

A Study on the Twenty-year Evolution of Green Cover in Deh-e Punak Neighborhood (2000-2020)

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ABSTRACT

The increasing development of the cities and the rise in their built spaces have led to some threats to the urban green cover; The green cover has cultural, historical, and social identities. In fact, urban green covers are one of the most important leisure and tourism platforms in the cities which have been neglected in the development of contemporary cities. Urban green cover is correlated with numerous components such as socio-demographic discussions, urban laws, ecological discussions, etc., and also affects some. In the present study, the Deh-e Punak neighborhood is investigated as a case study from 2000 to 2020. It is a comprehensive case that includes all evolutionary processes of the urban green cover, because it is historically, religiously, and naturally valuable and at the same time, has experienced different types of land-use change processes from micro- to macro-scales. It is a documentary study conducted through an investigation of the case study. In the present study, through comprehensive qualitative and software investigations, the green cover structures in the Deh-e Punak neighborhood are analyzed. Moreover, in addition to the factors affecting the Deh-e Punak's green cover, their importance and necessity, their historical-religious identity, laws, and regulations affecting the green cover, and the socio-ecological effects of green cover are studied and some solutions are provided to improve the Deh-e Punak's green cover considering all these components. The results indicate that Deh-e Punak's green cover directly affects the quality of life, and urban tourism is the most important factor that plays a role in the improvement and evolution of the urban green cover of the Deh-e Punak.

Keywords: Deh-e Punak, Urban Green Cover, Quality of Life, Documentary Study, Tourism.

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1. INTRODUCTION

Urban green cover is a part of human environmental-social identity in the heart of modern urban life, and connects people and nature in cities. This is important because, in today's modern society, no city can function properly without creating recreational spaces. Therefore, urban green cover is a fully functional structure to meet the socio-environmental needs of society. Urban green cover is considered a place for gathering and creating vitality (Rahimi and Rezaei 2018), which is actually a platform for urban tourism. Of course, it should be stated that green cover also has different categories, including urban gardens (private spaces), urban parks and gardens (public spaces), etc., each of which is a part of the urban green mosaic. A city is a human-dominated and modified environment created by urbanization processes (Zeng, Xie, and Liu 2019; Dinda, Chatterjee, and Ghosh 2021). The urban landscape is actually an independent object that is perceived by humans, in fact, the platform of the urban landscape is geometry, space, body, and in other words, physical form (Mansouri 2009; Sayafzadeh 2011). The urban landscape is an ever-changing phenomenon that is formed under the influence of different social and cultural conditions (Khakzand and Teimuri 2014).

This research has been carried out with the assumption that at first, each of the factors affecting the urban green cover will be identified, and then these factors will be recognized. This results in achieving an interactive relationship between effective-affected trends regarding the green cover. By acquiring accurate knowledge of it, a fundamental step can be

taken to increase the quality of urban life. Therefore, the current research seeks to find the correct answer to the following question:

- On what factors has the green cover of the Deh-e Punak been effective during the 2000-2020 period?

This important question requires the investigation of the interactive relationship between the environment and society with urban green cover. In short, this research seeks to improve the quality of urban life through the intervention in urban green cover and how improving the natural texture of the city improves the lives of citizens. This research is based on the following hypothesis:

- An accurate understanding of the relationship between urban green cover and the urban environment and society is to what extent effective in improving the optimality and satisfaction of the urban society.

The necessary information for this hypothesis has been obtained based on the analysis of Deh-e Punak as a comprehensive sample that has experienced various improvement and destruction trends of urban green cover over time. To answer the question, the following exclusive objective will be emphasized:

- Identifying the problems and providing solutions to improve the green cover of Deh-e Punak.

2. RESEARCH BACKGROUND

Every research has a background that is basic for future research, and this research was no exception. Many studies have been conducted to investigate urban green cover, among which several studies that have dealt with this issue are shown in Table (1).

Table 1. Research Background

Title	Year	Author(s)	Research Approach
Reduced urban green cover and daytime cooling capacity during the 2012–2016 California drought	2021	Allen, Roberts, and Mc Fadden	Investigating the relationship between urban green cover and drought
Relative importance of quantitative and qualitative aspects of urban green spaces in promoting health	2021	Zhang, Ten, and Richards	Investigating the relationship between urban green cover and the quality and health of urban community life
Quantifying the local cooling effects of urban green spaces: Evidence from Bengaluru, India	2021	Shah, Garg, and Mishra	The effect of urban green cover on air conditioning and temperature reduction
Green spaces, quality of life, and citizen perception in European cities	2021	Giannico et al.	The relationship between urban green cover and quality of life in European cities
Monitoring and determination of urban green cover threshold based on Landsat data, case study: Districts 1 and 6 of Shiraz city	1399	Abdolazimi and Roosta	Changing the use of urban green cover over time can create various environmental risks for the citizens.
Investigating the role of urban green cover on the trend of surface temperature changes in urban environments, case study: Sari City	1399	Abdi, Kamyabi, and Zand Moghadam	Investigating the relationship between urban green cover and ambient temperature based on the survey of Sari's neighborhoods

Reviewing the conducted research, it can be stated that different approaches have been taken into consideration to investigate the factors affecting urban green cover. Among these approaches, we can mention issues such as quality of life, water scarcity, ecology, and social issues, which have been analyzed with a one-dimensional view without considering other components. However, this research has analyzed and investigated a set of approaches in Deh-e Punak with a comprehensive perspective. Deh-e Punak is one of the few urban green covers that has experienced various urban evolution trends over time, which can be considered a comprehensive sample. In Deh-e Punak, you can see issues such as social problems, laws, ecological issues, land ownership, change in land use on the micro- and macro-scales, etc., and each of these components, in turn, have a significant impact on the green cover of Deh-e Punak.

3. THEORETICAL FOUNDATIONS

In this section, the impact of effective and affected factors regarding the urban green cover has been investigated, and protective guidelines have also been investigated.

3.1. Effective and Affected Factors for Urban Green Cover

Green cover is like a link connecting the built and natural spaces in cities. Urban green spaces are always mentioned as a place to gathering of people and creating vitality (Rahimi and Rezaei 2017). Urban green cover is an effective element in the formation of the social foundations of cities, because nature is a part of human existence, and communicating with it brings human comfort. With the increase of the population in cities and the increase of built surfaces, the need for urban green cover is grabbing more attention. In fact, the correct use of urban green cover can increase the quality of the social life of citizens (Kabisch 2015; Hillsdon 2006; Zhang 2015).

Coexistence with nature is necessary for sustainable human living. If this coexistence is endangered and damaged, human life will face disruptions in various ways. Since urban green cover is a clear link between humans and nature, with the expansion of urbanization and the increase of abnormal urban behaviors, especially crimes, the issue of environmental prevention through environmental planning and design has become very important (Ghorbani Golzari, Mokhtari Farivar, and Ghorbanian Tabrizi 2015). Parks and urban green cover, as the most important arenas and public spaces of contemporary cities, play a very important role in meeting various social, cultural, and psychological needs of citizens, one of the most important of which is the sense of social security (Asadi Fard 2014). One of the ways to meet this need is the expansion of urban tourism

and subsequently, the expansion of urban green cover.

3.2. Correlation between Urban Green Cover and Quality of Life

According to Diener's definition of the psychological dimension of quality of life (Diener, Helliwel and Kahnemon 2010), it is a feeling of happiness, when people give a positive evaluation of their lives. Many researchers have evaluated and described the quality of life. These evaluations have been investigated from two emotional and cognitive dimensions. The diverse and continuous presence of a set of natural elements in sensory and activity interactions improves the quality of human life in urban society. Nature and quality of life are interwoven indicators and they indicate that there is always a relationship with nature in the essence of human existence. Nature is a conceptual element for humans, which, in thousands of years of human life, is always associated in his mind as a home for comfort. Today, the concept of cities without effective green space in its various forms is unimaginable. The most important effects of green spaces in cities are their environmental functions, which have made cities meaningful as the environment of human society (Modir and Divandari 2016; Daeipour 2014). The most important investment that local authorities and municipalities can make for the well-being of citizens is the development of urban green space, which itself increases the quality of life of citizens. (Salbitano et al. 2016).

3.3. Correlation between Urban Green Cover and Urban Tourism

The tourism industry in the 21st century is one of the main pillars of the national economy of any developing country (Alafteh and Savadi 2015). On the one hand, green spaces have improved the environmental condition of cities, and on the other hand, they provide suitable conditions for citizens to spend their free time. The most important effects of green space in small cities are controlling the temperature, increasing the relative humidity, and developing leisure spaces (Poramraei, Akbari, and Saberi 2014). Although ecotourism is considered a clear development approach to tourism and is widely pursued by governments and businesses as a marketing strategy (Joppe and Dodds 2000), ecosystem services are vital for humans in urban areas. However, urban development poses a great risk to the ability of ecosystems to provide these services (Niemela et al. 2010). One of the most important urban ecosystem services that should be specially considered is tourism, an identity that creates many benefits by increasing the presence of people in urban recreation spaces. Among these benefits, the preservation and expansion of urban green cover can be mentioned.

3.4. Urban Green Space Protection and Ownership Laws

Over time, protection concepts have evolved from the mere maintenance of single historical buildings to the concept of protecting complexes, textures, historical cities, historical urban landscapes, and cultural landscapes (Pour Bahadur and Bahramjardi 2017). Urban green spaces can be divided into two private

and public sectors in terms of ownership. Public lands (such as parks) are less prone to destruction because they are managed by public institutions, but the changes in these green lands are controlled by certain rules. All countries have specific rules and guidelines for public and private green cover. Some of these rules and guidelines are discussed in Table (2).

Table 2. Laws for the Protection of Gardens and Agricultural Lands

Approving Country or Organization	Guideline's Title	Explanation
	Municipality law enacted in 1955	The municipality is obliged to create public gardens.
	Urban Renovation and Development Law approved in 1969	Building, improving, developing, preserving, and maintaining existing public parks and gardens is one of the basic duties of municipalities, and municipalities are required to prepare basic plans and comprehensive maps for the implementation of the said duties.
Iran	The legal bill for the preservation and expansion of green spaces in cities approved in 1981	According to Article 1 of this law, to maintain and expand the green space and prevent the cutting of trees, the cutting of any type of tree on the roads, highways and parks, gardens, and places that are known as gardens and within the legal limits and boundaries of cities is prohibited without the permission of the municipality.
	The Law on Conservation of the Use of Agricultural Lands and Gardens approved in 1995	According to Article 1 of this law, to preserve the use of agricultural lands and gardens and continue their productivity, from the date of approval of this law, it is prohibited to change the use of agricultural lands and gardens outside the legal boundaries of cities and towns, except in necessary cases (multiple notes)
Food and Agriculture Organization of the United Nations (Salbitano et al. 2016)	'Guidelines on Urban and Peri-Urban Forestry' (2016)	All cities have a similar physical texture, which includes "grey" infrastructure (e.g., residential and industrial buildings, roads, utilities, and parking lots), water infrastructure (e.g., rivers, lakes, ponds, and water channels), and green infrastructure (e.g., trees, shrubs and grass in parks, forests, gardens, and streets).
The World Health Organization (Europe 2017)	Summary of effective measures on urban green cover (2017)	Urbanization leads to a relative increase in the population living in cities. In Europe, it is expected that by 2020, about three-quarters of people will live in urban environments. Urban life limits access to nature and can increase exposure to some environmental hazards such as air and noise pollution.
Germany (Jessel et al. 2018)	Green cover in cities (2018)	Urban green spaces are the main elements of the cities and an important part of building culture. They form large, medium, and small cities and towns in developing regions and account for many functions in sustainable urban life.
The Organization for Economic Co-operation and Development (Kocak 2020)	Expansion of green cover (2019)	The global movement toward sustainable development has been successfully renewed in the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change. At the same time, people around the world are concerned about lagging growth, inequality, jobs, and globalization.

Based on the approach of international organizations and developing countries, it can be stated that the relationship between the quality of life and urban green cover has been considered in the most basic sense, and then special attention has been paid to the interaction of built spaces, water, and green cover which is itself the reason for paying attention to the relationship between all environmental elements in the expansion of urban green cover (Salbitano et al. 2016). Also, with the increase in the earth's population, the relationship between the population ratio and urban green cover has been considered by the World Health Organization (Europ 2017). Principles such as the interaction of institutions and society in improving urban green cover and the use of pre-planned solutions, which lead to sustainable development, have been among the main approaches in 2018 and 2019 (Jessel et al. 2018; Kocak 2019). Also, according to the Iranian laws, it can be stated that the main approach is to preserve the existing urban green cover and expand them. In urban ecology, the city is considered an ecosystem, and natural resources are considered the bases of the city. In this regard, the natural platform of cities is always a priority (Irani Behbahani, Zandi, and Abrokar 2002). Strict implementation of the approach of preserving existing resources and expanding them can also be a suitable solution to improve urban green cover, provided that this approach is accompanied by careful planning and attention to all components. The change process of urban green cover has been examined in many studies. In the present study, after examining the research done in this field, according to the context of the subject, a framework of the change process has been developed, which is shown in figure (1). In this framework, which is based on the changes

in the size of the sections, there are two forms of the change process of urban green cover. One is about integrated and large lands with an area of more than 5,000 square meters with integrated ownership, and the second is the case of small plots with several owners, each of which has gone through different changes depending on their characteristics. With the support of the owner of the garden, the government, and the relevant organizations, urban green spaces either remain in the same integrated form as they are, or are divided into smaller pieces due to factors such as heredity, etc. Due to the division of each land into smaller pieces, the municipality and subordinate organizations use part of the garden space to create an access path to each smaller piece, which is actually added to the network of urban communication routes. Each piece, whether big or small, can be converted to other uses such as residential, educational, commercial, recreational (garden hall, garden, etc.), and office, or remain as a garden, based on the location and special features of each site, as some gardens have been preserved in their original state, but it has decreased a lot with the expansion of cities and the increase in land prices (Abdolazimi and Roosta 2019; Rafiipour, Dadashpour, and Taqvaei 2016; Nakhaei, Ansari, and Zandieh 2015; Nazmfar and Kamelifar 2016; Janadaleh 2016; Ahadinejad et al. 2014; Ebrahimzadeh and Hatami 2014; Khan Mohammadi 2014; Rahnama and Roosta 2013; Tabari et al. 2013; Sadr Mousavi and Rahimi 2012; Salehifard et al. 2010; Pourahmad, Akbarpour Saraskanroud, and Sotoudeh 2009; Zangiabadi and Rakhshani Nasab 2008; Ebrahimzadeh and Ebadi Jokani 2008; Parivar, Yavari, and Sotoudeh 2008; Salehifard and Alizadeh 2008).

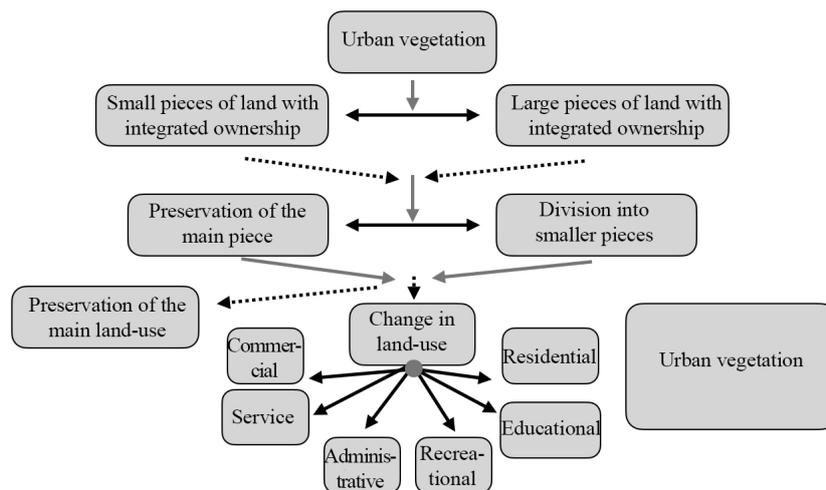


Fig. 1. The Effective and Affected Factors Regarding Deh-e Punak's Green Cover

3.5. Ecological Evolutions

Based on the ecological data of the city of Tehran (Fig. 2), it can be stated that the temperature of

Deh-e Punak is also increasing relative to the average temperature of Tehran, which requires the expansion of green cover to adjust the ambient temperature of

the area. Also, although the water resources needed for the green cover of Deh-e Punak are supplied from the Farahzad River and the water resources of Tehran city, due to the variable amount of rainfall and the increase in the temperature of the city, which

also increases the evaporation of surface water, the amount of water resources is not constant and may decrease in the coming years. Based on these cases, solutions for optimal use of water resources are very important.

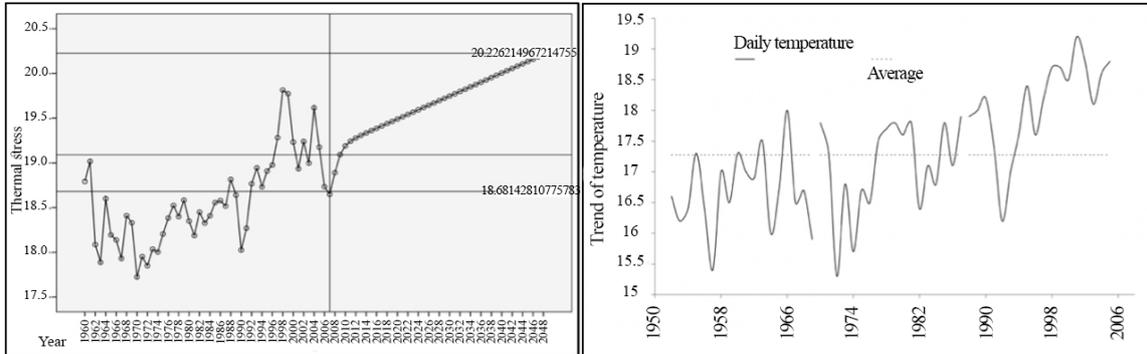


Fig. 2. Trend of Temperature and Thermal Stress in Tehran
(Mohraz et al. 2016)

Table 3. Trend of Rainfalls in Tehran

Year	1390	1391	1392	1393	1394	1398	1399
Rainfall per mm	356	239.7	157.6	115.4	370	295	310

4. METHODOLOGY

The present study is an applied qualitative research conducted using the documentary and case studies. Finally, the areas investigated in this research were compared. The geographical area under study is the Deh-e Punak neighborhood of Tehran. Deh-e Punak is a comprehensive sample of urban green cover evolutions, where there are various urban green cover evolution trends. In this regard, first, the evolutionary process of the green cover in this area and its various effective elements have been investigated. Finally, the inferential relationship of different components with urban green cover has been explored. The required data has been collected by using the library study, referring to statistical sources along with field observations, and analyzing the green cover maps of Deh-e Punak with the help of Rhino software and the Grasshopper plugin. In the software analysis, first, all the maps of Deh-e Punak from 2000 to 2020 were extracted with the help of Google Maps software, and then, with the help of Rhino software and the Grasshopper plugin, the percentage of green cover was determined in four green cover categories (pasture, meadow, sparse, and forest). The percentage of each type of green cover in the studied period has been obtained. Also, the effectiveness of various factors in reducing or increasing the green cover of Deh-e Punak was examined, and finally, the obtained data have been analyzed.

5. INTRODUCTION OF CASE STUDY

The studied lands are located northeast of Tehran, on the western edge of Farahzad valley, as shown in figure (3). They are limited by Ashrafi Esfahani highway from the west and Hashemi Rafsanjani highway and Hamila boulevard from the north and south, respectively. In terms of the divisions of the urban area, Deh-e Punak is located in Tehran's municipal district No.2. A new residential area is created on the North of Hamila Boulevard, adjacent to Ashrafi Esfahani Highway and both sides of Poonak Boulevard. It can be said that the area of the gardens is currently much smaller than the residential area.

5.1. Historical background of Case Study

Deh-e Punak's gardens have long been a place of recreation and pilgrimage for the people of Tehran. The pilgrimage aspect of this complex is due to the tombs of Imamzadeh Ain-Ali and Zain-Ali being present in this area. The history of the construction of the current building of these two Imamzadehs' tombs dates back to the era of Fathali Shah Qajar. During the era of Naser al-Din Shah, a porch was added on the east side of the mausoleum and a small mosque on the west side of it. It was restored in 1959 by the Farman Farmayan family. According to historical texts, with the modification and improvement of the conditions of Imamzadeh and its garden during the time of Fethali Shah in 1337 A.H, the prosperity of

Deh-e Punak's gardens was begun. The name Deh-e Punak was recorded for the first time on the map developed by August Karl Kriz in 1874 (Table 4), and based on the data and information in existing maps, it was a rest area and recreation place outside the walls of Tehran. Deh-e Punak and Farahzad valley river are mentioned beside the villages and gardens in this area in the map developed by Alexander Friedrich Stall in 1908.

In the late Pahlavi I period and also in the Pahlavi II period, and the years 1952, 1957, 1958, and 1969, with the expansion of the city of Tehran, the Deh-e Punak area has come close to the city of Tehran (Shirazian 2015). The area itself has expanded and the number of its gardens has increased according to the available maps (Table 5). After the Islamic revolution, in 1980, many changes and repairs were made to Imamzadehs Ain-Ali and Zain-Ali, which increased

the attendance of the people of Tehran in this area and the prosperity of the area, however, due to the start of the Iran-Iraq war, this area was neglected for some time. It was placed and the expansion of this area was stopped. But, in 1997, the late Feriedoon Parhizgar reconstructed the Imamzadeh, and in 2001, the new shrine by Abolhasani Meybodi replaced the wooden and meshed four-sided shrine (Jaafari) (Auqaf and Charitable Affairs Organization, Comprehensive Base of Imamzadehs and Beqai Mutbarkeh of Islamic Iran). These measures have caused people to pay attention to this area again. In recent years, many surrounding gardens have been destroyed due to reasons such as the increase in land prices and the issuance of some permits. in the following, the trend of garden destruction during the last 20 years will be mentioned.

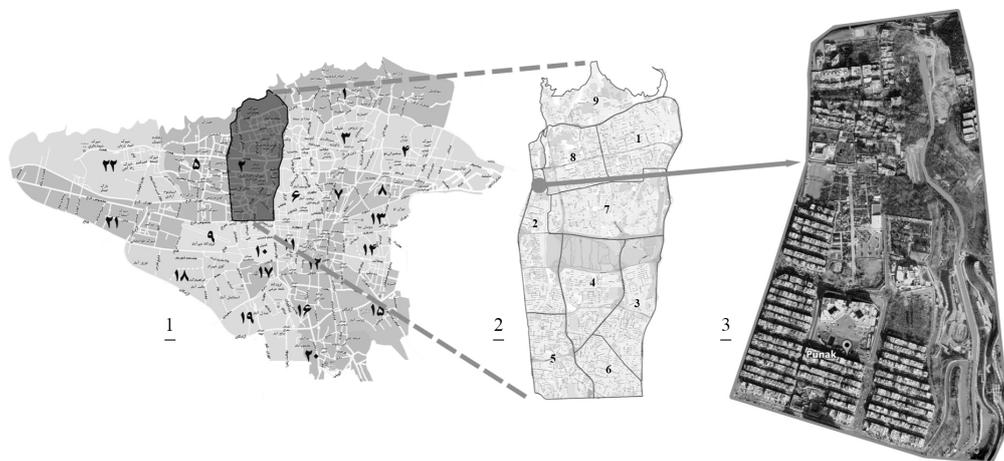


Fig. 3. The Location of the Studied Area and the Photographed Points
(1) Tehran City, (2) Tehran's municipal district No.2, (3) Deh-e Punak and Farahzad valley river

Table 4. Deh-e Punak Maps in Qajar and Pahlavi Eras

Maps Developed in Pahlavi Era		Maps Developed in Qajar Era	
			
1969	1959	1889	1875

Deh-e Punak gardens have experienced many ups and downs over time, which is presented in table (3) as a

part of this evolutionary process.

Table 5. Historical Evolutions of Deh-e Punak's Gardens

Year	Explanation
1875	Mentioning the name of Deh-e Punak on the map for the first time by August Kriz
1887	Mentioning the name Deh-e Punak once again by Alexander Friedrich as a recreational space outside old Tehran
1959	Renovation of the Imamzadeh building during Fathali Shah and changing Deh-e Punak gardens into a recreational area outside of Tehran
1952-1980	Expansion of Deh-e Punak's gardens area
1980	The plan to improve Imamzadehs and Baqai Mutabarikah and their grounds, which led to the prosperity of Imamzadehs and Deh-e Punak's gardens.
1980-1997	Neglecting the gardens of Deh-e Punak and destruction of them
2000	The expansion of Tehran City and the annexation of Deh-e Punak's gardens to the city
2001	Construction of the new shrine of Imamzadeh drew attention to the gardens of Imamzadeh and its surroundings in Deh-e Punak
2000-2020	Expansion of the process of gardens destruction; Carrying out extensive constructions such as residential complexes and universities; Turning gardens into wedding halls; Demolition of a part of Imamzadeh garden and construction of traditional medicine hospital; Demolition of gardens along the river valley to create a park; The start of the construction of phase 3 of Nahj al-Balagha Park; Decreasing green cover in Deh-e Punak (dense type trees)

6. DEH-E PUNAK'S EVOLUTION TREND

In this section, the examination of Deh-e Punak's evolution trend from the historical, social, and environmental aspects is dealt with.

6.1. Evolution of Green Cover and Land-Use Changes during 2000-2020

The changes in the green cover of the studied area

in the period 2000 to 2020 are shown in Figure (4), depicted in the form of spots on satellite images and comparing them to the maps of Tehran city on images in Figure (5). Since in some years, an appropriate map was not available, those years have been excluded. The specified spots are based on four types of green cover (pasture, shrub, sparse trees, and dense trees). The results of green cover changes are listed in Table 3.

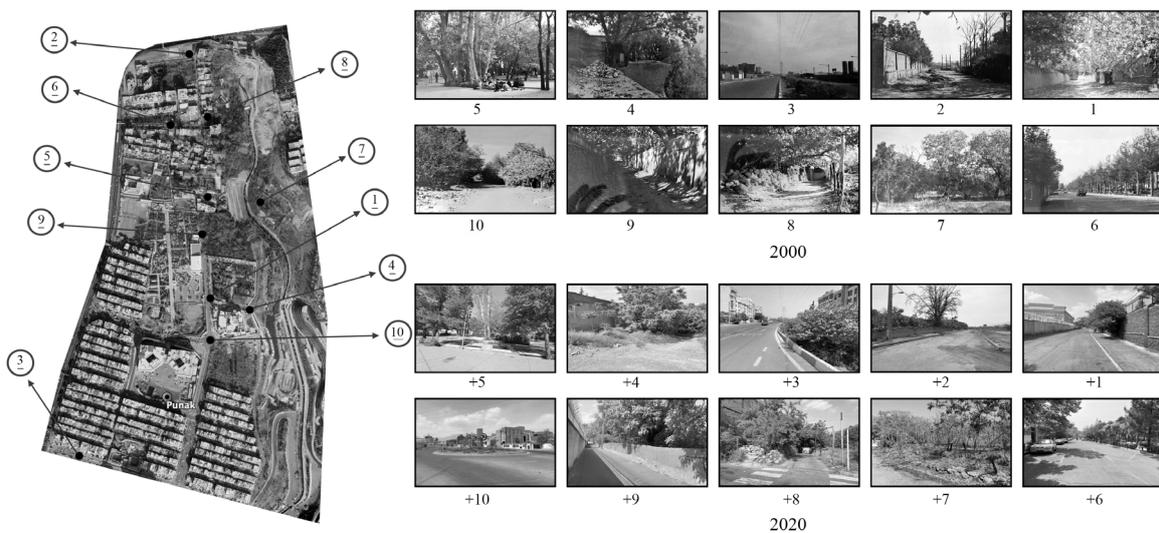


Fig. 4. Images of Evolutions and Their Locations

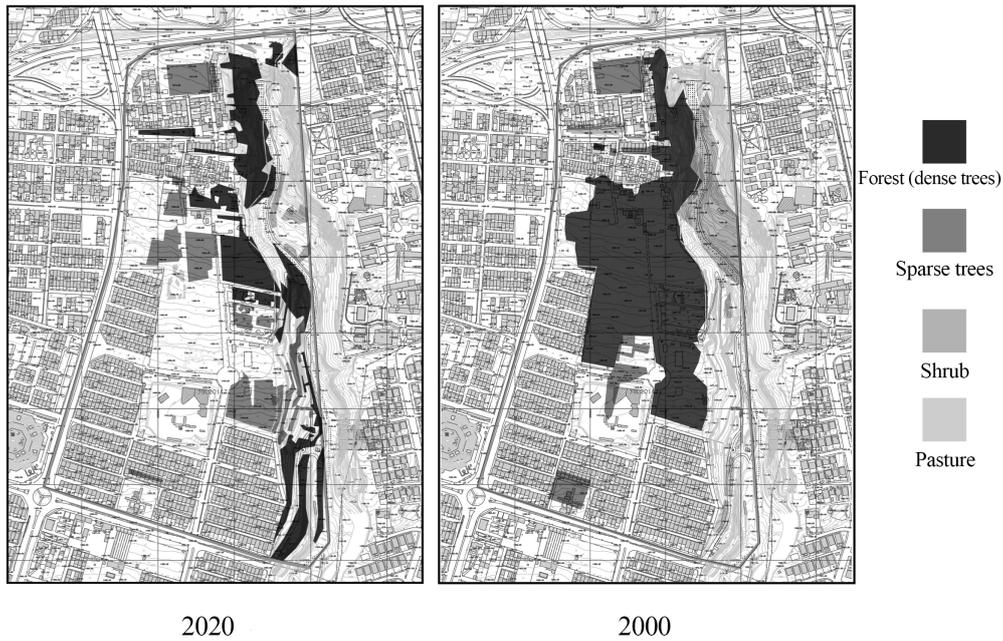


Fig. 5. Changes in Green Cover in the Studied Area in 2000 and 2020

Green cover in the area, in general, has suffered a lot of damage due to excessive construction and the increase in land prices, and as shown in Table (6) and Figure (6), from 2000 to 2020, 14.48 percent of limited green cover has decreased. The major reduction of green cover in the area is due to the construction of residential complexes, wedding halls, traditional medicine clinics, universities, and government-service centers. And, if it continues in

the coming years, will cause a much sharper decrease in the amount of green cover in the studied area. Of course, in some years, the amount of green cover in the studied area has increased, which is due to the evolution of the green space of Nahj al-Balagha Park in the valley lands adjacent to Deh-e Punak. But this increase is very small compared to the rapid destruction of the area.

Table 6. Rate of Changes in the Green Cover (per Percent)

Year	The Total Area of Green Cover	Pasture	Shrub	Sparse Trees	Forest (Dense Trees)
2000	35.27	4.11	2.43	4.12	24.61
2005	27.34	0.01	0.52	5.24	21.57
2006	21.22	0.01	0.02	5.90	15.29
2007	28.03	2.53	3.08	7.35	15.07
2010	26.71	0.73	1.43	7.81	16.74
2011	28.22	0.39	2.26	6.59	18.98
2012	27.62	1.27	3.62	11.35	11.38
2013	28.38	0.67	5.44	12.48	9.79
2014	23.91	0.09	3.51	10.76	9.55
2015	22.83	0.24	4.47	7.08	11.04
2016	26.32	0	10.27	2.30	13.75
2017	22.51	0	5.61	6.12	10.78
2018	21.81	0	6.35	5.53	9.93
2019	20.57	0	0.79	9.44	10.34
2020	20.79	0.24	0.95	7.62	11.98

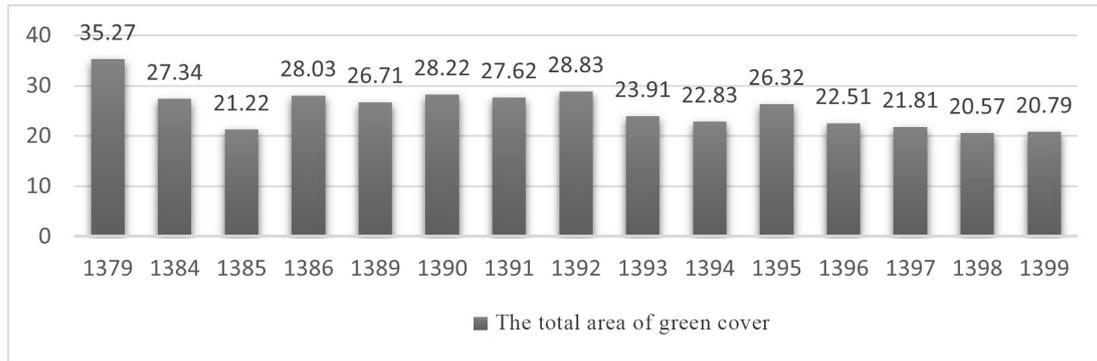


Fig. 6. General Changes in the Green Cover of the Studied Area

The highest rate of green cover reduction can be seen between 2000 to 2005, and in these years, due to the issuance of many permits from competent organizations, many gardens have been converted into residential complexes. Of course, the decrease in the green cover of Deh-e Punak is also due to the lack of proper treatment of the green cover in this area, however, it is worth mentioning that this rate is very limited compared to intentional destruction,

and can be compensated by planting new plants and improving and revitalizing the green cover in the area. The highest increase in green cover can be seen between 2016 and 2017, which is due to the increase in rainfall and attention paid to the construction of the garden halls in this period. Generally, the trend of changes in the green cover of Deh-e Punak can be seen in the table (7).

Table 7. Introducing the Change Process of the Main Zones of the Area under Study

Zone Number	Ownership	The Changes Made	Map
1	Integrated ownership that has been divided over time among different heirs and several government agencies.	Division of the zones and turning them into residential uses, garden halls, villas, and offices.	
2	A large part of this zone is owned by Tehran Municipality, but there are also gardens in this zone that were purchased by Tehran Municipality to expand phase 3 of Nahj al-Balagha Park.	Changing from a garden to a park and public urban green space.	
3	Private property sold to the Islamic Azad University, Central Tehran Branch.	Change of land use from a villa land to a research educational unit.	
4	Private property	Converting from a garden villa to a residential complex.	

6.2. Demographic Evolutions of Deh-e Punak

The urban population is always increasing, and Tehran's urban areas are no exception. District 2 of Tehran city (Deh-e Punak is also located in this area) has a population of 608,814 people according to the last census in 2006, of which 29,000 people live in the Poonak neighborhood, and more than 43% of the population of Poonak neighborhood live in Deh-e Punak. In general, based on the information from the Tehran City Atlas and the National Statistics Portal, District 2 had a growth rate of 5.3% from 1986 to 1996, 4.7% from 1996 to 2006, 2.36% from 2006 to 2011, and 2.36% from 2011 to 2016. Based on the

statistics, Tehran city has had a population growth of 6.6% and from 2016 to 2020, it had a growth rate of 0.75% (ILNA 2021; Student News Agency 2020; IRNA 2020; Amarista 2015). Based on the available data, Deh-e Punak has undergone a slow population growth process, and its population has been rising in all years.

6.3. Social Problems

Based on the obtained data, it can be stated that Tehran's municipal district No.2 and the Deh-e Punak neighborhood have many social problems. Also, with the increase in the population, according to the

surveys conducted in the neighborhoods of Tehran and municipal district No.2, social problems have also increased. Based on available analytical data, in general, for a ten percent increase in the population of different areas of Tehran, the amount of social problems increases by about 23 percent (Jabbari et al. 2018; Mukhtarpour and Manteghi Fasaei 2017;

Hataminejad 2016; Riazi 2016; Parvin and Ghasemi Ardehaei 2014). Accordingly, with the increase in the population of Deh-e Punak from 2000 to 2020, it can be said that social problems have also increased, which requires proper management to reduce social problems.

Table 8. Statistics of Social Problems Rate in Municipal District 2 and Deh-e Punak

Region or Neighborhood	Social Problems	Ranking among Tehran's Districts
Tehran's Municipal District No.2	Number of prostitutes	3
	Car theft	6
	Mugging	8
	The number of beggars	10
	Burglary	10
	The number of the homeless	11
	The number of social issues	11
	The number of criminals	13
	Drug dealers	14
	The number of the addicts	15
Deh-e Punak Neighborhood	Out of 335 neighborhoods in Tehran, it is ranked 7 because of the highest frequency of social issues	

7. DISCUSSION AND CONCLUSION

The green cover of Deh-e Punak has always undergone many changes in different years. These evolutions can be due to changes in the population, ecological factors, laws, and the needs of society. Based on the obtained data, it can be stated that the population of the studied area is increasing, however, due to the demographic forecasts, the growth rate of this population will decrease in the coming years. Accordingly, the green cover of Deh-e Punak should also be increased proportionately, which has not only been realized in a good manner in the years 2000 to 2020 but also the amount of green cover has decreased in some years. The inadequate amount of green cover and population in Deh-e Punak has led to an increase in many social problems. According to the surveys, one of the ways to reduce social problems is to create green and recreational spaces, which is done by expanding urban green cover which subsequently leads to the expansion of urban tourism and the creation of a sense of belonging between residents and the environment.

By examining the laws and guidelines of other countries and international organizations related to urban green cover, it can be concluded that the green cover of Deh-e Punak should be in balance in terms of the population and the number of such spaces, the

amount of water, and built spaces and green cover. Also, special attention should be paid to the optimal use of this green cover to develop urban tourism. Tourism creates a local economy and connects society and green cover. It is important for maintaining and expanding the green cover of Deh-e Punak from two dimensions. First, by linking the livelihood and economy of the local community, the destruction and change of land use are prevented and it creates a sense of belonging in the local community. Second, due to the urban community's need for recreational spaces, especially the green cover of Deh-e Punak, which has a historical-cultural identity for the people of Tehran, and by creating an objective and subjective view for the audience, it expands tourism, and because of that, it leads to the expansion of the green cover in Deh-e Punak.

Ecological issues such as the increase in temperature and the amount of rainfall should also be taken into consideration because based on the available data, the temperature of Tehran city has been continuously increasing every year and the amount of rainfall has increased in 2019 and 2020 compared to the previous few years, but not at a constant rate. Therefore, two important issues should be taken into consideration. Firstly, special attention should be paid to the expansion of green cover to prevent the increase in environmental temperature and to reduce it, like

the developed countries which pay special attention to this issue in their protective guidelines. Second, attention should be paid to water resources because the amount of rainfall was not constant and may decrease in the coming years. Accordingly, attention should be paid to methods of water-saving to create and expand sustainable green cover in Deh-e Punak. With the investigations carried out, it is possible to reach a network of relationships in which each component has an impact on another, and is itself the

inference of other components. Based on the analysis of various components of urban green cover, it can be stated that these components are very similar to the components of quality of life and in fact, urban green cover improves the quality of life. In this regard, based on the investigated components, regarding their impact and the extent they are impacted, the overall structure has been shown in Figure (7) to improve the conditions of the green cover in Deh-e Punak.

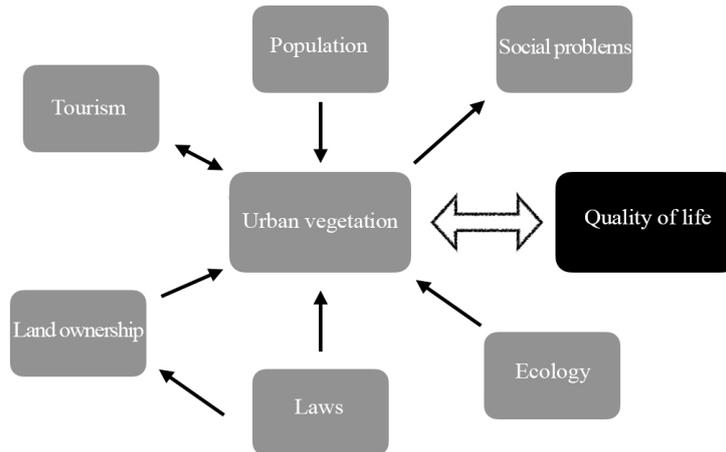


Fig. 7. Process of Changes in Urban Green Cover

Based on the structure of the general relationships of Deh-e Punak factors, it can be said that the green cover of Deh-e Punak is effective in a series of factors and, in other factors as an intermediary. Therefore, the green cover of Deh-e Punak is affected by factors such as laws, land ownership, ecology, and population, and it has a two-sided influence on factors such as tourism. Also, it only affects the factor of social problems and is not affected by it, in such a way that the population affects the green cover of Deh-e Punak and the green cover affects the social problems as a controlling joint. Finally, all these back and forth of various factors lead to the improvement or lack of improvement of the green cover of Deh-e Punak, which is directly related to the increase or decrease of the quality of life in this area. The following are the main solutions to improve the green cover of Deh-e Punak:

- According to the law enacted in 1954, the municipality should expand the public green cover of Deh-e Punak, which will improve the quality of life and reduce social problems in Deh-e Punak.
- Based on the laws approved in 1969, 1981, and 1995, the destruction of Deh-e Punak's gardens by their owners should be prevented and special attention should be paid to the preservation and expansion of gardens.
- According to the international guidelines and the laws of developed countries of the world, urban green cover improves the quality of life, which is

done by mutual interaction between gray covers, blue infrastructure, and urban green cover. This interaction is disappearing in Deh-e Punak due to the expansion of construction and the change of use of gardens in recent years, which requires consistent planning to improve the conditions.

- One of the main issues of Deh-e Punak is the existence of gardens with private ownership. Some of these gardens have been converted into educational centers, residential, and administrative spaces in recent years, and this is also the most important reason for the reduction of green cover in 2006, 2019, and 2020. This process of destruction is due to issues such as the increase in land prices and the economic needs of the local community. One of the ways to meet these economic needs is the development of urban tourism in Deh-e Punak, which creates a constructive interaction between residents, users, and limited green cover.
- The increase in temperature and the variable rate of rainfall in Deh-e Punak is one of the main problems of the green cover of Deh-e Punak. In this regard, special attention should be paid to ways to reduce water consumption and reuse water resources. Also, due to the increase in the temperature of Deh-e Punak, which also increases the environmental temperature and the possibility of water resources shortage, special attention should be paid to planting plants that require less water and provide better shade.
- The increase or decrease of the population is always

effective on the green cover level. In the area of Deh-e Punak, although the population has increased, the green cover has not increased proportionally. However, based on demographic analysis, the growth rate of the limited population is decreasing in the coming years, as a result, by properly controlling the existing green resources and increasing these resources, it is possible to plan carefully to meet the needs of the society for green cover.

- Green cover is always one of the factors affecting social problems. In this regard, the amount of green cover should be in correct proportion with the population and as a result, social problems. According to the analysis of data obtained, a ten percent increase in population causes a twenty-three percent increase in social problems. As a result, the urban spaces of Deh-e Punak need green cover to the same extent, which is a platform for recreation and relaxation of the society.

- The expansion of green cover also affects the quality of life, based on the factors that affect it. As in the international guidelines, the relationship between quality of life and green cover is clearly stated. Deh-e Punak also needs an increase in the quality of life for its citizens. Therefore, special attention should be paid to the improvement, maintenance, and expansion of these spaces. One of the ways to improve these

urban tourism conditions is to increase people's participation.

8. SUGGESTIONS AND SOLUTIONS

Due to their connection with the landscape and cultural-historical identities of Tehran, Deh-e Punak Gardens are highly valued by the people of the city. The green cover of Deh-e Punak, as the historical-cultural identity of Tehran, has undergone many changes in the course of the city's development and evolution, but these changes have also caused the destruction of the green cover in this area; A destruction that can be improved with proper and optimal planning. This can be comprehensively covered with programs that lead to an increase in the sense of belonging of residents to urban green spaces. By increasing people's participation and the sense of civic responsibility of the people toward the preservation of gardens and urban green spaces, it is possible to maintain and expand these spaces in the city. In general, if the local community, competent authorities, economic needs, laws, and environmental values are properly considered in their place (according to Fig. 8) and are in constructive interaction, a constructive effort can be made to improve the urban green cover.

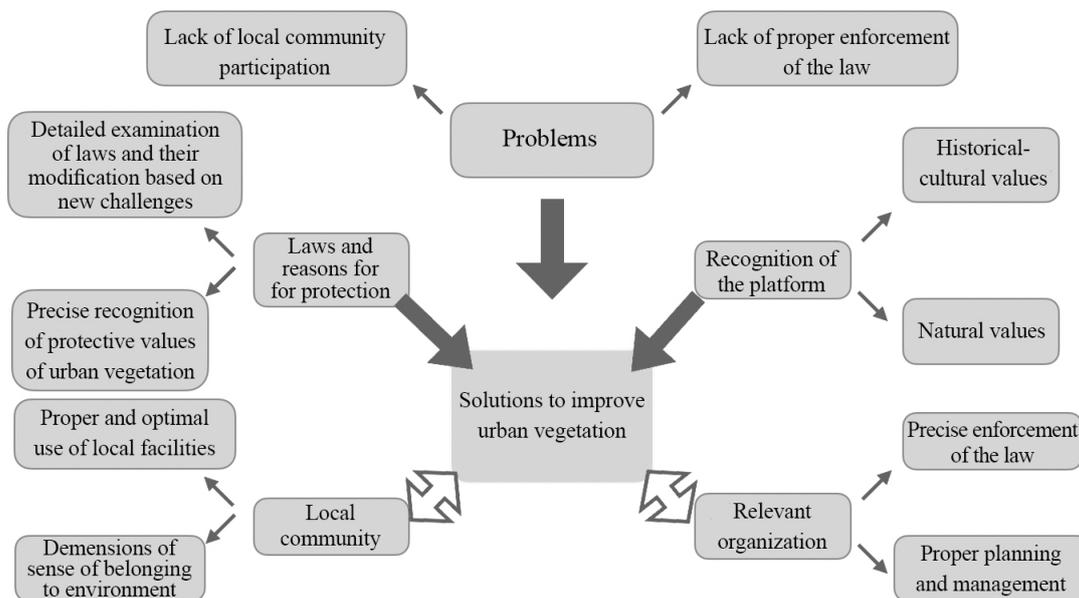


Fig. 8. The Cycle of Relationships Affecting Urban Green Cover

9. LIMITATIONS AND FURTHER RESEARCH

Every research has limitations and is also a base for further research, and the present research was also no exception. One of the limitations of this research is the lack of access to maps with suitable details for

analysis in the years 2001, 2002, 2003, 2004, 2008, and 2009, which has made it impossible to show a continuous chain of green cover changes in the analyzed period. Also, one of the other limitations is that the rainfall data was only available for the last 10 years.

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