities in the world. They were small and a large rural population supported them. Cities began to develop from nineteenth century and in the twentieth century the world has witnessed large urban areas with a high population density [17].

In 1801, Britain contained 865,000 people and it was near to get one million people. At that time, London and Wales only contained 10% of country's population. In 1901, less than 35% of the UK population lived in the cities; but in 1951, the population of London and Wales increased about 38.6% and 69.3% respectively [17]. The rate of urbanization in Iran was 61.2% in 2006, and 67.6 in 2011 [20].

Golmohammadi, et al. (2010) stated that the urban sector has developed rapidly in the last fifty years and especially in the past two decades. It forms nearly seventy percent of Iranian society up to now. This amount is sharply increasing. Ghanbarinasab and Valadbeygi (2010) also argue that the rural and urban populations affect environment by using different energy resources and ecosystems; and if the environment cannot meet these requirements, the ecology will be lost [4]. One of the most important demographic phenomena is rapid urban growth and urban population increase as a result of economic and industrial development. In recent decades, the economists and researchers have shown an inclination for the consequences of urbanization, especially its effects on the environment and accelerating the process of resource depletion and the impact of it on consumption patterns in general and the pattern of energy consumption and emissions, in particular. Such an unprecedented growth requires additional infrastructure. The result will be the consumption of greater resources and a pressure on ecosystems. Therefore, due to the impact of urbanization on energy consumption and carbon dioxide emissions in developing countries, this is taken into consideration by the authorities significantly [8].

Public space has been used for different occasions such as national events, announcing news, etc. in Iran. Green public spaces such as Chaharbagh was created as an important part of Iranian cities. Therefore, the public spaces have been used as a place for social communication, national and religious ceremonies. Among the different types of urban space in ancient cities of Iran, gardens has played an important role regarding their importance in providing urban green spaces, as well as their social and environmental role [13]. Estehman (2004) stated that converting forest and grassland to urban land are directly traceable by satellite photos. Friedman (2011) examined increase in energy consumption and air pollution in New York, and argues for the need to take serious decisions to control them as well as to control the urban development [4]. Green spaces have a vital role in increasing the quality of life in urban areas. These spaces can change the adverse weather, preserve biodiversity and promote human health. In fact, they act as a visual display to avoid the monotony of space and remove the noise [13].

Ahani, et al (2009) also assessed the land use changes and Tangeh-Sorkh watershed in Shiraz by using satellite photos.

### Case Study

Shiraz the capital of Fars province is one of the most populous cities in south of Iran. It is located in 52°34' longitude and 58°28' latitude and it is 1488 m above sea level [4]. It is placed in a semiarid climate with an annual average rainfall of 320 mm [10]. At the 1996 census, the population of the city was 263,243 and it increased in 2011 to 1,460,665 (Table 1). This means it has increase 1.4 % between 1996 and 2011 while the population of Iran shows a 1.25% increase (Table 2).

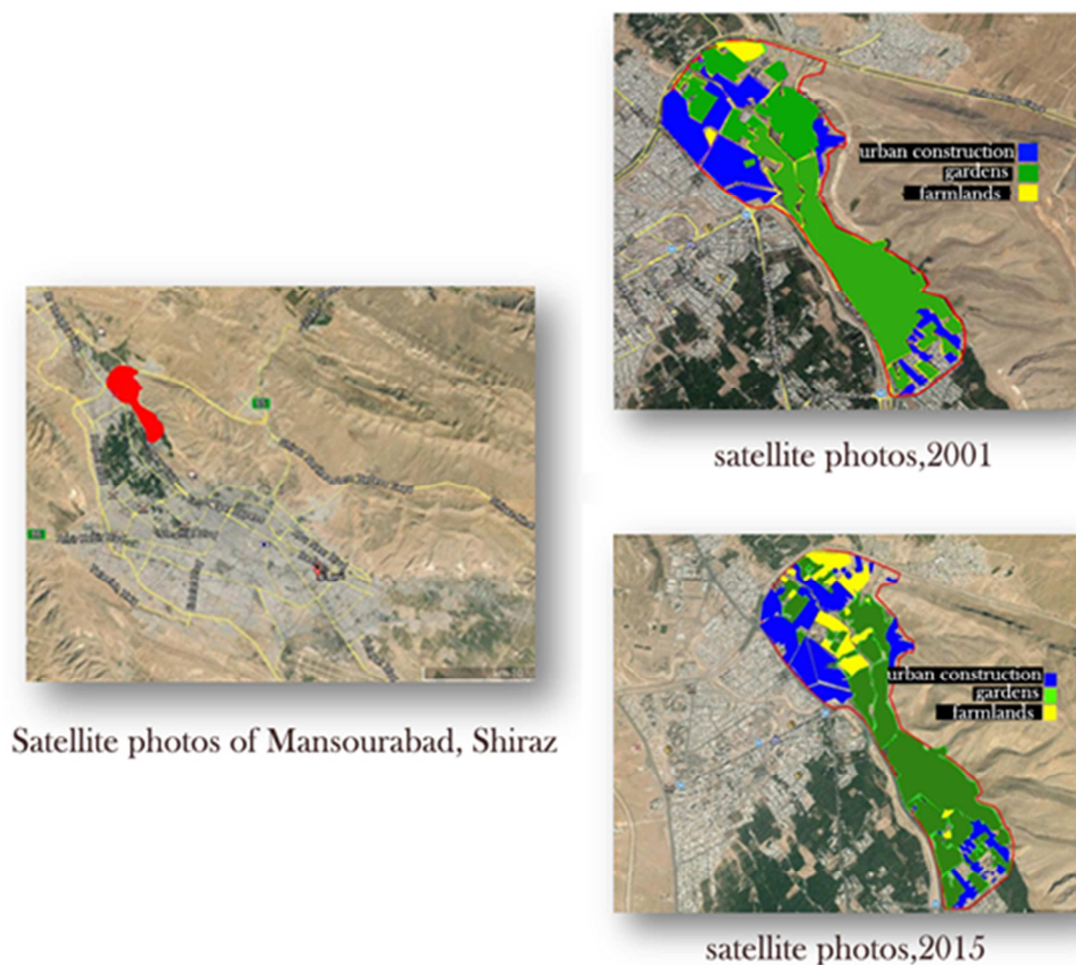
Mansourabad gardens (Fig. 1) are located in region 6 and in the northwest of Shiraz. It is limited by Akbarabad ring from north, Niyayesh Blv. from south, Chamran and Sanaye Blv from west and Mansourabad from east. 15% of population is living in region 6 (equal to 79,083) (Table 3).

**Table 1: Shiraz and Iran population between 1996 and 2011 [20]**

year	1996	2011
Shiraz population	1053025	1460665
Iran population	60055488	75149669

**Table 2: the process of population growth rate between 1996 and 2011 [20]**

year	population	growth rate
1996	1053025	1.59
2006	1227331	2.52
2011	1460665	3.21



Satellite photos of Mansourabad, Shiraz

Fig. 1: Case study location [16]

Table 3: characteristics of region 6 in Shiraz [19]

	Area (h)	percentage	population	percentage	Gross population density
Region 6	2779	15	79083	6	7.28
City	18622	100	1314437	100	6.70

## RESULTS AND DISCUSSION

### a) Urbanization growth and destruction of gardens and farmlands

Urban gardens play a vital role in sustainable urban management. They reduce air pollution by absorbing  $\text{CO}_2$  and release oxygen back into atmosphere to guarantee human health. Gardens also play role in people's comfort and are effective in reducing daily stress. In addition, they provide a variety of vegetables for citizens' consumption. They also can attract tourists and improve economic. Unfortunately, in recent years and due to the rising of land prices to construct buildings, the gardens have dried up and destroyed. The area of gardens in the mentioned region is presented In Table 4 between 2001 and 2015. About 124 hectares of them were destroyed in 2015. This was happen for farmlands too. Farmlands decrease from 38.31 hectares to 13.65 between the years mentioned. It can threaten safety and security of citizens.

In this paper, garden and farm land use changes were examined for Mansourabad region by using satellite photos between 2001 and 2015. The results are shown in Table 4. As was mentioned in Table 1, Shiraz population was increased by growth rate of 1.25 between 1996 and 2011. The effect of urbanization in Shiraz also is obvious in Mansourabad. In 2001, there were about 206 hectares of green gardens in this area; this amount decreases to 81.5 hectares in 2015. The best gardens of Shiraz, the lung of the city, were sacrificed about 124 hectares during this short period due to the rapid urbanization. It also causes to loss 25 hectares of farmlands. Instead urbanization growths fast, enters into the realm of gardens and changes their land use. In 2001, the constructed area was close to

78.63 hectares; we witness a growth rate of 1.53% in 2015 (about 120.29 hectares). In return for rapid urbanization what is lost is the lung of the city, unfortunately.

**Table 4: Estimating land use for Mansourabad in 2001 and 2015**

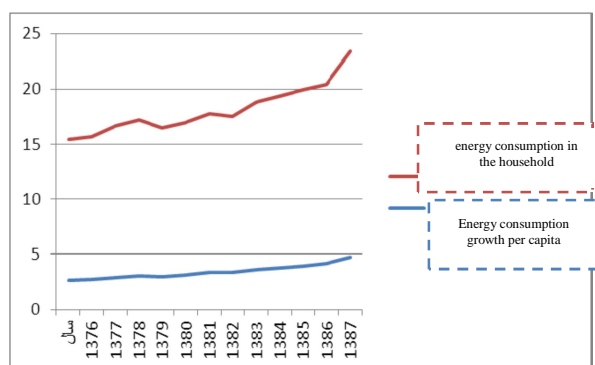
	gardens	land farms	Urban construction
2001	205.97	38.31	78.63
2015	81.5	13.65	120.29

b) An increase in emissions and reduce the production of oxygen

According to information obtained through Great Electrical Distribution Company, the power consumption of each Household per capita is 290 KWH which is three times more than global consumption (See Table 5). In Iran, the gas consumption household per capita is also 1700 m<sup>3</sup>, which is four times more than world consumption (Fig. 2). As a result, every 1 KWH of electricity produces 15 g and every 1 m<sup>3</sup> of gas produces 1800 g of CO<sub>2</sub>. That means each household produces 43.5 Kg environmental pollution with consuming 1 KWH of electricity and produces 3060 kg environmental pollution with consuming 1 m<sup>3</sup> of gas.

**Table 5: The per capita consumption of energy in the household sector [3]**

year	1994	1995	1996	1997	1998	1999
Per capita consumption	2.65	2.72	2.93	3.09	3	3.15
Household's consumption	12.80	12.97	13.72	14.16	13.47	13.84
year	2000	2001	2002	2003	2004	2005
Per capita consumption	3.35	3.35	3.64	3.81	3.98	4.15
Household's consumption	14.46	14.20	15.16	15.54	15.93	16.26



**Fig. 2: the comparison of energy consumption by each household according to growth rate of energy per capita [1]**

c) Comparison of produced oxygen and absorbed CO<sub>2</sub> by gardens with emission of environment

Breathing space of each person is 17-23 m<sup>2</sup> around him, a space in which individuals work, watch TV, sleep, etc. Trees play a vital role in reducing air pollution [15]. Oxygen produced by trees is different in cities. It is due to the number of healthy trees and their growth and also the diameter of the tree trunk. The amount of oxygen (produced by urban gardens) people need is based on the population and density. Cities with a high population density tend to consume the oxygen produced by urban gardens [5]. A healthy adult tree can produce about 120 kg of oxygen annually. On the other hand, each person consumed 175 kg of oxygen each year. Each tree can absorb near 454 g of pollution annually [18]. One Hectares of a forest is able to absorb 10 tons of CO<sub>2</sub> yearly.

Today, there are only about 81.5 hectares of garden in the region under study. According to a 124.5 hectare decrease in gardens, the growth in energy consumption per capita and an increase in the pollution are directly under the influence of rapid urbanization. Therefore, it seems necessary to use renewable energy due to the fossil energy poverty and environmental conditions of Mansourabad region.

## CONCLUSION

Shiraz has faced a rapid urbanization and migrations in recent years. It has also an effect on the region under study. In 2001, the area for construction was about 79 hectares while it increases to 121 hectares in 2015. One reason can be an increase in the land price. About 124 hectares of gardens destroyed to construct buildings. It leaves an irreparable environmental damage. Land use changes occur as the result of urban growth in Shiraz and in

Mansourabad; and the consequence was a serious decline in agricultural and horticultural crops and creating serious problems for citizens. In Iran, energy consumption is three times more than global standard in residential sector. It results in increasing environmental pollution, environmental degradation and health risks.

Researches indicate that rapid and unplanned urban growth threatens the environment and citizens' security and health in Iran. It is hoped that by changing policies and planning in the future, more sustainable and habitable cities create. In this regard, it is expected to improve the lives of citizens, the green spaces preserve, their area increase throughout the city, and then using programs to learn conservation of energy in society. Finally, because of drought and water shortage in recent years, some solutions are proposed to provide water such as rainwater harvesting, and store water in agricultural sector in order to prevent destruction of gardens and crops. It can help to prevent migration from rural area to urban area and control the population in the cities.

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