

**A New Approach to the Iranian Urban Planning, Using
Neo-Traditional Development**

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by

Houshmand Ebrahimpour Masoumi

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Doctoral Committee

**Supervisor: Prof. Dip. -Ing. Christa Reicher
TU Dortmund**

**Supervisor: Prof. Dr. -Ing. Michael Wegener
TU Dortmund**

**Examiner: Dr. -Ing. Mehdi Vazifedoost
TU Dortmund**

Date of Defense: 20th December 2011

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Houshmand Ebrahimpour Masoumi

Statement of Authenticity of Material

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Houshmand Ebrahimpour Masoumi

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List of Abbreviations

BCD	Beirut Central District
BRT	Bus Rapid Transit
CBD	Central Business District
CNU	Congress for the New Urbanism
CSD	Conventional Suburban Development
DPZ	Duany Plater-Zyberk & Company
DXF	Drawing Exchange Format
EIA	Environmental Impact Assessment
FAR	Floor Area Ratio
FHA	Federal Highway Administration
GDR	German Democratic Republic
GIS	Geographic Information Systems
LRT	Light Rail Transit
NTD	Neo-Traditional Development

NUC	Neighborhood Unit Center
PUD	Planned Unit Development
RA	Relative Asymmetry
RRA	Real Relative Asymmetry
SS	Space Syntax
TAD	Transit-Adjacent Development
TND	Traditional Neighborhood Development
TOD	Transit-Oriented Development
UCL	University College London
UGB	Urban Growth Boundary
USA	Urban Service Area
UVF	Urban Village Forum
VHT	Vehicle Hours Traveled
VMT	Vehicles Miles Traveled

Abstract

The present research is intended to show the possible applications of the traditional urbanism and especially urban form to ease some of the modern urban problems. The Neo-Traditional Development is one of the urban design and architecture trends that have a look to the traditional values. The most famous western NTD concepts are New Urbanism, Transit-Oriented Development, and Urban Village. The aforementioned trends have been claimed to have advantages for the new urban problems, most serious of which is urban sprawl. Similarly the Iranian traditional urbanism, as a part of the Middle Eastern urbanism, can have advantages for promoting the quality of life and sustainability in the new cities. The linkage between the study of traditional urbanism and the new urban problems is often neglected in the urban planning-related literature of Iran. This is the knowledge gap that this study focuses on. The main theory that the research applies is the interactions of urban form with transportation and environment.

The main research questions that this research answers are; which characteristics of the traditional Iranian urbanism can be used to solve some of the modern urban problems of the country? and how can the effective traditional city characteristics be applied to ease some of the modern problems? To answer the first question the previous literature about the traditional cities and the historical cores of the Iranian cities are considered. Also new information is produced by consideration of two case study cities in the center of Iran; Yazd and Kashan. The observation of the two cities is done by direct observation, literature review, and application of Space Syntax theory. An important section of this part is a spatial comparison between the structures of the historical cores of the cities and the new developments. It is meant to show how there is little balance between accessibility and sustainability in the historical cities. Integration, connectivity, and depth are of the Space Syntax indicators that are used in this study. To answer the second question, some general strategies are suggested by descriptive consideration of the seven urban problems of the study and the formulated characteristics of the traditional Iranian urbanism. The seven urban problems are urban sprawl, environmental pollutions, land consumption, unsustainable transportation, public transport, sense of community and place, and social relationships. Eight concepts are suggested by this dissertation as the notions that are neglected by the new urban planning of the country. It is suggested to focus more on these strategies to create better quality of life in the Iranian cities. More detailed suggestions are derived out of the strategies in form of 33 practical ideas, which are examples of the methods of implementation of the recommended strategies. The results are recommended for the medium-sized cities of the center, south, east, and some parts of the west of Iran.

Chapter one

1- Introduction

The present research aims to reintroduce some aspects of the traditional urbanism of Iran that have the capability of being used to enhance the quality of life in the modern cities of the country. Also some methods for using these capabilities are recommended. The outcome is suggested for implementation in the center, south, east and some parts of the west of the country. Generally the medium-sized cities are targeted but many of the recommendations can be implemented in the large cities.

Unlike some of the western neo-traditional trends like New Urbanism and Urban Village, this study does not emphasize on the architectural forms. Also the use of the traditional architecture and urban design to promote national identity, pride or value such as the Arabian interpretation of the traditional design is not focused. What is especially intended is to find vernacular functional uses that are helpful due to the local conditions like the climate, culture, and economy. These uses do not necessarily bear symbolic values.



Fig. 1-1: Location of the Iranian cities that are discussed in this dissertation.

The geographical locations of the cities that are talked over in the dissertation are illustrated in Fig. 1-1 on the map of Iran. This is particularly for the non-Iranian reader, who does not have an exact background of the geography of the country.

1-1-Statement of the problem

Here a general view of some of the contemporary problems of the Iranian cities that are discussed in this study is presented. The problems are connected to each other in the way that is illustrated in Fig. 1-2.

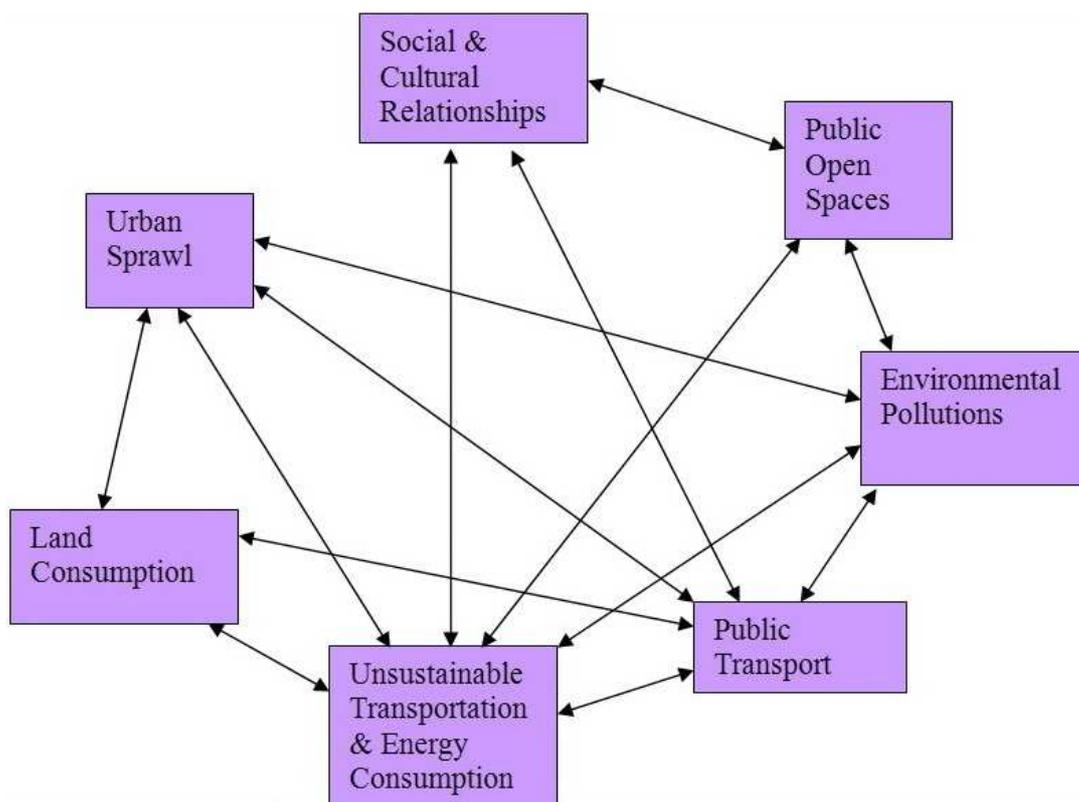


Fig. 1-2: A general view of the urban problems in modern Iranian cities.

The 7 problems are briefly described here. These problems are in accordance with the observations and the analysis.

1-1-1-Urban sprawl

Urban sprawl in Iran is almost a new problem that is seen in the urban form related to the last three or four decades. The observation showed that there is a form of development in Iran that can be called urban sprawl as defined by the international researchers. The urban form that is considered as sprawl is more seen in the periphery of the larger cities. The settings usually include dispersed developments that are planned or unplanned. Examples of the planned development that lead to sprawl of the cities were shown in the observation. The southern part of Shahedieh in Yazd is a planned development that increases the sprawl of the city. But most of the dispersed developments seem to be unplanned. The functions of such developments are mainly industrial or service uses. Samples of such developments are seen in the northwestern part of Yazd and also in large areas in west and southwest of Tehran.

The main reason for the presence of such developments is that the master plans are not completely executed. In Iran the plans that are by 50% executed are considered to be successful. So this is not surprising that while there are researched master plans, there are so many dispersed developments.

Another reason for the existence of urban sprawl is that the cities have grown fast during the last decades; so many nearby villages are now officially a part of the cities. Therefore the unplanned, organic settings of such villages are now a part of the cities. This is observed in the southwest of Kashan and northwest of Yazd. In this condition the gardens that were previously located outside the villages become a part of the city or its periphery and then the price of the lands increases. This is the time the ambition for construction in these lands rises.

The fast growth of the cities leads to uncontrolled land consumption. Vast lands have been under construction in the precious forests of the south of Caspian Sea to develop tourist-attracting places and private bungalows and villas. So this is not a problem of defining the value of the lands, because in each case the lands are a part of the national resources and it is not wise to consume them unlimitedly.

According to chapter 4, the urban sprawl can have bad outcomes for the environment and also the economy. Although the average temperature of the country

is increasing, but the urban form of the new urban areas is not suitable for being safe from the high temperatures. The solution that the traditional city had for this problem was placing the buildings very close to each other so that they could use each other's shadow and lower temperatures. Such urban layout is not seen in the structure of many new settlements.

Another problem that should be noticed is that the larger the cities are, the higher the construction costs of their infrastructure will be. The infrastructures like public transportation, urban parks and green spaces, public plazas and so on are usually considered as the secondary infrastructures and receive less planning. But the main planning problem for developing new urban fabrics or improving the quality of the existing ones is to improve or construct the street network. Even with this look of the planning bodies of Iran to the problem, the costs of urban sprawl will be high as a consequence of dispersed developments.

Apart from the aforementioned sprawl effects, uncontrolled dispersed development can have negative effects on the environment. An example of these effects is the city of Mashhad in the northeast of Iran that has had a fast growth after 1976. The population of the city has increased from 240000 people in 1976 to 2427000 in 2006. The area of the city has grown from 7800 hectares to about 30000 hectares in the same period of time. The fast sprawl of the city has had impacts on the underground water resources and the agricultural lands. The level of the underground water of the city has lowered 13.5 meters between the years of 1976-2006 (Urban Planning and Sustainability Research Group of the Municipality of Mashhad, 2010).

1-1-2-Environmental pollutions

Today the environmental pollution is a serious urban problem in the larger Iranian cities. It is largely associated with the automobile-oriented planning of the country. The worst environmental situation is seen in the largest metropolitan areas of the nation.

The air pollution has been an extremely big problem in Tehran in the last twenty years. The pollution has addressed Tehran as the most polluted city of Iran and one of the top polluted metropolitan areas in the world. The medical reports show high fatality rate caused by the air pollution. There are few accessible and trustable researches in this case. One of them was conducted in 2001-2002 and showed that the number of the patients with respiratory diseases related to the air pollution doubles during autumn and winter (Mohammadi, 2006). The air pollution is bothering especially in the cold months, because there is an inversion effect at this time. The nonacademic resources indicate that each year between 10000 and 18000 Tehrani residents die because of the air pollution and also an average of 13000 is announced by the official authorities.

The main reason for the air pollution of Tehran and other Iranian cities is the increase in the energy consumption. It is estimated that 75% to 80% of the air pollution of Tehran is caused by urban transportation (Roshan Zamir, Ikani, 2011). The low-standard car engines are the main cause of the high production of carbon emissions by the transportation sector. The emissions of about two million cars affect Tehran's urban environment largely. Topography has an absolute effect on the air pollution of Tehran. The heights on the east, north and south of the city and also the west-east direction of the wind cause the pollution remain in the environment of the city (Safavi, Alijani, 2003). Also the temperature of the central city is higher than the suburbs and it makes the wind blow inside the city and take the polluted air of the west to the city (Afshar, 2000). It is also estimated that 20% to 30% of the city's air pollution is caused by the near industrial factories (Pour Ahmad, 1998).

The other main pollution of the Tehran is the sound pollution that has become a disturbing pollution during the past years. Great percentage of this type of pollution is caused by the motorbikes that are popular, especially in the traffic-congested parts of the city center.

Many of the cities of Iran are going the way of Tehran. There are news and reports about the increases in the air pollution of cities like Mashhad, Shiraz, Arak and Tabriz. Esfahan as the third large city of the country has been raised as the second

polluted city. Of course the air pollution of Esfahan has mainly roots in the industrial factories of around the city but also the urban transportation has a major role in it.

Apart from the above factors, the urban form is another reason for air and sound pollution that is often neglected. It is in correlation with other transportation-related issues like urban travel generation and distribution, lack of sustainable transport modes, and weak public transit.

1-1-3-Land consumption

Bad land consumption is a result of poor urban planning. As a consequence of the boom in the population growth of the country in 1970s and 1980s, the urban areas needed more space for accommodating the new population. Since then on, the Iranian urban planning authorities have opted to use new lands in the periphery of the cities instead of thinking of revitalization and gentrification plans. There are two main outcomes of such strategy. The first result is that the historical cores of cities have become too old to be used by the residents conveniently. Thousands of hectares of old urban settings are identified as old urban fabrics that need renovation in less than one hundred cities. Low-quality urban fabric has encouraged many people to migrate from their old neighborhoods. The second outcome has been fast urban sprawl that, as mentioned above, has caused environmental and economical problems.

These two results of wrong urban strategies are working together. The inner cities are not renewed because there are ready lands just outside the cities and the outer lands should be developed because there are people, who are interested to settle there. Many of these people are the residents of the cores that do not find their old neighborhoods livable. The general consequence is high land consumption.

One of the results of the rapid land consumption in the peripheries of the cities is the environmental impact. Traditionally the old cities have been built near the lands that contained water where life and agriculture were possible. Thus vast lands around the cities are agricultural. Such lands are the target of the urban sprawl for changing the function and converting it to urban lands.

As an example, 27748 hectares of agricultural lands around the city of Mashhad have been built up between 1956 and 2006 (Urban Planning and Sustainability Research Group of the Municipality of Mashhad, 2010).

1-1-4-Unsustainable transportation

The transportation in the Iranian cities seem to be unsustainable. It is increasingly becoming automobile-oriented. This trend has caused environmental impacts. The personal impacts of this general attitude, such as personal health, have been neglected across the nation. Also the uncountable number of cars in the larger cities has caused traffic congestion problems. The strategies like public transportation have not been enough so far. The planning bodies of the country have not been successful in developing more sustainable transportation modes like pedestrian movement, biking, and public transit. This has worsened the traffic conditions in the greater cities, particularly Tehran. The World Bank (2007, 7) reports that 29% of all trips in Tehran are made by personal cars. This rate is 31% for Esfahan. A large metropolitan area like Tehran that about one third of its urban travels are made by personal cars can have large traffic congestion problems. The same report indicates that the motorbikes are another widely used transport mode. 15% of the whole urban travels of Esfahan are done by motorbikes. The same rate related to Mashhad is 12%. The motor-vehicle-oriented urban transportation planning has several reasons, of which the built environment is the most neglected.

The urban form of the Iranian cities urges people to use the personal cars. This is shown about Yazd and Kashan in the observation chapter. The new built environment is so that people can not provide the every day needs in the neighborhoods. Therefore, they should reach for the destinations in the main streets and travel to the far away points. The question how the new urban fabric encouraged to rush to the main streets and desert the neighborhoods will be discussed in the next chapters. The unsustainable trend is that people are using more cars and using environment-friendly modes like walking, biking, or using public transit is being forgotten. As described before, the traditional urbanism provided most of the needs

in a short and walkable distance from the living places, so it was easy to just walk there. In addition, some cities like Esfahan and Yazd have been traditionally the bicycle cities of the country during the first half of the twentieth century. The bicycling culture has been weakened and little sign of the previously strong habit of biking is remaining.

The general urban form characteristic of the built environment that especially makes the transportation more automobile-oriented is a combination of high density and monocentricity of the city. Fig. 1-3 shows how Tehran has an unsuitable place in the diagram of Monocentricity-density. The diagram is provided like the one that was drawn by Newman and Kenworthy in 1989. It shows that as of 1996 the city, with 146 people per hectare, had a high population density. It can be a high amount for a metropolitan area of about 13 million people. Just some cities like Mumbai, Shanghai, and Seoul have higher densities (Berated, 2003).

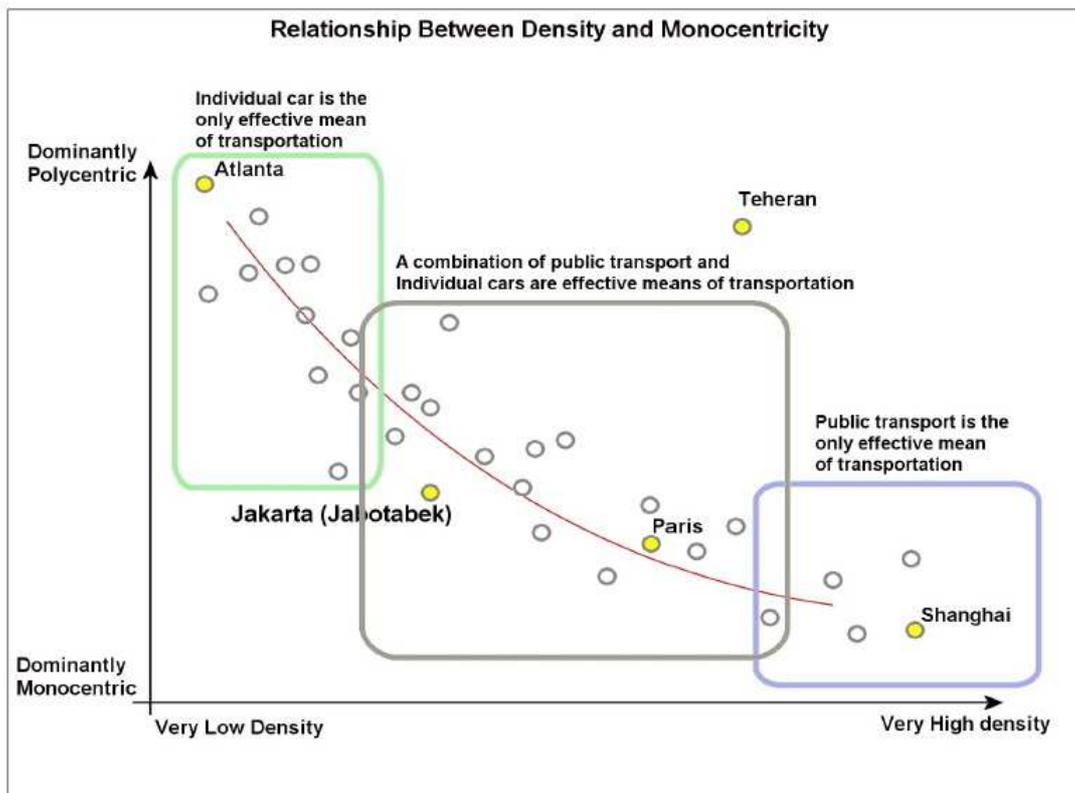


Fig. 1-3: High density of Tehran and its almost polycentric form accompanied by weak public transit makes the transportation car-oriented. Source: Bertaud, 2003.

However the high density becomes problem making when it is combined with concentricity or polycentricity. The result is that the city has been placed completely out of the curve of the diagram. It seems that the city has fragile conditions in both concepts. When it comes to lack of strong public transportation facilities the situation becomes worse. The outcome is fast increase in automobile travels. Most of the large cities of the country have the growth pattern of Tehran. Failure to make the cities polycentric will cause numerous problems as they have high rates of urbanization and weak public transit.

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Passenger Cars	2300	2386	2451	2528	2638	2775	2899	3080	3317	3589
Buses and Minibuses	105	112	116	119	121	123	125	130	135	139
Trucks and Pickups	550	588	616	638	659	689	717	766	809	861
Motorcycles	-	39	95	133	165	201	243	303	359	483
Total	2955	3125	3278	3418	3583	3583	3984	4279	4620	5072

Table 1-1: Accumulated number of vehicles registered by type (000) in Iran. Source: World Bank (2005, 50)

The people are willing to use personal cars because the car production of the country has boomed. Of course the birth of car industry is related to 1960s but its rapid progress happened in the recent two decades. In 2010 the car production of the country reached a total of 1599454 vehicles including 1367014 cars and 232440 commercial vehicles (OICA, 2010). That is more than the production of countries like Russia, Italy, UK, and Turkey. The production of 2010 is 14.7% more than that of the previous year. As a result, the car ownership has been rising during the past years. Table 1-1 indicates the increase in the number of the motor vehicles and their types between 1992 and 2001 (World Bank, 2005, 50). In 9 years the number of the vehicles increased 71.6%. Also the motorization rate, which is the number of private cars per one thousand people, rose from 104 to 122 between 1996 and 2002 (World Bank, 2005, 7).

The fossil fuels are diminishing throughout the world (there are more explanations about it in chapter 4). In addition, the political problems like the international economical sanctions and the aged oil industry have made a critical condition in the energy sector of the country. So the transportation fuels are not as accessible as previous decades and the prices are rapidly increasing. Although providing the energy is not easy like before, but the rate of energy consumption has increased because of increase in the number of cars.

Nevertheless the services and fuel in Iran are cheaper than many countries. Fig. 1-4 shows a comparison between the fuel price in Iran and in the United States in 2008. As a consequence of the rapid increase in the number of cars, the fuel consumption of the transportation sector has dramatically increased. Table 1-2 shows that the energy consumption of the transportation from 1997 till 2006 has increased more than two times. The information of the table is not limited to the urban transportation and covers the road transportation too, but generally the results of the increase in the car use can be concluded from it. That is while the country has recently encountered serious problems in relation with the gasoline production in the country and the existing refineries are not capable of producing the necessary car fuel anymore.

The biggest environmental problem caused by the high motorized vehicle use is the increasing rate of the emissions. The highest amount of the pollutants of the country is produced by the transportation sector. The share of transportation from the pollutants of the country in the year 2007 has been 92.9% of the hydrocarbons, 39.9% of the aldehydes, 12.1% of Sox, 69.5% of NOx, and 93.7% of CO. The emission of the pollutants by the motorized vehicles during the past years has had a ceaseless increase. This increase has had an average of 6.17% per year during the period of 1997-2007. The above increase has been more than other sectors like industry, household and commercial, agriculture, and oil refineries and the only sector that has had more yearly average of increase in the amount of emissions has been the energy production sector (Iranian Fuel Conservation Company, 2007).

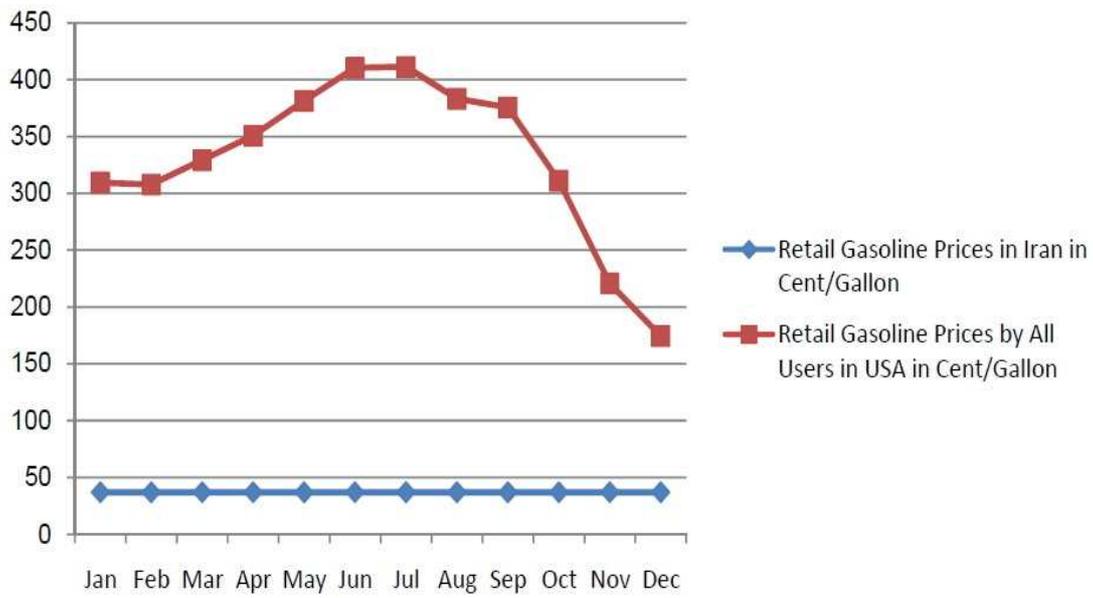


Fig. 1-4: The comparison of the fuel price in Iran and the United States in 2008 (Cent/Gallon).
 Source: Rahdari et al., 2009

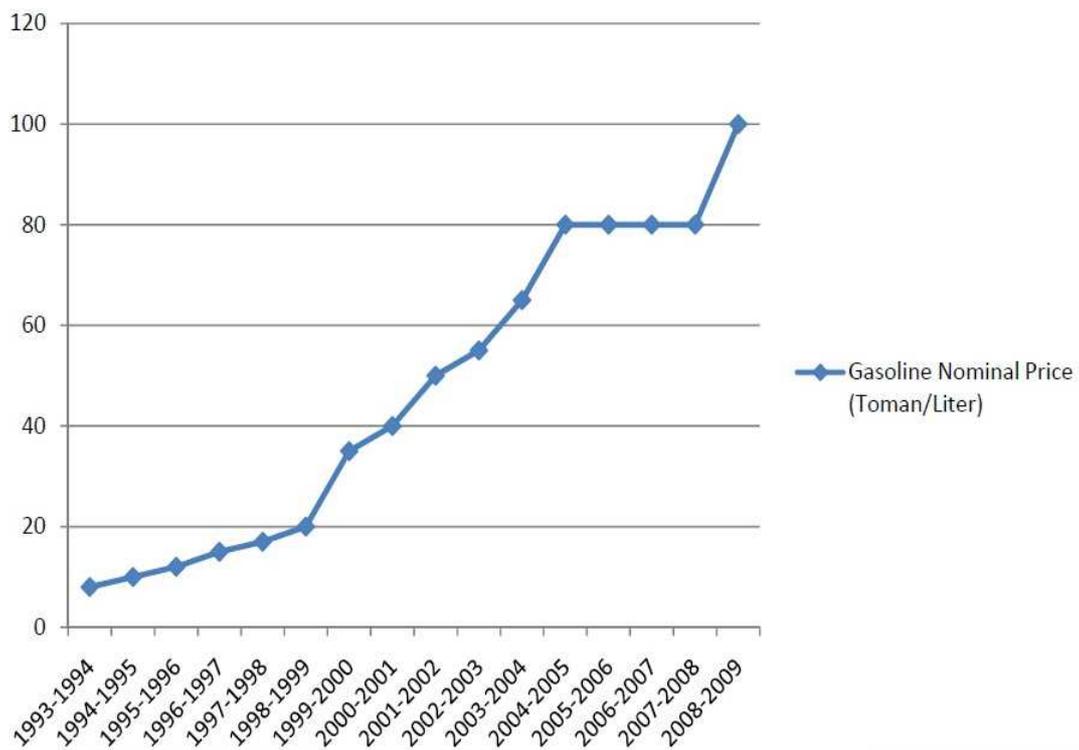


Fig. 1-5: The rise of the fuel price in Iran since 1993 to 2009 (1\$=1250 Toman in 2009), source: Rahdari et al., 2009

Year	Gasoline		Gas Oil		Fuel Oil		Liquid Gas
	Consumption (Million Liters)	Percentage	Consumption (Million Liters)	Percentage	Consumption (Million Liters)	Percentage	Consumption (Thousand Tons)
1997	12147	98.57	12240	51.23	336	2.19	82
1998	13502	98.62	11956	57.95	644	4.64	114
1999	14039	98.73	12671	55.06	768	5.41	196
2000	15337	98.85	13555	55.81	681	4.63	267
2001	16558	98.94	14152	56.42	683	4.47	298
2002	18265	99.05	15054	58.17	647	4.38	318
2003	20350	99.09	14859	57.82	625	4.59	293
2004	21963	99.12	15802	57.78	593	4.32	271
2005	24213	99.25	16762	58.42	594	4.10	235
2006	26638	99.15	16883	53.70	491	3.13	564

Table 1-2: The energy consumption of the transportation sector of Iran between 1997 and 2006.
Source: The Transportation Information and Statistics bureau, 2007

1-1-5-Public Transport

The shortcomings in the public transportation of the country has worsened the urban transportation problem and has led it more personal car-oriented. When the built environment pushes people to reach far away destinations and there is little chances of using appropriate public transport, the people opt to own their personal car and use it, regardless of the increasing price of the fuel.

The traditional modes of the urban public transport in Iran are taxis, buses and minibuses. Of course the main one is the collective taxi that is the fastest and the most comfortable. According to the World Bank (2007, 7) about 30% of the motorized trips of Esfahan and Tehran and 20% of Mashhad and Shiraz are done by taxis. The share of buses and minibuses are lower than what it should be. It is 27% in Shiraz and 24% in Esfahan. Of course there are also planned and built BRT and

LRT lines in Tehran, Mashhad, Esfahan and Shiraz but these lines are not so inclusive.

With an exception of Mashhad's LRT, the urban rail transport in Iran is mainly in the form of metro lines. But there are plans for construction of light rail lines in Tehran. Although the date of the oldest urban rail system of Iran goes back to nineteenth century in Tehran but the oldest metro line is related to the last decades. The planning of the Tehran Metro first began in 1962, but the construction was started in 1978 and the first line was used in 1998. Today 4 lines are active and 1 line will be added to the system. The length of the active network is about 120 km and 1900000 people use it daily via 70 stations. The Tehran Metro is the only active metro system of the country at present, but similar plans for Esfahan, Mashhad, Tabriz and Shiraz are underway.

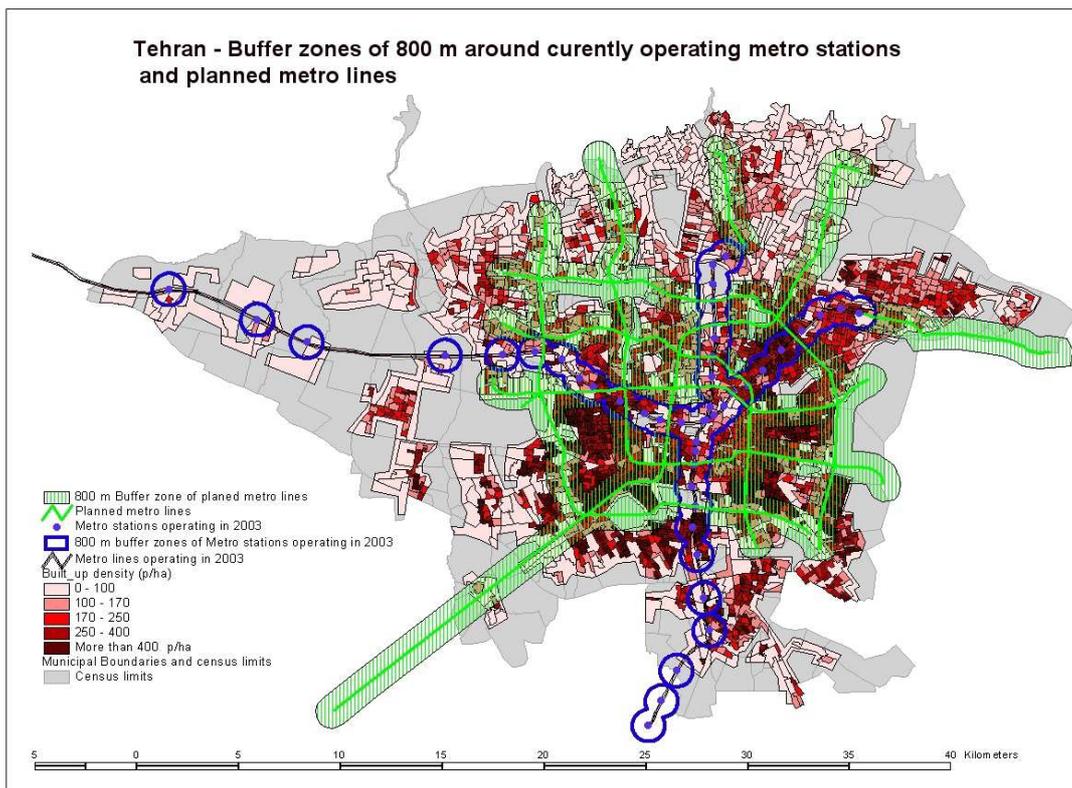


Fig. 1-6: The Tehran metro and the buffer zones of 800 meters around the stations. Source: Bertaud, 2003.

Although the Tehran Metro has been an almost successful experience, but it is limited to just one city and also using it has numerous difficulties. The network does not cover most of the places and the majority of the stations that were built in the first years are located in the places that are far away from the main squares and destinations. For example, for many trips it is necessary to take an extra taxi or bus to reach the metro station.

Fig. 1-6 shows the constructed lines of Tehran Metro till 2003 and the planned ones. Of course the present lines and stations are more today. The buffer zones of 800 hundred meters include the walking distance to the stations. Accordingly large populated areas are far from the nearest station. Such illustrations show why complements like bus lines and also light rail systems like trams are necessary for large cities. The same study can be done about other public transit stations like the bus stations. It is likely that many residential neighborhoods are far outside of the pedestrian zone of the bus stations, because the bus lines work just in the main streets.

Generally the public transit system of the Iranian cities is not responding the increasing needs of the urban community. There are many neighborhoods, particularly in the peripheries, which are not served by the public transport networks. Apart from the coverage, the discomfort of using the facilities is another issue that discourages people to use them. This is much more felt in the larger cities. Also except the metro of Tehran, people can not count on the preciseness of the headway times of governmental public transport. In most of the cases there are no time schedule for the buses and the minibuses.

1-1-6-The social relationships

A concept that has been repeatedly discussed in the Iranian urban research community is the notion of social relationships. The change in the traditional urban structure has resulted in weak social interactions in the new urban settings. The phrase “social relationships” that is used here refers to the face-to-face interactions of the urban dwellers in the urban environment. The meeting place can be the main

public spaces of the city or the local places like neighborhoods. The latter is more emphasized in this study. This research does not ask if the new city has lower social capabilities than the traditional city, but the matter that is going to be shown is how the urban physical structure can weaken or promote the human contacts.

The main reason that the researchers raise as the motive, which weakens the social interactions, is the collapse of the traditional neighborhood (Azad Armaki, 2006). The traditional neighborhood was formed by people having similar interests, origins or carriers. They lived in a small place as a community. So it was natural that they help each other in the daily life. Another possibility that the traditional citizens had was suitable urban form. The neighborhood centers, religious buildings, and open spaces supported the social behaviors. The residents could meet each other in such places.

The structure of the new urban form shows weakness in making a social urban environment. This is felt in the way that people have their urban travels. The first matter that is notable is that the role of the new streets has been mainly raising mobility needs. The streets of the new city are places for the motorized traffic and the social activities like meeting other people, creativity, entertainment and so on are brought to a secondary position discussed.

The second issue that should be mentioned in this case is the distribution of the local travels in the level of the neighborhood. In most of the new developments, no planning effort that tries to bring people to a special place to meet each other and socialize is seen. The local grocery stores, other shops, and mosques, are located far away from each other in different points of the neighborhoods. Normally the secondary streets in the level of the city that are the main traffic route of the local quarters include such places. The new urban form does not guide people to a specific place of the residential places to raise the daily needs and also have social activities. In other words, the local urban travels are dispersed and are not aiming to a hub, so the human interactions are low in the number. This is caused by networks of full or semi-grid-iron streets that have some shops in the corner of some of the streets here and there.

1-1-7-Sense of community and place

Another deficiency in the social aspects of the new urban planning is lack of the sense of community and place. The new places made by the new urban planning have little meanings for the residents and the visiting passengers. Most of the streets and allies are like each other and the number of the elements that transfer a meaning to the minds of the people is few. That is in contrast with the traditional urbanism that has special meaning in every corner. The physical body of the traditional city bears historical significance for the residents via unique elements.

The weaknesses in the meaningfulness of the new developments are seen in both poor and rich quarters. But such problems are more in the poor neighborhoods. The people do not accept their surrounding urban environment as real living environments and feel little sense of belonging. The result is high rates of social problems like crimes and delinquencies. The problematic poor neighborhoods that are influenced by weak economy and low sense of community are seen in different cities. They are usually built in different times during the twentieth century. According to a research about a poor neighborhood in Ahwaz in the southwestern province of Khuzestan, 77% of the residents have announced that they feel a sense of belonging to the neighborhood but also 33% of them have said that they are willing to leave the neighborhood and live elsewhere. The neighborhood has been built in the first half of the twentieth century and due to serious economic and social problems, it has become not only a poor residence but also a slum. The place has several problems like security, safety, education, narrow allies that make it hard to pass for the cars, and jobless families. 25% of the questionnaire respondents believe that the neighborhood does not have enough security (Movahed, et al. 2008).

This shows that the beliefs of the residents about their living place like sense of community, sense of place, and sense of belonging are in close relations with other quality of life indicators like economy, security, safety, and so on. However the direct methods that can lead people to have stronger senses about their neighborhoods should be researched. The goal of such studies can be how it is possible to make people feel more responsible about their living place. When they

have responsibilities about the urban environment, then they will keep it well. A part of the answer is in the urban landscape. The urban landscape that bears special meanings to the residents is valuable to them and is protected and managed.

1-2-Research questions

There are two research questions that are answered in chapter 9 as the result of the study:

- Which characteristics of the traditional Iranian urbanism can we use to solve some of the modern urban problems of the country?
- How can the effective traditional city characteristics be applied to ease some of the modern problems?

A sub-question that is focused in this study is the following:

- What relationship is there between sustainability and accessibility in the transportation structure of the Contemporary Iranian cities?

The consideration of the mentioned subject is mainly done by Space Syntax theory that is one of the research methods of the study. The sustainability/accessibility issues are considered in the two case study cities. The sustainability problems are the representative of the traditional urbanism and the accessibility, as seen in the case study chapters, are seen as a characteristic of the modern cities. Therefore this sub-question can be a part of both main research questions.

1-3-Hypothesis

There is one hypothesis for the research, which is as follows:

- There are characteristics in the traditional Iranian city that have the capability to be used in contemporary Iranian cities to improve the related conditions of urban transportation, environment, energy use, and land consumption.

1-4-Organization of the research

The presented dissertation includes 4 main parts;

- 1) Discussion and statement of problem: This part consists of chapter 1, which is brief introduction to the research and the research problems.
- 2) Background, theory, and methods: This part of the thesis includes chapters 2 to 6. The nature of this section is literature review. Chapter 2, 3, and 4 cover the background of the research. The previous practices of this kind in academia or in practice are covered in these chapters. The theory of the research is explained in the second part of chapter 4. A part of the knowledge that the reader should have about the urbanism of Iran is presented in chapter 5. Some sections of this chapter are explained in order to give a good understanding from the Middle Eastern city to the western reader. Such descriptions, like the urban infrastructure of the Iranian cities (Badgir, Ab Anbar, Jame mosque and so on), are not directly used in analysis but can be helpful to give an understandable image of the historical urbanism. These amenities are repeatedly named in the later chapters, so presence of the related explanations seems useful. Chapter 6 is a presentation of the research methods. Apart from the literature study and direct observation, the most prominent method that is used in this research is the Space Syntax theory. Hence the first half of this chapter is considered as a literature review of Space Syntax theory and practices. It is necessary for the reader to have a precise understanding of Space Syntax to be able to relate the observation and analysis.
- 3) Analysis and findings: This is the main body of the dissertation, which consists of chapters 7, 8, 9, and the second half of chapter 6. Chapter 7 is about the observation of the first case study city, Yazd. The next chapter is in the same way about Kashan. Chapter 9 includes recommendations for promoting the urban planning according to all other chapters.
- 4) Results and Summary: This part is a quick review of the findings and results of the thesis. Also some suggestions about the possible topics for the future

research and the subjects that were not studied properly because of lack of time and resources will be presented.

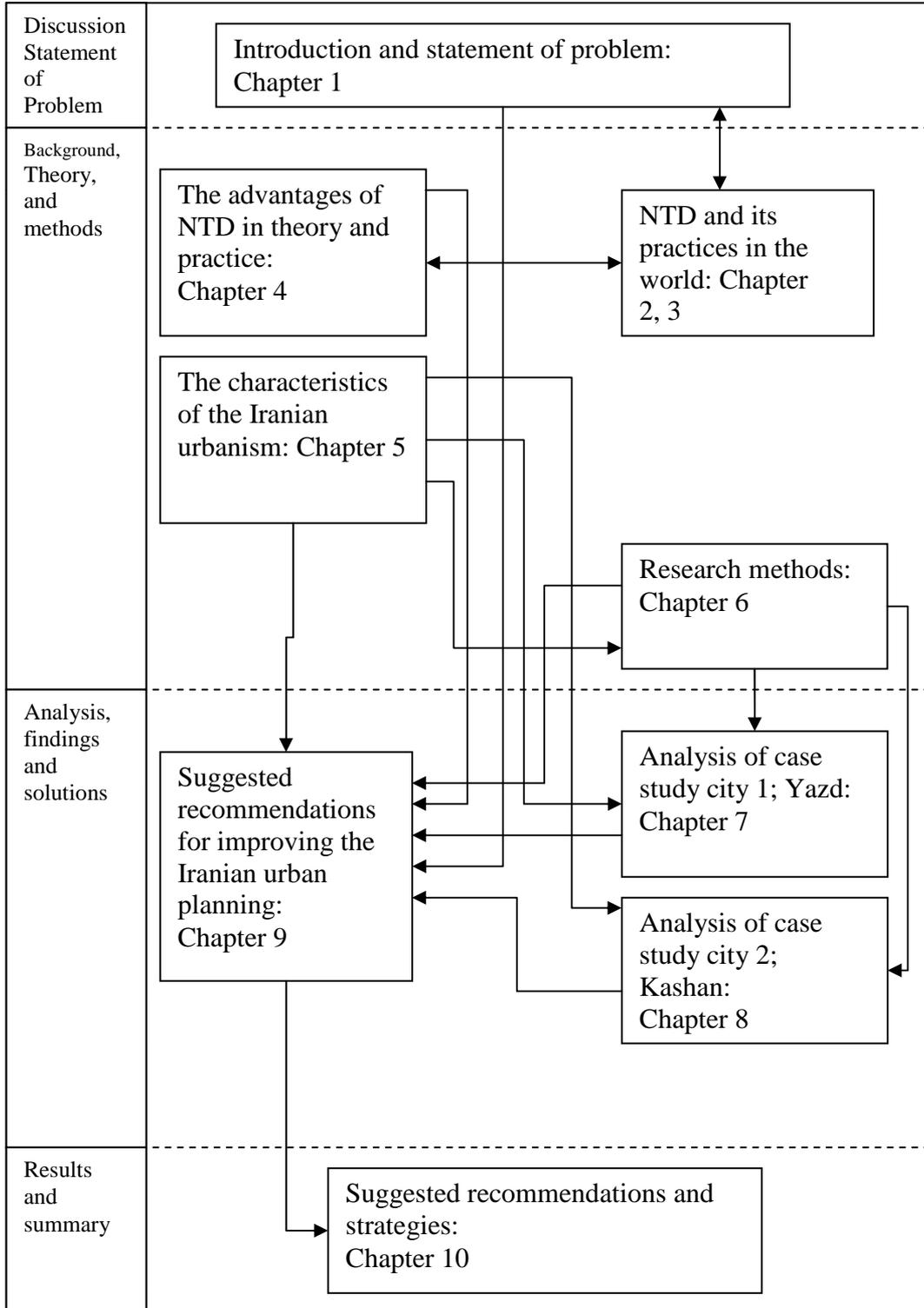


Fig. 1-7: Diagram illustrating the organization of the dissertation.

1-5-Research methods

The present research is a qualitative/empirical study.

-Relational: the relationship between the traditional Iranian city and the modern urban problems is considered.

-Qualitative: The above-mentioned relationships are considered by qualitative study of the traditional concepts and the modern urban problems.

-Empirical: The possibility of using such solutions is considered by studying empirical evidence.

Generally, the method of the research is deductive. Thus the process of the research is as follows:



Fig. 1-8: The method of deductive research.

The methodology of the research is explained separately in chapter 6. However it can be briefly mentioned here that three main research methods of direct observation, literature review and Space Syntax theory are used.

1-6- Knowledge gap

The characteristics of the traditional Iranian city have already been considered in several studies. A historical view of the Iranian city, its growth, form and

organization has been focused before by mostly Iranian scholars (for example: Soltanzadeh, 2006; Habibi, 2009). In a smaller scale, the function and specification of the neighborhoods have been studied (Khaksari et. al, 2007). Also the social and geographical aspects of the city have been topics that have been noted by several researchers (such as Kheirabadi, 1993; Sohrabi, 2007).

Likewise, the Iranian urban planning and the contemporary urbanization and its related problems have been also noticed (Mashhadizadeh Dehaghani, 1994; Hesamian et. al, 1998).

However there are few studies that have been focused on the possible uses of the traditional urbanism for easing the new problems. The only studies of this kind are the researches on the uses of the vernacular architecture of Iran especially Badgirs in air-conditioning of the modern houses and ventilation methods (Mahyari, 1996; Poshtiban et. al, 2007; Deldar, Tahsildoost, 2007). Although such studies are innovative way of looking at the old lifestyles, however they do not include a wide range of the urbanism, the city and the nation-wide problems. Therefore they can not be considered as a missing link between the historical urbanism research and suggestion of creative solutions for modern urban problems. Better links between historical studies and new urban planning and design are needed. What we look for is methods that have roots in the old urbanism. These methods should have the capability of promoting the quality of life in the new cities.

1-7-Observation and case studies

The observation includes literature study, direct observation and Space Syntax analysis of two cities of central Iran; Yazd and Kashan. In summer 2010 direct observation was done in Iran after literature study in Dortmund. In the meantime more library work was done in Iran. As a complement Space Syntax analysis of the texture of the two case study cities was conducted.

The selected cities for case study are Yazd, which is now the capital of Yazd Province in center of Iran, and Kashan, a medium-sized city in Esfahan Province. Yazd has long history in the Iranian history of urbanism. Recently the authorities of

the municipality of the city and the Iranian Institution of Cultural Heritage have conducted a series of revitalization projects in the city. Some parts of these projects were observed in the field work in Yazd.

Kashan is the representative of the historical medium-sized cities of Iran. There are many old neighborhoods in the fabric of the city but usually no preservation or revitalization projects catches eye in the city. Migration from rural points and villages has caused the city grow fast.

Both cities have similarities to the urban fabric of the historical cities of the center of Iran. Thus it is believed that the recommendations that are derived from observing the core of these cities can be suggested for the cities situated in the center, east and south of the country. The cities of the mentioned region have mostly hot-arid climate. Therefore the recommendations that are presented in chapter 9 are generalized to the above area.

1-8-The structure of the dissertation

The first half of this dissertation, including chapters 2 to 5, is dedicated to introduce the modern neo-traditional urban design and also the history and main elements of the Iranian urbanism. So the combination has something new for a wide range of readers. The second part including chapters 6 to 10 is the main body of research that considers the case study cities and suggests recommendations and practical ideas.

In a more general view the dissertation can be classified into two main parts: the main body of research and the literature review. The main body of research contains the statement of problem, the observation chapters, recommendations, and conclusion. The literature review includes the background of the foreign experiences, theory, and the introduction to the Iranian urbanism. Chapter 6 is divided between these two parts (Fig. 1-9).

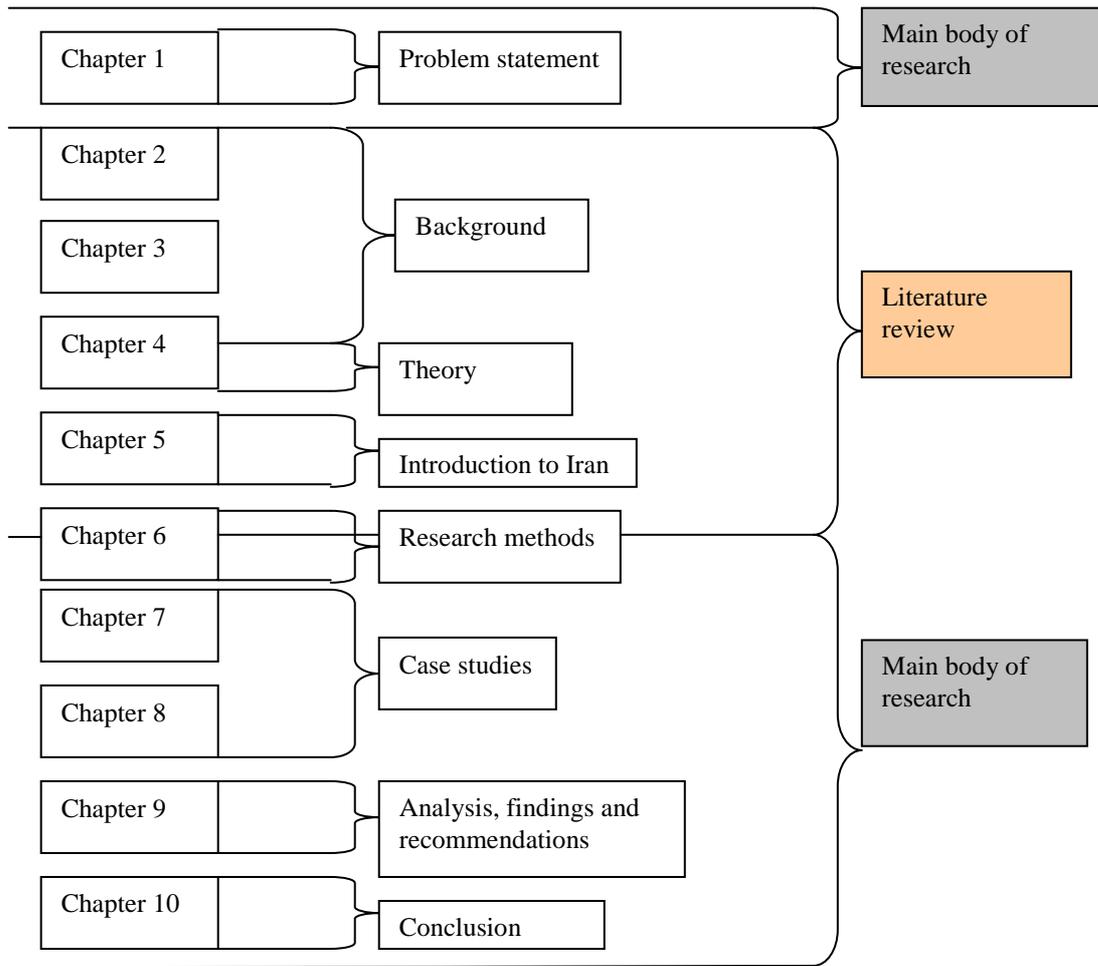


Fig. 1-9: The classification of the dissertation into “the main body of research” and “literature review”.

Chapter Two

2-Neo-Traditional Development and its different types

2-1- Introduction

Neo-Traditional Development (NTD) is a good example of how old values can be used to solve modern problems. In this special case, old urban form and traditional urban structure can, not only be used in new planning efforts, but also have considerable results in solving modern urban problems. Since the mid twentieth century, air pollution, noise pollution, traffic congestion, low levels of human relationships, weak sense of community and place, etc. are the problems that are brought to mind when talking about cities and metropolises. NTD is about creating sustainable settlements by means of dense, mixed-use neighborhoods, which have human scale. For NTDs, high accessibility and connectivity is a goal that should be achieved by planning pedestrian and bicycle routes. As the advocates of NTD claim, the traditional design leads to a better quality of life.

Certainly, this way of urban design is not new. The traditional urban fabric is as old as the history of urbanism. The structure and form of the ancient cities of Mesopotamia like Ur or Uruk, traditional Islamic cities, Medieval European cities, and other types of traditional settlements are similar to the principles which have been presented during the last three decades as the basics of NTD. Most of these principles have been used automatically in shaping of the organic urban fabric through hundreds of years. However the question is what draws the attention of urban designers to the traditional way of thinking and designing.

This happened in 1970's and 1980's when the modern movement had shaped architecture and urbanism; modern aspects of human civilization like automobile were completely effective on the fundamentals of urban planning and design. Thus most of the urban areas of the United States and Canada and also many metropolitan areas of Europe were affected by urban sprawl. After the World War II, the built area of the western city became vaster, while the population and construction density

diminished. According to the claims of neo-traditional advocates, the increasing car dependency affected the social relations between people. Selecting car as the daily transportation mode in urban planning made the area of the settlements and neighborhoods vast and there were no observable neighborhood centre as a place for the daily socialization for people. These are points that NTD advocates claim that traditional urbanism has solutions for.

In case of density, in the sprawling communities the housing density of less than 8 units per acre was normal. Hence great land consumption was resulted. In such a condition, the neo-traditional planning leaders designed the first sample of built traditional community in modern United States. Seaside, FL is still discussed as a pattern of Traditional Neighborhood Development and it has advocates and critics. It is just like the whole neo-traditional movement which has increasing number of supporters, followers and active critics. After two decades the debates on the claims of the neo-traditionalists who say they can provide better sense of community, quality of life, human relationships, public health, air quality, etc. through using old design values, continue. However, the success of the traditional neighborhoods is not deniable. In some parts of America like Florida and California, people pay much money to own expensive residential units in traditional neighborhoods and this, as some advocates of neo-traditionalism claim, is a reason for the success of NTD. On the other hand, some accuse the movement to build a market for earning more and more money.

Although NTD has had a success in drawing attention of planners and home buyers, it has not taken the shape of an universal planning movement and has been mainly limited to some western countries like the United States, Canada, the Netherlands, Great Britain, etc. It is seen scarcely in other countries. Of course some projects, which have identical and traditional elements have been executed here and there, specially in some of the developing countries that give importance to their culture and heritage but the whole trend is completely in the shadow of the international design concepts. Therefore, the necessity of further research on the local ways of urbanisms and urban forms is felt.

Of course NTD has different definitions, which more or less all of them indicate a unique concept, but the methods of creating neo-traditional environments are somehow different according to the view of the theorist, the planner's culture, or the place of the settlements. The mentioned definitions and methods and also the benefits of such built environments will be considered in the following text.

2-2- Definition

Since the late 1970s traditional cities and neighborhoods have been a source of inspiration for neo-traditionalists to develop the Neo-Traditional Development (NTD) approach. Some call this method of urban design and planning the Neotraditional Town Planning and some other prefer Traditional Neighborhood Design (TND). The ultimate objective of NTD is to create higher levels of quality of life, sense of community, human scale and other characteristics of the traditional towns. Generally, their idea is that there were values in the traditional urbanism that can be a solution for some of the modern urban problems. Neo-Traditionalism has been one of the most important urban design and architecture streams of the second half of the 20th century and has been the only movement that has been successful in eclipsing the power of modern urban design and architecture (Lang, 1994, 44). Neo-Traditionalism is a part of a stream called Neo-Empiricism. The general meaning, which the Neo-Empiricist works bear is showing the details of life and environmental problems in practical designs (Broadbent, 1990). The designers of this stream are often called New Humanists (Lang, 1994). Neo-Empiricists are categorized into two major groups. The first are the designers whose designs are based on their own understanding of the environment. The second group is made up by the researchers, who are not necessarily designers but their research has great impact on others' designs and planning. Their work reflects their theoretical interpretation of the environment. In addition to neo-traditionalists, Christopher Alexander, Leon Krier, Charles Moor, Ralph Eskine, Herman Hertzberger, and Lucien Kroll are among Neo-Empiricists (Lang, 1994).

The central idea emerged after some deficiencies were noticed in Conventional Suburban Development (CSD) and suburbanization in the United States. One of other motives that caused neo-traditionalists to develop their approach was urban sprawl. After the World War II, the North American urban areas started sprawling in a fast rate. The land usage, construction costs, energy consumption of the automobiles, the high volume of gas emissions, car ownership, etc. were some causes of starting to develop traditional guidelines.

As Berman (1996) writes, the 11 main aspects of NTD are the following:

1. Mixed use core within walking distance for residents.
2. Local employment and civic centers.
3. A range of housing types for different income levels.
4. Higher housing densities and smaller lots than those found in suburbs.
5. District architecture based on the vernacular architecture.
6. Creation of a sense of community.
7. Creation of a sense of tradition.
8. Common open spaces.
9. Streets that are social spaces as well as a transport facility.
10. Narrow streets with side walks and alleys running behind homes.
11. Grid street patterns that provide multiple paths for drivers and pedestrians.

Yan Song (2005) summarizes the characteristics of the compact developments and Traditional Neighborhood Design according to the ideas of Andres Duany, Elizabeth Plater-Zyberk (1992) and Katz (1994) as follows: “a street network circulation design that will utilize shorter street lengths in a grid-like pattern to promote better traffic flow; higher-density residential uses surrounding retail, recreational, and governmental uses; more mixture of land uses that will reduce the number of vehicle trips; better accessibility to retail and transit that will improve quality of life; and pedestrian-friendly neighborhoods”.

2-3- Different forms of NTD

Urban scholars often categorize some urban forms as relevant forms of NTD. Here we discuss about the urban form approaches which are repeatedly considered. Alexander Christoforidis categorizes the following 5 urban forms as the most well-known NTD approaches (1994):

1. Traditional Neighborhood Development (TND) or the New Urbanism
2. Transit Oriented Development (TOD)
3. Hamlets
4. Metropolitan purlieus
5. Revitalization of the existing traditional towns.

In another research, Yosef Rafeq Jabareen classifies the following approaches, as forms of NTD (2006):

1. New Urbanism
2. Transit Oriented Development (TOD)
3. The Urban Village

Generally, the most important forms of TND including TND or New Urbanism, TOD, and Urban village are explained here:

2-3-1- New Urbanism or Traditional Neighborhood Development (TND)

New urbanism, which is also referred to as Traditional Neighborhood Development is the most famous form of Neo-Traditional Development. This fame is so that most of the times New Urbanism represents NTD and many new urban characters are talked about as they are the general specialties of NTD. This approach is one of the best organized ones during the last two decades and has been written about repeatedly. New Urbanism is creating mixed-use compact neighborhoods within a walking distance from a neighborhood center. The basis of New Urbanist planning and architecture is the traditional pattern of the late nineteenth century and the early

twentieth century of the United States, especially its east and north-eastern parts. The goal of the New Urbanist designers is to reactivate the quality that existed in the American cities before the World War II; The quality of life that was quite different in absence of the present automated life style while people walked to their nearby workplaces and there were no environmental pollutions due to unstoppable car use. The urban spaces and buildings were human-scaled and every corner of the towns had a sense of place.

The type of utopia that the New Urbanists are going to make is quite urging. So it is not so wonderful that it has grown so much during the last two decades and the number of the planned traditional developments has proliferated. The city that New Urbanism has drawn in the planners' and governors' mind is a city with less cars, more pedestrian trips, more green landscapes, less speed, and more time to watch the beauties of the designed spaces. It is cheaper to build so it can draw the attention of governors and developers. The term "New Urbanism" reminds every one of the new methods of urbanism, while according to many critiques, the type of development that New Urbanism proposes has been declared by the Garden City movement a hundred years before the New Urbanism (Gosling, 2003).

The emergence of New Urbanism was a result of the urban sprawl in the American cities, which was started in 1940s and its speed was becoming more in the next 3 or 4 decades. Along with other policies such as Urban Containment and other sustainable urban forms, New Urbanism was introduced as a solution to urban sprawl (Katz, 1994; Fulton, 1996; Duany, 2001). In many cases which are debated over, as the weak points of the Conventional Suburban Development (CSD) or sprawl, the New Urbanism has some answers. These problems are sense of community, car dependency, air and noise pollution, cost of construction, vast built areas, health problems, human interaction issues, low accessibility, and so on.

2-3-1-1- The principles of the New Urbanism

The emergence of the New Urbanism goes back to the first years of the 1980's, but the first organized attempt for classifying traditional planning occurred in 1991,

when a group of enthusiastic architects and planners gathered together in Ahwahnee Hotel in Yosemite, California to provide an agreement in the way of achieving the neotraditional development and sustainability. The major members were Peter Katz, Andres Duany, Elizabeth Plater-Zyberk, Stephanos Polyzoides, Elizabeth Moule, Peter Calthorpe, and Michael Corbett. The meetings were set regularly and after two years changed name to a more official one: Congress for the New Urbanism or briefly CNU. The Ahwahnee Principles are about three main subjects: community, region, and implementation strategy.

Community Principles:

1. All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.
2. Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
3. As many activities as possible should be located within easy walking distance of transit stops.
4. A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
5. Businesses within the community should provide a range of job types for the community's residents.
6. The location and character of the community should be consistent with a larger transit network.
7. The community should have a center focus that combines commercial, civic, cultural and recreational uses.
8. The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.

9. Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
10. Each community or cluster of communities should have a well defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
11. Streets, pedestrian paths and bike paths should contribute to a system of fully connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high-speed traffic.
12. Wherever possible, the natural terrain, drainage, and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
13. The community design should help conserve resources and minimize waste.
14. Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
15. The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles:

1. The regional land use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
2. Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.
3. Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
4. Materials and methods of construction should be specific to the region, exhibiting continuity of history and culture and compatibility with the

climate to encourage the development of local character and community identity.

Implementation Strategy:

1. The general plan should be updated to incorporate the above principles.
2. Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.
3. Prior to any development, a specific plan should be prepared based on the planning principles. With the adoption of specific plans, complying projects could proceed with minimal delay.
4. Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

The Ahwahnee Principles were the first of their kind in regulating the form of a traditional and sustainable community and became a base for the future traditional guideline sets. Later, some other efforts were also made and different sets of TND principles were presented. According to William Fulton (1996), the major ideas which are noticed in all of the offered principles are the following three:

- Walkable neighborhoods oriented to the quarter-mile, five-minute walk.
- Primary orientation to public transit systems, rather than private automobiles.
- Greater integration of different land uses (such as housing, shops, work places, and schools) at the neighborhood level.

The most referred New Urbanism principles have been presented by Andres Duany and Elizabeth Plater-Zyberk, two of the most prominent leaders of the movement, as follows:

1. The neighborhood has a discernible center. This is often a square or a green and sometimes a busy or memorable street corner. A transit stop would be located at this center.
2. Most of the dwellings are within a five-minute walk of the center, an average of roughly 2,000 feet.
3. There are a variety of dwelling types - usually houses, rowhouses and apartments - so that younger and older people, singles and families, the poor and the wealthy may find places to live.
4. At the edge of the neighborhood, there are shops and offices of sufficiently varied types to supply the weekly needs of a household.
5. A small ancillary building is permitted within the backyard of each house. It may be used as a rental unit or place to work (e.g., office or craft workshop).
6. An elementary school is close enough so that most children can walk from their home.
7. There are small playgrounds accessible to every dwelling, not more than a tenth of a mile away.
8. Streets within the neighborhood form a connected network, which disperses traffic by providing a variety of pedestrian and vehicular routes to any destination.
9. The streets are relatively narrow and shaded by rows of trees. This slows traffic, creating an environment suitable for pedestrians and bicycles.
10. Buildings in the neighborhood center are placed close to the street, creating a well-defined outdoor room.
11. Parking lots and garage doors rarely front the street. Parking is relegated to the rear of buildings, usually accessed by alleys.
12. Certain prominent sites at the termination of street vistas or in the neighborhood center are reserved for civic buildings. These provide sites for community meetings, education, and religious or cultural activities.

13. The neighborhood is organized to be self-governing. A formal association debates and decides matters of maintenance, security, and physical change. Taxation is the responsibility of the larger community.

2-3-1-2- The Roots of New Urbanism and TND:

As the most common and most familiar form of TND, New Urbanism and its roots and history have been repeatedly studied. In fact the result of the studies about the roots of New Urbanism can be the general history of TND.

Although promoting systematic TND has been done during the previous three decades, but TND and New Urbanism have theoretically obvious roots in the urban movements of the early twentieth century. The first urban design flow, which affected the New Urbanists of 1980s and 1990s was the Garden City and the other one was the City Beautiful movement (Fulton, 1991; Gosling, 2003).

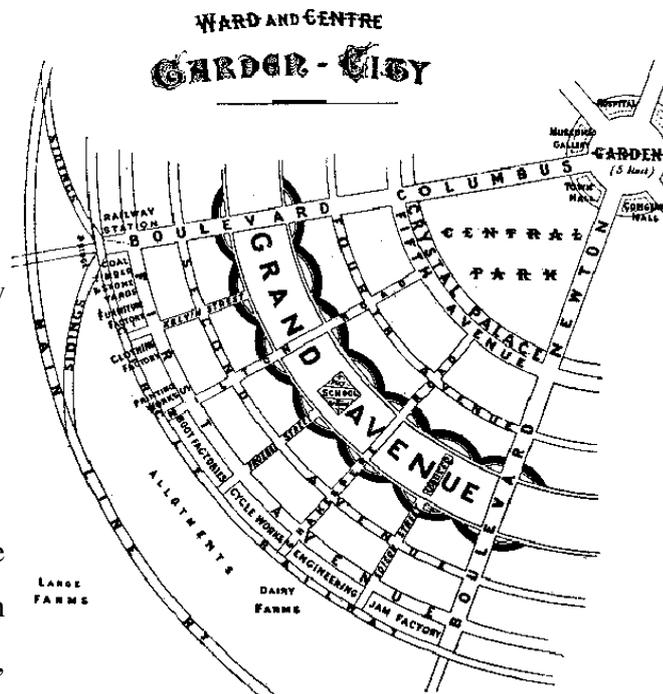


Fig. 2-1: Howard's Garden City (Howard, 1898)

Garden City, which has been one of the most prominent urban utopias of the twentieth century, was proposed by Ebenezer Howard in 1898 in his "To-morrow: a Peaceful Path to Real Reform" and then in the reprint of the book with the name of "Garden Cities of To-morrow" in 1902. The city was a 32000-inhabitant community that was limited to a 6000-acre (2400-

hectare) site. The influence of the Clarence Perry's neighborhood unit who argued that the longest distance to the schools should not be more than a mile so that the students can go to school easily, can be observed in Howard's plans. The basic points of the Anglo-American values are seen in the proposal: individuality and communality, much open space, automobile ownership and in the same time acknowledging the worth of walking, safety for children, efficiency in circulation yet openness in spirit, high mobility, and setting the school at the middle of the residential unit (Lang, 1994). The mentioned values are the ones which are heavily paid attention in the TND plans so that is why the Garden City is considered as one of the antecedents of the traditionalism throughout the USA. Gosling (2003, 231) compares Seaside, FL, the first and most known example of built New Urban communities planned by Duany and Plater-zyberk with Radburn, NJ in case of easy walking distances.

City Beautiful movement has been the other inspiring urban design flow which affected the foundation of TND in the United States. The origins of the City Beautiful goes back to the neoclassical architectural movement of Beaux Arts (Municipal Arts) in 19th century France and the World's Columbian Exposition in Chicago in 1893 (Lang, 1994). Beau-Arts architecture can be summarized in symmetric, flat-roof buildings with neoclassical and classical details and arched windows and doors. The related urban areas were also completely symmetric. This kind of European architecture and urban design was the last ancestor of the Baroque architecture. On the other hand, the World Columbian Exposition was also a major origin of the City Beautiful movement. It was planned and constructed in 1893 by planners Fredrick Law Olmsted and Daniel Burnham who are still known as two of the founders of the movement's principles. Columbian Exposition was success. Its bold, clean and unified urban spaces had the capabilities, which the contemporary urbanism of America lacked (Lang, 1994).

Therefore, architects and planners of that time were attracted to the thoughts and later at the turn of the century the ideology of the City Beautiful was shaped. Other planners of the movement who had a fundamental role in implementing the

principles were Emmanuel Louise Masqueray, and specially John Nolen who had a special effect of the New Urbanist theorist (Fulton, 1991).



Fig. 2-2: World's Columbian Exposition in Chicago, 1893
Archival Photographic Files, [apf3-03160], Special Collections Research Center, University of Chicago Library.



Fig. 2-3: McMillan Plan, Washington D.C., 1902, the symmetric streets and avenues and also the landscape architecture are noticeable.

After the success of the World Exposition in Chicago some other projects were planned according to the well-shaped City Beautiful principles of the early twentieth century, which the most famous ones are the Louisiana Purchase Exposition (1901),

McMillan plan of the Washington D.C. (1902), and a group of developments in other cities of North America like Columbus, Denver, Montreal, Madison, and Cleveland.

The major goal of the movement was to enhance public pride through the grandeur of the built environment. The elements of the baroque architecture are seen in it. Wide streets and avenues terminating at focal points, great classical buildings, and vast plazas are apparently observed in the City Beautiful designs. However, what connects this movement to Traditional Neighborhood Development is the way of looking to environmentalism, landscape architecture, green spaces, and especially human relationships. The beauty of spaces has a major role in the designs of the movement and the relations between the design and nature and also the relations of human and the environment are the themes which inspired the new age designers.

The mentioned urban movements of the late 19th and the early 20th centuries were completely influential in the shaping of the New Urbanism. But along with the theoretical work, other efforts were made by New Urbanist architects and planners in order to form the traditional principles of the American urban form. For instance, in the first years of the 1980's, Andres Duany and Elizabeth Plater-Zyberk studied the form of the urban form and architecture of the east and northeast of the United States in order to formulate the form of the cities of the area in the late 19th and the late 20th century.

2-3-2- Transit Oriented Development (TOD)

TOD is mostly known by the works of Peter Calthorpe (1993) and has been a popular and successful approach. Other scholars have also worked on this type of urban form and different phrases have been used, some of which are “transit village”, “transit-supportive development”, and “transit-friendly design”, but Transit-Oriented Development is the most used one. Like most of the other types of neo-traditional developments, TOD was first developed as an alternative to suburban sprawl but later it was improved and entered the mainstream of development and real estate (Parker et Al. 2002). The United States Federal Transportation

Administration (FTA) characterizes the TODs in two ways: an alternative to sprawl or a specific development type (Parker et Al. 2002).

TOD seeks a way to develop a pleasant connection between node and place, neighborhood and region, or house and job. This occurs by developing mixed-use compact neighborhoods around transit stations. As Still (2002) writes, a TOD is a mixed-use community that encourages people to live near transit services and to decrease their dependence on driving. According to Boarnet and Crane (1997) TOD is a developing or intensifying of residential land use near rail stations. Dittmar and Poticha (2004) define TOD as the pure form of it: “a mix of uses, at various densities, within a half-mile radius around each transit stop”. California Department of Transportation defines TOD in the following phrases: “Transit-Oriented Development (TOD) is moderate to higher density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment and shopping opportunities designed for pedestrians without excluding the auto. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use” (Parker et Al. 2002).

Calthorpe himself notes that TOD is “moderate and high-density housing, along with complementary public uses, jobs, retail and services, are concentrated in mixed-use developments at strategic points along the regional transit systems” (1993).

There are two types of developments in TOD family (Parker et Al. 2002): TOD which is explained above and TAD (Transit-Adjacent Development) which is a development in a close proximity of one-quarter of mile to transit. Of course TOD can usually be a type of TAD but there are separate definitions in some resources.

There are 5 main goals for any TOD project to achieve: location efficiency, rich mix of choices, value capture, place making, and resolution of the tension between node and place (Dittmar and Poticha, 2004). Location efficiency means the houses should be placed around the transit systems in a way that the inhabitants can walk instead of use cars. The density is so that the people are in the walking or cycling distance of the transit stop. The transit is place in the center of the system so it is accessible and the network is pedestrian- friendly. Rich mix of choices means since there are

variety of houses, shopping centers, transit choices, etc., people can use different types of traveling. Another goal of TOD is value capture for both household and community. Transportation is the second-highest consumer expenditure after housing. So the communities and households can reinvest the profits if they have an efficient transit system and this is the TOD planner’s job to create such efficiency. Place making is a great challenge for TODs. They should promote the attractiveness and pedestrian-friendliness of the places. On the other hand, there should be a strong connection between the desired destinations of people and the transit system. Finally, there should be a tension between the transit stop as a “mode” and as a “place”. This means that the transit stop should be an attractive place itself and should be able to attract people and passengers so that they are urged to travel, work in the station, have a shop in it, and do their everyday works in it.

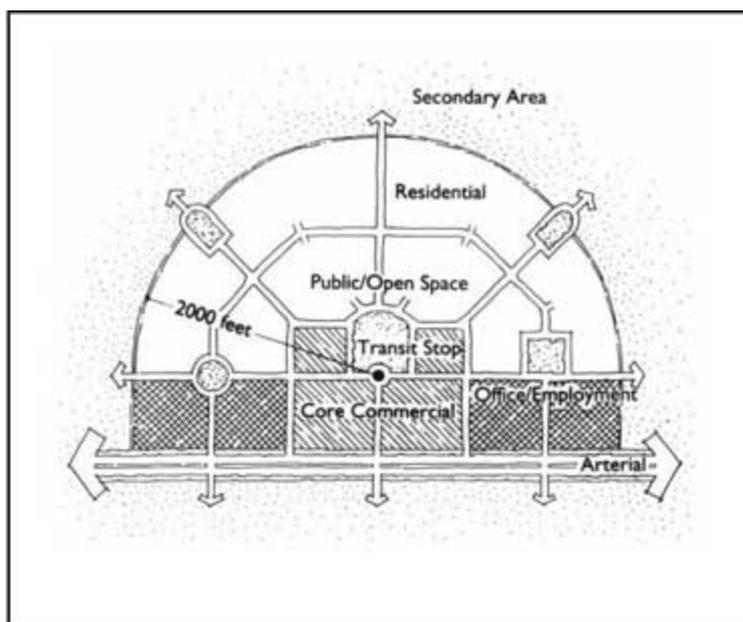


Fig. 2-4: The structure of urban TODs (Calthorpe, 1993)

Calthorpe summarizes the TOD in the following 7 principles (1993, 43):

1. Organize growth on a regional level to be compact and transit-supportive.
2. Place commercial, housing, jobs, parks, and civic uses within walking distance of transit stops.
3. Create pedestrian-friendly street networks which directly connect local destinations.
4. Provide a mix of housing types, densities, and costs.

5. Preserve sensitive habitat, riparian zones, and high quality open spaces.
6. Make public spaces the focus of building orientation and neighborhood activity.
7. Encourage infill and redevelopment along transit corridors within existing neighborhoods.

There are two types of TODs (Calthorpe, 1993): urban TOD and neighborhood TOD. Urban TODs are located on the trunk line transit networks like light transit rail, heavy rail, or express bus stops. Employment and commercial uses are located in the proximity of the transit stop (center of the unit). The uses within an urban TOD serve a metropolitan area and have a regional importance, for example a major employment center or a large shopping mall (Parker et Al. 2002).

Neighborhood TODs are located on a local or feeder bus line. Most of the uses around the transit stop are residential, retail, entertainment, civic, service, and recreational uses. The maximum transit time from the trunk line transit stop is 10 minutes which is equal to 3 miles (Calthorpe, 1993). The residential densities and the mix of housing types should be met as the following figures and table:

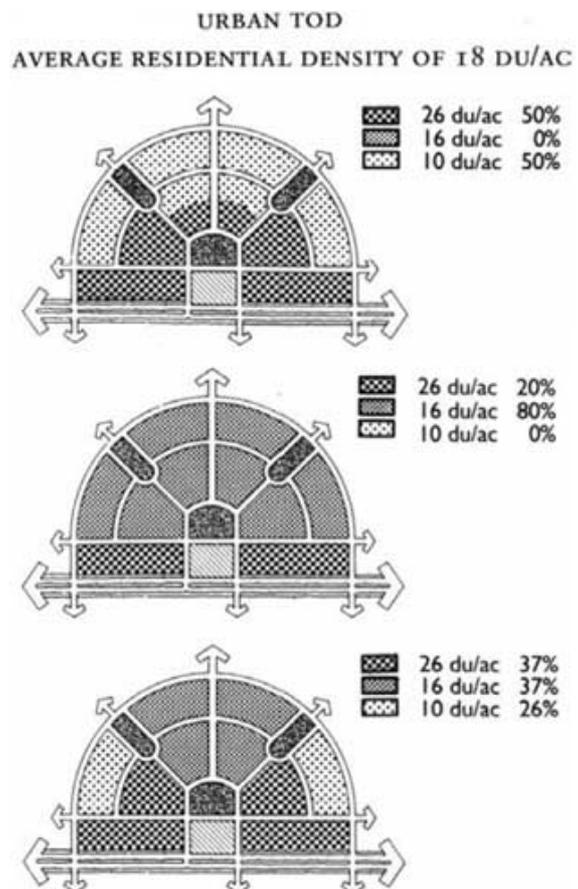


Fig. 2-5: The residential densities in TOD (Calthorpe, 1993):

Use	Neighborhood TOD	Urban TOD
Public	10 - 15%	5 - 15%
Core/Employment	10 - 40%	30 - 70%
Housing	50 - 80%	20 - 60%

Table 2-1: The percentage of uses in urban and neighborhood TODs

The location and distribution of the urban and neighborhood TODs are according to certain principles, for example, the TODs, which have major competing retail centers should have a minimum of 1 mile distance from each other.

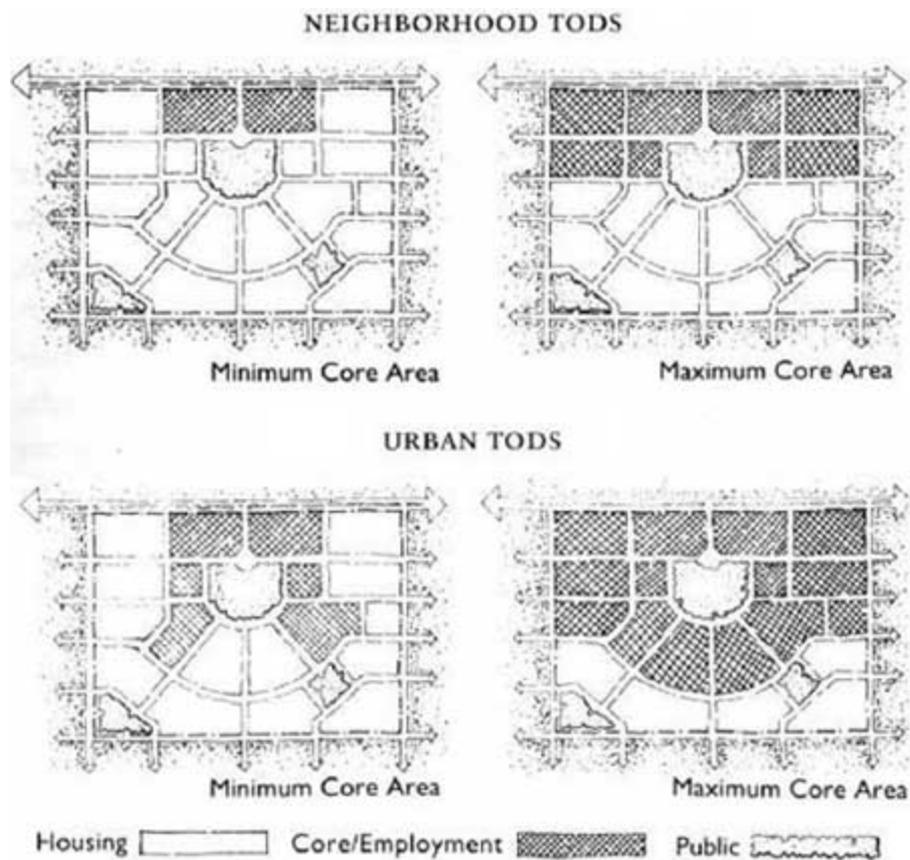


Fig. 2-6: Minimum and maximum core areas and housing uses in urban and neighborhood TODs (Calthorpe, 1993)

2-3-3- Urban Village

The phrase Urban Village is some times used to describe settlements in suburbs, or in between urban and rural areas, which have a compact or traditional form. This

definition is usually used in North America. Since the traditional, compact urban form is studied in the parts of the study that are related to New Urbanism and TOD, therefore, the concept that is focused as Urban Village here is the phenomenon, which was developed by The Prince's Foundation for the Built Environment in the Great Britain.

Although the British neo-traditionalism is mainly known by the urban village movement, but there were successful practices with a look to traditional urbanism before that. One of the best known examples was Essex new town, which was built in the early 1970s. The main reason for a change in the attitude of the British urban designers was the criticisms for the monotonous uniformity and the lack of local character of the British towns of that period of time (Ellin, 1996). Essex new town is one of those settlements. It was planned for a 450-hectare site so that 17000 people were settled in 5500 residential units. Houses, commercial area and factories were all designed according to traditional patterns. Commercial areas were designed based in medieval designs and the factories were like eighteenth-century warehouses and houses.

However, for the first time in Britain, the urban village achieved a type of neo-traditional development in an organized and systematic way and had success in drawing the attention of people and planners. This notion has introduced very small scale neo-traditional development. The result is a village or a town with a population of less than 5000 people. The phrase "Urban Village" was first used by Taylor (1973), and after that by Stephanie Grauman Wolf (1976), but became common after the 1992 report of the Urban Village Forum (UVF) was published (Urban Village Forum, 1992).

The urban village concept originally was shaped after Prince Charles showed interest in changing the architecture and urbanism of Britain by using sustainable and traditional urban forms. He was specially influenced by Seaside and the New Urbanism movement in the United States and was convinced that a settlement with the advantages of a village and at the same time with the good qualities of an urban area can help promote the quality of life of the British communities. Both urban and village words bear meanings and emotions, albeit apposite, are good for every one to

experience in life. As we can see in sentences of David Sucher (2003), the word “urban” bears these meanings: hustle-bustle, liberty, lonely, hostel, far-away, strangers, possibilities, growth, artificial, complex, large, skyscrapers, liberal, and anonymous. While the emotions and sensations which the word “village” transfers to the hearer’s mind are: tranquility, structure, together, friendly, close by, kindred, limits, stasis, natural, simple, cottage, conservative, and familiar. Most of the people want to feel all of these feelings. The advantages of urban village believe these opposite feelings are within a community like Urban Village.

In 1988, the Prince of Wales appointed Leon Krier, a well-known European neo-traditionalist, to provide the building code for a 160-hectare site (100 hectares of mixed-use building and 60 hectares of landscape). The code was written based on the structure and form of the eighteenth-century English village with houses for all income groups and residential building near to the shops and public squares. Later, Prince Charles wrote a book entitled “A Vision of Britain: A Personal View of Architecture” (1989) and publicized his opinions about architecture and urban planning. He declared his will for building “traditional Dorset towns or villages”. The settlements were each one consisted of 500 to 800 households on no more than 100 acres (Ellin, 1996).

The result of the first serious trial to plan an urban village was Poundbury. This settlement, in west of Dorchester, UK, is the most famous built example of urban village which was designed by Leon Krier. It was designed for a land area of 380 acres (152 hectares) and consisted of four neighborhoods (four phases of project), which the first of them was completed by the year 2002. The number of the dwelling units in the master plan is 2250 and 1.3 automobile parking spaces were designed for every household (comparable to the original allotment of 2.3). Pedestrianization and walking distances of 5 minutes were the basis in the neighborhood design. The sustainable energy consumption of many of the houses was achieved by EcoHomes Excellent standards and features like photovoltaic panels, rainwater harvesting, solar water heating, and sheep’s wool insulation were used (Farr, 2008).

After commencement the construction of Poundbury, urban village concept was more organized than before and the Urban Village Forum began to give out

publications about traditional and sustainable urban form and architecture. In the 1995 report of UVF Urban Villages (Aldous, 1995) and also in Thompson-Fawcett writings (2000) these characteristics have been emphasized:

1. Size: It must be small enough to allow people to know each other, but large enough to support a range of facilities and businesses. The notional area is about 100 acres (40 hectares) and the population is between 3000 and 5000 people. The area has almost a circular shape with a diameter of 900 meters.
2. Mixed usage: Residential, commercial, retail and occasionally public buildings are all included and combined in the UVF concept. There is diversity in types and size of the houses.
3. Maximum possible self-sufficiency: Including maximum ratio of jobs to economically active residents, live-work spaces and a consideration for the “balance of usage”.
4. Social and economic integration: A variety of residential and commercial tenures that make it easy for people of different income levels and wealth to live and work in proximity. Urban Villages are not as isolated elements and they should be linked to each other with cycle and footpaths. Neighborhoods should have linkages to each other.
5. Transport and design: An “attractive and civilized environment” with good transport links, good public transport, minimum car usage and a priority for pedestrians and cyclists.
6. Management and control: To ensure that the Urban Village concept is achieved and endures.

Planning new towns is not the only shape of Urban Village concept. It can take elements of centerist and decenterist positions so it takes the shapes of, on the one hand, urban regeneration and containment, and on the other hand, controlled nodal decentralisation (Thompson-Fawcett, 1997). Poundbury is a new town project, and there are a few other projects, which are planned according to urban village principles such as Devonport in Plymouth, Llandarcy in West Glamorgan, Little

Germany in Bradford, Ancoats in Manchester, James Road, Gastin and Evertin in Liverpool, Broughton Atterbury, Jewellery Quarter in Birmingham, etc. (Franklin, Tait, 2002) Here we consider the specialties of another urban village project that is an urban regeneration one. This Urban Village practice is considered here because it has general characteristics that most of the regeneration Urban Village projects have and it is useful to study them as a guide to the concept. Later in the practiced examples, another case study of this kind will be considered.

In 1990, the Crown Street regeneration project in Gorbals district, Glasgow, was planned for 800 accommodation units. The project was started with a vision of long-term regeneration of the location and its economy (EDAW, 1997). The objectives of the project were defined as the following:

- Make the Gorbals a place in which people want to live.
- Develop a new and positive image for the Gorbals as a popular, balanced community.
- Assist in bringing new energy and growth into the social, economic and physical fabric of the existing community.
- Private solutions that stand the best of time.

Also three guiding principles were set (Thompson-Fawcett, 2000):

- The redevelopment of the site will seek to apply the highest attainable quality of development.
- The site will not be developed in isolation from the surrounding area, but become cohesive and integrated part of the Gorbals physically and socially.
- The development will exploit where possible the opportunities for importing the local economy of the Gorbals.

The following design principles were emphasized during the developing the master plan (Thompson-Fawcett, 2000):

- Creation of the livable, urban city.
- Reinvention of the tenement block.

- Reversal of the road hierarchy and reintroduction of the shopping street.
- Redefinition of the grid pattern with linkages into surrounding communities.

To date, 1870 houses have been built (more than the original planning) in a site area of 16 hectares. In general, the Crown Street project has experienced success and has made a positive change in urban form and economies of Gorbals (Thompson-Fawcett, 2000), for instance, in economy sector, the project was successful in providing 112 full-time jobs, 15% of it were taken by the local people (EDAW, 1997).

Although the urban village phenomenon has changed from a newly introduced concept for a minority of people to the center of the British planning policy (Department of the Environment, 1997), but few research has been conducted on it and there is broad space for new empirical and theoretical research.

Chapter Three

3- Neo-Traditional Built Communities and Practiced Examples

Consideration of the international examples of neo-traditional planning can lead to having a better understanding of what should be planned in case of the Iranian cities. This study can outline what should be targeted and what should not be.

In studying the built samples of NTD we observe a noticeable number of communities in the United States. Maybe more than 80 percent of the planned neighborhoods and communities have been implemented in the U.S. The others are mainly built in Canada, Great Britain, Germany, France, Philippines, Mexico, Guatemala, Australia, Sweden, the Netherlands and some other countries. Here we briefly consider some practices of New Urbanism, TOD, and Urban Village concepts and also other practices that are not named to be a part of the above movements.

3-1-USA

3-1-1- Seaside, Florida, USA

Undoubtedly, the first example and the most discussed one is Seaside, FL that was illustrated in 1981 by DPZ Company led by Duany and Plater-Zyberk and is still considered as one of the best practices of New Urbanism. What makes Seaside important is its success in creating a charming space for life and in the same time, its economical success in drawing the attention of house buyers. In 1990, the Time magazine recognized it as the “Best of the Decade” in design. Seaside was designed for a population of 2000 people in an 80-acre (32-hectare) site and a five-minute walking distance was implemented in the designing of its dense neighborhoods. Originally, there were 350 houses and 300 other residential units like apartments and hotel rooms in the plan.

The original idea was creating neighborhoods with the characteristics of the 1920's and 1930's of urban America. So in addition to the developing issues, the reason for building a very small neighborhood is that the designers were simulating a neighborhood based on the scale and size of normal small towns of the north-east and east of the United States. The public buildings and spaces of Seaside include a town hall, and open air market, a tennis club, a school, a very small post office, and an amphitheater.



Fig. 3-1:
Seaside, FL: type
of houses in
dense
neighborhoods
(Katz, 1994)



Fig 3-2: Bird-
eye view of
Seaside in
October 2006.
The can easily
be found in the
picture.
Source:
Google.

There is a variety of house design in the master-plan of Seaside, like Victorian, Neoclassical, Cracker, Modern, Postmodern, and Deconstructivist, but as Peter Katz (1994) writes, the combination leads to creation of a sense of community.

The claims of the new urbanists about the positive impacts of the built neo-traditional urban fabric on the travel behavior began since planning Seaside. The plan contains pedestrian routes, especially in the back side of the houses. The houses are built in a walking distance from the center. The presence of the public transit is not felt strongly because the town is too small and maybe construction of public transport systems was not efficient. The mobility modes are mainly pedestrian/bike and automobiles.

Ten years after the construction of the first parts of the town, the price of the urban land of seaside became tenfold and many advocates of New Urbanism recognized it as a reason for success and acceptability of the quality of housing and community design of the new settlement.

3-2- Communications Hill, San Jose, California, USA

Communications Hill is an example of traditional neighborhood planning in midst of a big city. In 1992 the city of San Jose decided to develop the prominent 500-acre area called Communications Hill. The name was derived from the communication facilities which were installed and working previously in the area and were particularly for AT & T. The height of the area was about 400 feet and the slope of the ground made the development of the area harder in comparison with the flat regions like Los Angeles. There is a slope of 10% to 35% among the hills, but there is also an area with a suitable slope of 1.5%. On the other hand, some other cities like San Francisco and Seattle had the experience of using gridiron planning with success (Katz, 1994). So the planners Daniel Solomon and Kathryn Clarke tried a compact, mixed use, gridiron plan for developing the area, which was located in the middle of the low-density suburban San Jose. They tried to make sense of community through designing walkable village centers in high-density neighborhoods.

According to the Communications Hill Specific Plan (1992), the main goals and strategies for the project were the following:

1. Distribute housing types and densities, workplaces and facilities to create a mixed but compatible arrangement of land uses within the Communications Hill Plan area.
2. Integrate existing land uses, particularly mobile-home parks and single-family homes, with new land uses, ensuring the viability and compatibility of both.
3. Adopt site planning and architectural guidelines and noise attenuation techniques to protect Communications Hill residents and workers from excessive noise from arterials, freeways, the fairground activities, adjacent industrial activities and trains and planes traveling nearby.
4. Minimize grading or re-contouring of Communications Hill to preserve the topography of the land wherever possible, and to avoid the creation of visible cut and fill slopes or obviously engineered of flat-surfaced slopes.
5. Minimize the potential adverse impacts of the Communications Hill area development on the immediate surrounding neighborhood.

The goals of the project were set based on different topics like urban design, neighborhood character, housing, commercial and industrial land uses, economic development, transportation, aesthetic- cultural and recreational resources, services and facilities. The goals that are related to the neo-traditional concepts are the ones that are set for urban design and can be observed as follows:

1. Require a very high level of quality in site planning, architectural design and landscape design for all new projects.
2. Ensure the proper transition between areas with different land uses through site development guidelines.
3. Take advantages of the hillside setting to maximize views and vistas, both private and public, to ensure privacy, and to provide optimal ventilation.

4. Provide pedestrian connections between all portions of the developed hill wherever possible.
5. Encourage development on Communications Hill that displays a strong urban form that is compact and cohesive with some emphasis on vertical element and sharp distinctions between most developed areas such as utility distribution lines and associated equipment underground to promote neighborhood visual quality.
6. Utilize various housing and building construction types that are adaptable to the variable terrain on Communications Hill in order to take advantage of the opportunity for higher density infill housing.

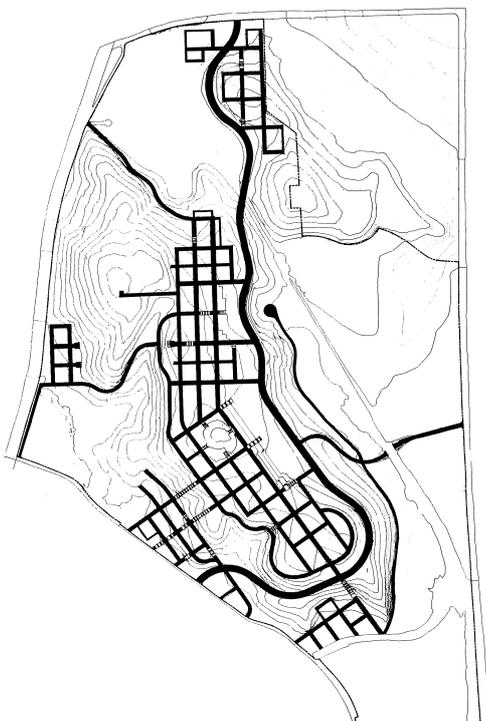


Fig. 3-3: The structure of the plan, (Communications Hill Specific Plan, 1992).

The plan was developed with regard to the following two essential features in order to create not only a place for dwelling, but also a suitable place for social interaction:

- 1- An integrated mix of uses.
- 2- A well defined urban structure

Today Communications Hill has a population of more than 41700 people and the plan has won several prizes.

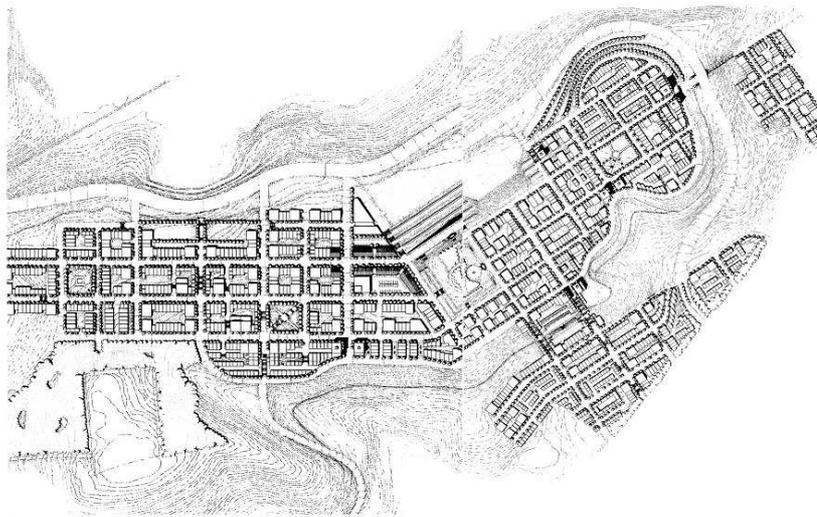


Fig. 3-4: A part of the plan of Communications Hill, (Communications Hill Specific Plan, 1992)

3-3- Rosslyn-Ballston Metro Corridor, Arlington, Virginia, USA

Rosslyn-Ballston Metro Corridor is a part of Arlington County, Virginia. Although the plan is still new but is considered as one of the successful practices of Transit-Oriented Development. The plan was implemented through the Arlington General Land Use Plan and the general intention was to revitalize the region of 5 metro stations in Arlington County. In 2004, the local government asked Fairfax County Department of planning and Zoning to research the development of five metro station areas: Rosslyn, Courthouse, Clarendon, Virginia Square, and Ballston. The plan was prepared in September 2005. The area of the five metro areas covers more than 1000 acres and the total under construction and existing development area is about 58.6 million square feet.

The project is a good example of regional planning as Calthorpe has explained; the neighborhoods are mixed-use compact urban fabrics around a rapid metro line. The locations of the neighborhoods are in a way which is called “bull’s eye” pattern, as is seen in Fig 3-5 and thus have a similarity to the ideas of Calthorpe.

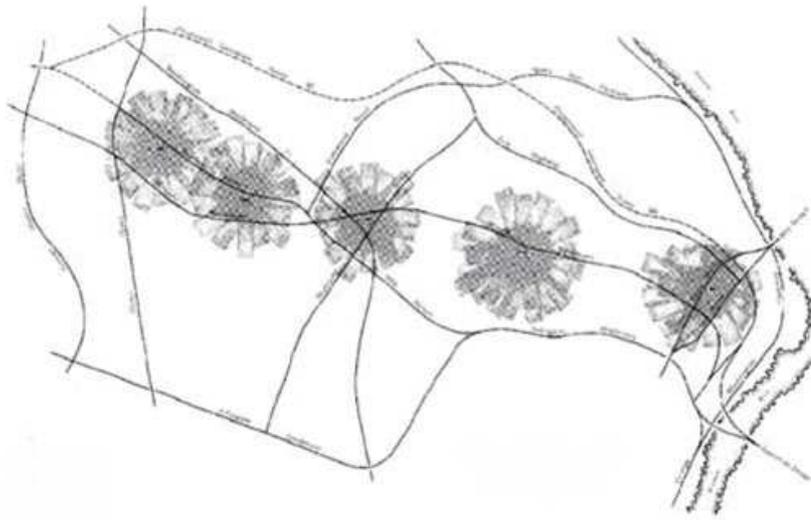


Fig. 3-5: “Bull’s eye” pattern, as implemented in Rosslyn-Ballston Metro Corridor plan

The whole area of the corridor has been a part of the Arlington County in Virginia and adjacent to Washington D.C. and the metro line is a part of the two-square-mile Suburban Washington D.C. TOD Metrorail Stations.

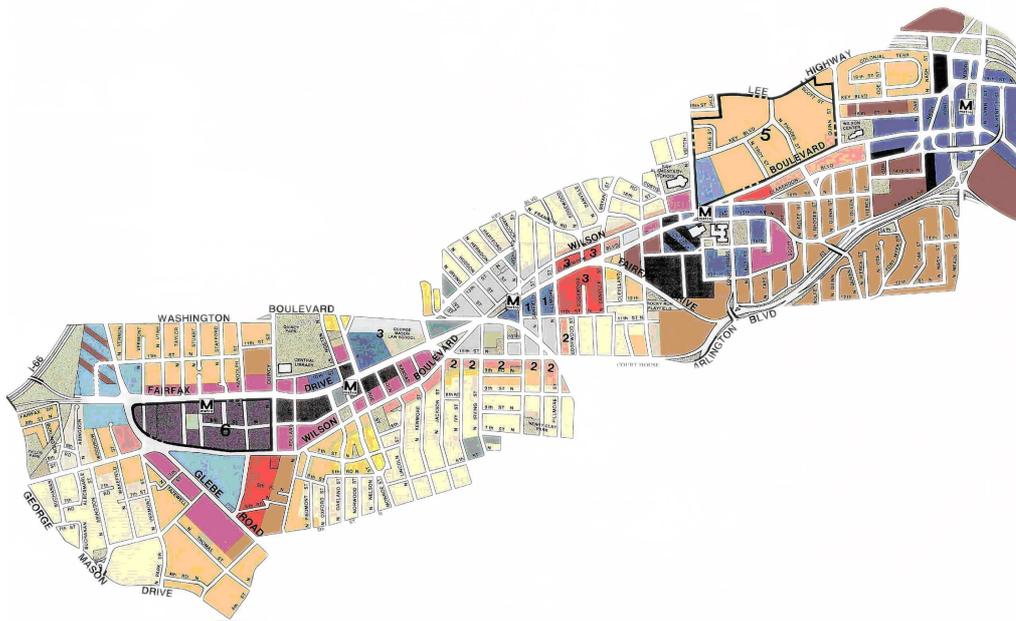


Fig. 3-6: Rosslyn-Ballston Metro Corridor plan: the metro stations from upper right to down left: Rosslyn, Courthouse, Clarendon, Virginia Square, and Ballston (Arlington County Department of CPD, 2005)

Courthouse, which has an area of 198 acres, is focused on governmental and institutional use. 171-acre Clarendon's main role is placing retail and restaurant uses. Virginia Square has an area of 143 acres and is a center for education and institutions. Finally 275-acre Ballston is focused on highly intense retail. The land use and location of the five metro stations can be seen in Fig. 3-6.

The most compact areas are placed around the stations, which are also the neighborhood centers. The station area that is most written about is Rosslyn. Before implementation of the plan, Rosslyn had an overall construction intensity of 1.78 Floor Area Ratio (FAR) that was equal to 18.3 million square feet of development on 236 acres. The existing land use is mainly built up of office (45%) and residential (43%) uses, which is about 80% of the land use of the station area.

After the 1996 decision of the local government to make the development of the county more compact and the implementing the Rosslyn-Ballston Corridor Plan, the intensity within a distance of 1600 feet of the Rosslyn Metro station increased to 3.8 FAR for medium to high residential use and 3.8 to 4.8 FAR for mixed-use office-apartment-hotel use. Therefore the increase of the intensity within walking distance of the metro station is quite observable (Fig. 3-7). In addition, a maximum intensity of 10 FAR is permitted by the County for developers to built special amenities like open space, significant residential components with the mixed-use project, enhanced retail facilities and pedestrian, vehicular and mass transit circulation systems.

The result of the plan is that today Rosslyn has changed from a depressed neighborhood to a vibrant one with 8 million square feet of office space, almost 5000 residential units, and more than 2000 hotel rooms (Arlington County Department of CPHD, 2005). This is the result that more or less other 4 metro stations have gained. The similar information of the five station areas such as intensities and units per acre of the residential uses can be seen in Table 3-1.

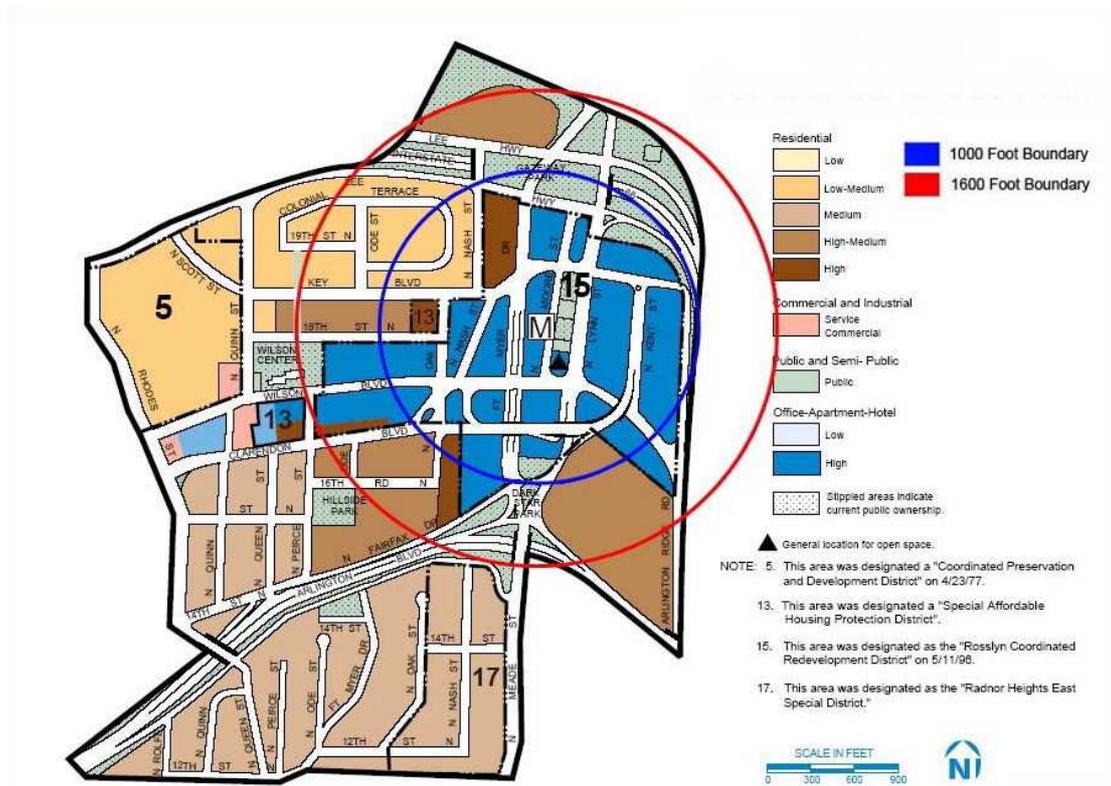


Fig. 3-7: Rosslyn uses plan, (Arlington County Department of CPHD, 2005)

Station \ use	Rosslyn	Courthouse	Clarendon	Virginia Square	Ballston
High Residential	4.8 FAR Residential, 3.8 FAR Hotel	4.8 FAR Residential, 3.8 FAR Hotel	4.8 FAR Residential, 3.8 FAR Hotel	4.8 FAR Residential, 3.8 FAR Hotel	-
High-Medium Residential Mixed-Use	-	-	-	-	<3.24 FAR, including asstd. office & retail activities
High-Medium Residential	3.24 FAR Residential	3.24 FAR Residential	3.24 FAR Residential	-	-

Medium Residential	32-72 du/ac	32-72 du/ac	32-72 du/ac	32-72 du/ac	32-72 du/ac
Low-Medium Residential	16-36 du/ac	16-36 du/ac	16-36 du/ac	16-36 du/ac	16-36 du/ac
Low Residential	-	-	1-10 du/ac	1-15 du/ac	1-15 du/ac
Coordinated Mixed Use	-	-	-	-	<6.0 FAR (w. office not more than 3.0 FAR)
High Office-Apartment-Hotel	3.8 FAR Office ; <4.8 FAR Apartment; < 3.8 FAR Hotel	3.8 FAR Office ; <4.8 FAR Apartment; < 3.8 FAR Hotel	3.8 FAR Office ; <4.8 FAR Apartment; < 3.8 FAR Hotel	3.8 FAR Office ; <4.8 FAR Apartment; < 3.8 FAR Hotel	-
Medium Office-Apartment-Hotel	-	-	2.5 FAR Office; <115 du/ac Apartment; <180 du/ac Hotel	-	2.5 FAR Office; <115 du/ac Apt; <180 du/ac Hotel
Low Office-Apartment-Hotel	-	-	-	1.5 FAR Office; <72 du/ac Apartment; <110 du/ac Hotel	-
Service Commercial/Industrial	-	-	-	-	1-4 stories
High-Medium Residential Mixed-Use	-	-	-	<3.24 FAR, with associated office & retail	-

				activities	
Parks/Semi-public	-	-	-	-	-
Commercial/Industrial	-	-	-	1-4 stories	-
Governmental and Community Facilities	-	-	-	-	-

Table 3-1: the specifications of 5 metro areas of Rosslyn-Ballston Metro Corridor according to Arlington General Land Use Plan (Arlington County Department of CPHD, 2005)

The results of Rosslyn-Ballston Metro Corridor have been inspiring for other cities. The residents of the 22500 units of the area live in a transit-friendly community. Most of them are familiar with public transit as a daily mode of transportation.

After the implementation of the plans of the area, 50% of the residents use public transit to work, 73% of them walk to the stations (Local Initiatives Support Corporation, 2009) and that is a success in low rate of automobile use in car dependent U.S., thus, it is of no surprise that the project has been the winner of the 2002 award for the Overall Excellence in Smart Growth by U.S. Environmental Protection Agency.

In addition to the benefits of the project for the environment and residents, it has also had advantages for the local government. This area that is 8% of the land of the County, generates 33% of the revenues (Local Initiatives Support Corporation, 2009). On the other hand, another result that shows the success of the project in the previous years is that the land value of the area has grown rapidly. The value of the land around the stations has had 81% growth in 10 years.

Rosslyn-Ballston Metro Corridor is an example of how public transit along with density can affect travel behavior. The quarters near to the transit stations have higher densities. Therefore the residents can easily use the nearest public transport facilities.

3-2- Europe

3-2-1- Coed Darcy Urban Village, Neath, Wales, the United Kingdom

Coed Darcy or Llandarcy Urban Village is Europe's largest brownfield redevelopment project which was planned for a former BP refinery site. The location is adjacent to Llandarcy in Neath Port Talbot county borough, Wales. The refinery was the first oil refinery in UK and was built between 1918 and 1922 and was closed in 1997 due to economic changes. The goal in designing Coed Darcy and other developments of its kind has been to create a sense of place and community within legible movement frameworks.

The project is a 1.2 billion Pounds development, which is expected to be home to about 10000 residents. The design phase is now finished and the construction of the first phase has been started in June 2008. The designers have tried to avoid imitation of the old Llandarcy village form which is related to 1920's, but preserve its character and scale.



Fig. 3-8: Master plan of Coed Darcy, Neath, Wales, (Coed Darcy Master Plan, 2006)

The master plan has proposed to accommodate 4000 residential units and employment areas and open space covering 1300 acres (Coed Darcy Master Plan, 2006). Coed Darcy Area 1, which is in the center of the master plan is the first phase of building and has a minimum massing between 2 and 3 stories. The predominant use is residential and comprises 178 residential units. The street set-backs of the buildings are between 0 to 4 meters.



Fig. 3-9: the first phase of the Coed Darcy Urban Village Development is high lighted (Coed Darcy Master Plan, 2006).

The structure of streets and routes of the phase 1 area is so that passengers with automobile or on foot can easily reach the key buildings and open spaces. So walkability has been paid enough attention. Pedestrian walkways are perpendicular to streets and lanes, therefore, residents can easily reach their destinations without car use.



Fig. 3-10: The location of the buildings in the Master Plan of Coed Darcy (2006)

Fig. 3-11: The hierarchy of the streets and routes of Coed Darcy according to its master plan.



3-2-2-Jakriborg, Sweden

As a part of Staffanstrom Municipality between Malmö and Lund in Sweden, Jakriborg is a small new town or village, which is planned and developed by a firm called Jakri AB, based in Malmö, Sweden. The housing project is a part of a larger village titled Hjärup that has about 4000 residents. The developing company is led by two architect brothers called Jan and Kristor Berggren. This planning practice is selected because the planners do not have any ties to DPZ and Leon Krier, who have had a hand in many European traditional projects.



Fig. 3-12: The row houses of Jakriborg along the curvy and stone-covered main street. Photograph by Håkan Dahlström



Fig. 3-13: The steep roof is the identical architectural specification of the houses of Jakriborg that comes from the traditional architecture of the region. Photograph by Rutger Blom.



Fig. 3-14: Jarkirborg detached from the main village called Hjärup by a street in the southeast. Source: Google.

The basis of the concept behind the design of the town is creating the sense of a medieval settlement through the architectural elements. However the design concept of the town is not inspired by the old Swedish cities, but is gotten from the pre-industrial settlements of the coasts of the North Sea and Baltic coastline in Estonia, Latvia, Lithuania, Belgium, Poland, Denmark and Germany. The settlements that have especially inspired the design of the town are the old north German Hanseatic towns (the medieval merchandising guilds in north of Germany, especially in the Baltic Sea coast, for example Rostock, Hamburg, Stralsund, Wismar, and Lübeck). Although design of the town has apparently traditional backgrounds but the planners do not address their practice as a part of the New Urbanism movement. However their town has become an example of the European New Urbanism. Maybe it is better to name the design as the European traditional planning.

The town has been developed by private sector with private money on private lands. Thus even the public spaces are not really public. Therefore the town is more like a commune. The activities of a normal city are not so familiar in its public spaces. The residents do not own the houses and are just tenants. The rent of the houses is lower than other places of the country, so this has been effective in attracting the people, who wanted to live there.

The symbolic image of the city consists of shoulder-to-shoulder row houses with steep roofs. There is a central square in the town that is also a gathering place. There is diversity in the façades of the houses and the small elements remind the visitor of the medieval architecture. Diversity is not shown in the appearance of the buildings, but the owners try to diversify the specifications of the tenants and have residents from students, elder people, couples, families and so on.

In the year 2005 the population of Jakriborg was about 1000 people that were accommodated in 300 apartments. The construction began in 1998. The development plan contains 400 more apartments. The owners have a plan to increase the population to 7000 people to make their financial plan beneficial. The project has a good reputation is low construction costs and has received a Municipality Prize in 2003 for its successful design and implementation (Stefan, 2005).

3-2-3- Brandevoort, Helmond, the Netherlands

Brandevoort is a new town near Eindhoven, Netherlands that has been developed in about ten years. Like many traditional urban development projects of Europe the designers behind the plan of the city are Rob Kirer and Christoph Kohl (K·K Gesellschaft von Architekten mbH, Berlin) accompanied by other planning and architecture firms like Paul van Beek landschappen BNT Amsterdam, Wissing Stedenbouw bv Barendrecht, and Grontmij have also had parts in the projects.

The ultimate population that the town is going to accommodate is about 20000 people. Brandevoort consists of the main part and a few so-called villages around it. The villages are attached to the main quarter. In fact the main center and the villages shape the structure of the city. The central part contains a town center that includes a fortress, school, public buildings, shops, and restaurants. There are 1500 row houses in this part. There are no row houses in the villages. The houses of these areas are detached or semi-detached. The master plan was developed in 1996. The construction began in 1997 and will be continued until 2017 when 6000 houses and apartments will be completed. There is a railway station that connects the district to the national railway network of the Netherlands. 1000 homes are built in the new quarter, but 3000 homes were built in the district before 2007. That is 30 residential units per hectare.



Fig. 3-15: The main part of Brandevoort is contains row houses and the surrounding villages include detached and semi-detached houses. Source: Brandevoort Master Plan, 1996.

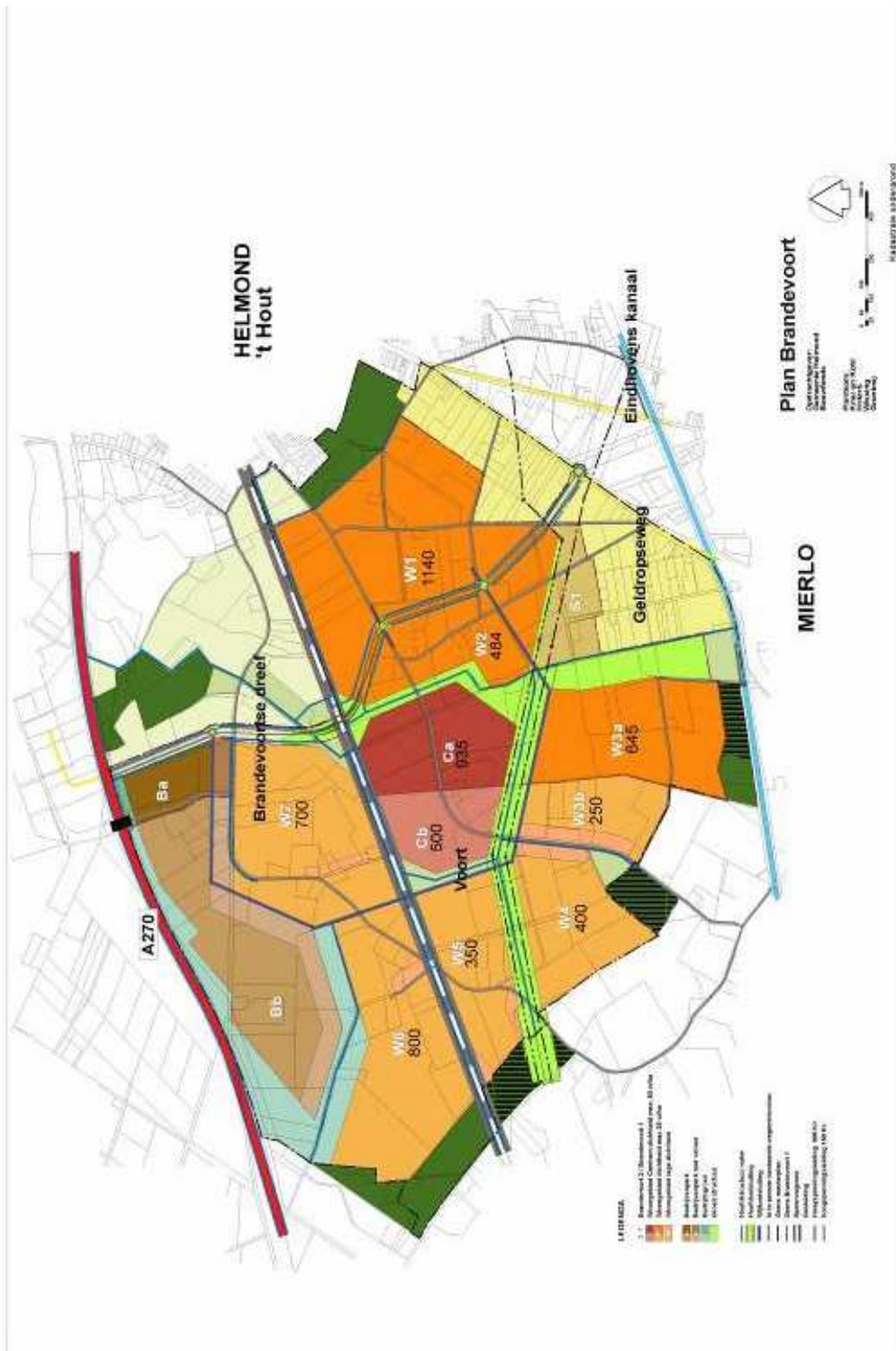


Fig. 3-16: The master plan of Brandevoort. Phase I lies in the eastern side. The western part is developed in phase II. Source: Brandevoort Master Plan, 1996.

The panels that are used in the construction of the walls and the roofs of the houses make the building method sustainable and affordable. Such prefabricated panels need little time for assembling, so the speed of construction is high.

One of the strategies of the master plan is to improve and strengthen the prominence of the water corridors and other natural elements of the area. This strategy is seen in Fig. 3-17 that shows the ecological corridors of the master plan. There are water canals around the residential district that makes as almost similar street view like the streets Utrecht and Amsterdam, which have small canals in the middle and automobile pathways on the two sides of the canal. The row houses of the central quarter make a closed loop, so a piece of land that remains in the middle. These inner courts are used as semi-private spaces for the residents of the surrounding houses. The houses of this quarter are closely attached together while the appearances are not just like each other and there are differences as having general harmony.

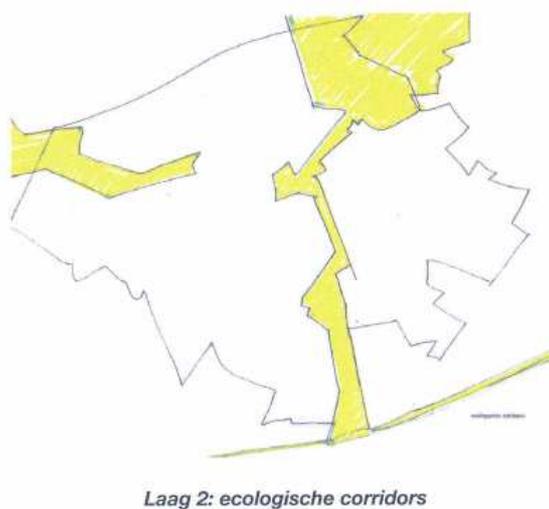


Fig. 3-17: The ecological corridors of the master plan of Brandevoort. Source: Brandevoort Master Plan, 2006.

3-2-4-Kirchsteigfeld, Potsdam, Germany

Kirchsteigfeld is the first and one of the most important residential projects that were planned after the reunification of Germany. The main point that caused the project be planned was to change the main planning concepts of German Democratic

Republic (GDR). The residential unit planning of GDR was based on high-rise constructions with large open spaces in between. The planning body of Germany decided to try a mixed-use residential quarter that included 3 or 4 story buildings. It was meant to focus more on the quality of the planned space than the East German previous plans. The importance of this project and the similar ones is in the method of changing the planning concept from large-scale to small-scale quarters. The new plans were tried to be human-scaled, compact, mixed-use ones.

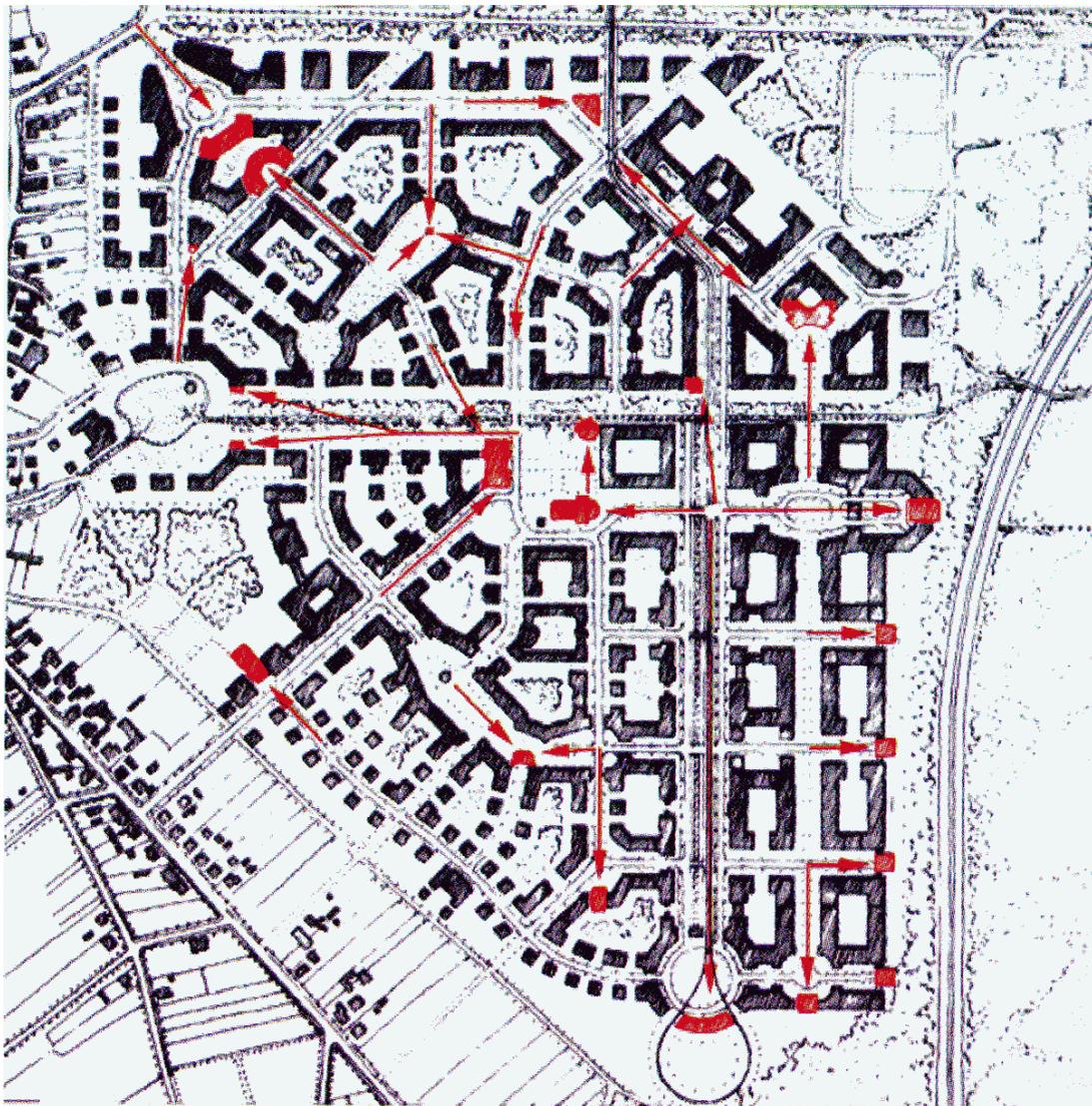


Fig. 3-18: The plan of Kirchsteigfeld. Source: Bundesamt für Bauwesen und Raumordnung, 1998, cited in Brunsing et. al, 2000.

The city of Potsdam that is located in the south east of Berlin experienced such new planning. Potsdam-Kirchsteigfeld is a district of Potsdam that was not built up till 1991 when the developer started to find suitable planning and design consultants. Krier and Kohl (K.K Gesellschaft von Architekten mbH) were the main consultants. The plan was implemented in a 60-hectare piece of land. The goal was to create a mixed-use, dense, compact, new neighborhood with 2800 residential units and 5000 jobs for the inhabitants (Wiegandt, 2004). The plan had a focus on the enhancing sustainable urban transportation, reducing the car ownership and increasing public transport use. Other objectives were promoting sustainability by use of social, economic and ecological potentials. The design of the new quarter was supposed to be a bridge between the 18th century city of Potsdam and the high-rise apartments (Brunsing et. al, 2000). The plan that was developed included 24.9 hectare for residential use, 9.8 hectare for commercial use, 9.5 hectare of mixed use buildings, 10.3 hectare for transportation, and 4.5 hectare for open spaces. According to the plan it was to build 110000 square meters of office (Brunsing et. al, 2000).

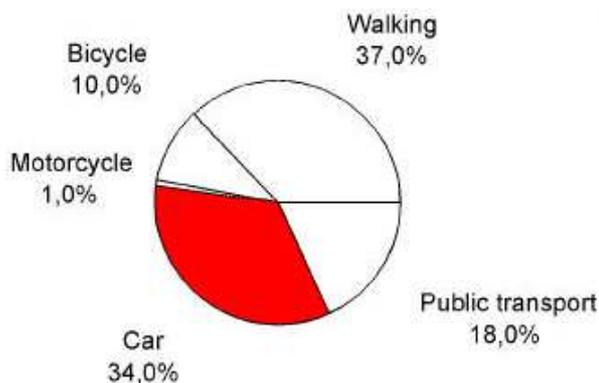


Fig. 3-19: The modal split of urban travels in Potsdam in 1991. Source: Studiengesellschaft Nahverkehr, 1993, cited in Brunsing,et al. 2000.

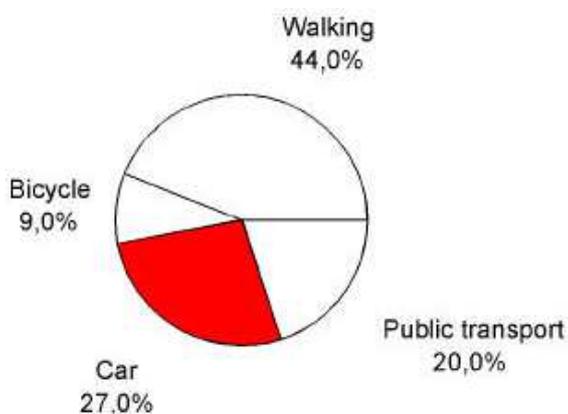


Fig. 3-20: The modal split of urban travels in Potsdam-Kirchsteigfeld in 1999. Source: Freie Planungsgruppe Berlin, 1999, cited in Brunsing et al, 2000.

Kirchsteigfeld has been successful in terms of urban transportation. It had especially had good effect on the urban travel behavior. In fact in this example urban design had pushed people to use more sustainable travel choices like pedestrian/bike travel and using public transport. The transport split mode statistics of the year 1991 shows that 37% of the urban trips of Potsdam were done on foot, 10% by bicycle, 1% by motorcycle, 18% by public transport, and 34% by car (Studiengesellschaft Nahverkehr, 1993, cited in Brunsing, et al. 2000). The mode share statistics of Potsdam-Kirchsteigfeld in 1999 shows progress in making the urban transportation sustainable. In 1999, 44% of the trips were made on foot, 9% were by bicycle, 20% were by public transport and just 27% were by car (Freie Planungsgruppe Berlin, 1999, cited in Brunsing et al, 2000). The role of the short distances from home to work place is seen in the results. Also the public transport policies had undeniable influence on the change of the transport mode share. The commuters received a 35% reduction in the public transport fares to be encouraged to use the new tram line that were built between the main square of Kirchsteigfeld and Potsdam.



Fig. 3-20: Four images of the residential buildings of Potsdam-Kirchsteigfeld. Photographs by Luke Stearns.

Fig. 3-20 shows views from the residential use in Kirchsteigfeld. The buildings seem like other German buildings in many modern or old quarters. The specific value that makes Kirchsteigfeld successful does not lie in the architectural elements that come directly from the traditional architecture. The winning point for the project is related to the compact and walkable structure of the quarter in addition to the accessibility to public transport. The mixed-use, walkable urban form comes from the structure of the old cities, while the public transport is newer. So the combination of old and new values seem to work well in case of Kirchsteigfeld.

3-3-The Middle East and India

Since the neighboring countries of Iran have similar cultures and urbanization systems, it is relevant to consider some of the practices in such countries. Three examples are selected for this part. There are some other projects that claim to take traditional or sustainable strategies in the region. Such projects are being executed in places, where unsustainable high-rise skyscrapers are built to make new benchmarks for newly founded countries and cities. This way of thinking that is often seen in the small countries of the south of the Persian Gulf pay little attention to sustainable trends like public transit. Instead their interest is in the symbolic architectural elements in the façade of the buildings and enhancing automobile infrastructures. Also air-conditioned shopping malls are another specification of this urbanism. On the other hand consumerism is the basis of such projects and millions of dollars are spent to plan and construct them. It does not seem that considering these projects can be useful for the progression of the Iranian urban planning. The following projects can be discussed more seriously.

3-3-1-Lavasa, Maharashtra, India

Lavasa is an example of the application of the traditional development in the Indian subcontinent. The new city is located in Maharashtra with 45 minutes travel (65

kilometers) to Pune and 3 hours to Mumbai. The plan that is in construction phase is developed by Lavasa Corporation, which is a subsidiary of the Hindustan Construction Company. The master plan has been conducted by HOK in the United States. The plan of Lavasa has won several prizes like the American Society of Landscape Architects Award of 2005 and the Award for Excellence 2005, which is given by the Congress for New Urbanism (CNU).

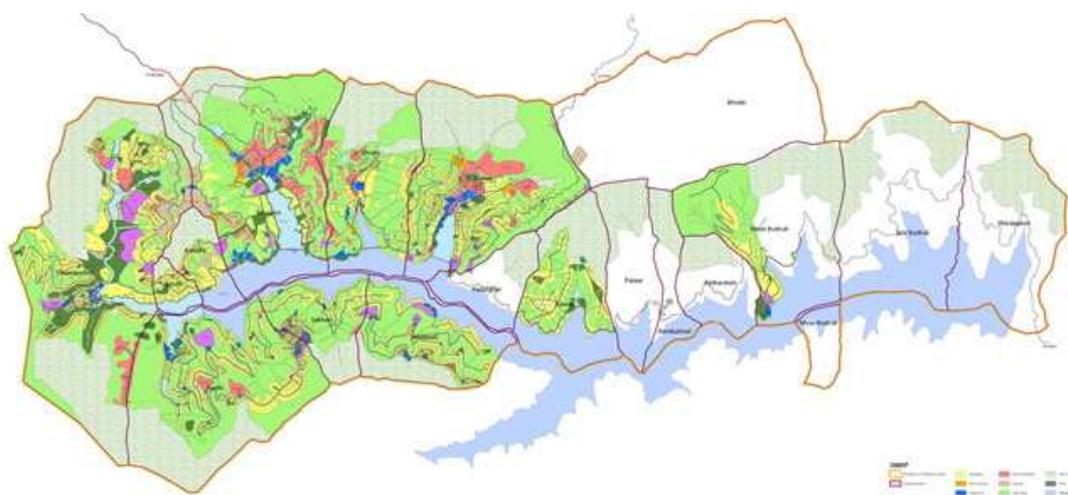


Fig. 3-21: The location of the urban centers of Lavasa along the new dam lake. Source: the master plan of Lavasa.

The master plan has been designed according to the principles of New Urbanism. However, the main focus of the plan is on tourism, particularly eco-tourism. 200,000 annual tourist arrivals are foreseen for the city. The project is quite large-scale in comparison with the North-American New Urbanist projects. It is planned to accommodate about 300,000 residents. The city has been started from scratch in an elevation of about 1,000 meters above the sea level. A dam has been built in the first phase of the construction and four separate interconnected city centers build up the plan. The centers are located on the coast of the dam lake and the suburbs are on seven hills. The construction of the city will continue till 2020, while the first center called Dasve was complete in 2010 and the construction of the second one, called Mugaon, is expected to be finished in 2013. About 60 kilometers of coast has been

created as a result of the construction of the dam. Also 12 mini dams are constructed. Each of the four centers has their own identity and amenities. The centers include walkable and dense spaces while the suburbs contain more dispersed urban texture. The city will have 3240 hectares area with 25000 apartments and villas. Also 50000 jobs are predicted to be created. However the final goal of the project is to have an area of 100 square kilometers and population of 1.3 million residents in 7 urban centers. It seems that the large scale of the project is what India need to accommodate the exploding urban population of the country.

Although the main attraction of the project lies on environment, it seems that there are problems regarding the environmental impact of the construction. The residents believe that the developer has not fulfilled the responsibilities to please the Environmental Impact Assessment (EIA) of the Indian Union Ministry of Environment and Forests. Recently there have been concerns about the lands and water resources amidst the farmers of the downstream of the dam (EQUATIONS, 2010, 45).



Fig. 3-22: Residential units in one of the four urban centers of Lavasa called Mugaon. Image by Ravi Karandeekar.

Another specification of Lavasa's plan is that it is not based on the traditional Indian city characteristics. In fact the plan looks to the neo-traditional development as a

world trend and accepts the North-American norms of traditional planning as the basis. Of course it should be noted that most of the values that are emphasized as the New Urbanism principles like connectivity, mixed housing, mixed-use and diversity, sustainability, smart transportation, etc. are general trends that can be positive in any project. However in case the traditional neighborhood structure or traditional architecture is envisaged, the design can not be like the American plans.

3-3-2-Ispartakule, Bahcesehir, Istanbul, Turkey

Ispartakule is phase II of a larger development called Bahcesehir that is located 25 kilometers west of the CBD of Istanbul. This community is one of the most famous master planned new towns of turkey, which is especially known for its gated communities. The organization of Bahcesehir is according to construction phases and each phase has its own planning management and builders. The goal that the first plans drew for Bahcesehir was to accommodate 90000 people in 20000 residential units that were to be built in 470 hectares. This was later reduced to 55000 people in 15500 units. The first phase was completed in 1993 and the second phase, which was Ispartakule, was designed in 1996. The construction of the first half of the phase was finished in 2000 (Erkul, 2009, 97).



Fig. 3-23: Ispartakule site plan, source: Erkul, 2009, 102.

As a neighborhood of Bahcesehir, Ispartakule was designed by the American consultant, CHK (Torti Gallas and Partners). The master plan contained 718 residential units within 68 hectares. The plan has won several national and international awards. Although it was not announced that the plan was designed according to New Urbanism or any other trends, but many of fundamentals of New Urbanism was fulfilled in its design. The main idea of the plan that is considerable to the new urbanism notion is emphasis on pedestrian flow, walking distances, mixed-use housing with diversity of house types, access to low-rise and mid-rise apartments, and attempting to attract people with a variety of income range. The plan seeks to place the houses to around the playgrounds, shops, and urban public spaces. The Nature Park that attached to the neighborhood has the task of enhancing the creativity and entertainment-related activities. It is also accessible for the pedestrians.

The housing has considerably variety. There are apartments of various heights, attached and detached villas, and row apartments in the neighborhood plan. Different homes with different prices will collect customers with different incomes and cultures. The designers and developers have also had a glimpse to TOD in design because a train station has been constructed to connect the neighborhood and the whole town to the national rail network. However the main transportation mode for reaching Istanbul remains car.

The neighborhood plan is successful in creating a pedestrian space in the fringe of the busy metropolitan area of Istanbul. But the nature of the plan is much like the European and North-American new urbanist plans. It seems that it does not focus on high density or compact city concepts. The impression of a visitor or a reader is that the residents of Ispartakule have the advantage of living in countryside far from the busy central city. The plan does not have the aim of providing affordable housing near to a third world large city and seeks to create high quality urban space like the ones in the western countries. It also does not have the objective to use the Middle Eastern architectural values like the project of Kemer Country near Istanbul, in which Andres Duany and Elizabeth Plater-Zyberk tried to use traditional neighborhood elements of the region.

3-3-3-Beirut Central District (BCD), Lebanon

After the Lebanese civil war of 1975-1990 the Lebanese government decided to rebuild the downtown Beirut that was partly destroyed during the war. The district that was to be renovated contained the parts, which until 1830 was the main city of Beirut. This reconstruction plan is still one of the successful large downtown redevelopment projects among the Arab countries and is taken as a pattern by some new projects. The look of the Beirut Central District (BCD) master plan to the traditional values of the old Beirut is the reason to consider it as an example of the neo-traditional projects.

Beirut is one of the Middle Eastern cities that tried to have a modern appearance and function during the first half of the twentieth century. This happened during and after the French mandate. In mid-twentieth century, Beirut had a prominent place in the region. Modern plans formed the city since prior to the Second World War till the civil war that started in 1975. Such plans were implemented in 1930, 1943, and 1964. The master plan of Beirut was introduced in 1986, but it could not have notable results because the war was not completely over just like what happened to the 1977 plan. After the war, in 1991 a company responsible for the redevelopment of the damaged downtown was established. The company was called Lebanese Company for the Development and Reconstruction of Beirut Central District or briefly Solidere.



Fig. 3-24: The street-wall defines a continuous line in the two sides of the street in contrast to the modernist architecture and urban design. Source: Gavin, 2004.

The plan area is 191 hectares of land in the north of the city. 118 hectares have been already the traditional city center and 73 hectares was reclaimed from the sea. About 98 of 191 hectares were allocated to the public spaces. The public spaces consist of roads (59 hectares) and landscaped open spaces (39 hectares). Around 93 hectares became residential quarters. The first phase of the project was executed between 1994 and 2004 and the second phase was started in 2005 and will continue to 2030. The main target of the company was to create a city center that, on the one hand contains all of the old traditions and values of the city, and on the other hand bears the capabilities to be the heart of a modern city of future. The core concepts envisaged in BCD were changing the function of the Beirut downtown, providing a unique local identity for the city, enhancing the quality of the open spaces, strengthening the active street network, and controlling the height and construction density of the buildings (Gavin, 2009, 22-25). In the first half of the twentieth century, the suburbs of Beirut grew in the same time the downtown was declining. Therefore the city center turned to a single-use area. The master plan now focuses on making the new center a vibrant downtown with mixed-use and residential parts in addition to commercial uses.



Fig. 3-25: The situation of BCD in the Beirut peninsula. BCD is defined in light color in the north. Source: Gavin, 2009, 15.

The uniqueness that is emphasized in the master plan should be gained by using the traditional and identical capabilities of the geographical place of the city on the coast of the Mediterranean Sea and the city itself. In this case the aim is to prevent the city to become a globalizing city without a look to the local identities. The master plan has especial interest in public open spaces such city-scale green spaces or neighborhood-scale squares. Such spaces were connected by pedestrian routes, so they became more important meeting points. Also the semi-private malls and spaces are encouraged to be changed to public malls and streets, so that the public spaces become more cosmopolitan. The street body should make a wall-like shape, so the set-backs of the buildings, particularly the high-rise ones should be in harmony to the other constructions (Fig. 3-24). The construction density of the center is determined by the parcels that each has distinct height and density.

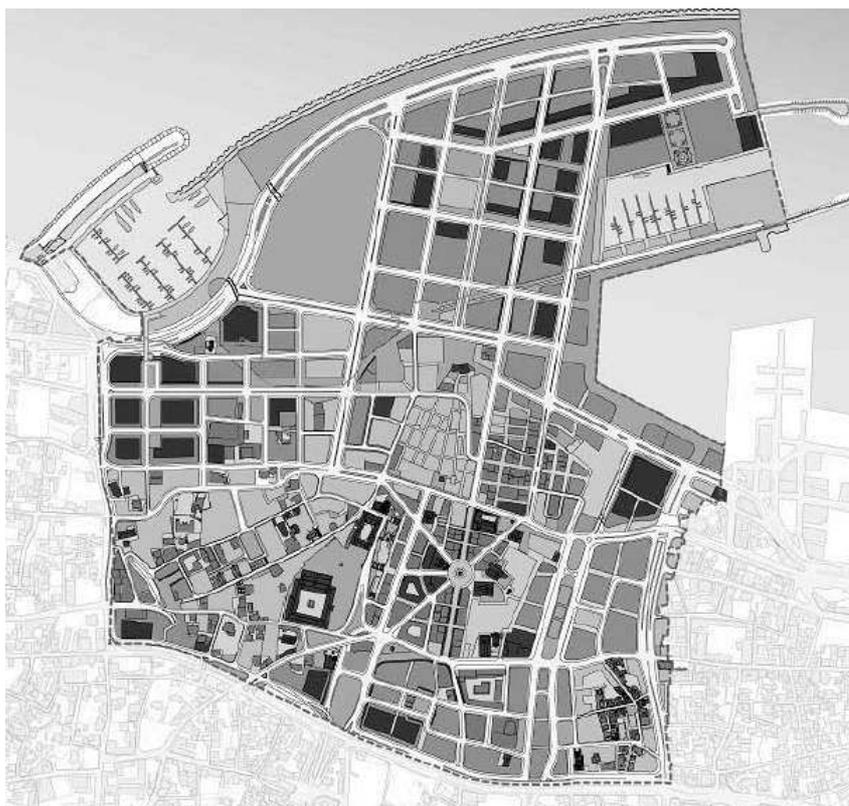


Fig. 3-26: The master plan of BCD with the public meeting points in the southern part. Source: Gavin, 2009, 16.

3-4-Conclusion

This chapter gives an image of the neo-traditional strategies that are helpful for the existing conditions of Iran. The North American New Urbanist view, represented by Seaside, Florida, is far away from today's conditions of the Iranian cities. It focuses too much on the quality of the houses and the financial problems, while what is necessary for the Iranian cities is affordable housing with more sustainable and public transport. Transit-Oriented Development can be more helpful but it is still away from the facts of Iran. As was seen about Rosslyn-Ballston Metro Corridor, Arlington, the center of the idea is based on metro lines and envisaging higher density around the stations. The problem is that such metro lines are limited to the large cities of Iran and the medium cities that are the target of this research do not have any kind of rail systems. Of course bus lines that most of the cities contain are good for this purpose.

The British Urban Village notion seems to be too rural for being a pattern to learn from. It does not have the capability to be the planning concept for construction of a 200000-residents city. Most of the experienced communities that have been planned according to this concept accommodate very little population. The example is Coed Darcy Urban Village, in Neath, Wales.

According to the examples that were discussed in this chapter, it seems that the European view, especially Potsdam-Kirchsteigfeld, is more realistic and near to what is needed in Iran. The look of the decision-makers is to both the density and the public transportation.

The Middle Eastern view to the neo-traditionalism is too much mixed with the issue of identity. However the case of Beirut seems a good pattern because the conditions are very similar to many Iranian cities. The redevelopment of such cities is today a hard task to do. This is the job that Beirut seems to be doing well on it. The project of the south of Persian Gulf does not have anything common with the Iranian cities and seemingly focus on market and high rise building.

The pattern that is suitable for the purpose of this study should include strategies like affordable housing, public transportation, high density, development of meeting

points, and pedestrianization. Each of these specifications is seen in few of the studied examples. Of course most of the considered experiments can be a lesson to learn from for executing infill projects that are discussed in chapter 9.

Chapter Four

4- The Uses of Neo-Traditional Development in Other Countries

4-1- Introduction

Chapter 4 studies the benefits of NTD in the international level. This part includes a review of the reasons for introduction of NTD in the western countries particularly North America and also the theoretical bases of the advantages. The aim is to learn how the neo-traditional way of thinking can be helpful in the modern urban life.

The first part of the chapter gives an understanding of the nature and definition of the main reason of NTD in the western countries. Also the urban sprawl in North America and Europe as the main centers of sprawl is considered.

The theoretical advantages of the second part are categorized in transportation, public health, environmental pollution, and energy consumption. The urban travel behavior has been studied as a part of transportation.

4-2-Urban sprawl

The most prominent application of Neo-Traditional Development in the western countries is using it as a tool for containing urban sprawl. During the past years there have been debates around the suburban and urban sprawl. Many scholars believe that this way of urban development is not sustainable, environment-friendly, and cost-efficient. So they started to seek other development patterns, which fall in the sustainability criteria better. Most of the researchers, who suggest sprawl containment strategies, are neo-traditionalists.

In this chapter we consider urban sprawl as an urban contemporary problem, which has had broad scales in the western countries. The result of this part will be better understanding of the nature of the problems and the answers that have been raised by the neo-traditional advocates. Since the urban sprawl has been defined as one of the urban problems that are going to be considered in this dissertation, the present

chapter can have notable outcome for the part of the study that is related to sprawl problems. The definitions of urban sprawl are especially used in the observation chapters (7 and 8).

4-2-1-Urban sprawl: the definitions and characteristics

In 1915, Patrick Geddes, in his book entitled “Cities in Evolution” predicted that the northeastern cities of the United States will expand to the outer spaces of the cities and the central cities would not have the previous population. After the World War II, gradually his prediction became reality. Although the sprawl in American cities had been started in the industrialized U.S. cities of the late 19th century, but until the 1950s and 1960s it had not the shape of a major urban development flow. After 1950s the sprawling communities changed the looks of American urban areas. The developments were made near the roads in the outskirts of the cities and the new planned subdivisions were built on the basis of automobile use. In 1980s and 1990s the criticism against the failures of urban sprawl became more. The critics gave out several publications on different subjects, from sense of community and automobile dependence to human health and construction finances. However, albeit these discussions, there is no exact and unique phrase that can be referred to as the definition of urban sprawl. People usually use suburbanization and sprawl instead of each other. Of course the meanings of these two concepts are quite near. But there are some differences. Sprawl is the expansions of urban areas in outskirts. These developments are made in the unplanned lands around the cities or the country. Therefore the result of this expansion will be fast growth across the roads. Urban sprawl makes up low-density urban form, which usually includes one-story buildings. The American sprawling areas are often zoned fabrics. Thus there is usually no diversity of uses.

There are several definitions for urban sprawl; (all definitions are gotten from Gillham, 2002) one of the old ones, which is related to 1958 is offered by the Merriam-Webster Online Dictionary: “the spreading of urban developments (as houses and shopping centers) on undeveloped land near a city”. The definition

presented by Encarta World English Dictionary looks newer; “the expansion of an urban area into areas of countryside that surround it”. In this phrase, the word “undeveloped land” has been changed to “countryside” and “city” is changed to “urban area”. So according to Encarta, urban sprawl is an expansion of central city and suburb into the countryside. In most of the non-encyclopedia definitions, the style and density of sprawl, as well as its density, are focused. For example, National Trust for Historic Preservation, Rural Heritage Program describes sprawl as: “dispersed, low-density development that is generally located at the fringe of an existing, settlement and over large areas of previously rural landscape”. Sierra Club describes sprawl as “scattered development that increases traffic, saps local resources and destroys open space”. U.S. Environmental Protection Agency again stresses on “unplanned”: “pattern of growth that increases traffic, saps local resources and destroys open space”.

Several publications have been written about the common characteristics of urban sprawl. One of the most accepted characterizations is presented by Reid Ewing (1997). He mentions the following characteristics as the most cited ones:

- Leapfrog of scattered development
- Commercial strip development
- Low density
- Large expanses of single-use development

The mentioned descriptors are the ones, which have been used by different scholars and organizations. There are two other aspects that are added by Ewing to describe urban sprawl better:

- Poor accessibility
- Lack of functional (public) open space

Leapfrog development happens when the office, shopping centers, and subdivisions leapfrog over the farmlands that are on the way of their development. This pattern of

growth usually happens in very fast developing areas. The intervening tracts or farmlands are filled with new functions after some time. Commercial strip development is another iconic aspect of sprawl. It is related to large pieces of land filled with large buildings or areas. Drive-thru banks, office buildings, restaurants, parking lots, retail stores with large surface parking space are of examples. These spaces are often auto-oriented and pedestrian crosswalks and walkways are rare.

Density is the major and most important aspect of urban sprawl. The density of the sprawling areas is something between the density of cities and the rural areas. The residential units are quite spaced and single-family. Also office buildings are separated. Density is measured by some ways like number of people per area unit, or the number of residential units per area unit. Another measuring tool is Floor Area Ratio (FAR), which is the number of square feet of built area divided by built land area.

The developments in sprawling areas are normally single-use. Zoning has been a main pattern of development after the war. This is hard to imagine the American suburbs with mixed uses like in central cities. They are strictly zoned with, even in some cases, undeveloped areas between the uses.

Accessibility is measured by the length, number, and time of urban or suburban trips. The indicators that are used are Vehicle Miles Traveled (VMT), Vehicle Hours Traveled (VHT). Many researches show that the distances of trips in suburbs or in other sprawling areas are longer than in central cities and compact towns. Therefore the dominant way of reaching the destinations is using automobiles.

Public open spaces like the ones in medieval cities of Europe or in some of the organic cities of the Middle East are rare in suburban developments of North America. That is what a group of social urbanists claim to be the deficiency of the suburbs. This makes low interactions between the people.

Although the characteristics that Ewing presents, are mainly suggested by means of the previous definitions of mainly American scholars and institutes, but the characterization is suitable for many sprawling areas in the world. For example the density, leapfrog, poor accessibility, and lack of open space are seen in other parts of

the world from Africa to Middle East. Of course the levels of such aspects are different in various regions.

4-2-2-A few words about the long history of urban sprawl:

Recently a large number of publications on urban sprawl have been given out, most of which discuss on sprawl as an urban problem that has emerged as a result of industrial revolution. This approach is generally correct. However one should note that the early sprawl existed in ancient cities. The cities of Mesopotamia experienced it, just as Rome did. Through the urban history, when great cities reached a level of wealth, and when the wealthy people could afford having a house in the exurbia, they migrated or at least commuted. It has not been easy for the working class to do that.

On the other hand, the idea of majority of the scholars about the time and reason of sprawl looks correct. According to Robert Bruegmann (2005), who has studied the history of urban sprawl, there are reasons for emergence of sprawl, the most important of which are economical possibility for the wealthy people to provide housing in the suitable hinterlands, and usage of the new transportation and modern infrastructure. Between these two, the presence of the economical ability of a group of residents of the heavily dense cores of the newly industrialized cities occurred first. In the seventeenth century, the industrial activities in some of the dense European cities reached a level that the people, who could afford, started to migrate to the exurbia. Of course, before that the wealth of the cities had risen so that as soon as the industrial activities of the central cities peaked, the wealthier people started to migrate to out of the walls of the cities.

This was the beginning. Because the rate of the migration was not in a way that shape of the cities completely change, but in the mid and late-nineteenth century this rate became more observable. Bruegmann (2005) notes that the major U.S. cities started migration later than the European counterparts. The American sprawl started in the beginning of the twentieth century along with public use of automobile and expansion of public transport.

During 1920s and 1930s migration from the inner city to the periphery was not limited to the affluent and the powerful class (Bruegmann, 2005). This happened in northern Europe and America. The southern Europe did not experience this movement in these years because there were fewer affluent and middle-class dwellers in them.

Buergermann (2005,36) also believes that the main reasons for 1920s' boom in the public movement of the Americans to the periphery was people's affluence, excellent public transportation, and rising automobile ownership. The migration was notable in northern Europe; however it was quite public in North America. In U.S. cities, the working-class of 1920s had the chance to move from industrialized dense city centers to the periphery, especially if they did a major part of the construction of a new house.

4-2-3-Suburban sprawl in the United States

The urban sprawl of the United States is thoroughly mixed with the issue of suburban sprawl and it is really hard to differentiate between these two. For most of American people, suburbanization is the synonymous of urban sprawl. It is not so wrong because a great percent of the urban sprawl of the United States has occurred in form of suburban neighborhoods and subdivisions.

The characteristics that is described here as the specifications of suburbanization of the U.S. are almost common in the urban areas of the North America. They are seen in California as in Ontario and even some parts of Mexico. However here is a difference between urban sprawl in the U.S. and Canada. The difference is in the way the cities of the two countries have used the public transit in planning their settlements. The U.S. cities are more auto-oriented, while the public transport in Canadian cities is more efficient, so there is lower level of sprawl in Canada. Nevertheless the general characteristics seem to be the same.

The beginning of the history of American urban sprawl goes back to seventeenth century when most of the today's metropolitan areas started to grow. But the suburbanization with today's form began in the second half of nineteenth century,

when the upper-class city dwellers provided with a second home in the country. These country homes were elegant residences, which were used in spare times of holidays by the affluent residents. Because of lack of the modern transportation facilities, the owners, who had jobs and businesses in central cities, could not commute every day.

In late nineteenth century, when the street railway was invented, public transportation facilities like streetcars and other modern amenities caused people to feel at home in suburbs and hinterlands. Streetcar networks in many cities started to work. The distances looked shorter and people were encouraged to live in suburbs permanently. So many suburbs of that era were shaped around the railways. Some of the suburbs of Boston like Roxbury, West Roxbury and Dorchester are of this kind (Palen, 1975, 150).

The effects of public transport on rapid growth of suburbs continued in 1910s and 1920s. Los Angeles, which has always been an icon of suburban sprawl, had one of the most efficient public transport systems of the world. A well-extended rail network of more than one thousand miles covered all parts of the city and the suburbs with fast electric interurban and streetcars. The travel statistics of 1920s of Los Angeles is surprising. In 1924, 110 million passengers traveled with the mass transit system of the city (Folgeson, 1993).

But a fast increase in the rate of automobile ownership decreased this statistics. During the 1920s, car ownership increased by 455 percent (Foster, 1975). Therefore the city started to build wide boulevards and highways to cover the increasing demand. The result was stagnation for the public transit; the passenger travels of 1933 were half of 1924 and it was halved in 1934 again (Starr, 1990). The effectiveness of strong public transit in urban growth and after that car use boom and as a result, decrease in public transport use occurred in different American cities. At first public transport was an effective factor in urban sprawl, but then private cars paved the way of urban sprawl.

Fishman (1987, 156-58) believes that building large public transit system and a huge network of roads was a tool for the city of Los Angeles to accommodate people in suburbs and high automobile use has been an effect, not a cause. Nevertheless,

Lionel Frost (2001) writes: “the irony is that while the sprawl of Los Angeles was made possible by mass transit, as the population grow, it became increasingly difficult for the mass transit system to operate effectively”. In either case, the effectiveness of mass transit system is clear.

After The World War II, the urban sprawl in the United States was more visible than in Europe. There are several reasons for this, the most important of which is the number of the people and their affluence. During the war, the European countries experienced serious loss in population and especially in urban infrastructure.

As a result, in 1940-1970-period, the population of many European cities became constant or even declined. While from 1945 to 1965, the population of the United States increased from 150 millions people to 200 million and the cities, especially in south and west had sudden increase. Meanwhile, the wealth of the urban residents of America was not comparable to that of European after-war urban dwellers. Therefore the American middle and the working-class had a new chance to approach the American dream: to own a single-family house surrounded by green space with enough room for raising children. This public attitude resulted to a huge growth in both home ownership and the number of single-family houses. In Los Angeles, between 1940 and 1950, the home ownership jumped from 40% to 53%, with the preference for single-family houses (Keil, 1998).

Single-family homes trend is a part of a social flow which was shaped after the World War II when the housing construction was improved and accelerated by the means of the federal governments loans like the loans of FHA. So the suburbs were not only a place for the white-collar families, but also a destination for the blue-collar majority. Therefore, it resulted in a change in the social and racial patterns. The suburbs were not a dormitory for the whites and the previous social and racial pattern of the suburbs of the early twentieth century was gradually changing.

The demographic study of after-war suburbs gives interesting points too. At the mentioned time the suburbs had mostly attracted couples with children. In 1970, 63.8 percent of the women of 14 years old and older in urbanized areas around the cities were married, while in central cities this percentage was 56.1 (Palen, 1975, 154). Suburbs also attracted special class of residents in case of income and

education. In 1969, the median income of the suburban families was about 11000 Dollars, while at the same year it was about 9000 dollars in central cities. The adults who had completed high school in suburbs were 62 percent, compared with 51 percent in central cities (U.S. Bureau of the Census, 1970, 405).



Fig. 4-1: A low-density suburb in east of Los Angeles metropolitan area. Source: Google.



Fig. 4-2: Another suburb in Pheonix, Arizona with single-family houses. Source: Google.

As a consequence of massive outward migration in U.S., the location of the jobs changed place and located in the outside of the central cities. In 1950, near 50 percent of the manufacturing jobs were located outside the central cities, while in 1900, this figure was about one third (Harris, Lewis, 2001). Two out of three jobs

created in the American cities in the years between 1960 and 1980 were in suburbs and nearly 60 percent of the metropolitan jobs were located outside the CBD (Feagin, Parker, 1989).

Another study shows that between 1958 and 1977 the number of manufacturing jobs in the American suburbs grew by 16 percent, while it had a reduction of 6 percent in central cities. Similarly, between 1963 and 1977, the number of manufacturing employments in centers of large metropolitan areas fell by 700000, while the related suburbs gained 1100000 jobs (Logan, Golden, 1986). In 2000, the traditional downtowns of the United States placed less than 10 percent of the metropolitan areas (Gordon, Richardson, 2001).

The result of the change in location of the jobs, first in the U.S. and then in Europe was deserted downtowns. The downtowns were no longer living places for a large number of people like they were in the nineteenth century. Gradually, not only the low population of the downtowns but also the empty lots related to the transferred industries to the suburbs, seemed to be a great problem. This “the crisis of the cities” started since the early 1970s (Keil, 1998, 61). But the nostalgia and the rising interest for preserving the historic heritage of the central cities aroused the cities to implement downtown revitalization plans. The goal of such plans is creating a livable and cosmopolitan urban environment, so that the people return to the downtowns.

In 1980s, big corporations and multinational ones were involved in building suburbs and supersuburbs. The examples of such companies were Exxon, Goodyear Tire and Rubber, Gulf, and Prudential. These suburbs were built in form of Planned Unit Development (PUD) or new towns. One of the biggest suburbs of this kind was Woodlands in north of Houston. It was a multibillion-dollar project, which was completed by Woodlands Development Corporation, a Subsidiary of Texas Oil Company. After completion of the project, 13000 residents and 200 businesses were housed in it. What is notable in circumstances of building of the mentioned suburb is that it was constructed with the 50-million-Dollar loans of the federal government (Feagin, Parker, 1989, 212-213). Another example is Westlake, California, which was developed by the American-Hawaiian Steamship Company and Prudential. This

suburb had an area of 12000 acres (Downie, 1974). So it shows how the federal government of the United States supported mass suburb construction.

In some parts of the country the attitude for building single-family homes has been changing to constructing apartments. For instance, the share of the multi-family buildings grew in Los Angeles after 1960. So between 1970 and 1973, the apartments made up 92% of the built residential units of the city (Marchand, 1986, 71-73; Clark, 1983). In addition to the interest to have or build apartments instead of single-family homes, the study of the area of homes and the lots is interesting too. It seems that the area of new built houses of after-war decades has increased from 1000 square feet to 2500 (Bruegmann, 2005, 58). That has probably happened because of the baby boom of the post-war era that matured in the last decades of the twentieth century.

According to some scholars, (for example: Bruegmann, 2005, 52-53; Sen et al., 1998) the rate of building dense suburbs has been slowing down since 1980s. The lot sizes have been smaller and the size of the houses has gradually been bigger.

Bruegmann writes that one of the main reasons for this “signs of life”, is the gentrification and redevelopment plans. He also considers the influx of immigrants to the central cities who have changed the view of the urban areas important in rejuvenation of the urban cores (Bruegmann, 2005, 53-55).

4-2-4-The public popularity of suburban sprawl in the United States

A great part of the urban sprawl in the United States happens in suburbia. If we accept suburbs as a part of the metropolitan areas of cities, then this is also acceptable to use suburban sprawl instead urban sprawl. But this can be done only in places like North America and parts of Europe, which suburbs have a vast urban area.

As a result of the recent debates in the academia and the public media about the deficiencies of suburban sprawl, this idea has partially been brought up in the mind of contemporary Americans. However, the idea that suburbs are a better place to live and are a complete utopia has been so long in the mind of the Americans that anti-

sprawl urbanists and compact-city advocates need hard work and long time to clean off the belief, which they call “myth”.

Since the first decades of the twentieth century, the media have shown such a good view of the “American dream” that most of the American urban residents were encouraged to try a new life style in suburbia, own a single-family, detached house, and raise a family. Family life in a personal beautiful world, with access to green space or nature, and away from the complicated crowdedness of the cities was the attractiveness of the suburban life.

Though, some writers have written about the people, who were deprived of their life style in suburbs. For example, Fogelson (1967: 186-204) describes how people, who were fleeing Los Angeles in the first decades of the twentieth century and started to live in suburbs, soon were disappointed by the life style they experienced there.

The main reason of many of these people for migrating to suburbs was the interesting racial diversity in Los Angeles. The result was drifting into personalism. Nevertheless there are many witnesses that show people were interested to live in low-density suburbs through the twentieth century. Sociologists like Ktsanes and Reissman (1960), Dobriner (1963), and Berger (1960) concluded that people after moving to suburbs to start a new life were largely satisfied with the suburbs.

But the thing that matters most is that the result of some surveys has been quite similar. A Gallup poll (1972) indicated that four out of five people of central cities of more than half a million preferred to live outside the cities (Gallup, 1972), while in 1966 this proportion was 36 percent.

In the same year Gallup announced that only 13 percent of the 1464 interviewees preferred to live in central cities, while 22 percent preferred living in central cities to small towns, suburbs, etc. in 1966 (Palen, 1975, 158).

In 1978, a HUD survey showed that 70 to 80 percent of the American people preferred living in small towns, rural areas, and suburbs to living in central cities (Abravanel, Mancini, 1980, 29-31).

4-2-5-Urban Sprawl in Europe

The European urban sprawl is in lower levels in rate of growth and area in comparison with the American sprawl. However this does not mean that urban sprawl in Europe does not have an historic background like that of North America. In fact, it is easy to say that modern sprawl started in Europe before the North America.

The idea of a single-family detached or semi-detached home or villa goes back to the industrial revolution era in England. In late eighteenth century and early nineteenth century, such houses became fashionable in Britain and a part of the middle class, who could afford to have them started to buy or build one in the country. For instance, Calthorpe family started to develop a suburban garden with low-density and detached and semi-detached houses. The form of this garden was opposite the form of the accommodation of the middle-class of Birmingham, which was terraced houses or row houses (Cannadine, 1980). These houses were built with an idea of a house with a private garden. Such developments, which were the base of future garden suburbs of Britain, did not become common until the late nineteenth century garden suburbs started to rise (Whitehand, Carr, 1999, 77). Mass construction of garden suburbs started between the two wars, when 4200000 residential units were built in England and Wales with the specifications of the garden suburbs: single-family houses in private gardens in the urban fringe (Becker, 1951, 321).

By starting the twentieth century, many European cities, particularly the central and north-European ones, experienced heavy urban and suburban sprawl. The research conducted by Jackson (1991) represents a fast sprawl in the first decades of the twentieth century in the English cities especially around London. He introduces 25 districts with growth rate of more than 25 percent in a decade, while the population growth rate of London in the first three decades of the twentieth century was about 10 percent each (1901: 6.5 million people, 1911: 7.2 million, 1921: 7.4 million, 1931: 8.2 million). During the same period, some suburbs had much higher population growth rate. Southgate in north London and Coulsdon in south London

had growth rate of over 100 percent between 1901 and 1911. Two of the highest growths were related to Wembley with 260 percent and Dagenham with wonderful 900 percent growth rate, which occurred in the decade ending in 1931. This difference in speed of gaining population by different regions is mainly because of population redistribution and migration to suburbs.

In fact, the redistribution of population to suburbs was a part of a governmental policy to fill the huge housing gap of after the World War I. Two major models were suggested: inner-urban and high-density tenements, and the outer-urban and low-density suburbs, which both were responses to the nineteenth-century slums (Turkington, 1999, 56). At that time, a housing shortage of more than 800000 homes in England and Wales had been identified (Bowley, 1945).

This happened to the European cities after a while. For example, in 1990s the inner ring of the suburbs of Paris gains only 20000 jobs, while the suburbs, which were located outside the ring, gained 160000 jobs (de Chenay, 2003).

4-2-6-What causes urban sprawl?

Bruegmann lists the following factors as the causes of urban sprawl (Bruegmann, 2005, 96-112):

- Anti-urban attitude and racism
- Economic factors and the capitalist system
- Government
- Technology
- Affluence and democratic institutions

The first factor is an urban sprawl cause special for the United States. The anti-urban ideology has been repeatedly brought up as a main reason for sprawl. For example Jeffery and Josef Barton (1973) believe that the rural ideal and pleasure of private family life as the main reasons for Americans to migrate to suburbs. On the other hand, there are several reports that introduce racism or worries of the white people about mixing with other races. Much has been written about the “selectivity” of

suburbs. This is used as a social motif for American families to change their permanent living place from inner cities to suburbs. This selectivity can include adopting better living environment for the whole family, having a good-quality single-family home, good neighbors, etc.

Good neighbors, sense of belonging and good community were the answer of a large majority of respondents in a research (Bell, 1958) about the reasons for American families of after-war period to migrate to suburbs. Of course race-related issues were a strong reason for migration to suburbia. The American inner cities were gaining new influx of ethnic groups and leaving the cities for the urban fringe was a solution for some many families, who believed they can have white educated neighbors in suburbs.

Although Bruegmann does not agree with those who believe that the Americans are anti-urban but he notes that living in suburbs is preferred to residing in dense central cities. Nevertheless, the anti-urban ideology has considered an important factor since the end of the World Wars.

As we noticed in the previous pages, the modern migration to the urban fringe was started when the affluent-class could afford doing that. So, economic factors were base for urban sprawl. But in a larger view, some authors believe that in capitalist systems it is a necessity to live in sprawled or suburban areas.

The governmental strategies have surely effective role in the formation of settlements. This is observed in the way people were induced to live in the urban fringe in the United States. Of course if these strategies were not in the same way that they have been, then we can not say that no suburbs and sprawl would exist. In other words governmental solutions like mass highway constructions plans, residential housing loans, long-term self-amortized mortgages, Federal mortgage insurances, suburban infrastructures, etc. were not the only reasons for suburban sprawl in the United States, but their role is not deniable. The opposite is correct about some developing countries that apply strict policies in containment of the urban areas. The result in these countries is very little urban sprawl.

As mentioned previously, urban and suburban rail systems and automobile had a great impact in emergence and continuation of sprawl. Transportation infrastructure

has been proven to be effective in the area and form of cities. This is often correct regardless of the place of the cities, whether in North America, Europe, or developing countries.

Oliver Gillham (2002) gives similar causes, each of which can be a part of Bruegmann's categories:

12. Land ownership and use.
13. Transportation patterns.
14. Telecommunications technology.
15. Regulations and standards.

4-3-The theoretical bases of the NTD

This section defines the theoretical basis of the so-called benefits of NTD. The literature review of this part is derived from the western studies and covers the interactions of urban form and transportation/environment/public health. Here, four aspects that are referred to in the literature as the benefits of NTD are discussed. These four aspects are transportation, public health, environmental pollutions, and energy consumption. There is notable evidence about the advantages of these four issues. Also sense of community and place could be analyzed, but due to opposite views about whether using NTD increases the sense of community and place or not, this issue has been kept silent in this section. The other four aspects are in relation with the 7 urban problems that were introduced in chapter 1. The transportation, public health, and energy consumption related benefits are in connection to the unsustainable transportation and public transport problems. Similarly the environmental pollutions have a counterpart with the same title among the urban problems of this research. Fig. 4-3 gives a quick view of these connections.

During the 1990's and after proposals comprising traditional urban fabric a couple of challenging questions were brought up by the researchers of different fields which after nearly two decades still make debates and those are why it is better to use traditional or compact designs in our developments? In which aspects traditional neighborhoods are preferred to the conventional ones, and why? Are reasons enough

for changing the design strategies and principles, which have been being used during the past decades? What are the deficiencies in the conventional developments that can be modified by changing the design strategies? These questions and other topics like these are the subjects that have been a research feed for scholars of traditional development during the past two decades.

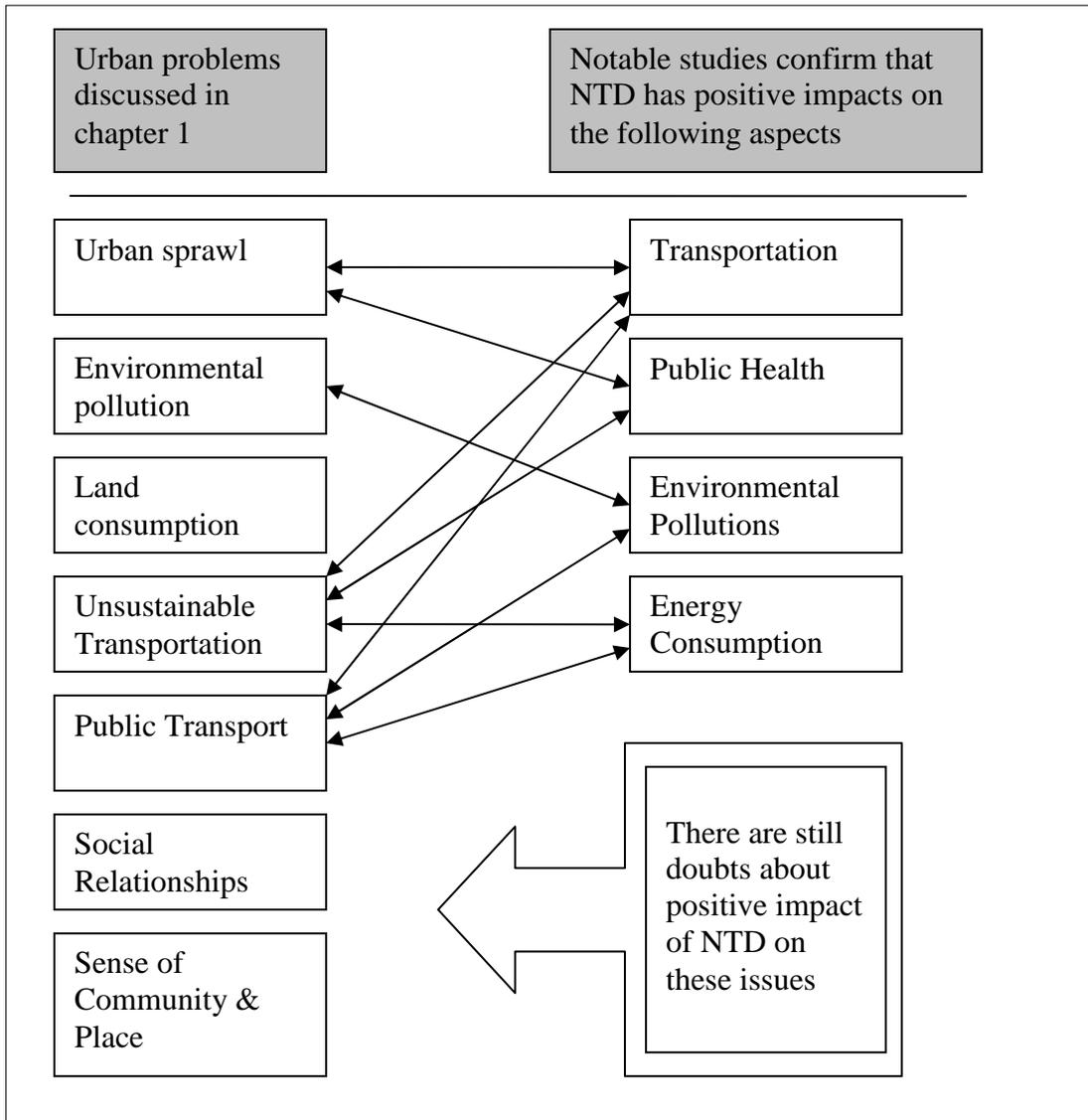


Fig. 4-3: The relationship between the urban problems of the research and the theoretical advantages of NTD.

The related research fields have been urban planning and design, urban transportation, building and construction management, civil engineering, architecture, environmental studies, and even health studies. However after doing

much work and energy on this topic, the necessity to have more research on this topic is still felt.

In this piece of research, the studies done on the advantages or disadvantages of the traditional urban fabric in comparison with the conventional ones are considered in separate categories classified by the urban characteristics, and so on. In each section a brief literature review will be presented and the related studies will be considered. Most parts of this chapter are literature review of the past studies. The topics, which are considered here are transportation issues like Vehicle Miles Traveled, travel behavior, and car dependency, and also problems related to environmental pollutions, public health, and energy consumption. The other subjects, which are suitable for consideration but are not studied here are land consumption, and costs of building. These topics will be reviewed in the future works.

4-3-1-Transportation

Transportation is the most debated field in comparison of the neo-traditional and conventional developments. Despite these efforts, the problem still exists and in many cases, there is space for further research. Since the traffic engineers are advocates of high way systems and wide streets and avenues, they usually have problem with the traditional urban fabric and pedestrian and bicycle routes. Therefore the debates have been challenging and continuous.

The urban problems of this study that are in relation with transportation are urban sprawl, unsustainable transportation, and public transport (Fig. 4-3). Generally, the transportation-related literature can be categorized to the following parts: travel behavior, VMT (Vehicle Miles Traveled), and car dependency.

The researches conducted on the impacts of type of neighborhoods and developments on the travel behavior and car dependency are a part of the studies done on the linkage of the built environment and transportation. Susan Handy (2005) categorizes the studies on these studies into three main groups: simulation studies which measure the impact of changes of built environment on travel behavior. They contain the impact of the built environment on VMT. The second group of studies is

aggregate studies, which are about the correlation between travel patterns and characteristics of built environment like density and era of development. And finally, the third group is the disaggregated studies which give out individual or household models on the characteristics of built environment and travel behavior.

The studies on the travel behavior and VMT are quite noticeable. The existing literature has often indicated that the high density of the traditional built environment has a positive impact in reducing the number of the auto-oriented communities. This has been shown in the researches before the emergence of the new traditionalism during the recent years. In almost all of the studies the influence of proximity and connectivity on the motorized travel behavior is observed (Frank, Engelke, 2005). Density has also a major role in most of the researches.

One of the first examples is the study of Levinson and Wynn (1963) who indicated that the neighborhood density reduces the trip frequency. In 1977, Pushkarev and Zupan had a similar study and confirmed that neighborhoods with a density of at least 9 units per acre had a reduced rate of trips.

In 1980's and 1990's, the neo-traditional development was offered as an alternative to sprawl so the first characteristic of it should be the reduced car travels. Andres Duany and Elizabeth Plater-Zyberk have shown how the traditional neighborhoods can reduce car trips by the different urban form in comparison with the sprawling neighborhoods in a famous image, which can be observed in Fig. 4-4.

As new urbanists claimed, the high connectivity of the traditional urban

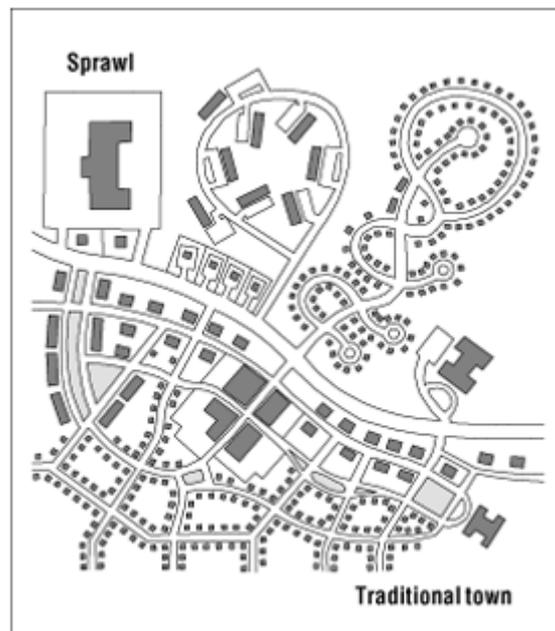


Fig. 4-4: comparison of the traditional neighborhood and sprawl by Duany and Plater-Zyberk (1992).

fabric enables people to reach their destinations more easily but this should have been proved through research.

After introduction of the neo-traditional movement and debates on failure of sprawl, an increasing number of studies were published, in which the subject were not only the density of the developments but also the neighborhood design.

In this set of studies, usually the traditional or pedestrian neighborhoods were compared to the conventional or the auto-oriented planned developments.

In one of the first samples of this kind, kulash (1990) showed the difference in VMT of arterial, collector, and local streets of the Conventional Subdivision Development and the Traditional Neighborhood Development. The VMT of the arterial and collector streets of Conventional Suburban Developments (CSDs) were significantly more and only the VMT related to the TNDs were higher of the ones in CSDs. This means that the TNDs were absolutely successful in reducing the traffic in regional and urban scale.

In 1992, Fehrs and Peers Associates found that the on-foot and transit trips made in the traditional communities of San Francisco Bay Area were more than the similar trips in the conventional subdivisions. McNally and Ryan (1993) concluded that the street networks of the TNDs are more efficient than those of the Planned Unit Developments (PUDs). The distances of the trips are shorter and the VMT (Vehicle Miles Traveled) are less.

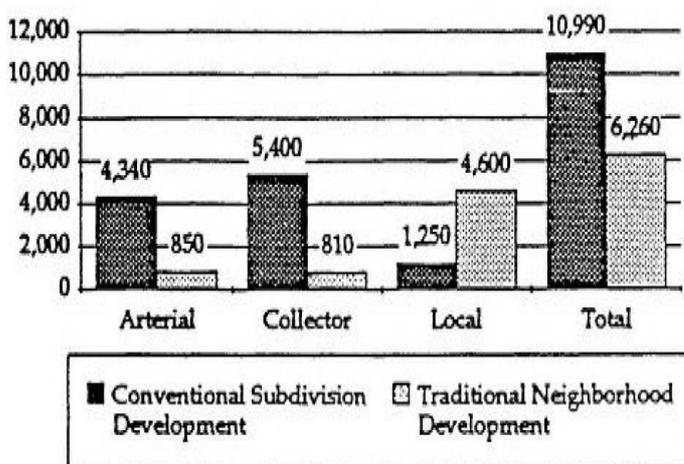


Fig. 4-5: The distribution of urban travels in different types of streets (Kulash, 1990)

The researchers usually separate the work trips and non-work ones like the shopping trips. Frank (1994) found that the most of the trips made in the mixed use

neighborhoods are pedestrian work trips but apart from that, the number of the shopping trips is noticeable by themselves. In another study, Robert Cervero and Carolyn Radisch (1995) showed that the pedestrian, bicycle or transit non-work trips of residents of Rockridge, an old traditional suburb in San Francisco Bay Area is 10 percent more than a post-WWII suburb with auto-oriented design in the same region (Lafayette).

The result of another study indicated that the overall trips in PUD's (Planned Unit Developments) were 30 percent more than TNDs (McNally, Kulkarni, 1997). In newer studies, Liu (2003) showed that infill developments with higher densities have 27% less per capita vehicle travel in comparison with the conventional residential developments.

In addition to the travel behavior and VMT of in the Neo-Traditional Developments, using this urban form has another important effect, which is reduction of automobile dependency. It is in direct relation with travel behavior. The built environment affects the travel behavior of people and therefore we observe a change in the rate of automobile use. According to studies, we often observe a change in usage of different modes of travel for various urban form types. In case of NTDs, comparing with conventional developments of North America, there are higher percentage of pedestrian and bicycle trips and less car trips. Less car dependency has other benefits in addition to the ones related to transportation. Most of these advantages are economical and health related problems. Every year a huge number of cars are produced in several countries of the world and the rate of the production is being raised. The total passenger car production in Europe in 2007 was 17,082,037, while ten years before in 1997 it was 14, 272, 474 (ACEA, 2008) and there are more or less the same condition on North America and developing countries. High car production has a considerable part of economic expenditures of many countries.

Some of the best examples of the studies on car dependency and auto ownership are works of Handy, Ewing and Bento. Susan Handy (1993) showed how the traditional neighborhoods of the same region encouraged the inhabitants to travel on foot or by bicycle to the retail shops to buy the daily needs. In fact, the average difference the pedestrian/bicycle trips made by them are between 2 to 4 trips more than the trips

made by the people of the auto-oriented neighborhoods. Reid Ewing et al. (1994) found the conventional neighborhoods of Palm Beach County produce more automobile trips than traditional ones. Bento, et al (2004) conclude that residents reduce their automobile travel by about 25% if they shift from a dispersed, automobile-dependent city such as Atlanta to a more centralized city, multi-modal city such as Boston, holding other economic and demographic factors constant. On the other hand, automobile dependency is in relation with human health issues which are described in the next section.

4-3-2-Public health

The negative health related issues have been considered as a major consequence of dispersed urban form. These issues are mainly in connection with two of the urban problems of this research, which are urban sprawl and unsustainable transportation (Fig. 4-3). The majority of the studies indicate that urban form affects human health through increasing physical activity and decreasing car use (for example see: Frank and Engelke, 2000, 2001; Frank, 2000; United States Environmental Protection Agency, 2001; Handy, et al., 2002). Activity patterns are influenced by the built environment and they affect public health. There is an interaction between activity patterns and public health.

The results of the recent literature have been obtained while worrying statistics about the physical conditions of people of different countries, especially North America and Western European countries, are regularly published. The national reports related to the United States are much more critical than other countries. Between the year 1992 and 2002 the percentage of the overweight and obese of the American people increased by 50 percent (National Center for Chronic Disease Prevention and Health Promotion, 2004).

About one in four adults of the United States remain completely inactive during their leisure time (Pratt et al. 1999). In general, the danger of inactivity is better specified when we know that each year in the United States about 200000 deaths are attributed to physical inactivity (Pate et al., 1995).

Density and zoning are the urban form characteristics which have been in focus for research on the physical activity studies. A question, which scholars have tried to answer is: does the urban form of the sprawling communities discourage people to have physical activity? Reid Ewing and his colleagues (2003) found small but significant associations between urban sprawl and minutes walked, hypertension and obesity. They also concluded that the residents of the sprawling communities walk less during their leisure time, weigh more, and have more prevalence of hypertension in comparison with the people in compact communities. Along with constructing sprawling neighborhoods throughout the North America and some parts of Europe, wide highways have been continuously built and existing roadways have been widened. This has led to limiting the streetscape of the neighborhoods, lessen the neighborhood amenities, and lessen the safety as a result of high automobile speeds (Rapoport, 1987; Untermann, 1987).

Walking is the most common type of physical activity among people with different age, income, gender, etc. (Ball et al., 2001; Booth et al., 1997; Giles-Corti and Donovan, 2002; Troped et al., 2001). So it is a good chance for policy makers and planners to increase the human physical activity by means of planning and constructing walkable neighborhoods, footways and pedestrian amenities. While considering the ways of encouraging residents walk and bike, the importance of walkable neighborhoods becomes clearer. The advantages of the dense mixed-use traditional cities and neighborhoods and the disadvantages of the sprawling urban fabric for public health are shown in a number of the recent studies (for example see: Handy, 1996; Saelens et al., 2003). These results have been concluded specially for the utilitarian trips (trips that are done for a special purpose and are different from the leisure time trips).

4-3-3-Environmental pollutions

The environmental pollutions are considered as a problem that should be eased in this study. It is also in relation with another problem, which is public transport (Fig. 4-3)

The effects of urbanization on environment are not a new subject and have been a hypothesis for a few authors (Howard, 1898; Lynch, 1961; Boyden, et al. 1981; Douglas, 1983; Owens, 1984; 1986; Owens and Rickaby, 1992; White and Whitney, 1992; Breheny, 1992; Jenks et al. 1996). This subject has received more attention during the recent decade. Based on the mentioned studies, this is almost a clear and proved problem that urban development and urbanization have negative effects on ecosystem and its functions. Generally, biotic diversity, primary productivity, soil quality, run-off, sedimentation rates, land cover, microclimate and air quality are affected by urbanization. In the meantime, urbanization has influences on availability of nutrients and water, thus it affects population, communities, and ecosystems dynamics (Alberti, 2005).

The critical situation is understood better when we know that the influence of urbanization is not limited to urban environment. The ecological footprint of cities is much greater than their geographical boundaries. That is about 100 to 300 times greater than the actual size of the settlement (Alberti, 1999). The ecologically productive area, which is needed for the ecological services necessary to support the human population is called ecological footprint, for example, the footprint of metro area of Toronto and Vancouver are 181260 (Onisto et al. 1998) and 29722 Square Kilometers (Rees, 1996) respectively and also the one for London is 120 times greater than the nominal size of the city (International Institute for Environment and Development, 1995). While the development of urban areas is getting more and more speed, the volume of the affected ecosystem will rapidly grow. So finding ways of preventing such a massive influence on our natural environment, even for a small part of it will be vital.

Apart from the aforesaid disturbances, change in hydrological patterns, morphology, soil conditions, and habitat are indirectly disturbed by urbanization (Alberti, 2005). Numerous studies have been done on the circumstances of these effects. A few examples of these studies have been conducted on the influences of cities on urban birds (Beissinger and Osborne, 1982; Nilon and Pais, 1997; Ronaldo et al. 1997; Bolger et al. 1997; MarZluff et al. 1998), biodiversity gradient of species (Blair, 2001; McKinney, 2002), high percentage of phosphorus in urban basins (Omernik,

1976; Wernick et al. 1998; Meybeck, 1998), and native species in urban fringe (Rapoport, 1993) are a part of the conducted studies.

However, the studies on the impacts of different urban patterns on the environment have been very few (for example some of the studies, which are about this problem are: Grimm et al. 2000; Picket et al. 2001; Alberti et al. 2003) and generally, this subject is still fragmented and needs stronger theoretical framework (Alberti, 1999). Urban pattern impacts are normally transferred to the ecosystem by a mechanism, which Alberti has shown in a conceptual model (Fig. 4-6).

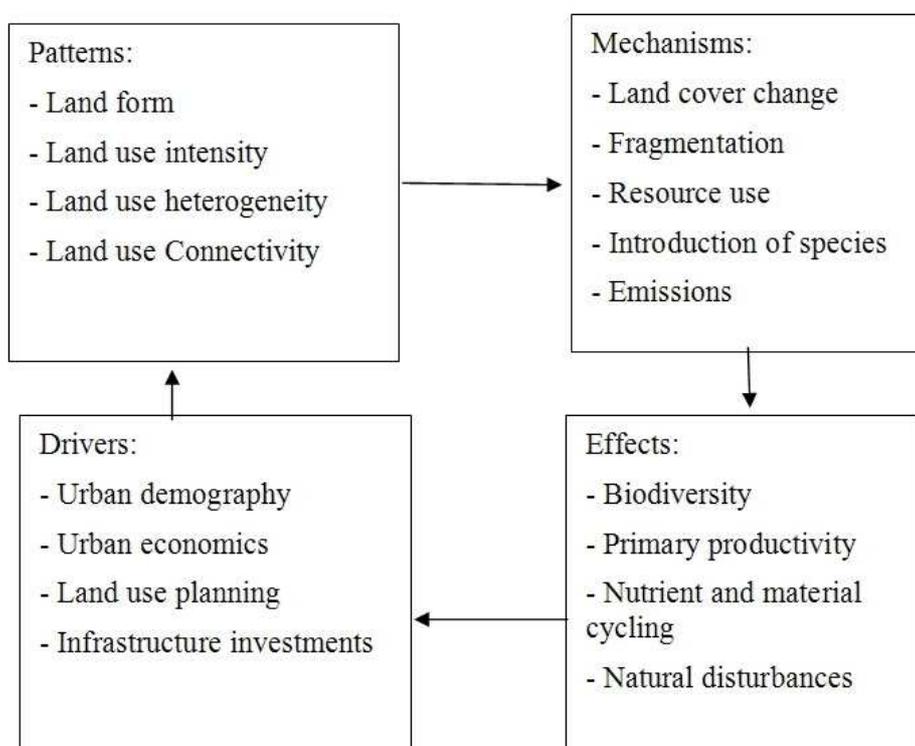


Fig. 4-6: Urban Patterns Impacts on Ecosystem Function (Alberti et al. 2003)

The most important urban-pattern-related factors which have been studied are density, urban land use, and connectivity.

Most of the studies which have been conducted about the impacts of the urban form are related to the transportation and emissions effects, which naturally lead to study air pollution. During the twentieth century, automobile changed from simple everyday tool of people to a main pollutant of the environment. In the recent decades, the rate of environmental pollutions resulted by automobile emissions has become a

fundamental worrying problem of the environmentalist organizations and individuals. However the production and use of a mass of cars has not been slowed down. Although the new generation of the car engines have lower emissions but the problem of environmental pollutions still exists. Automobiles are source of emitting sulphur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), and Particular matters (PM).

This is exactly the point, which dense traditional urban fabric has privilege over the low density neighborhoods. There are several reports about the link between urban form and trip generation and also travel behavior (as was considered in the previous sections). If traditional urban form generates less urban trips so naturally it will lead to less emission. There are few studies about it. Although urban environmental impacts are explained by several factors not only the density (Medley et al. 1995) but as Alberti (1999) notes, urban densities are correlated with higher pollution concentrations. In one of the important reports, Frank (1998) found that households located in more compact urban form generate more VOCs and CO on per mile basis but the same households generate fewer VMT so the overall emissions of the dense interconnected neighborhoods are less than the conventional ones.

In another research about the relationship, Frank, Stone, and Bachman reported an inverse relationship between this vehicle emissions and household and employment densities. They concluded the same result about the relationship between emitted nitrogen oxides and street connectivity. In a more recent study (Stone et al. 2007), the authors answered “yes” to the question “is compact growth good for air quality?”. They found that the metropolitan areas can expect a 10% increase in population density to be associated with a 3.5% reduction in household vehicle travel and emissions.

Although there is still not enough evidence that dense traditional mixed-use urban form can undoubtedly reduce the environmental pollutions, but the few conducted studies can be an alarm for urban planners and managers so that they have more attention to the capability of the produced urban fabric for preventing the present critical environmental situation.

4-3-4-Energy consumption

The literature related to energy consumption that is here reviewed is in connection with two of the urban problems that are unsustainable transportation and public transport (Fig. 4-3).

There are direct linkages between urban form, travel behavior, environmental impacts, and energy consumption. Most of the related studies show that the form of the built environment could be associated with energy consumption. The importance of this matter becomes more obvious when we pay attention to some statistical facts: between 1950 and 1999, fossil fuel use of the world has increased from 1.7 billion tons of oil equivalent to 8 billion tons. The latter amount has been 85% for the commercial energy use of the world, a large amount of which has been used in cities in transport or other forms (Girardet, 1999).

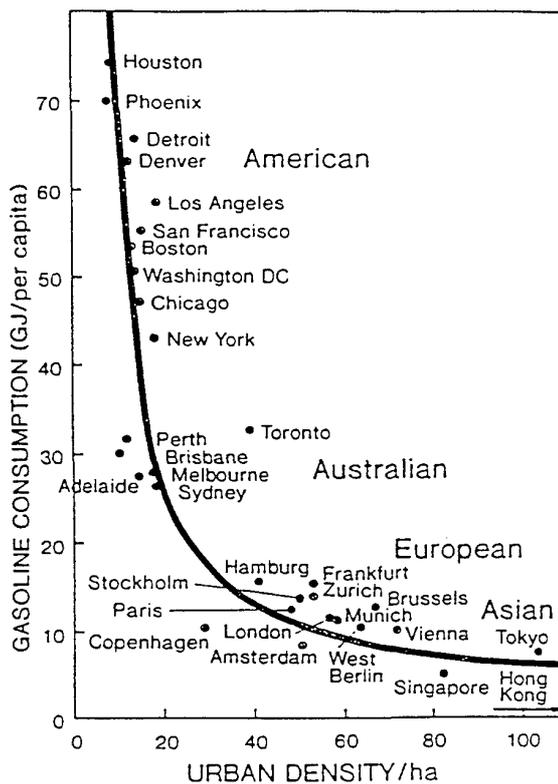


Fig. 4-7: The relationship between urban density and gasoline consumption in 32 international cities, (Newman and Kenworthy, 1989)

Meanwhile, the fossil fuel supplies of the world are estimated to be expired in the next decades. Dale L. Keyes (1982) estimated that the fuel consumption could be reduced between 0.8% and 1.2% by means of changing the urban development patterns. This estimation is based on a study

done by Hirst and Moyers, who in 1973 found that approximately 8% of the energy use of the United States is built up by urban travel. Therefore using any possible

methods like implementing sustainable urban forms are suggested to promote the energy conservation in the cities (Droege, 2002).

In the past years, the impacts of urban form on energy use have been focused and have been almost proven. The architecture, construction density, population density and other factors are influential. As Holden and Norland (2005) write, the following four characteristics of housing are important in energy use: type of housing (single-family or multi-family houses), size of housing, age of houses, and density matters. Density is the most important factor through the urban form parameters. It can affect transportation and travel behavior, so indirectly influences fuel consumption.

The early studies on this issue were comparisons between the low density neighborhoods and the more compact ones. The one Roberts did (1977) was a comparison between sprawling neighborhoods and the compact urban fabric, using existing neighborhoods. He concluded that the neighborhoods concentrated around a transit station, like today's TODs are more energy conservative than the low density sprawling neighborhoods. Also Keyes (1977) concluded that land-use change can result in half a percent reduction in energy use. In the first glance it looks small. But Keyes reminded that the mentioned percentage was equivalent to the effect of 80 percent increase in gasoline price.

There are two fundamental urban patterns that are considered or suggested in the related literature (for example: Anderson et al. 1996; Holden and Norland, 2005): the compact city and the urban sprawl. The compact city is a general phrase for dense, mixed-use settlements, which neo-traditional and new urban developments can be a part of them. Higher density is the common characteristic of these urban forms. On the other hand, urban suburbs and sprawling communities are low density, auto-oriented fabrics which are criticized by compact city advocates for high fuel consumption. The effect of density on energy use is a completely confusing research problem. The most cited research on this issue is done by Kenworthy and Newman (1989), who considered the density and per capita gasoline use of 32 international large cities of the world (13 in Europe, 10 in the US, 5 in Australia, 3 in Asia, and 1 in Canada). They concluded that the population density is the most important factor in gasoline use. Although their work is still referred in new

studies but they have had serious critiques (Breheny, 1992; Gomez-Ibanez, 1991; Gordon and Richardson, 1989).

An interesting part of Newman and Kenworthy's work is shown in Fig. 20 which indicates the status of the chosen cities based on the urban density and gasoline use. The Cities of the United States have the least density and the most gasoline use and the cities of the east and southeast of Asia have the most density and the least gasoline use. It seems that the European Cities, like West Berlin, Frankfurt, Munich, Copenhagen, Amsterdam, Vienna, London, Brussels, Stockholm, Zurich, and Paris have the best situation on the curve, as they have low gasoline use compared with the American cities, and they do not have a very dense urban fabric like the east Asian cities.

Chapter Five

5- The Characteristics and Elements of the Traditional Iranian City

5-1- The Effective Factors on the Urbanism of Iran

The factors that influence the urbanism and the urban form of Iran are mainly geography and climate, security, religion, and mobility. Here the mentioned influences are briefly explained.

5-1-1- Geography and Climate

There is high diversity of climates and geographical morphology in Iran. Generally the climate of Iran can be categorized into three main sub-climates; Caspian mild, mountains, and desert/semi deserts. There is mild weather and climate in the southern coasts of the Caspian Sea. So the northern provinces of Gilan, Mazandaran, and Golestan have no problem with lack of water because there is usually showers especially in the cold seasons. The amount of the rains become less from west to east of the coastline. This climate can be classified into two parts; Caspian mild and wet, and Caspian mild.



Fig. 5-1: The climates and sub-climates of Iran.

The second main climatic group is the region covered by mountains. This area is spread in the northwest, west and north of the country. The weather of this area is warm in the summers and cold in the winters. The coldest points of the country are located in this area. Most of the places of the mountains area are divided between the Elburz and Zagros mountains. Some parts of the mountains have Mediterranean weather and other parts are cold mountains.

The largest part of the county is covered by desert and semi-deserts. This part is the location of the type of urbanism that is considered in this research and the results will be used for the cities of similar parts. The sub-climates of this region are very cold mountains, cold semi-deserts, hot semi-deserts, dry deserts, hot dry deserts, hot coastal dry lands, and coastal dry lands. The lands of this climate are not necessarily hot or arid. For example the coastlines of the Persian Gulf and the east of the Gulf of Oman are in the group of hot coastal dry lands. This southern part has often very humid air. Also some parts of this climate in south of the Elburz Mountains and east of Zagros Mountains contains cold snowy winters. However most of the cities of this region face hot summers.

Maybe the most apparent effects of the weather on the urbanism of Iran are seen in this region. The old houses are built very close to each other so that they lie in the shadow of the neighboring buildings. The intention is to make the environment cooler. This has made the layout of the cities of this region very compact.

5-1-2- Security

Security is one of the main factors that have influenced the morphology of the Iranian cities. The threatening forces have been either the attacking powers of other regions and other countries or the thieves and local outlaws from inside the cities or the neighboring lands. Lack of security originated from inside of the cities usually happened when the central and local governments were not in good conditions so the first part of the urbanism that was affected was the security.

The defensive effect of urban form was apparent in the form of public space like streets and allies. As the attacking power entered the city, it was easy to reach the

center of the city and the main streets by the attacking forces. But it was harder for armed horse riders to chase the residents or arrest them in the innermost points of the neighborhoods because the inner allies were narrower. Also there were some height limitations like arches at the beginning of some allies and neighborhoods. So armed soldiers could not pass by horse or at least there were difficulties to pass rapidly.

5-1-3- Religion

Religion has undoubtedly a strong effect on the urbanism, urban form and architecture of Iran. Mosque and Madreseh (school) are of the main elements of the Iranian city, which are both directly or indirectly related to religion. The religion has had effects on the urbanism by these elements or through the religious and traditional thoughts of the residents. The presence of religion in the traditional cities of Iran is still seen in the urban landscape of the cities. The minaret and the domes of the mosques that are seen in the skyline of the cities are the symbols of this presence. These monuments are good landmarks for strangers and in many cases beautiful vistas.

In fact the religious cities are completely under the influence of their religious elements. A good example is the city of Mashad (or Mashhad), as the second large city of Iran, which is believed to be a holy city because the temple of the eighth Imam of the Shia Moslems located in the city. It had caused the city to be the most tourist-attracting city of the country. Another example is Qom in south of Tehran, which is a religious city because of the religious temples and its famous religious school.

Some of the social activities of mosque-Madreseh are described in the article related to the elements of the Iranian city. So here some of the effects of the religious thoughts on the urban form and architecture of Iran are briefly explained.

The religion had influenced on the urban form and architecture of the neighborhoods through some factors, most important of which is “privacy”. Privacy seems to be notable apart from the religious beliefs but after Islam it obtained much more importance. Under the Islamic way of thinking, presently it is not pleasant that the

private family life and especially women be observed by the third persons. This notion has influenced the form of the semi-private spaces. A common form of such spaces was the end of the dead-end narrow allies that were supposed to be used by some neighbor families. It would not be a normal action if some body other than those families entered the ally. Nevertheless in normal conditions no barriers closed the semi-private space.

The privacy has also had major effects on the architecture of the Iranian houses. In this case, the Iranian houses have been affected like the houses of the other countries of the Middle East and the North Africa. The inward-looking courtyard houses are the direct result of cultures that seek high levels of privacy in their buildings.

5-1-4- Mobility

Mobility has been an effective factor in the formation of traditional settlements, not only in the Middle East or generally the East, but also in European historical cities that were located in better climates. Up to the new ages that the motorized transportation vehicles were used to make broad-ranged and fast mobility, the urban form of the cities and the neighborhoods were built in a way that the residents could easily reach the destinations on foot. So in Iranian cities as well as the cities in other parts of the world, the neighborhoods were built in a dense way, so that the distance between the houses and the possible destinations like the shops and the work places were quite short.

5-2- The history of the Iranian urbanism

The history of the Iranian urbanism is mixed with a succession of historic, political, and religious events. To understand and analyze this urban history it is necessary to study the causes in the history. Definite events and trends have caused the urban form and structure of the Iranian cities to be in the way that they today look. Here a glimpse of the urban history and the historical events that have had impacts on the urbanism are presented.

5-2-1- Pre-Islam era

The contents of beginning of this article includes a period of time starting when the people of the Iranian Plateau began to live in urban settlements to the year 726 B.C. when the first Aryan dynasty of Iran started to rule the region. The beginning of the urban culture in today's borders of Iran dates back to about the tenth millennium B.C. when human went out of the temporary shelters and started agriculture, settling down in villages and later in towns. There are evidence of old settlements in Kermanshah in west of Iran that shows there was urban culture there around the year 9000 B.C. (Behnam, 1972).

Such evidences are spread in the ancient periods of the country. The economy of these settlements was based on the handcrafts and agriculture. There are examples that show the approximate age of these historic towns. The evidences of human life and working places have been found in archeological excavations in sites like Tepe-Zagheh near Ghazvin (late seventh millennium B.C.), Tepe-Sialk near Kashan (sixth millennium B.C.), Tel-Eblis in Bardsir region near Kerman (fifth millennium B.C.), Tepe-Hasanlu in south west of Lake Urmia in northwest of Iran (sixth millennium B.C.), Khabis near Kerman (fourth millennium B.C.), Shahr-e-Sukhte (burnt city) in north of Sistan-o-Baluchestan province in southeast of Iran (third millennium B.C.), and Elam in Khuzestan Province in southeast of Iran (Negahban, 1986).

Shahr-e-Sukhte is a good sample of the cities of this age. Some parts of the city have remained almost safe during thousands of years. The whole city has been destroyed in a burning event and after that maybe a flood. The remainders of the city that have been examined by archeologists have been covered by ashes. According to the results of the investigations of the past decades, now we can say that the city has had a population of 5500 people that is considered to be a large population for the fourth and the third millennia B.C. Shahr-e-Sukhte had its largest size and most population during 3200 and 2100 B.C. It had advanced handcraft industries and business relationships with the next door civilizations. Some separate part of the city was allocated to industry. The residents were active in pottery, stone carving, metallurgy, and also producing texture, jewelers, etc. (Sajjadi, 1986, 54).

Elam has a great part of the history of Iran before the Aryans move to the Iranian Plateau. Today the province of Ilam in west of Iran, is still called by the name of this ancient civilization. Elam at its most powerful times ruled the southern and western parts of Iran like Khuzestan, Ilam, Fars, and some parts of Kordestan, Lorestan, Bushehr, and Kerman. They governed since 3200 B.C. to 640 B.C. when their power collapsed by the Assyrian Empire.

The Elamite civilization showed their advanced urbanism in 32 cities, particularly in their capital city, Susa, which is still inhabited in Khuzestan (it is pronounced Shush in Persian language). The remainders of wide and straight streets have been found in this city. The width of these streets reaches nine meters (Grantosky, Dandamaev, 2006, 24-48).

During the second millennium B.C. Aryans, who were based in the north of Caspian Sea and the central Asia began to migrate to the Iranian Plateau, India and Europe to find better conditions for life, better weather and more fertilized lands. Gradually they overcame the local residents of Iran by their large number and fighting abilities and settled down in different parts of Iran. They reused the culture of the defeated nations and improved their cultures. The major branches of Aryans that settled within today's borders of Iran were called Mede, Pars, and Part. Except the years after the invasion of Alexander when his descendants and he controlled Iran, the Aryans governed Iran since 9th century B.C. to the Arab domination in 7th century A.D. Through their governance undeniable masterpieces of art, architecture, and technology were created, which in many cases had hybrid nature that had origins in Iranian-Mesopotamian cultures. Also their method of governance, particularly the Persians (the people of Pars) was so successful that was not experienced later. The Medes inhabited in west and northwest of Iran in the presently called Hamedan, Kordestan, Lorestan, Ilam, Azarbaijan, Zanjan, Markazi, Qom, Tehran, etc.

The Persians moved to Fars in south of Iran. Later through the centuries, all the people who lived in Iran were called Persian by other nations especially the Europeans. This was started from the Greek literature that used the word Persia for the whole Iran and Persian for the Iranians. When the Arabs captured Iran they called the region "Fars", because they could not pronounce P. This name is still used

to call the Fars province and the Fars race. In 1935, the international name of the country was officially changed to “Iran”, which is originated from “Arya” and has been used by the Iranians in the past three thousand years. The third branch of migrant Iranians were Parthians, who were based in northeast of Iran, where now is Semnan province. Their territory was called Parthia.

The Medians (the people of Media), who had lived in Iran since the second millennium B.C., conquered Assyria, the most powerful empire of the world of that era, and also Lydia in Asia Minor. So the kingdom that they established embraced larger area than the modern day Iran.

Due to the short distance from west of Iran to the Mesopotamian civilizations like Babylonia, Sumer, and Assyria, the Medians made up a culture that in many cases had Mesopotamian elements. This is especially seen in their cities and urbanism. Power and religion are two major roles in their cities. The location of the governing person or organization has a prominent position in the cities of this age. According to Mohsen Habibi, the main parts of the Median city are the castle and a number of residential units that were spread around the stable walls of the castle (Habibi, 2009, 7).

Hegmataneh (Ecbatana), which is today’s Hamedan was the capital city of Media. It was selected as the center of the kingdom when the first king, called Deioces (Daiukku or Dayukku), managed to unite the mad tribes and established the Median Dynasty in 7th century B.C.

In 549 B.C. Cyrus the Great, the king of Persia, captured Ecbatana and ended the kingdom of Astyages, the last emperor of Media. So the world’s largest empire up to that day was established. At its largest, the Achaemenid Empire ruled from Indus River to Bulgaria/Macedonia and from Transoxiana to Egypt.

Since 550 B.C. to 330 B.C., while the Achaemenids brought security and stability to the Middle East, cities of the region improved in quality and number. The Achaemenid cities inherited some of the characteristics of the Mesopotamian cities, especially Susa, the capital of the Elamids became one of the capital cities of the new Empire. The other city that had effect on the urbanism of the Persians was Babylon that was conquered by Cyrus in 540 B.C.

Like the Median cities, the Persian cities had a quadrangular shape. As Habibi writes, the normal size for the sides of the quadrangle was about 9 kilometers (Habibi, 2009, 11). He also points that the form of the cities of this age can be classified into three parts; the governmental castle, that was fortified by stable walls; the inner city, that was located around the castle and upper-class people lived in it; and the outer city that normal people inhabited in it (Habibi, 2009, 14).

153 years after Xerxes, the Persian emperor, captured Athens in 483 B.C., Alexander headed east to put an end to the Persian-Greek conflicts. After the death of Alexander, which happened in Babylon in 323 B.C., vast lands with several historical cities were inherited by his descendents. The Seleucid Empire that had taken a big part of the civilized lands of that day's Middle East, tried to take functional methods of governing an empire that was several times larger than their own land. Their governing ideology was shown in their way of building new cities. These cities were mostly like military castles. As a result, a large number of new cities were built from 312 B.C. to 64 B.C. when they ruled Iran.

The independency of the Greek city-states and power of the central government and the city were indicated in the 400 new cities that were built by them. Such cities were built in a location that was near the network of roads, near old cities, between a

number of villages, and/or had geostrategic value (Habibi, 2009, 17-19).

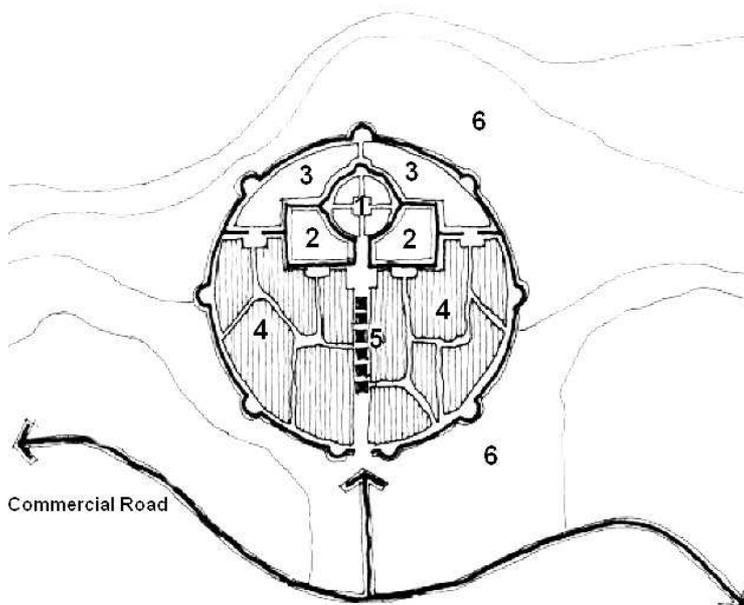


Fig. 5-2 : The Parthian City had a circular plan with distinct parts. This kind of zoning was later developed in the Sasanid cities of between third to seventh centuries. The main parts of such cities were:

1- The castle, 2- Garrison, warehouses, and treasury, 3- The houses of the governor's relatives, 4- the inner city, 5- bazaar, 6- agriculture lands (Habibi, 2009,).

In the third century B.C., when the Seleucid Empire had a long way to be collapsed completely, the Parthian tribes founded a kingdom in northeastern Iran, which lasted from 247 B.C. to 224 A.D. They succeeded to sweep away the Seleucids to west. Seleucids were later totally defeated by the Romans, who had newly risen as a new power in Europe. The Parthian Arsacid Empire was important because it reestablished an all-Iranian government after the Macedonian invasion and later it blocked the ambition of the Roman Empire to develop to east. The Arsacids also took the Persian-Hellenistic ways of governing during the first half of their reign and emphasized on the Iranian views as time passed by.

This view is also observable in the Parthian urbanism. The organization of the cities of the first decades of the Empire had similarities to the Seleucid urbanism. At first the Parthian cities had the form of military castles that had residential quarters outside. Nevertheless late Parthian cities became more like Achaemenid cities with public settlements, which were directly connected to the central power of the country. They gradually gave up the idea of city-states that had come from west.

The Parthian city obtained certain structure that is still found in archeological sites. Circular form was the dominant shape of their cities. Fortified walls around the city protected the castle and the neighborhoods. Like the Persian city, the Parthian city still had the three main parts; the castle, the inner city, and the outer city. The bazaar was seen in the inner city or the outer city.

Two of the main cities of the era are Nisa and Firouz-Abad. Nisa was located in northeast. Its location is now near Ashgabat or Ashg-Abat (the name is gotten from Arsaces that is a Greek pronunciation for the Persian word Ashk), the capital city of the present Turkmenistan. Nisa was selected as the first capital city of the Arsacids. Firuzabad is now an inhabited city in Fars province and had a population of nearly 68000 people in 2005. The city was called Gur in the Achaemenid era and was destructed by Alexander but later it was reconstructed and was called Ardeshir-Khureh in the Sasanid period. The remainders of the old city show that it had an exact circular plan with a radius of about one kilometer. So it has had an area of more than 300 hectares.

In the third century A.D. when the bases of the Arsacid kingdom were not so strong, Ardeshir I, the Persian king, defeated Artabanus IV, the last Arsacid king, and then captured the whole empire. The Persians founded the Sasanid Dynasty, which lasted from 224 till 651 A.D. They established a new and great empire with an aim of relocating the glory of the Achaemenid era.

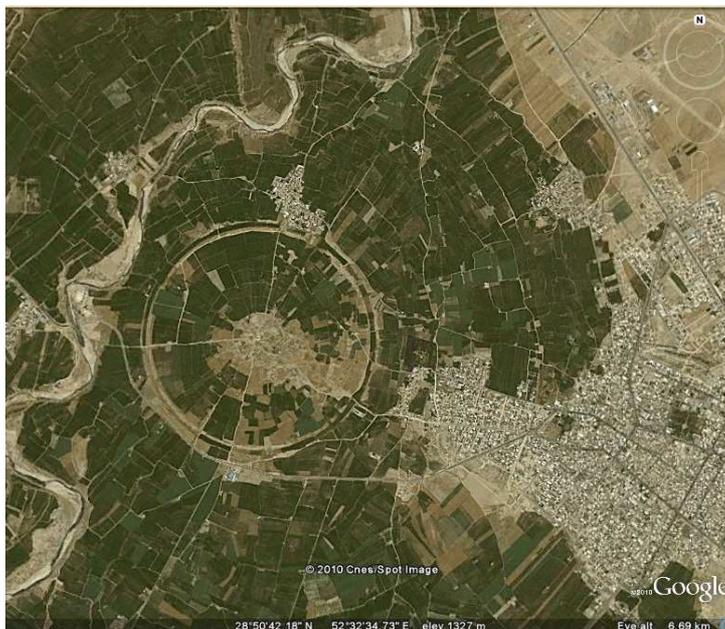


Fig. 5-3 : The city of Gur next to the present Firuzabad city in Fars province in south of Iran had a circular plan with a radius of 1 kilometer. Source: Google

Nevertheless the urban form of the cities of this period is very similar to the structure of the Parthian cities. The Sasanid cities had either circular or quadrangular plan that included the castle, the inner city, the outer city, bazaar, and Meidan. The outer city included both the urban functions like neighborhoods and a part of bazaar and also gardens and farms. Since this period, the bazaar and Meidan became two of the main physical elements of the Iranian city (Habibi, 2009, 32-34).

5-2-2- From Islam to the nineteenth century

In 650 the uprising power of the Arab Moslems flew out of the Arabian Peninsula and conquered the brilliant Sasanid Empire that had ruled for 426 years up to that date. The main thing that was brought by the dominant power was their ideology. The Islamic ideology affected on the structure of the cities in a way that the role of religion was boosted and at the same time the role of the central political power was weakened. Of course the religious temples already existed in the structure of the

cities, but during the Islamic period the presence of the religious elements rose dramatically. The increase in the number of such monuments was so strong that mosque along with bazaar and neighborhood as the representatives of religion, trade and residence are considered to form the main parts of the Islamic cities of Iran (Habibi, 2009, 46-49). In another view and with a larger scale, the new Islamic Iranian city consists of the castle, (Kohan-Dej), the city (Sharestan), and the suburb (Rabaz or Savad).

Not long after the Islamic army conquered Iran in the year 650, the Umayyad Caliphate (661-750) was replaced by Abbasid Caliphs (750-1258) who ruled a vast Islamic territory from their center in Baghdad. Their reign began independently in political, religious, economic and other aspects but long before their power was collapsed by the Mongols in 1258, the Iranians had established independent kingdoms that were only nominally within the Abbasid Caliphate. This was like other parts of the empire in which Sajids, Hamdanids, Tulunids, Aghlabids, Idrisids, and Umayyads were ruling from Caucasus through Morocco and Spain independently. The first dynasty that rose was Tahirids (820-872) in center, east and northeast of Iran to Uzbekistan and Afghanistan. Among the states that rose at this period of time were Saffarids (861-1003), Samanids (819-999) and Buyids (934-1055), Ghaznavids (963-1187), Khwarazm-Shah dynasty (1077–1231) that ruled till the Mongol invasion.

Some transformations were formed in the structure of the cities, when Samanids established a more stable and more independent government that existed longer. The result of the created stability was that the walls around Sharestan lost importance and were omitted. The population of the Samanid cities, in the northeastern parts of the Iranian Plateau and Transoxiana, reached for outer space of Sharestan. Also bazaars and work places were developed into Savad. This was the time when infrastructure engineering started to boom. Water transfer techniques that had been experienced since hundreds of years before were applied by the governors successfully during the next 4 centuries. Transferring water from the rural areas to the cities by Qanats and storing it in Ab Anbars by the governments were improved during this period. The only obstacle that succeeded, not only to block this

improvements but also to ruin the whole structure of the urbanism of Iran was the Mongol invasion.

In the age of the Buyid Dynasty (934-1055) a liberal way of governance caused the urban neighborhoods have equal rights and levels in religion. At this time no neighborhood had privileges to others in religion or race. Although the Buyids were one of the first Shia governments of Iran, but they did not let the religious issues lead to inequity between the parts of the cities. Another specification of the cities of this period was strong presence of central plazas (Meidan) in the center of the cities, which were surrounded by bazaar, mosque and the neighborhoods.

The presence of the central Meidan, as the hub of the city, is also seen in the Seljuk cities (1029-1194). The Seljuks were a group of central Asian nomads, who succeeded to overcome the Iranian governments and establish an empire in Iran and the next-door regions. After the collapse of their empire a group of them founded a small kingdom in Anatolia, which later became the basis of the Ottoman Empire. The urbanism of the Seljuk Empire in Iran shows the fundamentals of the Iranian city. The main street of every neighborhood found way to the bazaar and the bazaar itself opened in the main Meidan. Opposite the Buyid city, the Seljuk city indicates the separation of race, religion, social classes and so on between the neighborhoods. The self sufficiency of the neighborhoods is apparent at this age. Every neighborhood had its own infrastructure and facilities. So they acted as small towns within the mother city.

The Buyid and Seljuk cities show the organization of the Iranian city before the Mongols. However not only the mentioned organization but also great part of the country was ruined by the Mongol invasion in 13th century. Three main reasons weakened the urbanism at this period. Firstly, the Mongol victories were accompanied by harsh killings of the civilians. Killing the city dwellers was more extreme in cities that had resisted for some while. Consequently the urban population was dramatically reduced. Many cities were completely destroyed by them, some of which never obtained the previous importance anymore. The examples of the cities that were fully or partially destroyed are Rey, Nishapur, Merv, Bukhara, and Samarkand. These cities were mostly located in the center and northeast of Iran.

Secondly, the Mongols destroyed the water networks of the conquered cities and regions. So when the basis of the production of the cities and the villages were collapsed, it was hard that the agriculture, trade and urbanism could get back to their golden age of 11th to 13th centuries easily. Thirdly, the Mongols ruled the captured lands without any governing laws and regulations. Every ruler had the right to rule the assets and the people in any way. This way of governance was different from ordinary way of ruling and was often completely savage. So the people did not feel secure to have their normal productive or urban activities, because they were not sure to be able to keep the results of their activities for themselves. They usually did not dare to risk their properties and belongings to start producing. The bases of urbanism were extremely endangered.

The unstable conditions of urbanism continued for about a century. The successors of the first Mongol rulers like the Ilkhanates (1256-1380) adopted Iranian cultural values. They picked Islam and Iranian names. Although they used the Iranian urbanism norms and also Iranian consultants in their ruling system, the urbanism of their age did not gain the previous prominence. Whenever a ruler tried to prove his power to the rivals and the enemies, a big city was developed. So there was not a network of cities in the country; but what were created were some big cities here and there, which somehow were connected to the governing body. Two examples of such cities were Tabriz and Soltaniyeh.

Tabriz was the capital city of Ilkhanate Dynasty (1256-1335), which inherited the lands that were captured by the Mongols in the Middle East. The city was the capital for a part of the period of this dynasty. Then it lost importance after this age. Soltaniyeh was developed as a new city and capital near Zanjan by Oljeitu, the Ilkhanate king, who had accepted Islam and changed his name to Mohammad. The new city had grid-iron streets and a planned structure. But it was deserted after the death of the ruler. Today the city is famous as one of the largest brick domes of the world, which covers the thumb of Sultan Mohammad.

However the effects of attacks of the foreign powers were not limited to the Mongols. The nomads of the central Asia continued attacking the Iranian cities all through the 14th century. Most famous of them was Timur. He had victories in all

over the Iranian lands and selected Samarkand in the contemporary Uzbekistan as his capital city. Although his successors tried to develop the cities especially in Greater Khorasan such as Mashad, Heart, Bokhara, and Samarkand, but generally the rise of the cities of before the Safavid dynasty were not as remarkable as before the 13th century.

The Safavid dynasty was created by a group of Azeri governors in 1501 and continued to 1736. They established a notable government that succeeded to rebuild many aspects of the Iranian civilization like art, architecture, technology and governance. Their urbanism, like many other aspects of the Iranian art, was a continuation of the Iranian urbanism before the Mongols. Their first two capital cities, Ardabil and Ghazvin, contained exactly the important elements of Buyid and Samanid city as the heart of the city. Bazaar, Meidan and the king's palace or a castle were these fundamental monuments. Later, when Esfahan was selected as the last capital of Safavids, the form of the Safavid urban form was indicated in a more matured way. The morphology of the cities of this era is now called the Esfahan School. The Esfahan School has roots in older patterns of urbanism, for example Kerman of the Buyid-Seljuk Period has older urban structure that can be considered as the origin of the Safavid urbanism. However Esfahan is the best showcase of this urbanism trend. Large central Meidan, which has some governmental roles, next to bazaar are the bases of this urban pattern. In capital cities, the palace of the king, which is called Alighapu is standing in the main Meidan. Other elements of the Esfahan School are streets that in some cases are planned and linear. The examples are Charbagh Street in Esfahan and Chenarestan Street in Tehran. These streets that are like the present-day boulevards had rows of trees, fountains and separated routes for passing carts and horse riders. Such streets were later called Charbagh as a general name. The Esfahan School pattern was repeated in several cities in the Safavid period. Apart from the above-mentioned cities, Bushehr and Shiraz are other examples of this type of urbanism.

After the Safavid era, until the beginning of nineteenth century, very few remarkable urban developments were executed. That is mostly because of the limitation of the power of the central government and the rise of the local rulers that weakened the

power of the Afsharid (1736-1797) and Zand (1750-1797) dynasties. The best example of the urbanism of this time is Shiraz of 18th century, which was under redevelopment plans by Karim Khan, the Zand king, who selected the city as his capital. He rebuilt a Buyid complex including Hammam (public traditional bath) and bazaar in the center of the city, which are still called Vakil to remind the Zand king.

5-2-3- The Contemporary Iranian City

The history of the contemporary Iranian city begins when the Qajar dynasty took over in 1794 with the victories of their first king, Agha Mohammad Khan. The reign of Qajars continued to 1925. The reason that places the urbanism of this era in the contemporary period is that the Iranian city was changed in a way that the modern aspects and a few foreign architectural elements were applied in the form of the cities. Although the Qajars were not successful in ruling the country and had many problems in the foreign policy and internal management, but the city that were formed in their time is considered to be prominent. Their first king selected Tehran as capital. The city was previously developed during the Safavid period in the north of the ancient city of Rey. The small city had some benefits for the new kingdom. It was near the location of their tribe that was situated in a short distance to Gonbad city in the north east of Iran, next to the Caspian Sea. On the other hand it was far from their rivals in the south of the country and near enough to the center of Iran. At first the structure of Tehran was developed according to the Esfahan School. The first monuments that were built were the continuation of the constructions of Shah Tahmasb I (1514-1576), the Safavid king. However as time passed by, the new urbanism showed new characteristics that today is called the Tehran School. A fundamental change that was applied to the Esfahan School to create Tehran School was made to the streets. In the mid-nineteenth century the Qajar kings, influenced by the attractiveness of the European cities, tried to change the view of the Iranian cities and especially their capital city, Tehran. The streets had the most changes. The new streets were built wide enough that the carts could pass through them. Also the design of the body of the main streets was so that the shops were located in them.

The aim was to make a lively urban atmosphere. As a result, the shopkeepers and many people were drawn out from bazaar to the streets. The bazaars of the Tehran School were not as important as the ones in Esfahan pattern. The bazaars were not the only economic hubs of the cities any more. For the first time the public transit was seen in the Iranian cities, when some carts and carriages started to work in Tehran. Of course at first it had an entertaining role. But later it became more serious.

The urban plazas were also changed in the Qajar era. The Safavid plazas that had several functions and especially governmental role were changed to plazas that had special functions in Qajar period. In nineteenth-century Tehran, there was Sabzeh-Meidan as the old-styled Meidan and also a few other Meidans with military, social, cultural, and commercial roles.

The main architectural elements of Tehran School were the governmental buildings, like post office, bank, municipality, and The Police center that were located in different plazas, especially the main Meidan. So the traditional elements of the city (mosque, Madreseh, bazaar, and the governmental center) lost importance. The main mosque (Jame) remained in the bazaar but there were several other mosques in different parts of the city and the neighborhoods. As the political conditions became hard for the Qajar dynasty and the country was under financial pressure before the World War I, the Tehran School was not completely developed in other cities of Iran. In contrast to Esfahan School, the pattern that was formed by Qajars was limited to the capital. The main similarity of other cities of this period with Tehran was that some public buildings were built in the public spaces to house the new ministries. Thus we see that the structure of Tehran as the major example of Tehran School is different from other cities of the country. This difference is also seen in the number and area of the neighborhoods. The neighborhoods of Tehran had larger areas and more population. But every neighborhood was consisted of some sub-neighborhoods. In other cities, more limited number of people and families were called a neighborhood. In fact, the cities of the end of Qajar era, other than Tehran, showed a mixture of the Tehran School and the Esfahan School. This mixture, like

the ones in Yazd and Kerman are considered to be irreplaceable samples of the Iranian urbanism (Habibi, 2009, 141).

After the World War I, in 1925 the power was transferred to Pahlavi family and a new age of dominance of modern aspects of life to the structure of traditional cities began. The main aim that was followed in this age was to show a modern view of the cities. Logically the first step was to provide room for automobiles to move in the cities. The historical urban texture of most of the cities of that age was cut through to build new wide streets so that the cars could drive through them. 1930s was the decade of changing the organic city form to modern and industrial city. The city of this period is still a hybrid city of the western and the eastern elements. However unlike the Qajar city, the new city had more western indications than eastern. In fact the urban style that is seen in such and urbanism could be called international style.

After the World War II the cities and towns continued to grow along the previously built roads. Lack of urban plans for the development of the cities became clear. On the other hand agriculture was underemphasized and the efforts of the government were focused on industrializing the country. So the villages and small/medium-sized towns had less growth and large cities, particularly Tehran enlarged fast. The difference between the largest city of the country and other cities, which had started to grow from the first decades of the century, became more in 1950s and 1960s. This degree of primacy looked hard to control when the new urban development plans in 1960s and 1970s could not give good shape to the slow organic growth of the small cities and fast sprawl of the large cities. The Tehran of this time had a rapid growth and became the biggest and the first metropolis of the country. In 1970s some organizations were founded to control the growth of Tehran.

After the 1979 revolution, the rural-urban and small town-big city migration that had began since previous decades did not stop. The macrocephalic shape of the urban centers became more apparent. The governmental authorities started to apply sprawl containment strategies for controlling the growth of Tehran and some big cities, while smaller cities had uncontrolled growth. The control of sprawl in large cities had a reverse effect. A high-density metropolis with low per capita planned

amenities was the result of these containments. So the quality of life was lowered in the large cities. The rate of population increase and especially west-oriented growth of Tehran caused authorities add two large urban districts to the west of the city in 2000s. Therefore Tehran and Karaj as two of the ten metropolises of the country are expected to join each other during the next decades and make a huge metropolitan corridor. That is while the quality of life had been lowered by lack of budget for development plans and wrong urban strategies.

5-3- The main elements of the Iranian City

The main elements of the Iranian city are Neighborhood and its center, bazaar, Mosque, open and public spaces, and public infrastructure. These elements are usually located in a regular manner, but this does not mean that all of the historical Iranian cities have the same shape.

The city had three main parts. Arg or Kohandej was a governmental castle, which had a governance or security function. In large cities the ruler of the city or the region lived in it. Some times in small cities the castle had the security function and it was attached to the wall of the city that surrounded the city. Otherwise it was located in the middle of the city. The second part was Sharestan that means “the city”. The residential quarters were located in Sharestan. This part of the city was protected by the wall. Finally, the third part was Savad or Rabaz that was the suburbs of the city and the gardens and the agricultural lands were located in it. In times that the cities grew, the Savad of the city developed and some residential neighborhoods and bazaars were built in it, and gradually it was included in the next wall that was built.

The main public space of the city was bazaar, which was built along the main inter-city road that passed through the city. It was usual that it was developed from one gate of the city to another one in the other side of the city. Bazaar was the commercial heart of the city. Neighborhoods accommodated the population of the city. The neighborhoods had centers that contained the facilities that were used in the daily life of the residents, like water reservoirs, religious buildings, public

gathering spaces, and shopping facilities. The Neighborhoods were connected to bazaar and to each other by a hierarchical network of streets and cul-de-sacs. These routes included public, semi-public and semi-private spaces that led to the private space (homes and courtyards).

5-3-1- Neighborhood

Neighborhood is the main part of the traditional Iranian city. Other elements of the city have the duty to serve this part. The population of the cities mainly lived in the neighborhoods and the neighborhoods were places for obtaining security, comfort and happiness for the residents. According to Khaksari et al. (2007, 50), the neighborhood is officially defined in the Iranian governmental organizations as a group of residential and service constructions that its residents believe that they belong to that place.

What we call neighborhood is a place in which some families with common culture and interests lived near each other. Iranian urban neighborhoods had great meaning for the residents. It was the second family for many neighborhood members. The social relations in a neighborhood were in a way that powerful sense of belonging was made and people felt this feeling for all their lives. Although the Iranian city dwellers had strong feelings about their neighborhoods, but there were no exact boundaries for defining the borders of the neighborhoods. Of course in many cases the entrance of the neighborhoods were signed or there were even gates that could close the entrance in emergency times, but no rule or physical separator existed to define the border between the residents of the houses of different neighborhoods. The only thing that defined who and which house was related to which neighborhood was the sense of belonging that people had.

The Iranian neighborhoods were somehow independent communities within a city. Every city has a number of them. There were forty small and large neighborhoods in Isfahan (Esfahan) (Fig. 5-4). Also 17 neighborhoods have been mentioned for Kerman (Basiri, 2007) and 10 for Shiraz (Soltanzadeh, 2006, 32) Fig. 5-5.

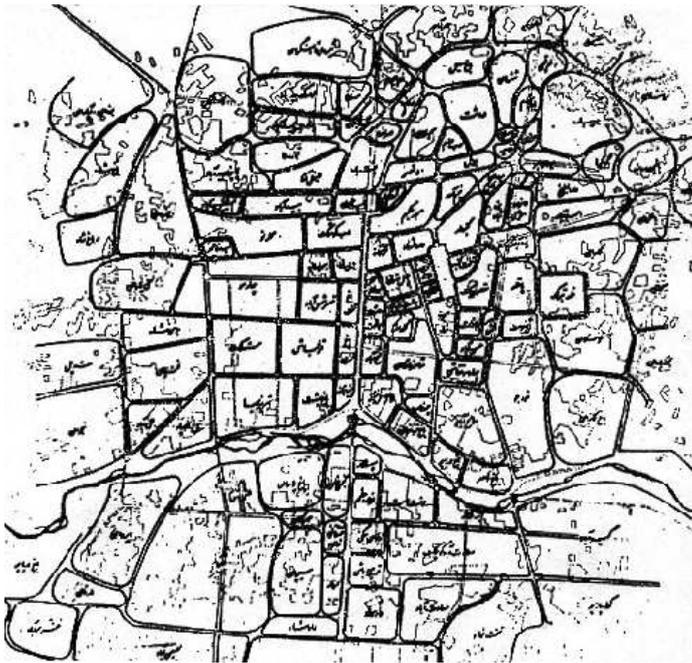


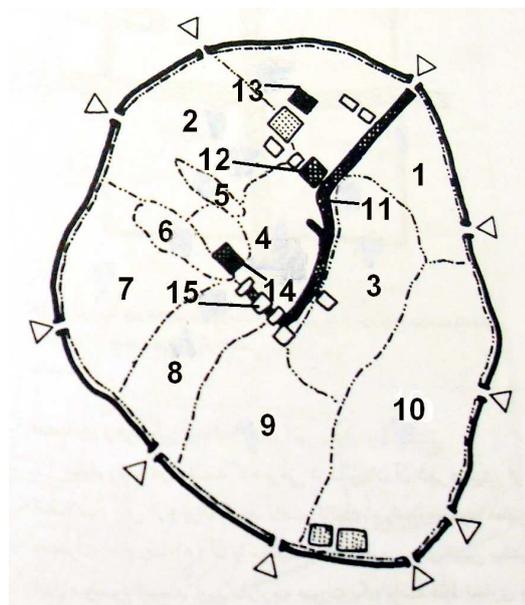
Fig. 5-4: An old map indicating the neighborhoods of Isfahan (Falamaki, 2005)

Neighborhood organization was almost similar in most of the Iranian cities, as seen in the above figure for Shiraz. However nineteenth-century Tehran had a different organization. There were 4 large neighborhoods, in which some smaller neighborhoods existed. Every small neighborhood consisted of between 100 to 300 houses (Khaksari, et al. 2007).

An important problem in consideration of the old neighborhoods of the Iranian cities is their independence. Every neighborhood was independent in providing the daily needs of the residents. The people often did not move to outside of the neighborhood to buy something or do a job. All the needed stores like bakery, butchery, grocery stores were found in the neighborhood center. Thus people were not obliged to have a trip to bazaar to buy the daily needs. Travel to the central bazaar happened when it was necessary to provide something that was not found in the neighborhood stores. So the neighborhoods seemed like independent cities within a larger city. Most of the neighborhoods had their own Ab Anbar, Hosseinieh, and Mosque. In time of neighborhood struggles or when the city was invaded, the people closed the gates of the neighborhoods and it was necessary for them to be able to provide the basic needs. When walking in old texture of Iranian cities, it is usual to see several mosques, Ab anbars and Hosseiniehs for each neighborhood.

Fig. 5-5: The 10 neighborhoods of the old city of Shiraz (Soltanzadeh, 2006, 32). The first ten sections are the main neighborhoods of Shiraz and the rest are: 11- Bazaar, 12- Vakil Mosque, 13- Arg, 14- The New Mosque (Masjed-e-Now), 15- Shahcheragh Tomb

The figure also shows bazaar (the long corridor in black) and the main gates of the city.



Most of these amenities were located in the neighborhood center. This place was shaped in a point where two or more streets reached each other and made a wide peace of ground. Or similarly the neighborhood could be shaped where the main street of the neighborhood became wider than usual. So there was enough room for opening some stores and sell bread, fruits, meat, etc.

Neighborhood centers were not necessarily located in the center of the neighborhood. They were located in every part of the neighborhood where there was enough room. For example, it could occur in places, in which two or more routes intersected each other or where the main street of the neighborhood was wider.

The neighborhood centers were usually places, in which people could socialize and have a conversation with other residents. There was enough room for them to spend spare time, talk to neighbors, and take a rest after the daily work. So the neighborhood centers had also a social role. The social relationships were very important in the organization of both neighborhoods and the whole city.

The management of the neighborhood was executed by the participation of the residents. A matured person called “Kalantar” was the connector between the residents and the government. He had responsibility when there was a disagreement between the two sides or in case of tax payment of the residents. Of course in case of disagreement, he usually did not support the residents.

The co-ordination between the neighbors reached the peak when the neighborhood was invaded by an enemy from outside of the city, for example nomads or a foreigner power, or when there was a struggle between two neighborhoods. Then the

neighbors had a close relation and co-operation with each other and tried to protect the neighborhood, women and children.

The traditional major neighborhoods could have different populations but normally it was between 10000 and 40000 people. According to Kahaksari and his colleagues (2007, 36), the population of Tehran in 1922 was 210000 people, who lived in 10 neighborhoods. As observed in Table 5-1, the neighborhoods have a population of between 5% and 18% of the population of the city (the first two low-populated neighborhoods had non-residential functions). So the population of each one has been at least 10500 and at most 37800 people.

Number	Name of the neighborhood	Percent of the population of Tehran
1	Bazaar	18%
2	Oodlajan	17%
3	Sangalaj	16%
4	Dowlat	12%
5	Mohammadiéh	11%
6	Ghanat Abad	11%
7	Qajarieh	7%
8	Hasan Abad	5%
9	Shahr-e-Now	2%
10	Arg	1%

Table 5-1: The population percentage of the neighborhoods of Tehran in 1922 (Khaksari et al. 2007)

The neighborhoods were often shaped because of a reason that had gathered a group of people together. This reason could be the career of the people, a common belief or religion, or a source for living for example a Qanat, a river, etc.

Also the names of the neighborhoods were usually gotten from the same primary reason for founding the neighborhood. In many cities, the name was gotten from the job or class of the residents. The similarity of the job, beliefs, or religion of the neighbors caused a cultural and social homogeneity. That made a social integration that resulted in simple life.

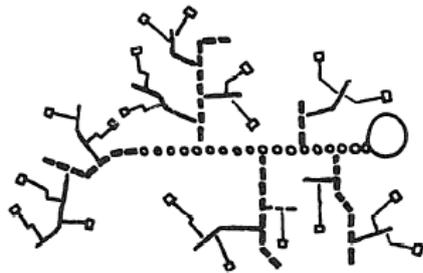
The process of modernization in Iran that was started in 1920s destroyed the organic discipline in the old neighborhoods of the country. Wide streets were necessary to

ease the automobile movement and build modern-looking cities. Thus the street cut through the historical neighborhoods and bazaars. The result of the destruction of those days is still observable in the old texture of the cities. One of the famous street building projects in Iranian cities is related to Hamedan. In 1931, the new streets were built in a radial arrangement. They reached each other in a central square. So the neighborhoods were cut through and their form and limitations were collapsed. Another project of this kind was executed in Semnan in 1938. As a result of this construction, the old neighborhoods of the south of the city lost importance and the direction of the city growth were changed to north (Khaksari, 2007, 32). Consequently, the body of the neighborhoods was torn apart and they had no longer the previous identity and character that they already had. Today's urban neighborhoods are textures between the main streets. The defining elements of the neighborhood limitations are streets, or indirectly the automobiles.

5-3-2- Public Open Spaces

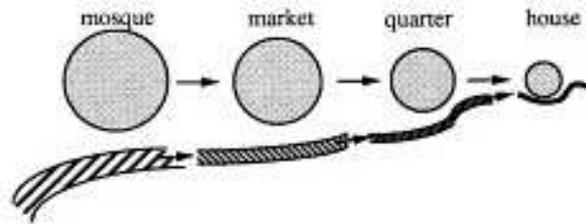
The main part of the public open spaces of the traditional Iranian city is made up of the streets and alleys. In other words moving through the city is the most important motive for creating public spaces. The streets of such city are more significant than the public spaces that are made for gathering together. Here the streets, alleys, gathering plazas, and religious open spaces are described as the public open spaces. The streets and alleys of the traditional Iranian city are formed in a tree-like organization. The main streets are the ones that are connected to bazaar. Every neighborhood has its own main street or streets, which is the fundamental route of the neighborhood and includes the neighborhood center in the wider parts. The main notion is considering the neighborhood streets is privacy. Of course here we study it as its religious meaning. This concept that has roots in Islam and also the old Middle Eastern cultures is about blocking the unwanted view of others to private places. It is directly about protecting the women and family from the non-related people, which includes relationships and visual issues. The privacy principles are put to work very simply and strictly in old neighborhoods.

As one goes from bazaar to the main neighborhood streets and then to alleys and dead-ends, the level of privacy and publicity changes. At first the streets are public, and then they become semi public, Semi private, and private. The most private level is seen in the houses, which are protected from the view of every one except the family members.



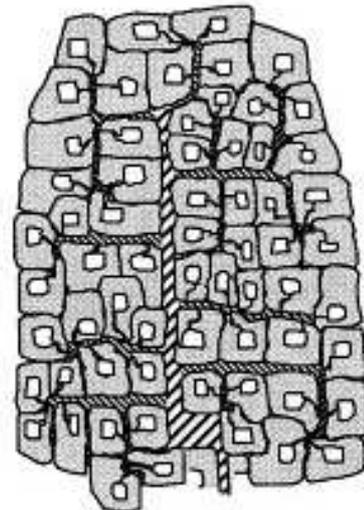
- public center [facilities and provisions]
- ∞ public thoroughfare [facilities and provisions]
- semi-public [residential]
- semi-private [residential]
- private [dwelling unit]

Fig. 5-7: (right) Another indication of hierarchical structure of the Middle Eastern city (Mortada, 2003) (the picture in the right side).



Semi-public and semi-private alleys are urban spaces that are in between the public and private spaces. The passengers could pass these alleys, but the neighborhood residents used these spaces as a common territory of the neighborhood inhabitants.

By going to the depth of the neighborhood the privacy increases. The semi-private spaces are places that are shared between some families and they use and protect



- /// public
- ▨ semi-public
- ▩ semi-private

this space. It was used by neighbor families in recreational ways. Women had daily contact with each other and children used it as playground.

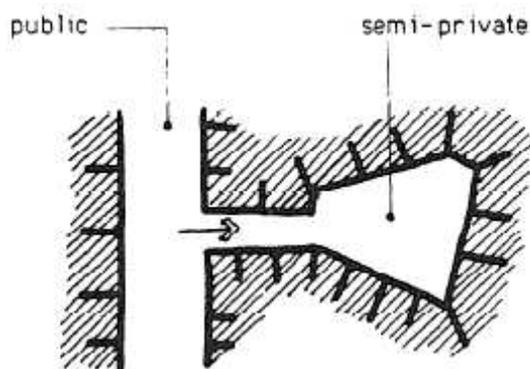


Fig. 5-8: Semi-private spaces as a shared place between a few families (Germeraad, 1993)

The narrow entrance of the semi-private spaces were a sign to inform the strangers that it is not a public passage and they could find their way to public places like bazaar, Jame Mosque, and generally the city center from other directions.

Apart from the main streets, another type of public urban space is Meidan (plaza). Meidan was a public place in which people gathered together for different purposes. This could be for a religious fest, watching a competition, listening to the governmental announcements, attending temporary bazaars and so on.

Soltanzadeh (2006), who has examined different aspects of Iranian urban spaces, identifies 7 categories of Meidans. The first type is general Meidan, which is a place that could be found in any city, town or neighborhood next to the general buildings like Ab Anbar or the neighborhood mosque. Another type is the business Meidan that was a plaza, in which goods were sold by people in an unroofed place. Governmental Meidan were not found in all of the cities and it was limited to the capital and the big cities. Naghshe-e-Jahan is the best-known plaza of this kind. When it was built in 17th century, Shah Abbas II was successful in showing his power to rivals, particularly to the Ottomans, who had Istanbul. Naghshe-e-Jahan with its 510 by 160 meters area was built to enable Esfahan to compete with Istanbul, the capital city of a Sunni Moslem country that was always in war with the Safavids. Many governmental ceremonies and also polo matches were carried out in this Meidan. Military Meidan was a Plaza in which the military troops practiced. The surrounding of the place was not built; there were just some places for settling

the troops. The samples of such plazas were found in cities like 19th century Tehran, which had a plaza for placing the canons and the artillery troops. The name of such

plazas remained until twentieth century, when the function was changed but still the name of artillery was remaining, such as Meidan-e-Toopkhane in Tehran, which was renamed to Meidan-e-Imam Khomeini after the 1979 revolution.



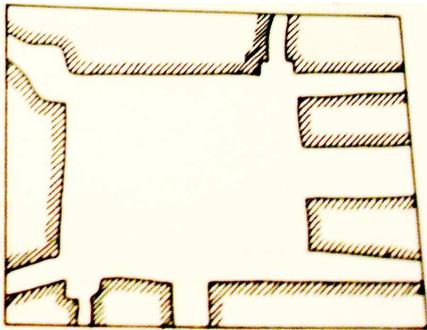
Fig. 5-9: Aerial view of Naghsh-e-Jahan Plaza in Esfahan. The northern part was opened so that the cars can pass through. Also the bazaar of Esfahan reaches the northern side. Source: Google.

Neighborhood open spaces or as is called in Iran “Meidancheh” or small Meidan is an open space, which features like Hosseinieh, Tekieh, neighborhood mosque or some small shops are found in it. Meidancheh can be neighborhood center. The gatherings of the neighborhood like the religious festivals of Moharram month took place in such spaces. Traffic-Meidan was a space, whose main role was to connect different parts of the structure of the cities together. These spaces were important in movement of the people across the city. Also some of the gatherings of the residents occurred in these places.

Finally, Sport-Meidan was a place, where the sport competitions, matches and so on were arranged in them. These spaces were not built spaces and were often arranged in the suburbs of the cities.

Meidans are social spaces that are today neglected in the contemporary Iranian cities. Today's Iranian planners and governmental authorities do not pay enough attention to the importance of social interactions and face-to-face socializing of people. Therefore the result is that the traditional Meidan, which had social functions, is replaced by transportation squares and roundabouts. The specification of these new spaces is easing the passage of automobiles and carries no direct social values.

In addition to Streets and Meidan, other types of public spaces are Hosseinieh and Tekieh. These are religious places, in which gathered together for religious ceremonies. There were normally no important between these two and both were names for one type of space, so we just name Hosseinieh here for simplicity. The places, where these spaces were located, were between the houses usually near the neighborhood center. It looked like some of the houses were not built and instead the remaining space were allocated to building Hosseinieh. In fact these places were urban blocks that were not built. They had two or more entrances (up to eight or even ten). Hosseinieh consisted of an open space that contained no social or retail element.



Hosseinieh consisted of an open space that contained no social or retail element.

Fig. 5-10 : The Tekkieh of Tajrish in north Tehran as a regional Meidan (Soltanzadeh, 2006, 96).

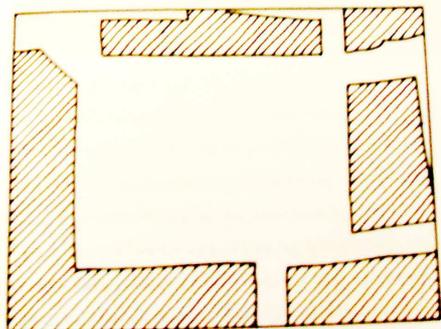


Fig. 5-11 : An old Tekkieh in Semnan (south east of Tehran), (Soltanzadeh, 2006, 96)

5-3-3- Bazaar

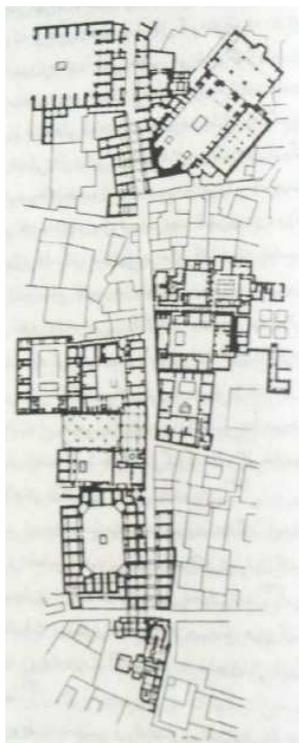
Bazaar is a Persian word that is derived from middle Persian language. Some believe that the word is made of “Baha” that means price and “zar” or “char” that means place. Therefore it means “the place of prices”. There are other Persian words like bazaar that are related to commerce and trade; the example is “Bazargan”, which means merchant.

Bazaar refers to a street or plaza that is a special place for merchandising goods. The word and the exact meaning have been used since an unknown date in the Iranian cultures. The word has been later used in other countries and languages in different ways. For example, in Turkish, Hindi, Malay, and Greek different forms of bazaar are used. Also the same word is used in French and English. The root of this word in modern European languages is in Portuguese. The date of using bazaar in this language goes back to the 16th century when the Portuguese navy and businessmen had presence in the Persian Gulf and the southern ports of Iran (Dekhoda, 1998).

Bazaars have been present in the structure of the towns and cities of Iran since the boom of merchandising between different regions of the Iranian Plateau and even farther places like India. The boom happened in the second millennium B.C. in Iran. Another development that was influential in the improvement of bazaars in the Iranian cities was handcraft work places. These workshops have been found in several ancient cities. It means that the productions that could be sold in bazaars were produced in the cities.

The central bazaars of the median era have not been improved yet. But in the Achaemenid, Parthian and Sasanid empires the bazaars became the main commercial hub of the cities (Soltanzadeh, 2001, 16-19). The commercial activities became easier when Darius the Great introduced Daric and Siglos as the official imperial gold and silver coinage in 514 B.C. Therefore the urban bazaars were improved faster. Similarly the developments of the international trade between the eastern and western nations like China and the Romans through the Parthian Empire had an enormous influence on the economy of the Iranian cities.

In the Islamic period, every time a powerful government ruled the country, there was higher security, so the trade and urban bazaars had better conditions. This happened in the age of some of the Iranian dynasties after the Arab invasion. Ghaznavids (975-1187) and the Seljuk Empire (1037-1194) were two of the dynasties that created a suitable space for trading, so bazaars were developed at their era. The commerce in the Iranian lands was corrupted like many other activities after the Mongol invasion in the 13th century, however during the Ilkhanate Dynasty (1256-1335), and especially the Safavid period (1501-1736) gained a dominant place in the urban life



of Iranians. This importance remained stable until the first decades of the twentieth century, when the automobile was brought to the Iranian cities. Therefore the structure of the traditional city was changed to use this new technology. The result was that bazaars lost importance to the car-oriented streets.

Fig. 5-12: Bazaar of Esfahan, which is still the trade center of the city (Soltanzadeh, 2001, 25)

The bazaars were developed in different forms. There were permanent bazaars in the center of the cities that all the needed materials of the residents of the city could be bought in them. Another type of the bazaars was the regional ones that were found in some parts of the big cities. Small cities did not have such bazaars because people could not easily reach for the main bazaar and provide their needs. Almost all of the neighborhoods had another type of bazaars that was called “bazaarcheh” (small bazaar). These kinds of spaces were formed in the neighborhood centers and were limited in area, length and goods.

The normal form of Iranian bazaars has been repeated in many cities. In old cities, the main bazaar (Rasteh) was in the direction of the inter-city roads that reached the city. The reason was that the goods were imported to the city bazaar by the caravans via the roads. After some time when the city grew bigger, the bazaar got also developed. So it was quite usual that the bazaar started from one gate of the city and

ended at the gate of the other side of the city. In large cities bazaars were organically developed in a second direction, perpendicular to the first one. Therefore the bazaars of such cities had a cross-shaped form. Also the other form of the development of the bazaars of large cities could be seen in the narrow allies leading to the bazaars.

5-3-4- Public Infrastructures

Public infrastructures are important parts of the traditional Iranian city, which were mostly created because of harsh environmental conditions. These amenities consisted of constructions that were built to ease the life of people particularly in the central parts of Iran. Such constructions were mainly built by people but some of them were also built by the governments. The main urban and neighborhood infrastructures were Qanat, Ab Anbar, Badgir, and Hammam. These constructions were built based on sustainable and environment-friendly fundamentals that could even be a good pattern for today's constructions. The result of building them is to have a better life conditions in harsh weather of some parts of Iran. This made such places more livable.

The origins of these structures are different, but most of them have roots in Iran and through centuries were used in other countries of the Middle East and North Africa as constructions technologies.

Two of the most prominent constructions of this kind (Ab Anbar and Badgir) are explained here and others like Hammam (public bath) and Qanat (underground water transfer system) are not discussed.

5-3-4-1- Badgir

Badgir is a symbol of the sustainable and environment-friendly architecture of Iran. It is an architectural element that has been drawn attention more than other aspects of the Iranian sustainable architecture. It has also inspired scholars for working on some passive cooling systems.



Fig. 5-13: Different types of Badgirs in the central cities of the Iranian Plateau: A, C, D, and E are some of the Badgirs of Fahadan neighborhood in Yazd. G is a renovated one in Naein. F shows the Badgirs of Amir-Chakhmagh Mosque in Yazd. Source: author.

The basis of the function of Badgir is cooling the interior space of the buildings by means of the wind blowing over the top of the building and circulation of the air and also cooling it by evaporation methods. Badgir was used in private houses or public buildings like Ab Anbars and some of the mosques.

In this research, the word Badgir is used for parts of a traditional building, which are designed to catch the winds in order to refresh the inner air of the primary buildings. Therefore here we do not use the word Badgir for the elements that are used to catch wind in temporary dwellings like tents or shelters.

Badgir is a Persian word that means “wind catcher”. Wind Catcher has been used as the equivalent phrase in non-Farsi resources. The other phrase, which is seen in related English-language literature, is “wind Tower”.

Badgirs are geographically located in the Middle Eastern countries. Iran, Iraq, Pakistan, Afghanistan, Egypt, UAE, and Bahrain are some of the countries in which Badgirs are found in the traditional urban fabrics. Apart from the Egyptian and Iraqi Badgirs, others have been within the cultural or political borders of Iran or have been constructed directly by the Iranian immigrants. The exploration that made some scholars claim that the oldest Badgirs were built in Iran was made by Masouda in 1971 and 1973 near Shahroud city. During his excavations he found ruins of parts of constructions that he assumed that they were fire places. Today some researchers believe that he had found remainders of old Badgirs (Mahmoody, 2009, 22). The building date of the explored houses in Shahroud was estimated by carbon 14 test.

According to the results, the date of the houses goes back to 7800 years before.

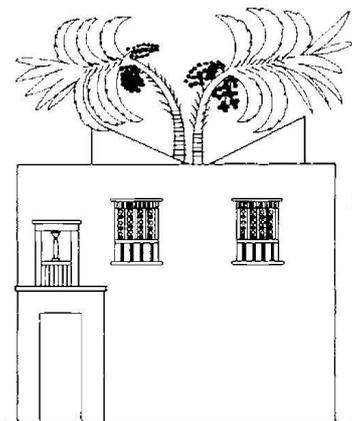


Fig. 5-14: Maqlaf in ancient Egypt (Fathy, 1986)

This is older than the Badgirs of Egypt that are estimated to be built between 3222 and 1580 B.C. (Roaf, 1988, 5). The drawings of such Badgirs were found on old papyruses from old Egyptian temples.

Of course the newer versions of Badgirs are called Maqlaf in Egypt. However Rosenthal notes that Egyptian Maqlafs are based on the Iranian Badgirs (Rosenthal, 1978, 2). The Badgirs of Afghanistan are very similar to the ones in the northeastern provinces of Iran (Mahmoody, 2009, 19). Also there are Badgirs in the Arab states of south of Persian Gulf like Kuwait, Bahrain, and United Arab Emirates. The form and structure of these Badgirs are like the ones in the southern provinces of Iran.

Mahmoody explains how the Badgirs of district called Bastakia in the suburbs of the contemporary Dubai was built by a group of Sunni Iranians, who had emigrated to the other side of the Persian Gulf from a region with the same name near Bandar-Lengeh in south of Iran (Bastak), after a struggle between Shia and Sunni groups in 1889 (Mahmoody, 2009, 21). In fact they built a new Bastak with the same architectural characteristics including Badgirs.

There are several historic texts about the presence of Badgirs in Iran in different eras. One of them is Marco Polo, who had observed them in the southern port of Hormuz in 13th century (Polo, 1984, 228).

The form and structure of the Iranian Badgires are mainly under the influence of climate, temperature and particularly the direction of the wind. The main factors that have defined the structure of Badgirs are the wind-related issues like the direction of the wind, the height of suitable winds, the directions of dusty winds, and so on. As a result of the differences in sub-climates in the country, we observe that the structures of the Badgirs are various. There are Badgirs in Yazd that have a height of up to 13 meters, because the useable winds are in higher elevation in that city, or there are Badgirs of 1.5 meter in the north east, where the good winds blow near the earth level.



Fig. 5-15: Illustration of the elements of the body of Badgirs; the panels, the inner blades, and the ceiling are seen in these images (Roaf, 1988)

The fundamental function of Badgir, which has caused several scholars raise it up as a traditional passive cooling system device is transferring new air to the inner space of the building, cool it and send the warm air to the outer space. For reaching this purpose, the architects built the body of Badgirs high enough to catch the useable winds. So the architects should have a good understanding of the nature, height and

direction of the winds of the region. The directions that Badgir could get or give wind were different. One, two, three, four or several-directional Badgirs were constructed in different cities and provinces. One-directional ones had just one opening, which were towards the good winds. In many Iranian cities this direction is the north or the North West.

Other mentioned types, especially four and several-directional Badgirs could catch the wind from each direction that the wind blew. Also some two and four-directional Badgirs had a get-give function. They could catch the good winds by the side that was facing those winds and give out the inside air from the side that was back to the good winds.



Fig. 5-16: X-shaped inner blades of the Badgir of Tabatabaee House in Kashan. The photo is taken from down to top of the inner space of Badgir. Source: author.

Fig. 5-17: Tabatabaee House in Kashan. The above-mentioned Badgir (Fig. 5-16) is seen on the right side of the image. The part of the house that is back to sunlight in summers was used during the summers. The bottom of the Badgir reaches the underground room called Sardab. Then the air flows to outer space. The resulted air circulation caused cooler living spaces. Source: author.



Two main parts of Badgir that are seen in the façade are the opening and the stem. In cities like Yazd that the useable winds blow in a high level, the base is long. But in some other cities like Kerman and Ardakan, in which there are good winds blowing near the ground level, the height of Badgir and stem are short. Some times there are no stem at all. The openings are divided into two or several parts by panels to lead the wind better. These panels are seen in the façade of the Badgir. The wind is led from the opening to the inside space of the buildings by canals, which are

surrounded by inner blades. The inner blades are fitted in the body of Badgir in shapes like +, X, I, H, or -. Therefore every opening has its own independent canals. Depending on the direction of the opening and the angle that it makes with the wind direction, the related canal has wind-catching or out-giving functions.

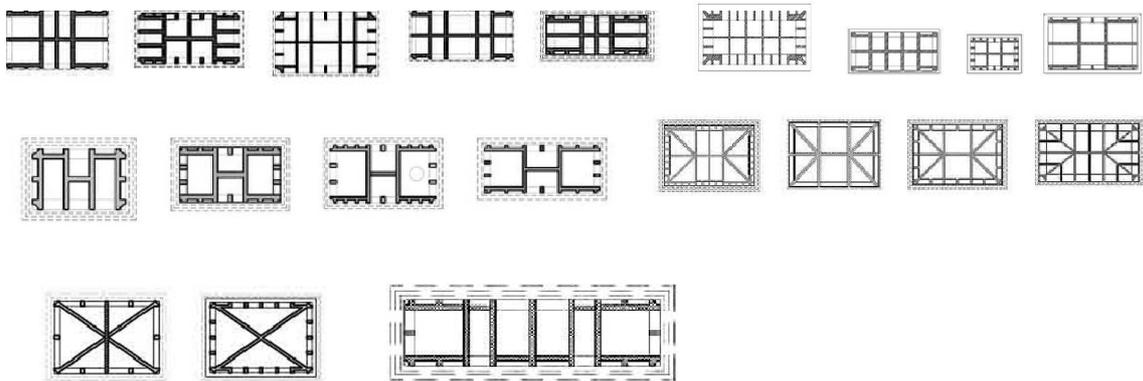


Fig. 5-18: The cross section of the stem of the Badgirs and the different forms of the inner blades are seen in this figure (Mofidi, 2008).

These functions are largely under the influence of the air pressure of the inside and the outside space. So the directions of the air movement in the canals are different during the days and nights.

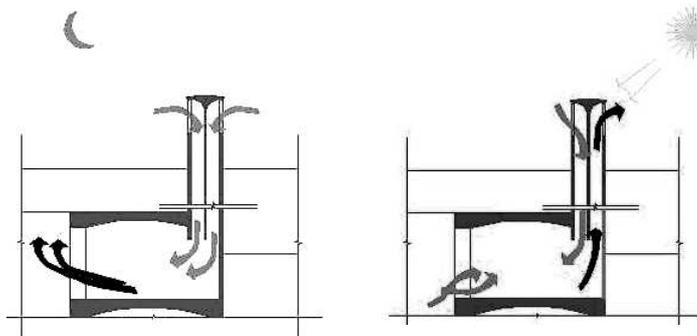


Fig. 5-19: Difference in the function of two-directional Badgir during day and night based on difference in the pressure of inside and outside (Azami, 2005).

According to Mahmoody, two cooling methods are applied by Badgir as a passive cooling device; air movement and cooling by means of evaporation (Mahmoody, 2009, 41-47). Air movement through the canals of Badgir is caused by difference in the pressure of the inside and outside of the building. As mentioned above, the direction of this movement is different depending on whether it is day or night, and also to which way the face of the Badgir is targeted. The second method was operated by the owners or the dwellers the buildings of the houses. This method,

which was special for the arid regions, was based on the evaporation of water by hot air. In the buildings that used this method, a jug of water or a basin were located on the way of the winds that came into the interior spaced of the building from the canals of Badgir. So the water was evaporated by the hot winds, and the humidity of the spaces became more and reached the livable limits. The families also benefited this technology to have cool water in the house.

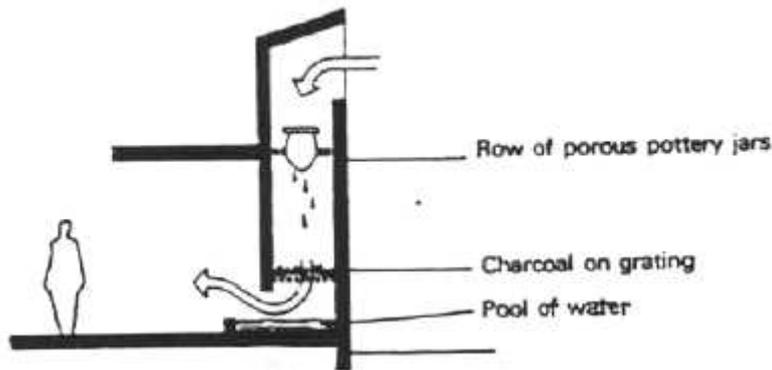


Fig. 5-20: Cooling the house by the evaporation system of Badgir (Danby, 1963, cited in Mahyari, 1996, 80)

Cooling by the help of evaporation was not used in the southern regions of Iran like the parts near the Persian Gulf and Oman Sea because the humidity of those places is often very high and evaporation of water and higher humidity have no influence on the coolness and livability of the air. Thus the only way of cooling the inside of buildings in cities like Bandar-e-Abbas, Bandar-e-Lengeh, Chabahar, and so on, was using air movement through Badgirs. Another type of ventilation was using Qanat and Badgir at the same time. The cool air that came up from Qanat that was located in the underground level mixed with the warmer winds that same from the openings of Badgir and made

pleasant atmosphere inside the house. The moving air went out of the house through the output vents of Badgir or the windows of the rooms that were meant to get cool.

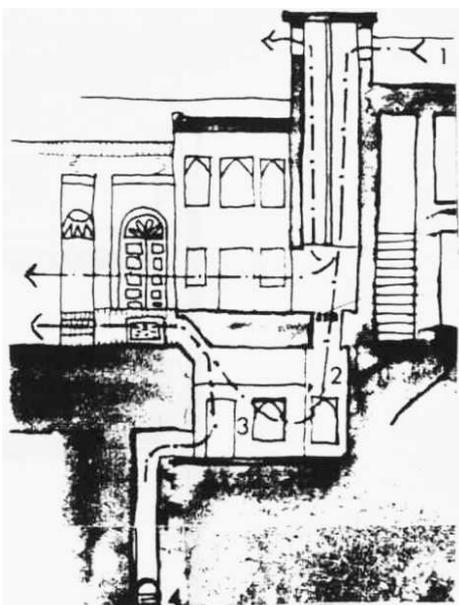


Fig. 5-21: Cooling the house by a combination of Badgir and Qanat, which leads to evaporated coolness of the house (Roaf, 1988, cited in Mahyari, 1996, 79 and Beazley, Harverson, 1982)

5-3-4-2- Ab Anbar

“Ab Anbar”, “water reservoir”, or “Cistern” is an old type of construction that was built in old Iranian cities to store the water, which was obtained from rain or Qanat, and was saved for the hot months of the year. It is also named by other words like Howz, Abgir, Berka, Tal, Talab, Sardaba, Masna, Yaxdan, etc. in different parts of Iran (Maserrat, 2010, 32-43). Ab anbar is a roofed, underground reservoir that was usually connected to Qanat or in places where there were no Qanat, the builders constructed water ways to carry water from seasonal rivers, basins and so on.

Some scholars and historians believe that Ab Anbar has quite old roots, even as old as Qanat, and some have stated that the Ab Anbar has completely Iranian roots and has been first constructed in ancient Iran (Arabinejad, 1999, 67). Building Qanats in Iran goes back to about the third millennium B.C. So Ab Anbar is likely to have the same age. The oldest known Ab Anbar that is reported in history is related to the historical city of Ur in Mesopotamia, which was built in the year 2150 B.C.

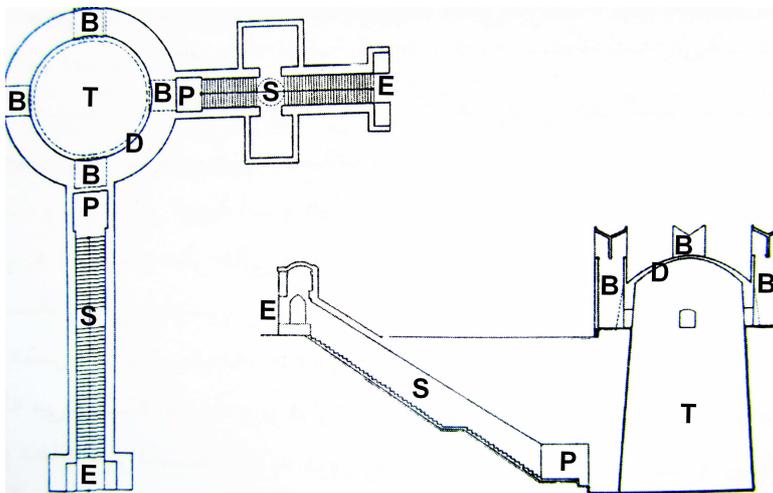


Fig. 5-22: Illustration of the main elements of Ab Anbar by means of the elevation and cross section of Dowlat-Abad Ab Anbar in Yazd. Source: Memarian (1993, 131)

Evidences of old constructions for storing water around Persepolis, the ancient capital of the Persian Achaemenid Dynasty, have been found. After the Achaemenids the construction knowledge of building reservoirs was developed up to the Arab domination in 7th century. In Islamic era, based on Islamic recommendation about the religious cleanness of human body and the accommodation, the importance of Ab Anbar became more (Great Islamic

Encyclopedia, P. 31) and such buildings were built in every neighborhood as a constant element. As Ibn Balkhi (or Ebnu'l Balkhi), the 12th-century Iranian historian, writes the oldest Iranian Ab Anbar of the Islamic era was a twenty-columned one that was built between the years 943 to 989 in Fars province.

Ab Anbar is a water reservoir, whose greatest parts are inside the ground level. From a formal point of view, Ab Anbar consists of some main parts like dome, Badgir, staircase, the entrance and Pasheer.

The most important element of the construction is the tank. It is built in some shapes, like long, circular, and combined shape that is a combination of long and circular tanks. The lengths of such tanks are 2 or 3 times more than their width. Most of the tanks of the reservoirs in the coastal regions of southern Iran are built in this shape. The combined shape is built in a star-shaped way. There is a circular tank in the middle and some long tanks are located around the central tank. This classification of the shape of the tanks is suggested by Nourbakhsh for the Ab Anbar forms of the southern parts of Iran, but it almost can be true for other parts of the country. Of course tanks with cylindrical or truncated cone-like forms can be classified as circular shapes in the above classification.

The capacity of the tanks depended on the tank's form. Small tanks have a volume of 20-30 or at most 84-88 cubic meters (Siroux, 1970, 226). Such volume was made in small column-less cylindrical tanks, which were dig into the ground. Big cylindrical tanks were made a height of 10 to 20 meters. So they have a capacity of between 300 to 3000 cubic meters. Regarding the width of the build tanks and the statistical factors like the thickness of the dome, it was possible to store 3000 cubic meters of water in a 10 meters high tank; however very large tanks did not have the stability of small tanks. So were the tanks with heights more than 15 meters (Sotoudeh, 1977, 8-9). Also building large tanks needed using heavy columns and walls to bear the weight of water and the dome, so it was not economical to build such Ab Anbars in every neighborhood.

The largest existing Ab Anbar tank is called "Berkeh-Kal" in Esfahan, which has walls with 3.20 meters thickness. The depth of the tank is 25 meters and its

perimeter is 90 meters. The walls of the façade are 6 meters high (Nowzari, 1992, 137).

One of the most important elements of an Ab Anbar in case of construction methods is the dome. With the traditional building methods, it was a hard job for the local masons to cover the dome diameters of more than 15 or 16 meters. The dome had the shape of hemisphere, egg-like, or cone. The cone-like domes had two kinds of external views: smooth-gradient, and stepped.

Although the roofs of the cisterns were mainly built like dome, but there are other examples that the roof is built as a horizontal surface. Such roofs were built when the builders wanted to construct the building as a part of a set of functions like mosque, school, Caravanserai, and so on. Usually the cisterns were located under all other functions. The weight of the roof of such cisterns was carried by columns (Varjavand, 2000, 156).

The example of the Ab Anbars that have a flat surface and are located under other functions are Haj Agha Ali Ab Anbar in Kerman, which is under a Caravanserai, and Vazir Ab Anbar in Esfahan, which has a mosque on top (Maserrat, 2010, 149).

Constructing the roof of Ab Anbar was done so that the most bearing capacity and the least weight were obtained. No molds were used in building the domes and it was tried to build the dome in a way that the thickness of the center of the dome was less than the thickness of the dome near the top of the walls (Siroux, 1970, 227). For example, for building a dome with a 20-meter span, the thickness of the tip of the dome was 20 centimeters, while it was thicker on top of the walls (Maserrat, 2010, 157). At the uppermost point of the dome, a vent with a width of 10 centimeters was provided, so that the smell and evaporations of the water could go out of the tank.

Pasheer is another part of Ab Anbar. It is a place that was built in the end of the stairs that led to the bottom of the tank. One or several valves were placed about one meter upper than the lowest point of the wall of the tank. The one-meter distance was for insuring that the settled germs of the tank's bottom did not flow from the valve. The valves were built of brass or bronze. Of course Pasheer has been added to the structure of the water reservoirs during the recent centuries. Before having metal valves in Iran, water was taken out of the reservoirs by hand and bucket. The

examples of such constructions still exist. This is obvious that these cisterns did not contain healthy water with today's standards. There was a drain under the valve location, which transferred away the water that was poured down from the valves or the clay pots.

The residents could reach Pasheer and the cold water of the tank by means of long stairways. In some Ab Anbars, the number of the steps was as many as 70 or 80. the steps had a height of 25 to 30 centimeters and a width of 30 to 50 centimeters (Varjavand, 2000, 156). The width of the steps was often between 1 and 3 meters (Memarian, 1993, 46). In every few steps, there is a space that has no steps, so that the people, who carried heavy jugs of water, could take a short rest (Varjavand, 2000, 156).

One of the main problems of constructing the stairs was building them in a way that they had the most sunlight and moonlight during the day and night. The logical solution was to build the stairs straight and without any turnings. In case the reservoir was built in a place that there was lack of space, the builders had to build the stairs in L-shaped forms. However they still tried to construct it very close to the tank. For providing with the necessary light, they also built openings in the ceiling of the staircase that brought light from the ground level.

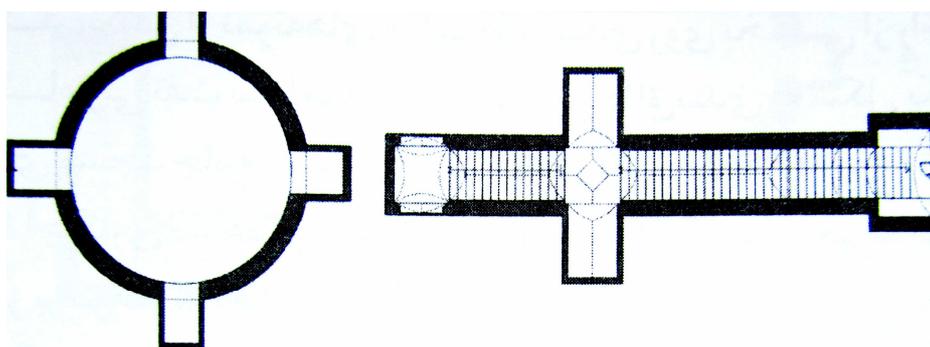


Fig. 5-23: Jannat-Abad Ab Anbar in Yazd. An example of staircase perpendicular to the tank. Source: Maserrat, (2010, 160), originally from The Organization of Cultural Heritage of Yazd.

In these staircases, one of the solutions was to build a part of the staircase without roof and the rest of it with roof. Usually the part that was roofed was built in front of the direction of sunlight or moonlight.

It was also tried to plan the construction in a way that Pasheer had the utmost light. For this purpose, the stairs were often constructed in a straight line perpendicular to the tank, except in cases that there was not enough space.

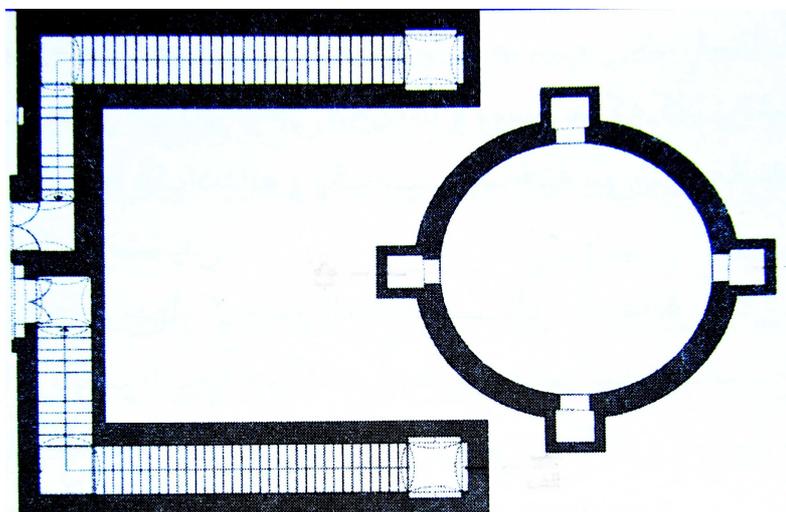


Fig. 5-24: Kiani-Aharestan Ab Anbar in Yazd. An example of the staircase not perpendicular to the tank with L-shaped form. Source: Maserrat, (2010, 163), originally from The Organization of Cultural Heritage of Yazd.

The entrance is a smaller part in comparison with the tank, the dome, and Badgirs. It is also often quite simple and does not have a complicated structure. The entrance of Ab Anbars usually faced a small Meidan, which formed a neighborhood center accompanied by the neighborhood mosque, Hammam, Public bath, some stores, and so on. This was the place, where the residents used to have a daily gab with the neighbors. Such gab between the residents or sellers was noted by the architects. So they designed stone or brick benches in the entrance of the Ab Anbars so that the people could sit on.

A part of the entrance that is seen in many water reservoirs is a board, on which the date of the construction and some information about the investor and builder of the building are written.

Badgir is an element that is seen in the façade of many Ab Anbars. It does not have a direct role in storing water, but its main duty is to cool the water by passing cooled air over the water. There are some old reservoirs that do not have any Badgirs, nevertheless usually it was a part of the reservoirs. In some of the reservoirs that do not have Badgir, in the highest point of the dome or its four corners, 1 or 4 wholes were built that were used to refresh the air of the tank. Air refreshing of this kind is

seen in Ab Anbars of 3 eastern provinces of Khorasan (Northern, Southern, and Razavi) (Varjavand, 2000, 156).

However the Ab Anbars that used Badgir had a better quality of cool and fresh water in summers. The number of the Badgirs of these water reservoirs reached 7 in some cases. The examples are Shesh-Badgiri Ab Anbar in Yazd that has 6 eight-sided Badgirs and Asr-Abad Ab Anbar again in Yazd that has 7 Badgirs.

There are different directions, in which Badgirs absorb the winds or give them out. Badgirs of the Ab Anbars, houses and other buildings of the historical cities of Iran have different directions. The reason is that the directions of the winds in different parts of Iran are various. Also the winds of one individual place in different months of the year can be various. Therefore in case the builders decided to construct an Ab Anbar with more than one Badgir, they built them facing different directions. So some should catch and some should give out the winds. The Iranian architects call this role of Badgir “give-get” (Maserrat, 2010, 197).

The mentioned elements are the main ones. There are also other secondary parts that give additional services to the people or have decoration roles. The whole system of Ab Anbar still works quite well. Although most of these buildings at least in Iran have no water in them at present, but when man experiences the cool air of inside of them in hot summers, it is easy to imagine how they could make water cool. Ghobadian writes about an eleven Celsius degrees difference in the temperature of the streets of Kashan with 29 degrees and next to Pasheer of Sabbagh-Kashani Ab Anbar in Kashan city with 18 degrees in the first day of summer (Ghobadian, 1985). A major issue in using the water of Ab Anbars for drinking uses was the health problem. Some actions were taken for having better quality of water.

First of all, the passages of rain water leading to the tank were cleaned just before the cold season, when there was possibility of raining. After the tank was filled of water, the people waited 2 or 3 days so that the particles of water were settled. Two main materials that were used to disinfect the water: salt or lead. Maserrat (2010, 201-202) notes that the volume of the salt used for disinfecting the water was dependent on the volume of the tank. For example, the 60 kg salt was needed to disinfect the water of Ghandehari Ab Anbar in Yazd and an annual amount of 48 kg

of salt was used for Dowlat Abad Ab Anbar, which had a tank with a span of 8 meters and depth of 10 meters. During the last decades of the usage of Ab Anbars in twentieth century, Chlorine was used to improve the health of the water (Pour Ebrahim, 1992, 108).

Ab Anbars were filled with water by use of rain water, Qanat, wells, rivers, and fountains. They were filled also with the help of the public urban water pipes in the first years that the water pipes were built for the Iranian cities. At the first decades of the twentieth century, when the poor people could not afford paying for a personal water pipe line, or when the Qanats were dry, the neighborhood authorities filled the reservoirs by the water of the pipes lines.

At present there are about 700 existing Ab Anbars in Iran. These old constructions do not serve the people any more. However some urban scholars suggest that the water reservoirs can be reused as tourist attractions or cultural centers, tea houses, cultural workshops, museums, art exhibitions, sport halls, and so on (Maserrat, 2010, 212-213).

5-3-5- Mosque-Madreseh

Mosque is the center and representative of religion in the Iranian city. Some believe that many temples of Iran and the Indian subcontinent were changed to the first mosques after the people took Islam as their religion. After Islam was fully accepted by Iranians, the mosques found undeniable importance in the cities. There are usually two types of mosques; the normal mosques that are built for every neighborhood, and “Jame mosque” or briefly “Jame”, which is the main mosque of the city. The residents of the major cities, from all the neighborhoods, went to the Jame mosque for Friday prayers. This was not usual to held Friday prayers in neighborhood mosques.

During the Abbasid reign, the cities of politically independent governments were nominally under the religious steer of the Abbasid Caliphate. On the other hand, only large cities were entitled to have Jame mosque. So having a Jame meant that the settlement is accepted to be a main city. The cities and their rulers requested that

the caliphate let them build a Jame mosque as soon as a certain city obtained power and population (Hillenbrand, 2001, 44). This had become a religious/political issue. The cities had often one Jame mosque. But in some cases like Baghdad, the city had a few ones. Later after the Abbasid Caliphate was collapsed, this tradition was terminated and the Iranian rulers and clergymen decided on these kinds of religious issues as well as the political matters.

The subject of this article is the places and roles of Jame mosques in the formation of the cities. Century after the Arab invasion, Islam was the official religion of the country and it was widely practiced. The simple mosques of the first years became the most holy places. So the most central places were used to build the Jame mosques. In the meantime, these mosques are often older than most of the buildings of the cities. So it is not wonderful that they are in central cores of the cities and very close to bazaars.

The centeredness of the Jame is associated with its social functions. According to Hillenbrand, apart from religious role, the mosques and particularly the Jame mosques were powerful centers for studying, education, official judgment, political and social activities (Hillenbrand, 2001, 59-63). The social roles of the mosques were strong enough to continue existing up to the modern times. There are many examples of the social roles of the mosques. For example, people used to socialize with each other during the religious ceremonies like prayers. It was also normal that the intercity passengers spent some time in the mosque to have a rest. The political role to the mosques has been always effective on the conditions of the governments. The important religious and political lectures of the clergymen were always held in the Friday prayers. Traditionally the Friday prayers are followed by two lectures about religion and the daily political problems. So the lectures and lecturers, who were the Imam of the mosque, have been always important for the governments and were usually affected by the politicians. Many political outbursts have been started from the mosques through the history.

Education and study has been, as Hillenbrand writes, the most prominent nonreligious function of mosques particularly during the first four decades after Islam (59). In the first days, the classes were held in the houses of the teachers. Later

the mosques became the center of learning. The students joined the classes in the mosques and stayed there during their studies. Madreseh (school) was first built as a special place for teachers and students so that the students gather there instead of all around the mosque. It was built as a part of mosque or next to it. Later more advanced schools were built as independent organizations. Hillenbrand reminds that the first schools of the Islamic Empire were built in east of Iran in the Seljuk period (1029-1194). Then its structure and idea were developed in other parts of the Islamic countries like Turkey. He also writes that in the year 1058, there were 38 Madresehs in the city of Nishapur in northeast of Iran (173-174). This was before the official universities of that age (nizamiyya) were established in eleventh century by Khwaja Nizam al-Mulk, the prime minister of the Seljuk kings. Mohammad Karim Pirnia (1922-1997), who has conducted extensive research on the Iranian architecture, describes that the lessons that were taught in Madreseh included a wide range, from Persian grammar to religious and Koran-related subjects. Also nonreligious sciences like mathematics, music and philosophy were taught to higher level students. This was of studies, which is still held in the traditional religious schools is called "Kharej". Many Iranian scientists like Avicenna and Razi were the output of these schools (Pirnia, 2006, 91). Pirnia also writes about the architectural form of the schools (92-95). They had a defined structure; some classes and living rooms around a central rectangular yard. Living rooms had an important role. All the students lived in Madreseh. Most of the times, there were one main room as the class and other lower level classes were held on the porch around the central yard. But there were several class rooms in greater schools and some times famous scientists had personal classrooms, such as Mulla Sadra (1571-1640), the prominent philosopher, in the Khan School in Shiraz. The Kharej students, who were like the modern university student or the graduate students, lived in the rooms of the first floor.

The combination of mosque-Madreseh worked as a system and attracted a part of the traffic of the central part of the city to itself. So here we see that not all of the people, who went toward bazaar, had an aim to shop. Of course the mosque was a destination for the people, who worked in bazaar, especially in the prayer times. The

traditional mosque-Madreseh had the meaning of today's social, educational, religious, and political organizations.

Chapter Six

6-The research methods

6-1-Methods

Since the present research is a descriptive and qualitative study, the most parts of it are based on the direct observation and literature review. However in some parts, the Space Syntax theory has been applied to present some more evidence. Here the three mentioned types of research methods are explained.

6-1-1-Literature review

The basic core of the idea of re-introducing the traditional urbanism for the purpose of solving modern problems is dependant to the practices and experiences of foreign countries, specifically the western ones. Thus the library work and literature review are the methods for having a better understanding of what happened in the neo-traditional development of the world and also what has the traditional urbanism of Iran looked like. A main part of 4 chapters of this dissertation employs review of literature and theories.

Chapters 2 to 4 are on the background of the NTD practices. So the main theme of these chapters is the background of the similar practices and ideas. The origin of the ideas, their history, their nature and theorists are introduced. Huge amount of information of such topic exists; so it is necessary to be selective. The main aim is to show the prominent points and the main ideas. The sources of such literature were found in the library of TU Dortmund or via the accessible journals through the internet network of the university library.

Chapter 5 is about the history and the specifications of the traditional Iranian urbanism. The publications generated on this topic in Persian language have been notable, most of which have been produced during the past years. The number of the

above literature has increased as the urban studies and planning of Iran started to be an independent branch of knowledge outside the limitations of architecture. The sources of such literature were brought from Iran to Dortmund during the fieldwork in summer 2010 to be used in writing the dissertation in the shape of computer files.

6-1-2-Direct observation

The direct observation is necessary for the investigation of the case study areas. The outcome of observing the historical the and new urban environment of the selected cities is seen in the chapters related to the case study cities. It has been a basic need for the author to have a general understanding of the traditional life style and the key problems of the two cities. Living for a while in such atmosphere and having been in contact the residents of the historical neighborhoods was a good indicator of the traditional life style for the author. The conversations, which did not have the form of surveys, took place especially about the view of the residents to their neighborhood unit and neighborhood center, how much they were relying to their neighborhood and to what content they had a sense of community to their living place. A part of the result of this contact is seen in determining the boundaries of the neighborhood units of the cities. Of course the larger part of it was derived from the previous studies, but the ideas gotten from the residents had influence on this reproduction. Also most of the pictures that are seen in the case study chapters were taken during the direct observation by the author in summer 2010.

6-1-3-Application of Space Syntax

The Space Syntax theory has been applied to represent the changes in the social behavior and the habits of the residents of the two cities caused by the built environment. Since the research sector of Iran has always suffered losses from the poor or unreliable raw data, using such tools that can produce numerical data for analysis can be helpful. The quick introduction of this theory needs more

explanation than the previous research methods. Such descriptions are presented in the following sections.

6-1-3-1-Space Syntax theory

The Space Syntax theory is one of the concepts help planners and architects have better understanding of the interrelations between the built environment and the human behaviors. It is often important to have a prediction of the human beings will interact with their living or work environments that do not exist or how an existing environment affects the users. The environment can be a building, the space between the buildings or an entire city. The basic idea of the theory is that the built environment has an undeniable effect on the social behavior of the people. This influence on the human behavior can be especially seen in the movement and mobility. The notion can be used in different research or practical issues, for instance, it is helpful to have an opinion on how the people will move in a neighborhood that is going to be constructed and is still in the planning process, or it is useful to have a good estimation on how the pedestrian and motorized flows will react after the construction of a new bridge or street.

Today Space Syntax has been successful to bring numerous planners and architects from around the world together in a community and massive amount of literature has been generated on this subject during the past 25 years.

Suggested and developed by Bill Hillier and Julienne Hanson from University College London in 1970s and early 1980s, Space Syntax became familiar after the book titled “The Social Logic of Space” was published in 1984. Hiller developed the theory more in his later publications (for example: 1986, 1988, 1993, 1996, 1999, 2002, 2005a, and 2005b). The basic idea has been under development since the mid 1980s and several researchers have worked on it. For instance, John Peponis has had notable publications about the development of the concept and its applications (Peponis et. al, 2007; Peponis et. al, 2008, Shpuza, Peponis, 2008; Peponis et. al, 2008). Also Bin Jiang has had publications on using Space Syntax in the GIS environment (Jiang et. al, 2000; Jiang, Claramunt, 2002).

6-1-3-2-The basics and fundamentals of the Space Syntax theory

The Space Syntax theory is aimed to analyze the urban and architectural built environment via modeling the spaces. The focus of the present literature review is on the urban spaces. The modeling of the spaces is conducted by three phenomena: axial lines, convex spaces, and isovists. These concepts have been thoroughly described in the publications of Hillier and his colleagues.

The human movements in the urban and architectural spaces have a linear nature. Therefore the easiest way of modeling the movement of the users is to draw axial lines to show the starting and ending point of the movement. The basis of such drawing is the visibility and the direction of the view of the passenger. The lines cross each other; as a result the interrelation of the lines with each other is done by the produced nodes. The people see the streets through linear views, so drawing axial lines for modeling the curves of the streets is done by use of several straight lines. The result of such modeling is the axial maps that give an understanding of what the moving person sees.

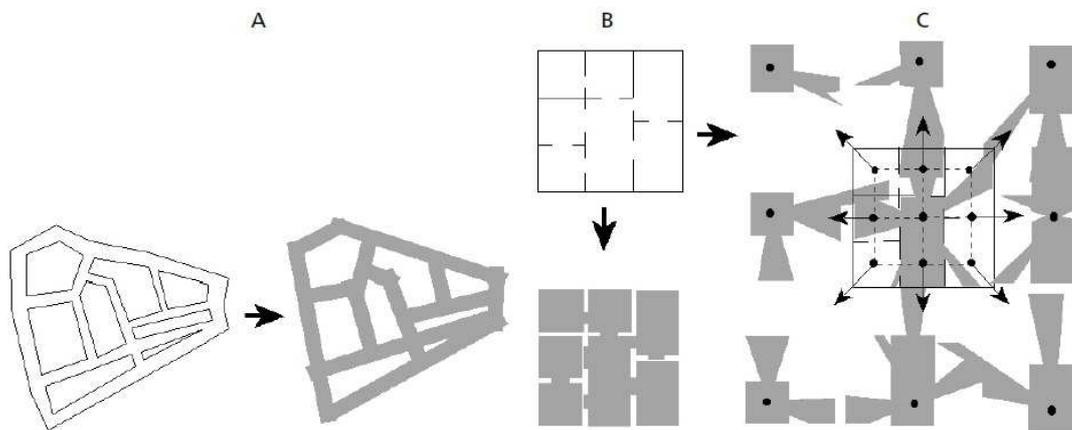
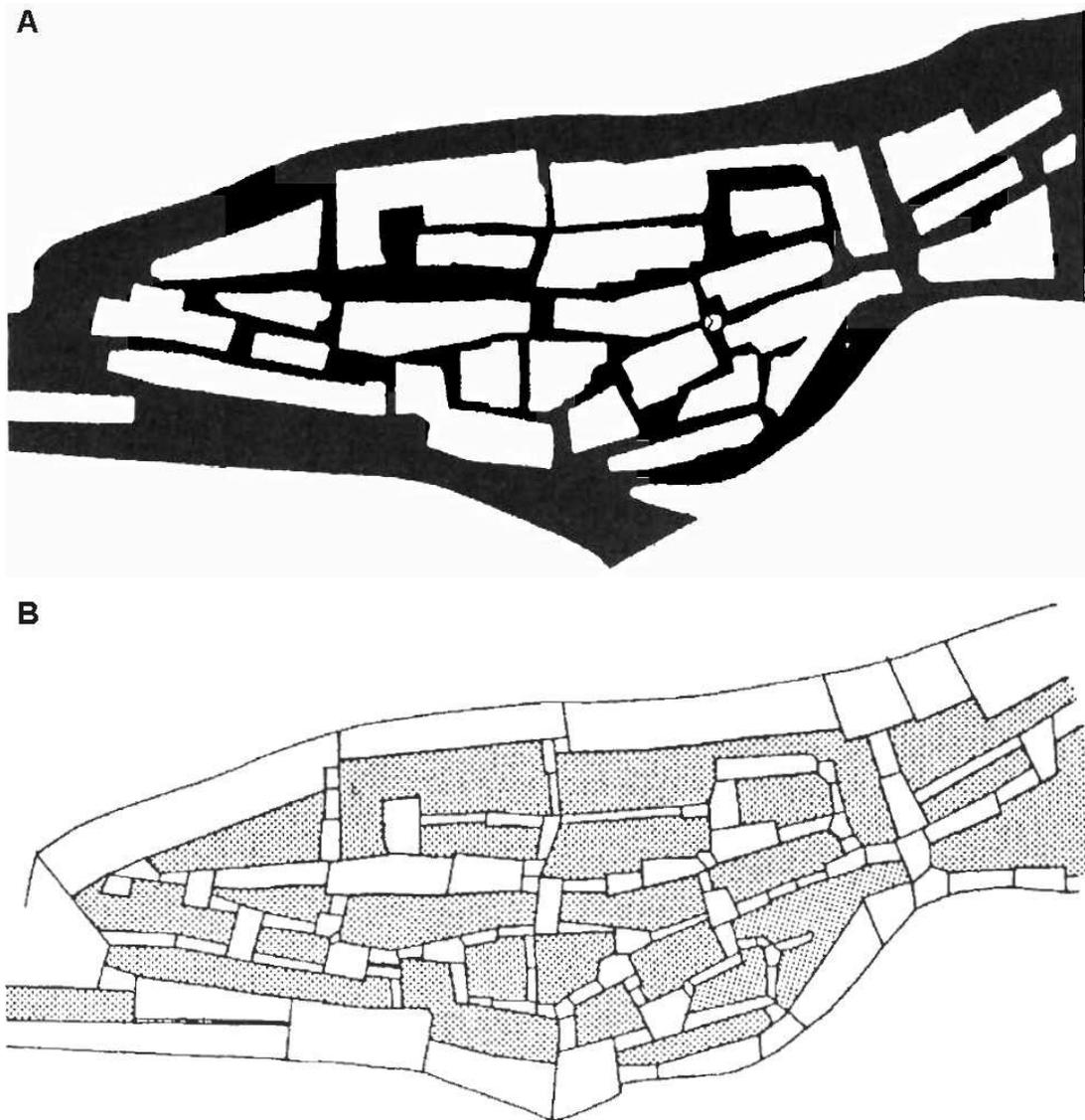


Fig. 6-1: The illustration of the three types of modeling the spaces: A) axial lines, B) convex spaces, and C) isovists. (Jiang et. al, 2000).

Another method of illustrating the spaces for modeling is using the concept of convex spaces. The least and fattest polygons that can be located inside the spaces are called the convex spaces. The convex spaces have connections with each other.

The examples of the spaces that can be modeled by this method are the rooms of a building or the urban open realms like plazas and squares.

The isovists are again in relation with the visibility. The spaces that are visible from a single point can be part of an isovist. Therefore a neighborhood or a town can be categorized into several isovists. Fig. 6-2 illustrates the three concepts of axial lines, convex spaces, and isovists.



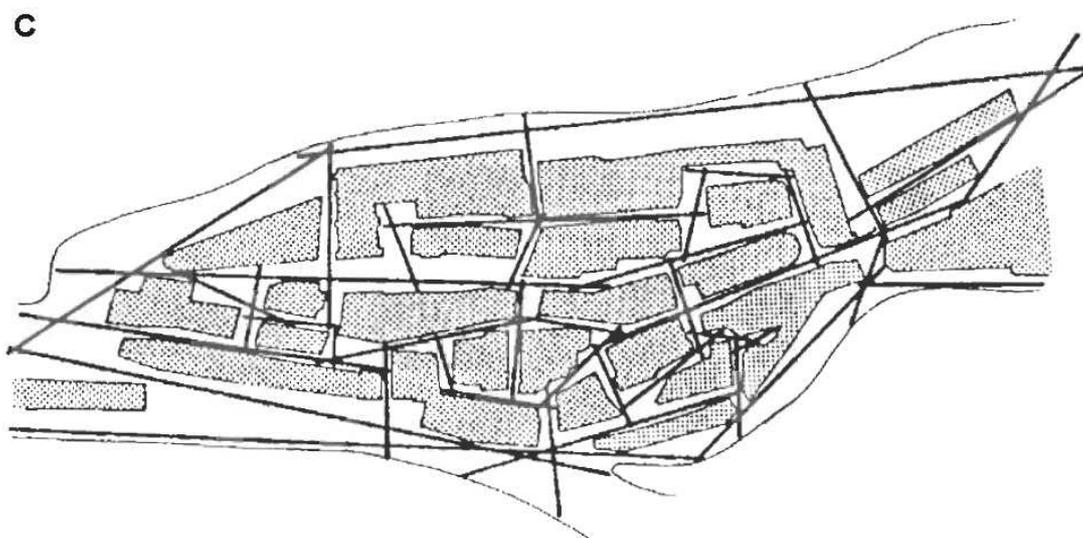


Fig. 6-2: Illustration of the spatial layout (A), convex map (B), and axial map (C) of a small town in the south of France by Hillier and colleagues (1987).

The analysis of the space is undertaken by means of Space Syntax measures and indicators. Each of these indicators has theoretical fundamentals and most of them have physical and social meanings. A great part of the recent research on Space Syntax has been carried out on measuring the significance of the indicators and comparing the relationship of the real physical measures with the outcome of the Space Syntax analysis. Here a brief introduction of the Space Syntax measures is presented:

One of the primary Space Syntax notions that are used in this study is “connectivity” that is the number of axial lines that a given line connects. So usually a street that is connected by a lot of alleys has high connectivity. In the Space Syntax literature, connectivity is taken as a concept that encourages people to move on foot or by bicycle because in connected spaces the distances between points are shorter. In such places there are more routes for the people to choose from to reach their destinations. So the higher the connectivity is, the more there are on foot and bicycle travels. Connectivity as an indicator of urban form has been studied and several reports have showed how it eases the pedestrian and bike flows (for example: Saelens et. al, 2003). Also the positive role of the specifications that generate connectivity, like average block areas and block length have been considered

(Southworth and Owens 1993; Hess et. al, 1999; Siksna, 1997; Cervero, Kockelman, 1997).

“Depth” is theoretically defined as the number of changes in the direction of the moving body while moving from one point to another, or as in the axial map, from one line to another. Depth is calculated in the form of “total depth” and “mean depth”. Total depth is the depth of a line from the starting line. The mean of the depths of the given line from every other line is called “mean depth”. The spaces that have long distance from a main route have high depth. Normally people should move more in deep spaces. The places that have higher depths are away from the every day life in the city. In buildings, the rooms that are in the depth of the construction have lower traffic. The logic of Space Syntax that supports such conclusion is that the places that are not visible for people and are hard to reach for them have low traffic.

Another important concept is “integration” that is calculated based on depth. Integration is the linear depth of a line from every other line of the system, so deep places have low integration. Integration is the traditional indicator of movement in the urban spaces. It is especially referred to as the indicator of pedestrian mobility. According to the observations of Hillier (1987), integration has the highest correlation with the pedestrian mobility among the Space Syntax measures (0.8004). In his study, he found that connectivity has a lower correlation of 0.6434 with the pedestrian movement, but it is still an acceptable amount. In a study on the campus the University of Brasilia, the coincidence between the patterns of the motorized flow and the integration of the streets was shown. The correlation coefficients that were obtained were between 0.80 and 0.88 (Barros et. al, 2009).

The mentioned correlation has been repeated in some other researches but in some cases the results for some types of land use were different. For example Haeng and his colleagues (2007) indicated that there was correlation coefficient (R-squared) of 0.07 between the pedestrian volume and the integration in the residential areas of downtown Seoul, South Korea. The similar coefficients for the business and commercial have been 0.872 and 0.694 respectively. However integration is widely used to model the pedestrian flow of any type of urban land use. Furthermore there

is evidence from the dense urban environments of Hong Kong that shows R-squared coefficient of 0.69 for the relationship between the integration and the pedestrian flow (Law, Zhao, 2009). On the other hand, some researchers question the capability of Space Syntax in defining an exact image of the pedestrian flow. An example of such studies is done on Santa Maria in Brazil and focuses on the deficiency of the theory to give a precise understanding of the pedestrian flow by use of linear variables (Zampieri et. al, 2009).

Other concepts that are used in this study are RA and RRA, on which integration is based. RA or Relative Asymmetry is calculated by dividing the depth between the starting axial line and the spatial configuration as a whole by the possible most depth for the k number of spaces in the configuration.

$$\text{So } RA = \frac{2(MD-1)}{(k-2)}$$

Where MD is the mean depth of the starting given line to every other line.

k is the total number of the spaces.

In order to let the size of the configurations have a part in the equation, RRA or “real relative asymmetry” is defined as:

$$RRA = \frac{RA}{Dk}$$

Where Dk is the D-value for k spaces.

Integration is calculated based on RRA:

$$\text{Integration (i-value)} = \frac{1}{RRA}$$

There are two types of integration: local integration and global integration. The integration that is calculated as a general measure of the whole system is called global integration. Local integration is an indicator of integration in a local environment surrounding a place. The limitations of this environment are defined by the number of turns that one needs to pass when moving through the spaces. For example an R³ integration is the local integration in which the passenger turns three times when going away from the main space. The number of the turns can be

determined by the analyzer in the calculations. Hence the analyzer can define what “local” means. The concept of local and global can be considered about other measures. Connectivity is a local indicator, while integration can be either global or local.

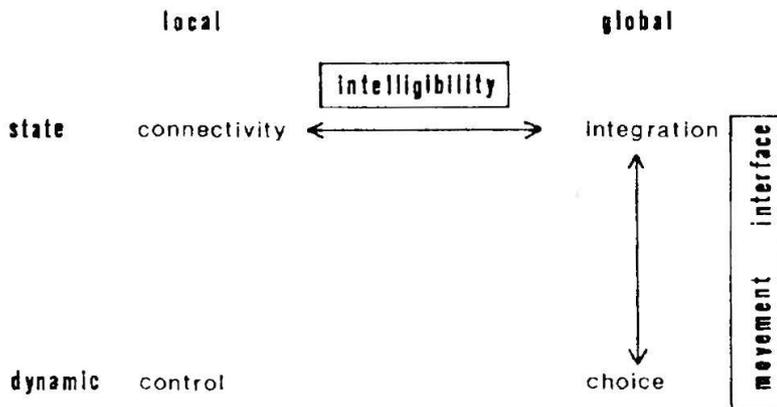


Fig. 6-3: Illustration of the relationship between the static/dynamic and local/global parameters (Hillier et. al, 1987).

Intelligibility is another Space Syntax measure, which is defined by the correlation coefficient of the local and global parameters. If a local area has a coefficient value more than the one for the global area, then it is said that the local place is intelligible. Another parameter is called “control”. The level of choice that each node has is defined as control value. A node that has connections with several other nodes has a high value of control.

An urban configuration can have “static” or “dynamic” properties. The static parameters are the ones that are defined according to the properties of the place, but the dynamic one become meaningful when there is a movement within the spatial configuration. For instance connectivity is a static/local parameter and choice is a dynamic/global measure.

The first step for analyzing a spatial configuration is to draw the axial map. Then import it to the environment of the applied Space Syntax software. The output of the analysis can be obtained both in map illustrations and in numbers. The different levels of indicators are shown by a spectrum of colors in maps produced by Space Syntax software. The red color shows the highest value and successively orange, yellow, green, and light blue have less values. The coldest color of the spectrum that is dark blue has the lowest value.

Here some of the practices that have been indicated in the relevant literature are presented.

6-1-3-3-The applications of Space Syntax in urban research

In addition to the studies that aim to develop the Space Syntax theory and its applications, there is a fast-growing amount of literature that uses the theory as a tool for observation, consideration, and problem solving in different fields of urban studies. The subjects that these studies are related to cover many aspects of urban life, from transportation to social behavior of the urban dwellers. Here some examples of the previous research in some of the fields are introduced.

A great part of the mentioned literature is related to measuring accessibility and mobility. An example of the publications of this kind is the study of Chulmin Jun and colleagues (2007) on the measurement of the accessibility of the public transport stations of Seoul, Korea based on the indicator of depth. In a similar study the theory was used to find the optimal location of LRT route and stations in Maebashi City in Japan (Kishimoto, et. al, 2007).

Also the suitability of Space Syntax in the studies related to the pedestrian flow has been shown. In 2003 the theory was used to calculate the pedestrian exposure rates and also to set up a Relative Risk Index for the pedestrian master plan of Oakland, California (Raford, Ragland, 2003). It has also been used to measure walking in Zurich and London (Sauter, Wedderburn, 2008).

Apart from the transport-related studies, Space Syntax has been used to analyze the existing urban settings in order to suggest urban design scenarios for the future developments. A study of this kind is a research, in which two modernist sprawling suburbs of Stockholm were considered and four strategic urban design scenarios for densification of the suburbs were suggested (Ståhle, Marcus, 2010). Also the congruence of spatial characteristics and the office location pattern in Lisbon, Portugal has been investigated (Pinelo, Heitor, 2005).

Another aspect of the Space Syntax applications has been on the social sciences and its interactions with the street network and the urban form. It has been employed to

consider the social exclusions and its relationship with transportation in a small town near Atlanta, Georgia (Conroy Dalton, 2007). The same city has been adopted to investigate the correlation of urban form factors, particularly the street connectivity, with the poverty and wealth of the inhabitants (Carpenter, Peponis, 2009). Urban ambience and its relationship with the urban form measures have been another topic for a Space Syntax research (Osmond, 2005, 2007). A different aspect of the social sciences that have been examined by use of the theory is the relationship between the urban space and the crime (Nubani, Wineman, 2005; Baran, et. al 2007).

6-1-3-4-The Space Syntax-based software

The spatial analysis can be done by connection graphs as seen in Fig. 6-4. In such considerations the graph can be different based on the point that the observer is located (vantage point). It is easy to calculate the indicators for a small spatial graph. Nevertheless it seems almost impossible to do the same for a metropolis. The computer-based analysis of the urban spaces is often done on the axial map that includes one axial line for each alley or street. Thus the number of the lines of the models of the large cities and metropolises reaches tens of thousands of lines. The computer software is a must for analyzing such models.

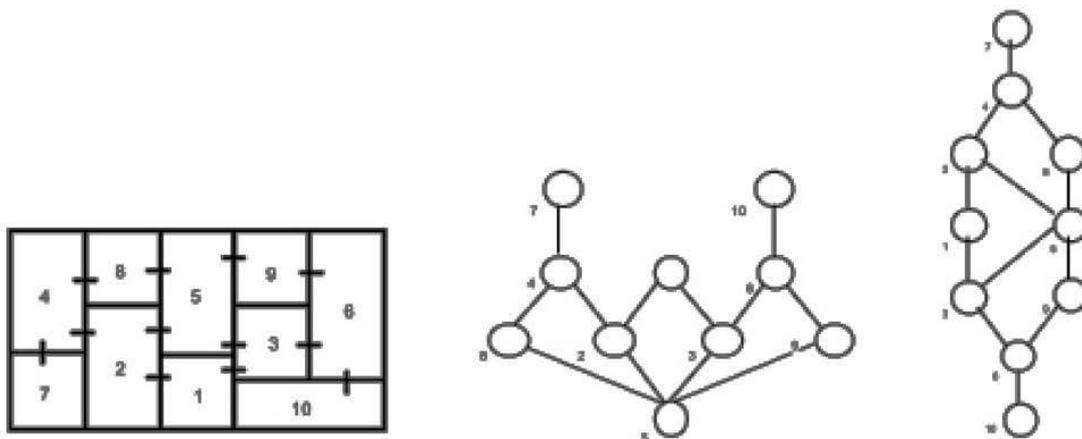


Fig. 6-4: The Spatial graph for the plan of a building. The Graphs are different for an observer in room 5 and 10. (Hillier, 2005b).

Two computer programs are applied in the present research. To examine the characteristics of the cities of Yazd, a Space Syntax software called UCL Depthmap was applied. This software has been developed at the VR Centre for the Built Environment, Bartlett School of Graduate Studies of University College London. The software that is employed to consider Kashan is called WebMapatHome, which is also developed by the UCL specialists.



Fig. 6-5: Illustration of integration in the spatial configuration of four cities in different parts of the world: Atlanta in the United States (upper left), Manchester in Britain (upper right), Hague in the Netherlands, and Shiraz in south Iran. (Hillier, 2005b).

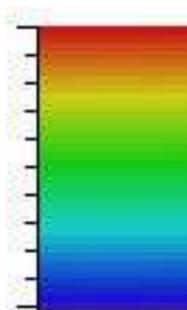


Fig. 6-6: The spectrum that is used to show the value of the Space Syntax indicators, the warm colors on the top show high values and the cold colors in the bottom indicate low values.

6-1-3-5-The application of Space Syntax in the present research

The Space Syntax theory and the related applications are employed to study the characteristics of the case study areas. Except one observation that is explained below, the considerations are similarly undertaken about the cities of Yazd and Kashan. The following are the SS uses in this research:

- Comparing the mobility conditions of the historical core before and after construction of the new automobile-oriented streets in 1930s till 1950s. The goal is to indicate the influences of the motorized life style on the traditional urbanism in the cities. The Bazaar and some sample neighborhood units are selected to be examined by means of the Space Syntax indicators.
- Comparing the mobility characteristics of the historical core and the newly developed parts of the cities. One or two new districts of the cities are analyzed and compared with the specifications of the historical settings.
- The correlation of the width of the streets and the integration is checked. The above correlation of the core and a new development will be compared in order to have more information about the suitability of the hierarchy of the new urban settings. This study will be limited to the city of Yazd.

Generally, the SS indicators that are used in this research are integration (global and local), connectivity, mean depth, total depth, RA and RRA. But the most referred one is integration, which shows the ability of the urban form to encourage people to have mobility. The mobility can be pedestrian or by car. Nevertheless, as mentioned before the association of this indicator with the pedestrian mobility is more than the motorized movement.

The relationship between the SS indicators and the urban problems of this research is through urban transportation. Although there may be other connections between the SS measures and the urban issues, but the applications of Space Syntax remain limited to urban transportation. However if we consider the indirect connections, more relationships are understandable. For example high integration and

connectivity means high motorized and nonmotorized mobility, and high mobility, namely motorized mobility means high environmental pollutions. On the other hand, as a consequence of the built environment/transportation interactions, urban sprawl and land consumption have been increased in the Iranian cities because of higher mobility. Table indicates the how the SS indicators of the research are in connection with the 7 urban problems of this study.

	Urban problem affected directly by the SS indicator	Urban problems affected indirectly
Integration, Connectivity	Urban transportation: positive relationship with mobility	Urban sprawl, Environmental pollutions, Land consumption
Mean depth and total depth	Urban transportation: Negative relationship with mobility	
RA and RRA	Urban transportation: Negative relationship with mobility	

Table 6-1: The relationship between the SS indicators and the 7 urban problems of the research.

6-2-Methods to study the urban problems

In order to indicate how the urban problems are measured, different methods are used in this study. In this part the linkage between each urban problem (chapter 1) with the related research method (chapter 6) is explained.

6-2-1-Urban sprawl

As stated in chapter 4, some characteristics have been defined by the scholars for types of development that are considered as urban sprawl. Two of them are studied here. The intention is to show if there is urban sprawl in the mid-sized and small

large cities of the center of the country. A combination of direct observation and literature review methods are taken for this study.

Method one: If the rate growth in the developed urban area is higher than the rate of the population growth, then it can be said, there is urban sprawl. This is measured in a period of time, for example at least 3 to 6 decades. Both cities of Yazd and Kashan are studied according to this method. The necessary data for calculating the growth rates are collected from the previous studies, so this part needs literature review.

Method two: Another characteristic that can show urban sprawl in an urban area is the form of the constructions and presence of leapfrog developments. There is no numerical method for showing that there are leapfrog developments. To indicate that such type of development exists, studying the urban form of the case study area is needed. This is a kind of direct observation. The study is done just about Kashan under the title “typology of developments”. The different forms of developments in four parts of the city from the city center to the suburbs are illustrated.

6-2-2-Environmental pollutions

The method for indication of environmental pollutions as an urban problem is fundamentally archival and descriptive. This problem has become so serious that showing it is not a tough job to do. In fact the problem is apparent in the large cities like Tehran, Esfahan and Tabriz and there is evidence that the environmental pollution is getting unnatural in some mid-sized cities like Arak. Although this study generalizes the results for the mid-sized cities of the south, east, and center of the country, but in the case of the environmental pollutions the recommendations can be suggested for both large and medium-sized ones.

The literature study method is taken to show that there is environmental pollution in the Iranian cities. However there is no empirical data about the differences in the environmental pollutions produced from transportation in different urban forms. In other words comparison of the pollution of generated from different urban textures based on the existing data is impossible. It is not the case of this dissertation either.

There is close relationship between the environmental pollutions and the transportation problems. Since about 70 percent of the environmental pollutions of the urban areas of the country are resulted from the transportation, increase in car use means increase in pollutions. This will be true if other effective factors like the quality of engines, quality of the fuel, and urban travel specifications are constant. So if a solution is suggested for reducing car use or using it in a more sustainable way, then it will be influential in reducing environmental pollutions automatically.

6-2-3-Land consumption

Two methods are used to consider land consumption.

Method one: Consideration of land consumption is very much related to studying urban sprawl. If it is proved that there is urban sprawl in an area, then it is logical to conclude that the peripheral lands are being used in an inappropriate way. This is again a descriptive research using literature study. It is possible to have land-consumption-related findings about both case study cities.

Method two: The poor land consumption that is caused by inefficient street network is shown by means of Space Syntax theory and direct observation. The method of research is to show that the coefficient factor of the diagram of the traffic flow/street width is lower in the new developments than in the historical core. This is shown about a neighborhood unit of the core of Yazd and the new development of Emam-Shahr. The result is that the pattern of traffic flow is different from the one for street network that is recently developed. In other words, if the coefficient factor of the streets of the core is higher, it means that the width of the old network is more suitable for the volume of the traffic. The wide streets with low traffic are of the results of such in disassociation. A high level of land consumption without any logical reason is the direct result.

The Space Syntax theory is used to measure the traffic. The Space Syntax indicators that are shown in the related tables are Integration, connectivity, total depth, mean depth, RRA, and RA. The indicators that are the representatives of motorized or pedestrian traffic are integration, connectivity, RRA, and RA. However the indicator

that is mainly used to measure its association with the widths of the streets is integration. The pedestrian and motorized travels are not separated in this study. The widths of the streets are measured via Google.

6-2-4-Unsustainable transportation

The unsustainable transportation is mainly represented by increasing car use and decreasing pedestrian flow. There are two topics about transportation that are to be studied. The first is the hierarchy of the street network of old and the new cities. The second one is consideration of accessibility versus sustainability in addition to studying the mobility habits in the old and the new cities.

The hierarchy of the street network of old and the new cities:

The street network of is analyzed by means of direct observation of the traditional city of Kashan and the SS analysis of Emam-Shahr as a new development in Yazd. In order to study the street network of the historical core of Kashan, all the streets and allies of the core are classified according to the level of their privacies. Therefore a hierarchical privacy of the public spaces is showed. The spaces are categorized as public, secondary, and semi-private. The observation is descriptive and no numerical output is produced.

Also the measurement of the association of the width of the streets with their traffic that was explained in the previous part is used for considering the hierarchy of the Emam-Shahr in Yazd. As stated before, this part of the study is done by Space Syntax theory. The results are numerical and can be shown by diagrams.

Consideration of accessibility versus sustainability in addition to studying the mobility habits in the old and the new cities:

The basic research method for studying mobility-related issues is Space Syntax. Since the interactions of urban form and transportation are targeted, this method seems efficient. The findings are numerically shown in the tables, but the output maps give good understanding of the research intention as well.

The main idea is to have an understanding of how the accessibility and sustainability interact with each other. For this purpose the axial map of the historical core of the two case study cities are modeled and analyzed in Space Syntax software. This is done two times and the results will be compared. The first modeling is done without the main streets, which represents the city before the construction of the wide streets, and one with the main streets that shows the structure of the city after the construction of the streets. The six SS indicators are calculated for the two models. Integration and connectivity are directly associated with mobility. That is, when the integration and connectivity indicators increase, it means there is more mobility. RRA and RA have an opposite meaning. When they increase, the meaning is that there is lower traffic. The total and mean depths are calculated to show how deep the organic city was in comparison with the new urban fabric. This is important especially for having an image of the proximity of the neighborhoods to their nearest attractive places. This place is the neighborhood unit center for the traditional texture and street for the new development.

After producing the output maps and tables two types of comparison are made. As the first step, a general comparison between the change in SS indicators of the historical core and a new development is done. The aim is to find out that the accessibility has been increased in the new development or not. If the integration and connectivity indicators are increased then the accessibility is higher. Also the depths are tested in each case. Lower depths mean better conditions for accessibility. The second step is consideration of each part of the core like bazaar and the neighborhood units before and after the construction of the streets. The aim is to understand what the effect of the streets on the travel behavior of the people has been. As before higher integration and connectivity mean higher traffic. It can be either pedestrian or motorized. The depths show the neighborhoods have become near to all other destinations or not.

None of the six SS indicators directly give any information on transportation mode choice. Integration is associated with both pedestrian and motorized flow. Of course as mentioned before, the coefficient factor of integration with pedestrian mobility is higher than its coefficient with car traffic. However in this case the high accessibility

in the new streets has a meaning of more car use in the streets. This can be discussed about the core and the new developments separately. In the core if one tries to reach a destination on foot, it is easier to pass the curved narrow paths that are hard for the cars to pass through. Similarly higher traffic in the streets of the new development does not necessarily mean that the flow is pedestrian or by bicycle. In the new developments the daily destinations are usually out of the walking distance and, except some of the daily shopping, other travels are not done on foot. Maybe the passenger can walk to the street, but it does not lead to pedestrian flow in the main streets. Therefore high integration in the main streets does not mean high pedestrian flow. In this study, high integration and connectivity mean good accessibility and this is considered as a positive quality. However a secondary meaning is higher car use, which with the mentioned conditions in Iran like the quality of the fuel and the engines can be unsustainable. The idea that is brought up with this study is the relationship between accessibility and sustainability. Some questions can be answered by means of this study. The answers are not derived directly from the output numbers, but they are interpreted from the output. The following are some of the questions that can be answered in this way:

-How did the new wide automobile-oriented streets affect the organic form of the cities and also people's life style?

-How did the modern technology affect the traditional urban form and life style?

Also there are some questions that are answered directly by use of the numerical findings, such as:

-Which city is more accessible and which is more sustainable, the contemporary or the traditional city?

6-2-5-Public transport

Public transport is a public urban problem in Iran. It is shown in a descriptive way not about the case study cities but about the whole country and other cities. The research method is literature study.

The main study that this dissertation is discussing public transport is that any change in the urban form of the today's Iranian city, in order to make the urban life more sustainable, without proper public transit will face failure. Thus although public transport does not originate from traditional city, it has been discussed here.

6-2-6-The social relationships

The social relationships that are talked over are the activities that are in association with the urban spaces. If there are suitable public spaces, people will naturally use them as a ground for the social behavior. If there are any short comings in the public spaces that specially enhance social behavior, then fewer social activities will exist. The method for this part is to show how the number of the social public spaces in the new developments is fewer than in the historical core. This is shown in a comparison between the core of Kashan and the new development of Naji-Abad. The method is direct observation and the outcome is descriptive. The study aims at providing proper urban texture that encourages people to have social interaction. Another method that does not fit in this dissertation is asking people about their idea about the deficiencies in social spaces.

6-2-7-Sense of community and place

This problem is increasingly discussed in the urban research literature of Iran. The method for research is to trust the idea of the scholars that believe there is deficiency in this case. As a result the method is literature study and the study is descriptive.

Chapter Seven

7- Yazd

Yazd is the first city that is studied as case study city of the present research. The pure historical urban heritage that has still remained through the centuries is the main reason for taking this city as case study. The historical core of this city is one of the best examples of the traditional Iranian city that can be found in larger cities. Of course there are other precious urban textures in some smaller towns but in comparison to the larger cities like Esfahan, Kerman and Shiraz, it is possible to claim that Yazd is unique. Despite some destruction in the historical core of the city, the image of the city still has the sense of the previous centuries. The curved, narrow routes and dead-end allies with short doors that have a step down to the level of the yards still remind the passenger of the traditional life style and urbanism. The bazaar of the city is active and the old city center, which is around the Jame mosque, in the

north of the bazaar and in the northwest of Amir-Chakhmagh square, still has the centrality function.



Fig. 7-1: Location of Yazd city in the center of Iran (left).

Fig. 7-2: A general view from Amir-Chakhmagh mosque to northeast; Badgirs are the prominent elements in the skyline of the city (right).



Yazd is one of the Iranian cities that have roots in the pre-Christian ages. The city lays in latitude and longitude of 31° 53' 50" N and 54° 22' 3" E in center of Iran, where the dominant climate is hot-arid, and the rain fall average is low. The average maximum, the average minimum, and the average of the daily temperature of the city during the years between 1972 and 1995 have been 26.1, 11.2, and 18.6 Celsius degrees respectively. The high temperatures are accompanied by low humidity. The highest average monthly humidity during the aforementioned time was in January with 52% and the lowest has been during the month of July with 13.75%. The average annual humidity of the city has been 30.30% (Kalantari Khalilabad, Hatami Nejad, 2006, 35-36). The central deserts of Iran are in the eastern side of Yazd, so the hot winds blow from east and northeast towards the city.

7-1- The typology of urban developments

The urban developments of Yazd that remain till today can be categorized into four types of development that have occurred in three periods of time. Fig. 7-3 illustrates the growth of the city in different periods of time. The oldest urban textures were built before 1930s when the traditional morphology was seen in every corner of the city and the transportation was non-motorized. The residents lived in inward-looking, courtyard houses and the texture was dense. The neighborhoods had the utmost importance and were the center of the activities after the bazaar and the city center. At this time, the area of the central city was about 600 hectares. By taking into account the villages around the city, the area of the whole developments were about 870 hectares.

The second time period is between developing the new paved streets for the cars in 1930s and 1940s up to the year 1980. At this period, the wide streets changed the morphology of the city. Also the less dense neighborhoods were developed. The new routes of these developments were wide enough for the cars to pass. The nature of the houses was changing from the traditional houses to more open residences. The courtyard houses were being substituted by the houses that had a yard in one side. Then at the second half of the period, some apartment buildings were constructed.

The street network was not a complete grid iron but the organic form of the traditional city was changed to a form that cars could more easily pass. By the development of the city, the area of Yazd reached 1800 hectares in 1980 and some of the villages of around the city became part of it. The urban morphology of this era shows how Yazd passed from the organic and traditional morphology and stepped into the modern times.

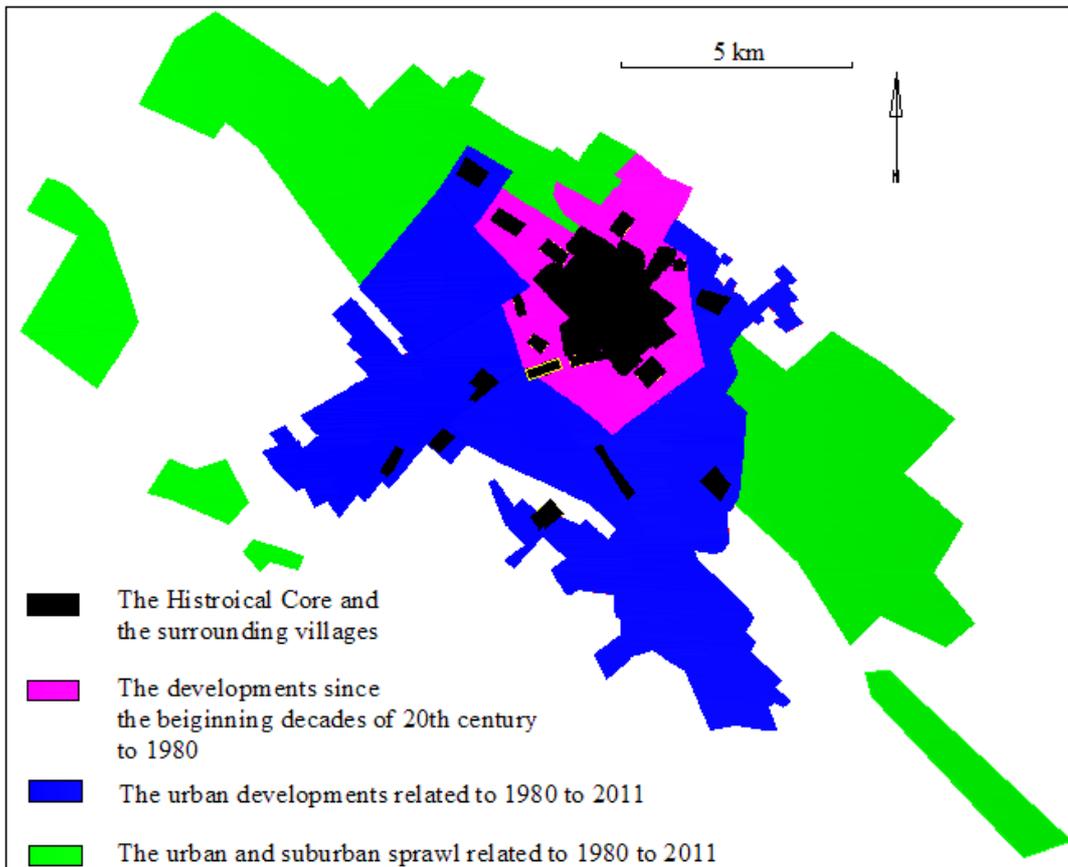


Fig. 7-3: The development typology of Yazd

The last period that is considered was between 1980 and 2011. The city started to grow rapidly. The growth was in the shape of new urban developments and urban sprawl. In the central city of this period, the number of the apartment residences grew and the outward-looking housing became the dominant pattern. The number of wide streets, either with the function of the main street or the neighborhood streets increased. The built area of the city decreased and the block-shaped buildings became the dominant view. Several new regions were developed in the south and the

west of the old city. The grid-iron pattern became quite natural for the car-oriented development. All of the villages around the city became part of the main city.

Another type of urban form that can be seen in the new developments of Yazd has the characteristics of urban sprawl. The density of these parts is much lower than the center of the city and leap-frog developments can be observed. Some industrial plants are within this part. The urban sprawl mainly took place along the transit corridor of Tehran-Kerman-Bandar Abbas. Therefore the development has a northwest-southeast direction. Both small villages and new residential developments are parts of these dispersed textures. The total sum of the area of the 1980-2011 period reaches about 12700 hectares (127 square kilometers).

It is possible to illuminate how the urban morphology of the city has changed from a chronological and descriptive view. The tightly dense neighborhoods of the old city have been changed to the new low-density districts. This is not because of the nature of the buildings, but it is mainly caused by the wide new streets that did not exist previously. The street network of the city has affected the density by making large gaps between the buildings.

The other change in the nature of the morphology of the city is in the form of the streets. An observer who moves through the center to the periphery sees tight, short, curved routes at the starting point and then wide, long, straight streets at the periphery. The street network becomes more symmetric from center to periphery. Furthermore, the area of the street network becomes more in the outer districts.

7-2- Area, population, and density

In this section, the growth of the city is tried to be chronologically considered. The raw historical information for this study is mainly obtained from the study undertaken by Armanshahr co. and then the result is shown in a unique map so that the historical growth of the city is indicated. The aim is to study the circumstances and speed of the urban growth in a traditional and sustainable urban area. Also it is interesting to know how much the area of an organic city is.

The ancient core of the city, which was called “Isatis”, was formed near the modern city center. This name is brought in the writings of the Greek historians. In the

following centuries, the city growth was oriented to a part of the city, which was called “Kasseh”.

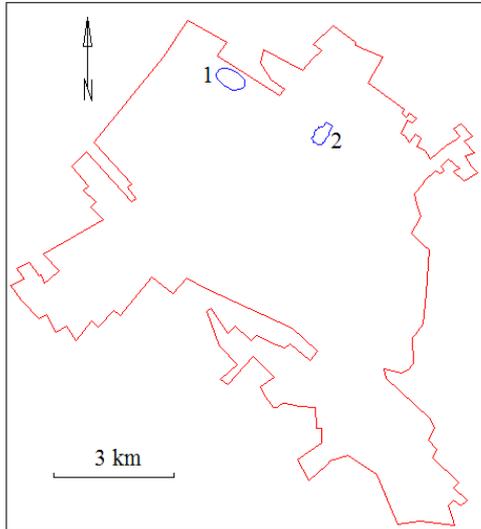
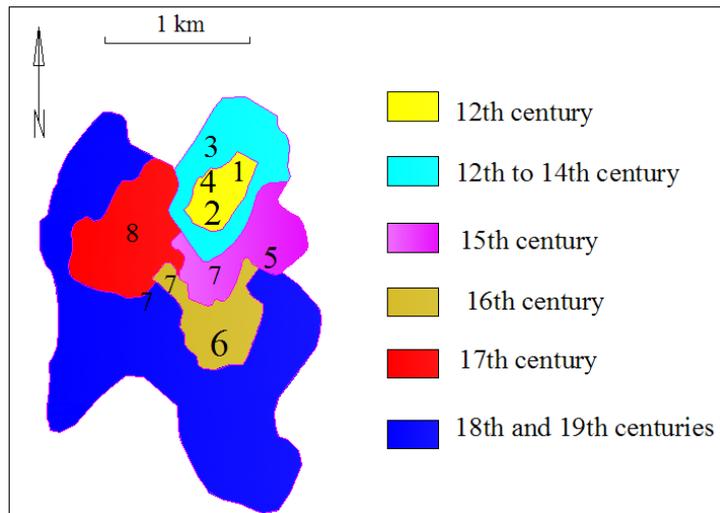


Fig. 7-4: The primary cores of Yazd; 1: The ancient city called Kasseh in today's Kasnavieh neighborhood, 2: The core that the new Yazd city was formed around it, founded in the 4th century A.D.

Fig. 7-5: The growth of Yazd since 12th century. The growth direction had mainly been towards south and southwest. The influential spaces and elements that have affected the growth direction have been the following: 1: Fahadan (Yuzdaran) neighborhood center, 2: Jame mosque, 3: Kushk-e-Now neighborhood center,



4: Primary bazaar, 5: Arg, 6: Amir-Chakhmagh complex, 7: Bazaar, 8: Shah-Tahmasb complex.

Fig. 7-6: Amir-Chakhmagh Plaza. The mosque and the Ab Anbar of the complex are seen in the image, source: author.





Fig. 7-7: A view of the bazaar of Yazd; although it was cut by Ghiam street and also was influenced by the street shops, but it is still the lively commercial center for the city, source: author

This part is now located in the northwest of the city center and is one of the old neighborhoods of the city. It can be seen by neighborhood number 49 in Table 7-5 and Fig. 7-12. The area is now recognized by the name of “Kasnavieh”. The city existed in the Median era in sixth century B.C. It is believed that Yazdgerd I, the Sasanid king, who ruled between 363 and 399 AD, developed a new city near the ancient city of Kasseh and called it Yazdangard. The construction of the city was a part of building a network of new cities during the Sasanid dynasty (224-670 AD). Anyhow the similarity between the names of the city and the king is apparent. So the development center of the city was transferred from Kasnavieh to a new place that is probably the same place that today is located. The development of the city can be tracked since ninth century. The early core of the city was shaped in Kushk-e-Now and Fahadan neighborhoods between 9th to 12th centuries. A new defensive wall was built around the city in the year 1045. The Jame mosque of the city that was first built in the 12th century and renovated in 15th century was within the primary limitations of the city. In 15th century the development of the city made the rulers build a new wall around the city. A governmental castle (Arg or Kohandej) was also built. Not much of this Arg is now remained.



Fig. 7-8: The Jame mosque while being renovated in summer 2010. With minarets as high as 48 meters is a powerful landmark of Yazd. Source: author.

Today the Jame mosque and the location of the Arg are connected to each other with a straight street. In 16th century, construction of Amir-Chakhmagh complex, which was consisted of mosque, Ab Anbar, Tekkieh, and a part of today's bazaar. The construction of this complex had a strong effect on the development of the city to the south. When the bazaar was further developed and other parts were added to it, the bazaar that today we know was created.

The element that influenced on the growth of the city in 17th century in the era of Safavids, was Shah-Tahmasb complex including plaza, Hosseinieh, Tekkieh, bazaar, and mosque that most of them have not survived. The mosque has been reconstructed completely and the form of the plaza has been changed after Ghiam Street was constructed and connected Amir-Chakhmagh plaza and to Shah-Tahmasb neighborhood and ran through the bazaar. In 18th and 19th centuries the growth of the city was faster but the number of effective elements of the city is not as many as before. The city area has had a steady but continuous growth. Even in the beginning of the twentieth century, when the city was a major city of the central parts of the country, it still had the shape of a sustainable and completely harmonious urban settlement. About the year 1956 and after the construction of several streets and at the beginning of a rapid growth, the organization and form of the city was still mainly based on traditional and organic growth. At this time the city had an area of 710 hectares and population of 63502 people (Shamaei, 2003). This was a start for a fast growth.

The growth of the city can be seen in Fig. 7-10. It can be categorized into three parts; since the ancient times till the beginning of the twentieth century, the city has had a mild slope of growth. Then between 1956 and 1981 the rate of the growth

increased and the area jumped from 710 hectares to 1800 hectares in 25 years. The reason was mainly the governmental attitude and policies for convert the urban landscape of Yazd, like other cities, to an industrial and modern city. However the enormous sprawl took place after the revolution of 1979.

Fig. 7-9: Population growth in Yazd since the census of 1956 till 2001 (Shamaei, 2003).

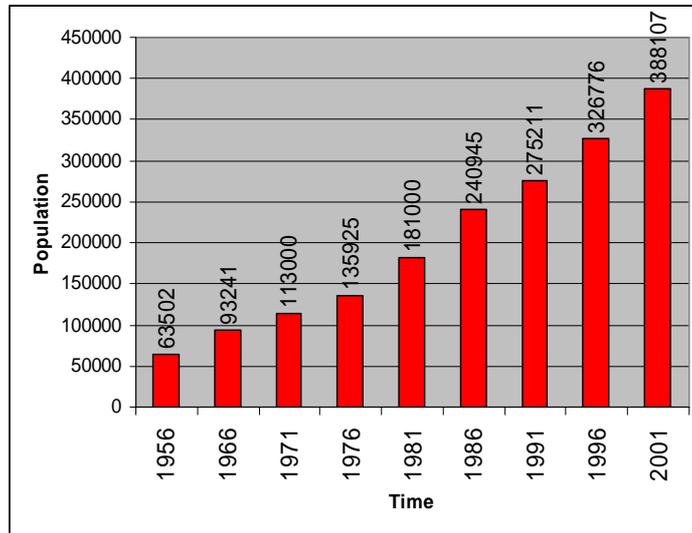
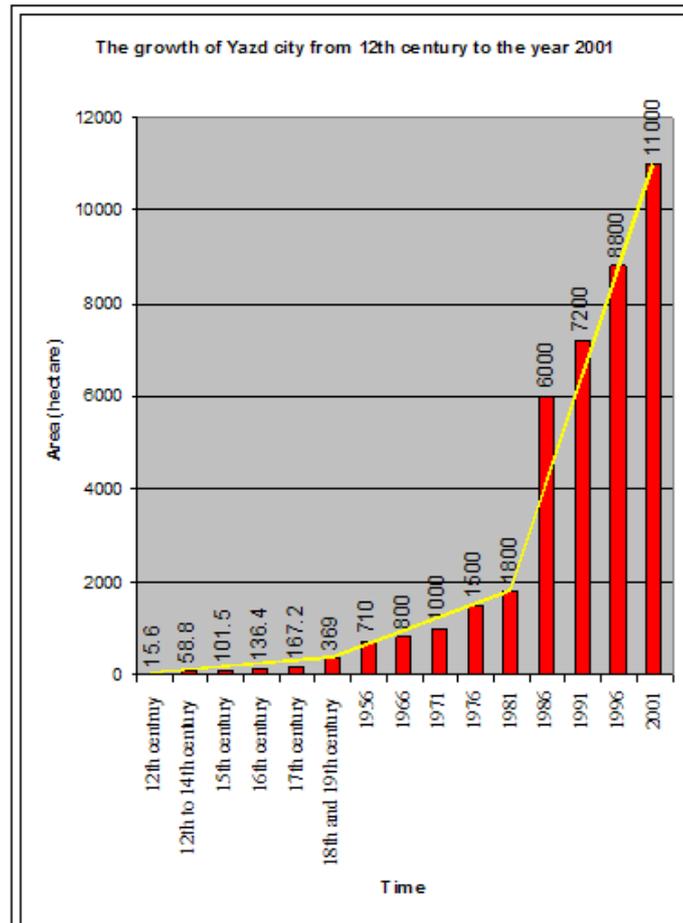


Fig. 7-10: The growth of Yazd since historical periods till the year 2001.



Between 1981 and 2001 the area of the city increased from 1800 hectares to 11000 hectares (110 square kilometers). This period, which is the third part of the graph, has the highest slope (the statistics related to the area and population are gotten from Shamaei, 2003). With a glance to the graph of the urban growth of the city, this idea comes to mind that the growth of the city is too fast to be normal and controlled. As described in chapter 4, it is common to call developments with higher rate of urban growth than population growth as urban sprawl. So to study the growth of the city, we should have an image of the population increase during the past decades. Fig. 7-9 shows the population growth between 1956 and 2001.

During 45 years, the population grew from 63502 to 388107 people. That is 611 percent growth. The graph tells us that the growth rate has been almost linear, while it is not true about the development growth. The area of the city has grown from 710 hectares to 11000 hectares since 1956 to 2001. So in 2001 the city was 1550 percent larger. In other words, the city of 2001 was 15.5 times bigger, while the population was 6.11 times more. That is, in the period of 1956-2001, there has been an urban sprawl in the development of the city.

The sprawl is much worse when we consider the 1981-2001 period. For the population increase of 181000 to 388107 or 214 percent, the city had an area growth of 611 percent (from 1800 hectares to 11000 hectares). So the area growth has been about 3 times more than the population growth.

Table 7-1: The comparison of the area growth of Yazd with its population growth in three periods of time.

	Area growth divided by population growth
1956-1981	89%
1981-2001	285%
1956-2001	253%

According to Table 7-1 the area growth of the city is 2.5 times more than its population growth between 1956 and 2001. But after breaking down the period into two parts of 1956-1981 and 1981-2001 it becomes clear that the urban sprawl of the

45 years is because of the unnatural growth of the city from 1981 to 2001. The same ratio for these 20 years is 2.85.

During the first half of the twentieth century, caused by the government's will, the economy of many urban and rural areas was pushed towards industrialization and the local and agricultural activities were underemphasized. This industrialization that never happened completely accompanied by several other motives made the rural population groups tend to migrate to the cities to find better life conditions. Despite this desire, it is apparent that the physical structure of the city of Yazd did not have a harsh reaction of expanding without control. In fact, the population growth has been more than the area growth so we see that the area growth to population growth of 1956-1981 is less than 1.

After the revolution, the migrations increased. The authorities decided to accommodate the overloaded population in new quarters around the city. After 1986, new quarters like Safayieh, Emamshahr, Kuye-Ostadan, Shahrak-e-Daneshgah, and Azad-Shahr were constructed. The main location of these developments was in the south and west of the city. Therefore the historical development direction was picked as a natural selection. The dominant use of such quarters was residential and small parts were allocated to public services and retail. But the main deficiency of these new parts was that little work places and opportunities within the new neighborhoods were foreseen. So the new residences had large urban trip generation and small trip attraction. In addition to ecological unsustainable urban form that was not suitable for the climate of the region, other issues like low sense of community and place and the identity problems are usually addressed in the recent research related to these new quarters. In the meantime, the density of these developments is quite different from the traditional ones.

The result of all the above is a sudden jump in the development area of the city during the past 3 decades while the population growth has had an almost uniform trend.

Apart from urban sprawl, the urban policies had other negative outcomes during the 1981-2001 period. One of these outcomes that is in relation with population and density issues, is urban decay of the historical core of the city. In absence of suitable

revitalization and regeneration plans, the population of the city center started to diminish and the old buildings received no renovation. Except the renovation plans that were made in some neighborhoods like Fahadan, Kushk-e-Now, Bazaar-e-Now, etc., very little efforts were made to restore the old neighborhood centers and routes. According to a recent research, after 1986 the population of the city center declined. In 1986, the city center had a population of 51282 people, which was 22.2% of the population of the city. Then in 1991 the population fell to 47624 that were 17.1% of the city residents. In 1996 the decrease trend continued. At this time 46553 people lived in the city center. They were 14.2% of the whole people of the city of Yazd (Kalantari Khalilabad, Hatami Nejad, 2006, 57). The main reason for the population reduction during these years was migration to other cities and other parts of the city. At this period of time 1.24% of the population of the city center had entered the area from outside and 11803 people migrated outward (p.69). The migration of the residents from the historical parts to the newer quarters was because of two main reasons. The first reason was that the central neighborhoods had become so old and inaccessible for the new motorized transport modes that people preferred to live in more attractive neighborhoods like the new quarters around the city or at least in the neighborhoods that were developed in the past decades. The second reason is directly related to the urban policies. In 1980s and the first years of 1990s the policy of selling urban lands to urban residents was seriously undertaken. So the residents of the old neighborhoods were encouraged to buy residential-use lands by almost suitable prices and build their own residences. Yazdi residents, like citizens of many other cities, started to build apartments of between 2 to 4 floors mainly by the help of co-operative companies in the lands that had low level urban infrastructure, which normally was supposed to be completed after the families settled in the quarters. The decay in the city center was also notable in the number of the usable residential units as the houses became older. In 1996 there were 11200 residential units in the city center, which shows a reduction in comparison to the previous years (Kalantari Khalilabad, Hatami Nejad, 2006, 90). That means that the construction density of the area was 18.46 units per hectare (7.38 units per acre). Of course the number of

residential units in the area of each of the major old neighborhoods was different (Table 7-2).

	Number of units (Kalantari Khalilabad, Hatami Nejad, 2006, 92)	Residential unit density (units per hectare)	Population in 1996 (Kalantari Khalilabad, Hatami Nejad, 2006, 105)
Fahadan	1756	15.72	8052
Gowdal- Mosalla	1037	14.99	3581
Sheikhdad	2095	22.80	8997
Dowlat-Abad	1375	18.19	5264
Gonbad-Sabz	2314	21.19	10611
Gazorgah	1330	19.27	5041
Sesh-Badgir	1293	16.16	5007
Sum	11200	18.46	46553

Table 7-2: The residential unit density in the historical core of Yazd in 1999,

The dispersed developments and the migration of people from the city center because of unsuitable living conditions have caused the urban sprawl of the city. The above statistics proves that the development plans have failed to contain the sprawl of the city. According to the master plan of 1984, it was supposed to control the growth of the city in a boundary of 3576 hectares till 1993, but in 1993 the actual area of the city was 7200 hectares (Shamaei, 2001, 254).

It is obvious that the city suffers from apparent urban sprawl and urban shrinkage. The urban sprawl of the city does not have the shape of the western, particularly the North American, suburban sprawl. However most of the characteristics of urban sprawl like low density developments, leapfrog developments, and fast construction development in comparison with the lower population growth are observed in the recent growth pattern of the city. The construction pattern of the new developments around the city has nothing to do with the dense setting of the city center. Obviously no harmony between these two is seen.

The unsustainable side of the urban development of Yazd during the past decades can be easily explained. Although the life is continued in the core, but the population growth is declined. Most of the people prefer to live in the new neighborhoods, even most of the residents of the core. The urban decay of the core, urban sprawl, and lack of efficient public transport has caused vast lands go under construction. The high rate of land consumption is especially seen after 1980.

In one point of view a large part of the lands surrounding the city are not cultivated or agricultural lands and no major settlements are in the neighborhood. Nonetheless what makes the land consumption unsustainable is that it generates high automobile use and environmental pollutions. This effect is more amplified by the lack of public transport facilities. The sprawled built environment and the weak public transportation encourages people to own personal cars and use them as the main mode of transportation. So the automobile use and car ownership are considerably rising. Furthermore, as seen in chapter 4, the larger the city is, the more the area of the ecological footprint will be. According to the theory, if Yazd had maintained in a reasonably compact size, it would have transferred less pollutants to the environment, even if the population was constant.

7-3- Neighborhood organization

There are two ways of considering the neighborhoods of the historical core of Yazd. The first view, which is normally done in the urban research, is to categorize the core into 7 large neighborhoods (Barzan). These urban districts are classified according to the pieces of land that are shaped by the new streets. Each one of these sections includes a few real neighborhoods. Table 7-3 introduces the 7 main large neighborhoods of the city and their area.

There are advantages and disadvantages for this type of consideration of traditional neighborhoods for this study. The Advantage is that it is easier to use the previous data about population, housing, and density. It is also possible to match the available census data with the defined neighborhoods.

Neighborhood	Fahadan	Gowdal-Mosalla	Sheikhdad	Dowlat-Abad	Gonbad-Sabz	Gazorgah	Sesh-Badgir	Sum
No. in Fig. 7-11	1	2	3	4	5	6	7	-
Area (hectare)	111.7	69.2	91.9	75.6	109.2	69	80	606.6

Table 7-3: The 7 main neighborhoods of Yazd historical core and their area, (Kalantari Khalilabad, Hatami Nejad, 2006, 114-115)

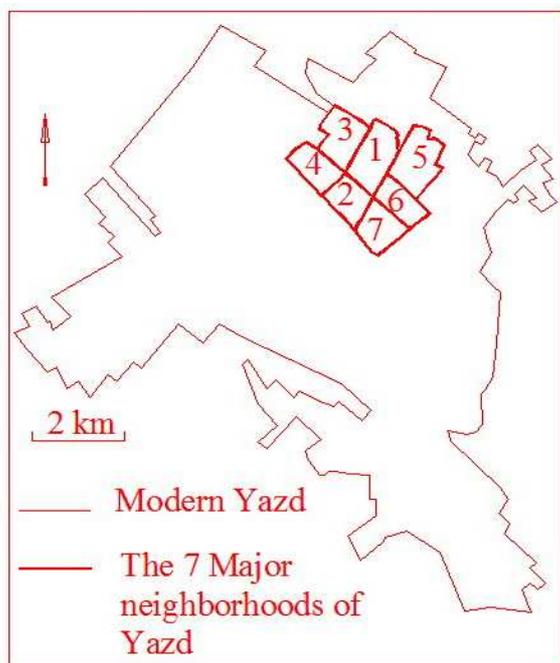


Fig. 7-11: The seven major neighborhoods of Yazd

On the other hand, this way of determining the areas fails to show the traditional behavior of the residents. The area of each of these neighborhoods is so large that the previous residents could not have a sense of belonging to the whole of it. What this research seeks for, is to consider how the people interact with their built environment. So smaller boundaries that people know them as their own territory and also belong themselves to them, are necessary to be defined. These areas are so small that the residents are in daily touch with them. Therefore another system of neighborhoods is thought of, while the aforementioned one is still used as a good source of information.

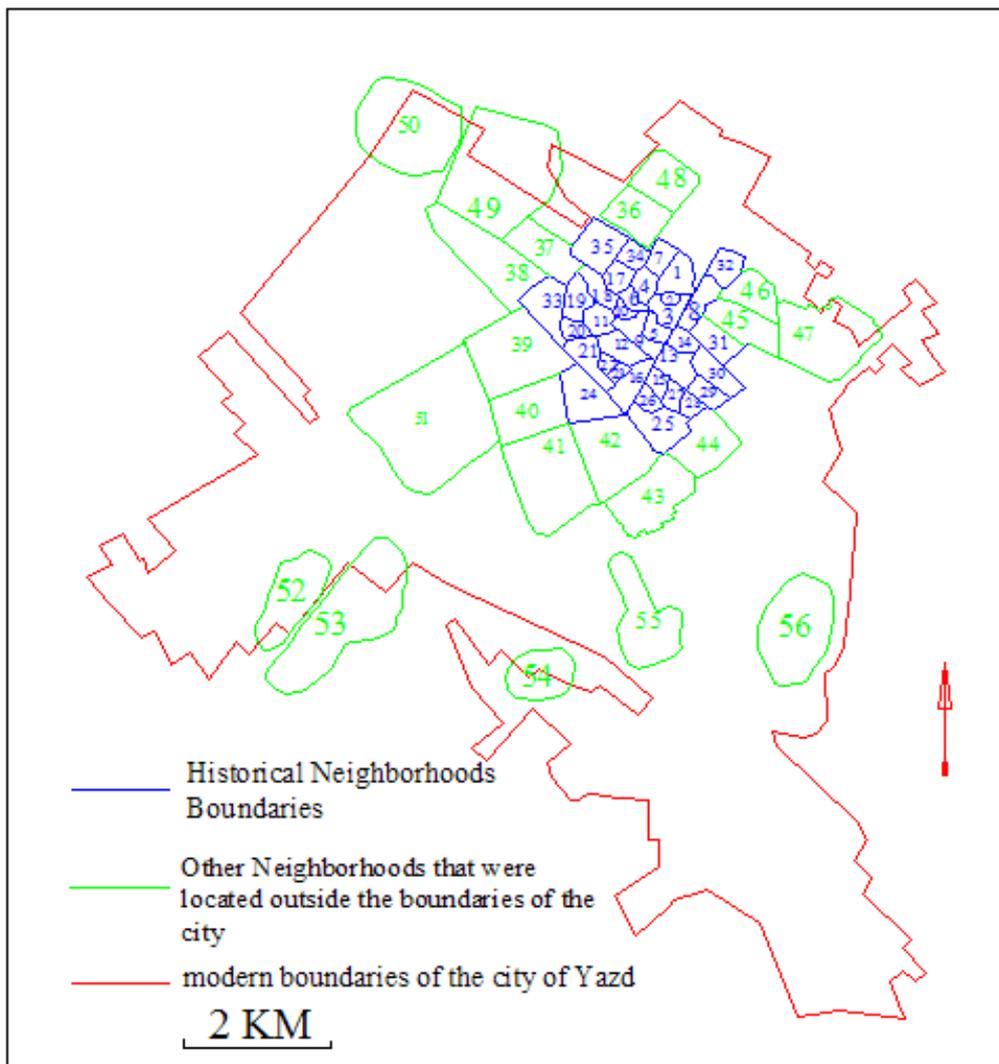


Fig. 7-12: The historical neighborhood units of the city of Yazd.

The second method is based on the social behavior of the residents. Like other historical cores, it is hard to define the boundaries of the neighborhoods within the old city of Yazd. Nevertheless it is possible to have an approximate imagination of the boundaries by talking to people, who still have close sense of belonging to their neighborhood. The resulted boundaries are neighborhood units that consist of a limited number of households.

A previous research of Armanshahr Consulting Engineers (Armanshahr, 2007) has been quite useful in defining the boundaries of the neighborhoods. 56 historical neighborhoods were determined in the historical core and around it. The neighborhoods can be categorized into 2 parts; the neighborhood units that were

located in the main city of Yazd till the beginning of the twentieth century and were recognized as parts of the main city, and other units that were basically old villages or gardens around the city, which are now a part of the central city because of the rapid growth of the city.

This part contains 35 units. The names, areas and the historical era of the development of the units are shown in Table 7-4. The second group of the neighborhood units was not recognized as Yazd city till a century ago. However some of these places are now in the middle of the main city. There are 21 of such neighborhoods, which are introduced in Table 7-5.

Of course, as seen in the previous sections, the age of the city is much longer than the dates that are seen in the two tables. Nevertheless the age that is applied in this table is related to the date that the city was developed in the past millennium and became as the base of the new Yazd. The focus of this research is on the first group of the neighborhoods that have been the urban neighborhoods. These urban neighborhoods have smaller areas and are located tightly close together.

The location of both types of the neighborhood units is shown in Fig. 7-12. Apart from Bazaar-e-Now, which was not a residential neighborhood, but a commercial place, the smallest unit within the walls of the city had an area of 4.7 hectare (Hashem-Khan). The largest neighborhood of the first group is Posht-e-Bagh, which covers 42 hectares. This neighborhood was settled by residents after the urban growth of the thirteenth century and was developed during the fourteenth century.

The general pattern, which is observed, is that the units of the center of the historical core are quite small and human scaled and the neighborhoods that were developed in later historical periods embrace the older ones and have larger areas. When it comes to the neighborhoods that belong to the automobile age, the very vast areas are notable.

Era (Century)	12th	16th	15th	15th	15th	15th	9th	14th and 15th	12th to 14th	13th	17th	16th	16th	15th	16th	16th	14th	15th	14th and 15th
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Table 7-4: The historical neighborhoods within the defensive walls of Yazd.

No. in Fig. 7-12	Neighborhood name	Area (Hectares)	Era (Century)
20	Char-Menar	8.8	15th
21	Takht-e-Ostad and Sar-	24.2	14th
22	Gowdal-e-Mosalla	5.5	15th
23	Hashem-Khan	4.7	16th
24	Posht-e-Bagh	42	13th and 14th
25	Tal	36.5	16th
26	Panbeh-Karan	8.9	17th
27	Nazar-Kardeh	10	16th
28	Lard-Asiab	8.6	16th
29	Salsabil	13.9	16th
30	Gazorgah	24	16th
31	Juye-Hor Hor	26	18th
32	Ab-Shur	18.6	14th
33	Dowlat-Abad	36.8	19th
34	Sar-Cham (Sar-Jam)	14.1	-
35	Sheikhdad	38	14th

No. in Fig. 7-12	Neighborhood name	Area (Hectares)
1	Fahadan (Yuzdaran)	19
2	Bazaar-e-Now	3.6
3	Vaghtolsaat	16.4
4	Shah-Abolghasem	13.8
5	Lab-Khandagh	10.2
6	Lard-Keivan	7.9
7	Kushk-e-Now	14
8	Malmir and Gale-Kohne	21
9	Darvazeh-Mehriz and Sare-Polak	19.8
10	Do-Menar	5.9
11	Shah-Tahmasb	15.3
12	Old City Center and Golchinan	20.5
13	Sarbaz	22
14	Pir-Borj	10.8
15	Amir-Chakhmagh	9.5
16	Gowdal-e-Abbasi	21.1
17	Bagh-e-Gandom	13.5
18	Abolmaali	16.4
19	Bagh-e-Sandal	18.9

No. in Fig. 7-12	Neighborhood name	Area (Hectares)	era
36	Janat-Abad	47.3	-
37	Sajjadih	50.6	-
38	Seyed-Sahra	96.2	-
39	Kucheh-Boyuk	113.8	-
40	Sare-Dorah	70	16th
41	Khorramshad	130.8	17th
42	Kucheh-Hana	91	-
43	Akbar-Abad	80.5	19th
44	Zartoshtiha	54.6	-
45	Sar-Sang	46.1	-
46	Yaghubi	33.8	12th
47	Maryam-Abad	118	13th
48	Rahim-Abad	47.7	19th
49	Kasnavieh	212.2	11th
50	Mahmoud-Abad	152.9	12th

No. in Fig. 7-12	Neighborhood name	Area (Hectares)	era
51	Aharestan	248.7	12th
52	Kheir-Abad	79	19th
53	Eish-Abad	187	19th
54	Ghasem-Abad	54.5	19th
55	Naeim-Abad	88.7	15th
56	Mehdi-Abad	120.3	19th

Table 7-5: The historical neighborhoods outside the defensive walls of Yazd

The form of the old neighborhood units of Yazd is the representative of a general pattern that is taken in building the Iranian urban neighborhoods. To recognize the characteristics of such urban texture, one of the oldest existing urban textures of the city, called Fahadan, is raised as an example. According to Table 7-4, the

neighborhood has an area of 19 hectares and is located almost in the middle of the city. The background of the neighborhood goes back to ninth century, when the city center was transferred from Kasnavieh (neighborhood number 49 in Table 7-5).

This part of the city is considered as one of the good examples of the Iranian urban form. Fahadan is the oldest existing texture among the units of the historical core of Yazd. After ninth century, the development direction of the city was oriented to south west and west. So Fahadan is now located in the north of all other historical neighborhoods. As there are not official defined neighborhood boundaries, so in every research the neighborhoods may be determined differently. In some resources, Fahadan is the name of a larger area than what here we deal with, including Vaghtol-Saat, Shah-Abolghasem and Bazaar-e-Now units.

In this study, the basis of calling neighborhoods and neighborhood units is the image that the residents have in mind. If the people have a sense of belonging to a neighborhood unit that embraces a plaza or a square that is usually a neighborhood center, that area is called a neighborhood. In this way the resulted neighborhood units have smaller areas.

Fig. 7-13 shows how the buildings and houses of the neighborhood are located tightly together. A majority of the residences are courtyard houses. 3.39 hectares of the neighborhood area is covered by private open spaces. That is equal to 17.8%. Badgirs are seen in the skyline of the texture. These elements were normally related to the houses of the richer people or the public infrastructure like Ab Anbars. Also there are some local mosques in the neighborhood. Nevertheless there is not a long way from the southern points of Fahadan to the Jame mosque of the city.

The streets and alleys have made an almost connected network of routes. The central point of the routes, where the main streets reach each other is the neighborhood center. Fig. 7-14 indicates the location of the neighborhood center in the southern half of Fahadan. Like many other neighborhoods, the center is not located in the geometric center of the neighborhood. In other words, the people, who lived near the boundaries of the neighborhood, had accessibility to other neighborhood centers. That is while many daily needs of the residents could be provided inside the neighborhood unit.



Fig. 7-13: The buildings and private open spaces of Fahadan neighborhood unit in Yazd.

As seen in Fig. 7-14, shopping, providing water, doing religious ceremonies, schooling and education, and gathering together for public festivals were possible in

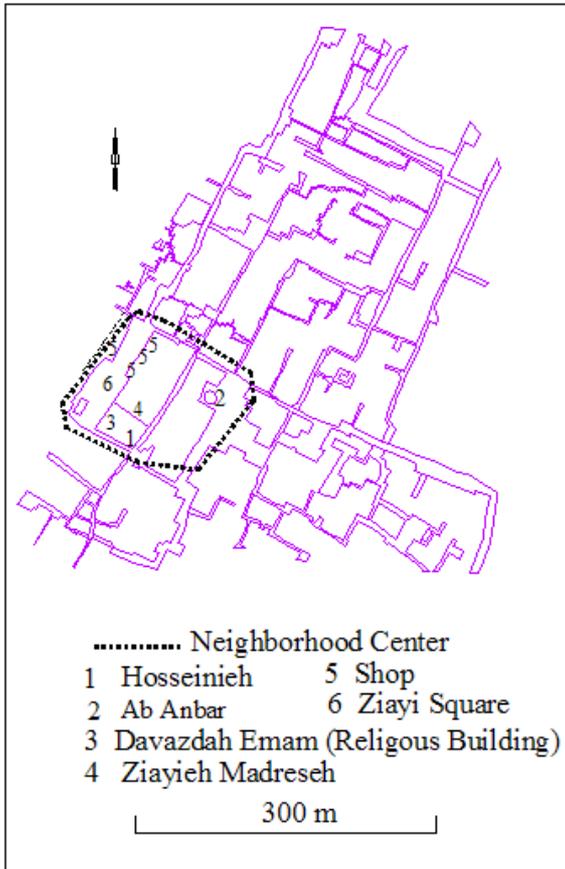


Fig. 7-16: Two of the main elements of Fahadan's neighborhood unit center; Davazdah Emam religious building in the right side and Hosseinieh of Fahadan in the left side, source: author.

Fig. 7-17: The neighborhood unit center of Fahadan. View from north to south. The Ziayieh Madreseh (left) and the religious building of Davazdah Emam (right) are seen. Source: author.



the neighborhood. Some shops are still working in the neighborhood center. Of course a sense of tourism is added to the places.



Fig. 7-14: (left) The neighborhood unit center of Fahadan and the facilities.

Fig. 7-15: (right) The walking distance from the farthest house to the neighborhood unit center of Fahadan, indication by Google.

A rectangular Hosseinieh is for religious gathering that are usually associated with the funeral ceremonies of the third Imam of the Shia Moslems, which are held every year. Another religious building, with an eye-catching dome is seen in the south of the Ziayi Square as the main space of the center. Also Ziayieh Madreseh is located in the center of the plaza that has once been a reputable education center.

Although Fahadan is not a small neighborhood and in comparison with other neighborhoods, it is considered as a medium-sized one, but still the facilities of the center seem accessible to all of the residents. Fig. 7-14 shows the on-foot trip from the farthest house in the northern part to the shops of the center in the southwest. The length of such a trip is 580 meters according to Google. Similarly other neighborhoods of the city have approximately the same walking distance from the farthest house to the center. That is while some houses are near to two or even three centers, located in different neighborhood units.

The organization of the neighborhoods and the neighborhood units that were described here is the dominant character of the traditional Iranian city. This organization is also seen in the traditional cities of other cultures like the Middle Eastern countries and the south European countries. The idea of human-scaled communities that are located beside each other can result in sustainability. Such neighborhoods are usually self-sufficient and are in some cases relying on the city as a whole. The traditional neighborhoods are self-sufficient in causing social interactions and raising the daily needs like shopping. On the other hand the reliance of the neighborhood on the city occurred in cases that could not be responded by a small community. Such activities were done in the center of the city and had a city-wide importance. The examples of these activities were wholesale business in bazaar.

Such an urbanism system that is based on neighborhood units can not be found in the contemporary cities of Iran. After the so-called modernization of Iran traditionalism became a part of a back-looking view in the social and human sciences. So was in urban planning and design. The definition of micro urban communities like neighborhood units is not seen in the development plans of the previous decades. Often no neighborhood unit boundaries are set in the detailed

plans and no significant neighborhood unit center with determined area of influence are defined. As a consequence, the neighborhoods are residential zones that are trapped in the grid-iron networks of streets. Of course zoning is not as strict as the western countries and the mixed use can be seen almost every where. Nevertheless the neighborhood amenities like grocery stores, small urban parks, neighborhood mosques, and so on are not centralized in one particular point of the neighborhoods. The same thing is exactly seen in the city of Yazd. The identity of the neighborhoods is decreased as getting farther from the core. In newer parts like Emamshahr absolutely no neighborhood center exists. In a social view, no space of interaction is defined for the people. The residential districts are just houses between the networks of auto-streets.

One of the main ideas that this study is going to raise is that urban developments based on neighborhood units have more capability to promote sustainability than the street network-based developments. That is especially correct for the Iranian cities similar to Yazd. Such promotion can be in concepts like sense of community and place, sustainable transportation, and environment. The neighborhood organization that was explained above has answers for such urban problems. The human-scaled spaces like Fahadan and its center can promote sustainable mobility modes within reasonable walking distances. This urban texture enhances a quality that is called “self containment” in the related urban literature. The urban neighborhoods should have the facilities to give suitable services to the residents. Such urban form that is missing in today’s urban planning can be a method for easing the traffic congestion of the Iranian cities. As the urban transportation and environment work function together, it is expectable to improve the environment quality by encouraging people to use sustainable methods of mobility like walking and biking.

Furthermore such structure can be effective in drawing the residents from the depth of the neighborhood to the center to socialize with each other and improve social relations. The social interactions are held in spaces that are wider than the normal streets and have special spaces for small meetings and sitting. That is the activity that is still alive in the center of Fahadan.

7-4- Accessibility

As seen in the case of Fahadan, people could easily access the neighborhood center facilities within a walkable distance of around half a kilometer. But that was before the emergence of automobile in the Iranian cities. According to the previous chapter, when the governmental top-down urban planning of the first half of the twentieth century cut through the neighborhoods to give way to cars, the old organization of the urban textures were corrupted. The commercial activities moved from the main bazaar and the neighborhood centers to the new wide streets. So a mass of human movements was transferred from the neighborhoods and bazaar to the streets. Many people were not able to walk to their neighborhood centers even if they wanted to, because the new streets were built between their living place and their traditional shops, bakeries, butcheries, etc. Apart from the new attractions of the streets that were drawing people, the streets were physical barriers for people to access their neighborhood centers. Therefore, gradually the neighborhood centers lost importance to the streets.

The above idea is tested in this part of the study using the Space Syntax theory.



Fig. 7-18: The axial map of Yazd before the construction of new streets in 1940s (left) and after the construction of the streets (right). Four areas that are analyzed by Space Syntax Theory; A: Fahadan neighborhood, B: Do-Menar neighborhood, C: bazaar, and D: city center and the area around the Jame mosque of the city.

To examine the social behavior of the residents of the city center of Yazd, UCL Depthmap software was applied. To show the influences of the new streets on the old organization of Yazd and also the mechanism of movement of people in the old routes, two axial maps were provided by Auto Cad.

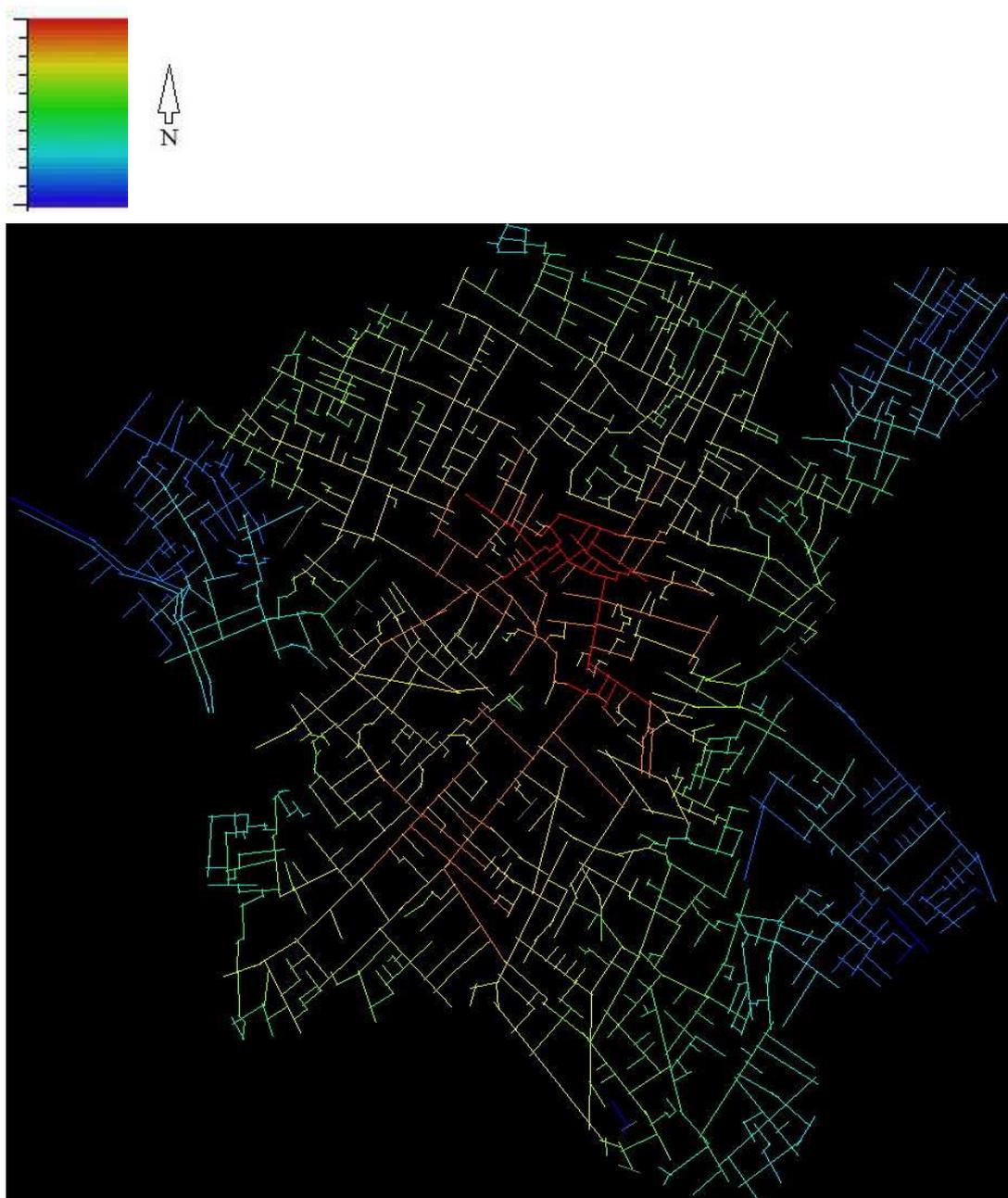


Fig. 7-19: Indication of integration in the city of Yazd before the construction of the new streets.

The first axial map is a redrawing of the spatial organization of the historical core of Yazd just before the construction of the automobile-oriented streets. This axial map

is related to the first years of the twentieth century. The second axial map is related to 1940s, when the new streets were built. Both maps are redrawn from the existing form of the city.

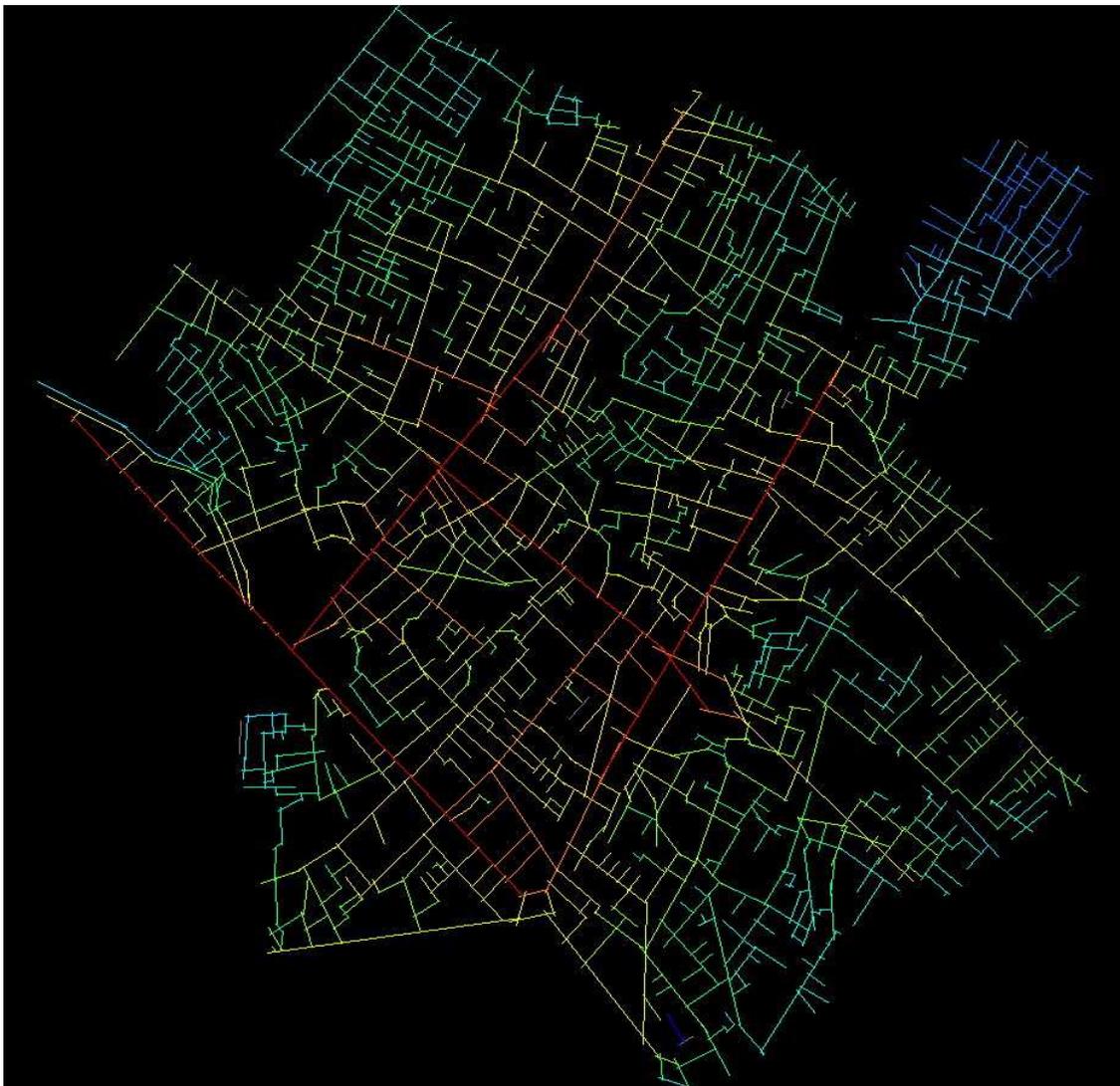
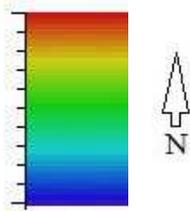


Fig. 7-20: Indication of integration in the city of Yazd after the construction of the new streets in 1940s.

Firstly, the maps were drawn in Auto Cad environment. Then the dxf format files were exported to Depthmap software. Fig. 7-18 shows the axial map of the city before construction of the streets, which is made up of 1215 lines and also the other map, which has some lines that have been omitted in the first map. Consequently the number of lines in the second one reaches 1332.

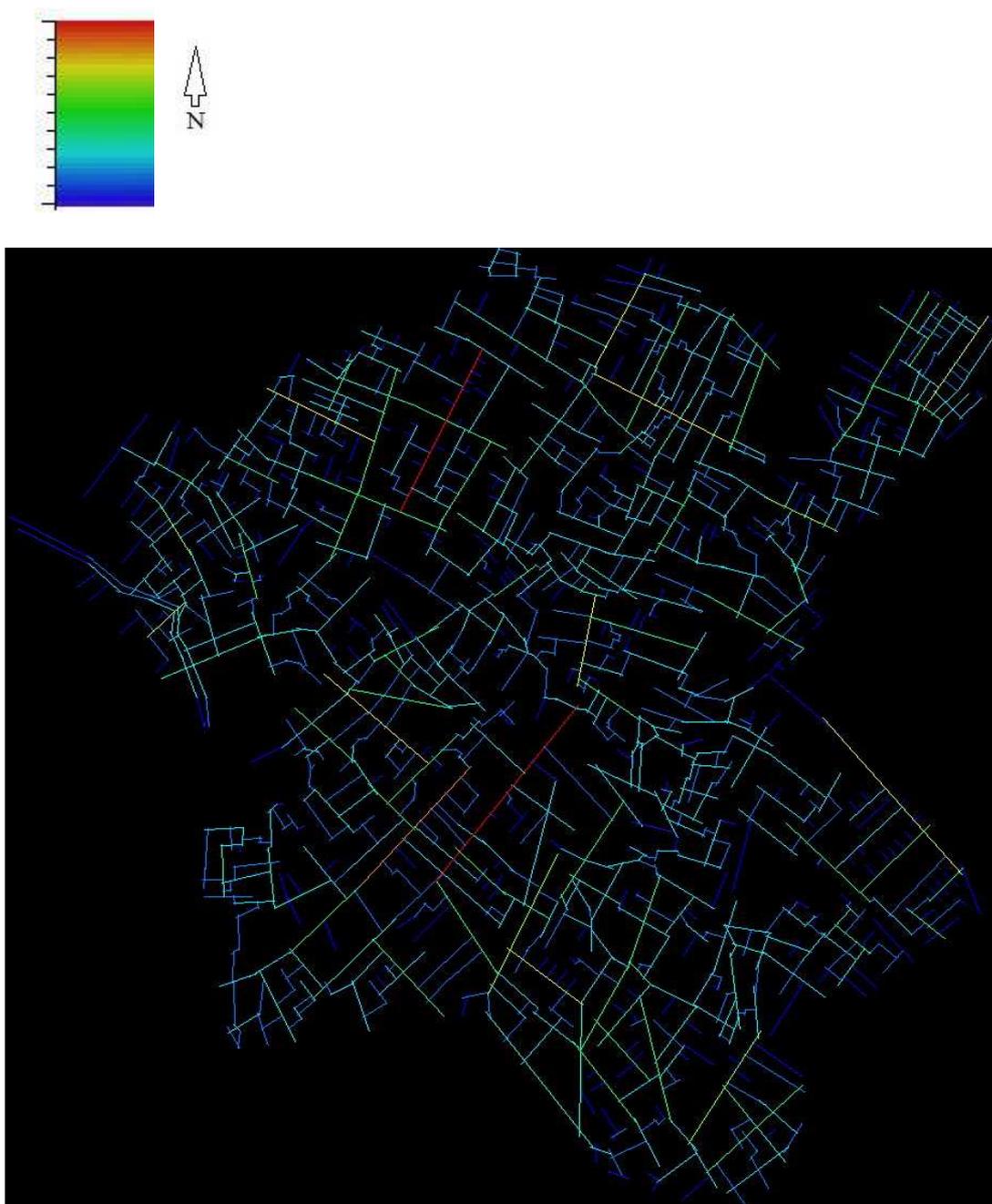


Fig. 7-21: Indication of connectivity of the city of Yazd before the construction of the new streets in 1940s.

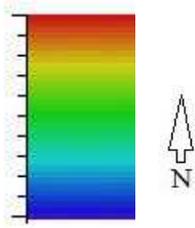


Fig. 7-22: Indication of connectivity of the city of Yazd after the construction of the new streets in 1940s.

To compare the influence of the new streets on the urban texture of Yazd, four areas of the city are selected. All four areas are shown in Fig. 7-18. Area A shows Fahadan neighborhood. B is the representative of Do-Menar neighborhood, C is the

bazaar, and D indicates the city center and the area around the Jame mosque of the city.

The analysis of the two maps shows how the social behavior of people was changed after the city was captured by cars. Figures 7-19 and 7-20 show the integration value of the axial lines of the city center with and without the new streets.

Fig. 7-19 is related to the city without the main wide streets and the map at the right side shows how movement of the residents was transferred from the center to many places along the main streets. To consider the city as a whole, it is observable that the city has had a vibrant center before the emergence of motorized travels.

In a smaller scale, the influences of the wide street pattern on the traditional neighborhoods are considerable. Fahadan as a historical neighborhood unit that was located in the north of the city is taken as an example. After analyzing the axial map of the whole city, it is possible to derive the average values of the Space Syntax descriptions by clicking on a number of them. Therefore the error in calculating values for a separated piece of the map is avoided. As seen in Table 7-6, the values of the space measures of the selected neighborhood were changed after the construction of the streets.

After the streets were built, the connectivity of the routes of Fahadan was decreased by 58%. The mean depth and the total depth have been reduced by 6 and 5 percent after the emergence of the car-streets. Similarly the RA and RRA values fell by 10 and 33 percent respectively. The meaning is that the uniform built environment, in which people could move from any place to any place, was changed. Instead the residents could easily reach the main streets and the flow of the pedestrians from the neighborhoods to the streets was strengthened. In other words, the destinations of the trips were changed from inside the neighborhoods and tight urban textures to the newborn streets, and the people were encouraged to use the cars.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RA	RRA
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Fahadan neighborhood- before constructions of streets	19	43	0.552	0.212	0.56	0.576	0.009	0.224
Fahadan neighborhood- after constructions of streets	19	43	0.755	0.088	0.528	0.551	0.008 2	0.168

Table 7-6: Comparison of the Space Syntax measures before and after the construction of the new streets in Fahadan neighborhood, Yazd.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RA	RRA
Do-Menar neighborhood- before constructions of streets	5.9	17	0.532	0.180	0.447	0.464	0.0028	0.0697
Do-Menar neighborhood- after constructions of streets	5.9	17	0.591	0.077	0.402	0.431	0.0044	0.0908

Table 7-7: Comparison of the Space Syntax measures before and after the construction of the new streets in Do-Menar neighborhood, Yazd.

Considering Do-Menar neighborhood unit, which is nearer to the city center, the same conditions are apparent. As seen in Table 7-7, the neighborhood that has an area of 5.9 hectares contains 17 main lines. Although the integration of the lines shows an increase after adding the streets, but the connectivity of the neighborhood streets decreased by 57% and the RA and RRA increased by 36% and 23%. Naturally the mean depth and the total depth decreased by 10% and 7%. The thing

that happened in Do-Menar before and after having the streets was the same is in Fahadan. People could move easier but the direction of their movement was swerved to the streets.

Another observation shows a significant change in the movement of the residents in the traditional bazaar of the city and the allies around it. The integration and connectivity of the bazaar fell after building the streets by 10% and 55%. A big part of the people that used to shop in the bazaar now does the shopping in the streets. Again the mean and total depths of the selected routes show reduction. The results can be seen in Table 7-8.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RA	RRA
Bazaar - before constructions of streets	25	46	0.767	0.203	0.471	0.487	0.004	0.1013
Bazaar- after constructions of streets	25	46	0.687	0.09	0.354	0.385	0.0029	0.0609

Table 7-8: Comparison of the Space Syntax measures before and after the construction of the new streets in the bazaar of Yazd.

The analysis of all 6 measures shows better conditions in the traditional city center. The integration and connectivity were reduced by 8% and 59%. As seen in Table 7-9, after the streets were built the mean depth, total depth, RA and RRA had increase by 4%, 7%, 72%, and 67%. Therefore reaching the main routes and also pedestrian movements in the city center and around the Jame mosque were reduced after the presence of cars. The reduction of the integration, which means lower mobility, looks strange because although the new streets were made to improve the mobility, but the result was weakening it. This reduction has happened in bazaar and the whole city center.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RA	RRA
City center- before constructions of streets	9.2	36	0.561	0.2	0.424	0.441	0.0015	0.0373
City center- after constructions of streets	9.2	36	0.518	0.083	0.440	0.476	0.0055	0.1147

Table 7-9: Comparison of the Space Syntax measures before and after the construction of the new streets in the old city center of Yazd.

Another ground for considering the changes in the built environment of the Iranian cities, is to study the Space Syntax measures in urban developments of different ages. The 6 measures of integration, connectivity, mean depth, total depth, RA, and RRA of 4 types of developments of the city of Yazd are analyzed; the first two are related to the city center, which were examined in the previous experiment. That is the city center of the late nineteenth century and the city center of 1940s. The third selected area is Emamshahr, which is a newly planned part of the city that has been developed after the 1979 revolution. Therefore it has the specifications of the new Iranian urban design. The structure of the streets is based on a grid-iron pattern. The fourth area is located in the sprawling parts of the city in northwest. The oldest developments are related to a village called Shahedieh. New neighborhoods have been recently built in the south of the old village. So the area has a dual nature. The two characters that the area has are the traditional form of the village and the grid-iron structure of the new developments. The main reason for picking this area for analysis is that at present it is not a part of the city, but it is expected that it will be a part of it in the future because of the direction of the growth of the city and the sprawled developments in between this area and the central city. The boundaries and location of the four areas can be observed in Fig 7-23.

Table 7-10 shows the Space Syntax specifications of the four selected areas.

	Yazd city of the late nineteenth century	Yazd city of 1940s	Emam-Shahr	Shahedieh
Area (hectare)	600	600	340	291
Number of lines	1215	1332	361	392
Line density (lines in hectare)	2.02	2.22	1.06	1.35
Integration	0.393	0.877	1.598	0.845
Connectivity	2.483	2.728	3.257	3.066
Mean depth	20.333	10.129	4.864	8.477
Total depth	20676	13339	1751	3314
RA	0.0425	0.0064	0.0215	0.0383
RRA	0.0517	1.171	0.651	1.234

Table 7-10: A comparison between the Space Syntax measures of four selected parts of the city of Yazd: Yazd city of the late nineteenth century, Yazd city of 1940s, Emamshahr, and Shahedieh.

According to Table 7-10, the integration and connectivity have been improved in the new developments. The depths of the new neighborhoods have been decreased. In Emamshahr the best integration and connectivity is noted. However the density of lines has a sign of lower construction and population density. In fact there are dispersedly developed areas in the eastern parts of Shahedieh. In this part several allies with low number of units per hectare is observed. Although the structure of Emamshahr and the new parts of Shahedieh have acceptable connectivity, but the integration of the allies other than the main routes such as the inner parts of the neighborhoods show low movement of the residents. It is logical to conclude that the orientation of the movement of the people is targeted towards the main streets and as one goes to the depth of the neighborhoods, the movements are reduced.

It is observable that generally the accessibility of the core has been decreased after the construction of the new streets. But with a closer look, it can be seen that the main Space Syntax measures of the new urban pattern have better conditions. This is true about the neighborhood units and bazaar. In other words, the new urban form can result in better mobility in each part of the core in comparison with the same place in one hundred years ago.

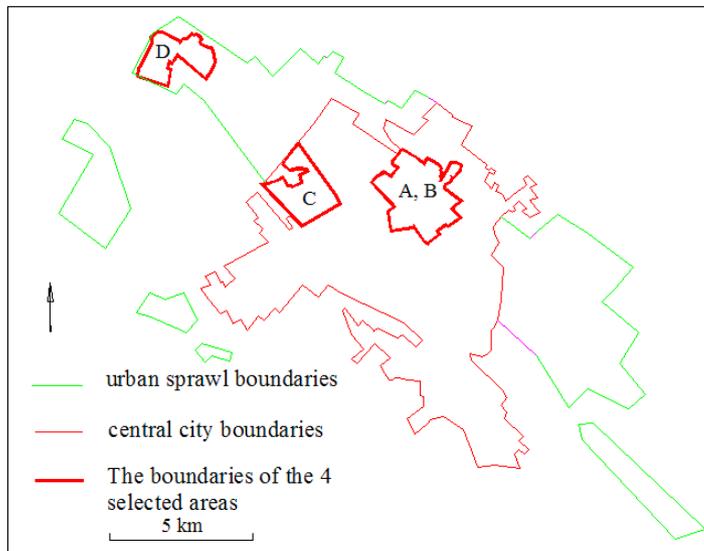


Fig. 7-23: Location of the four selected areas in the city of Yazd; A: Yazd city of the late nineteenth century, B: Yazd city of 1940s, C: Emamshahr, a ne development related to the recent planning practices, and D: Shahedieh, a combination of new, planned developments and a village in a sprawling area that will be a part of the city in the future.

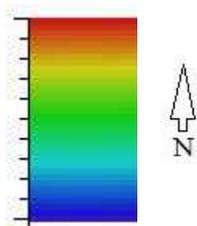


Fig. 7-24: The integration of Shahedieh in sprawling areas of northwestern Yazd.

However that is not the whole story. The integration maps that are generated in this study show that the mobility has been produced especially in the main streets. In other words, the people are going to the main streets to do the daily activities, not the neighborhood centers.

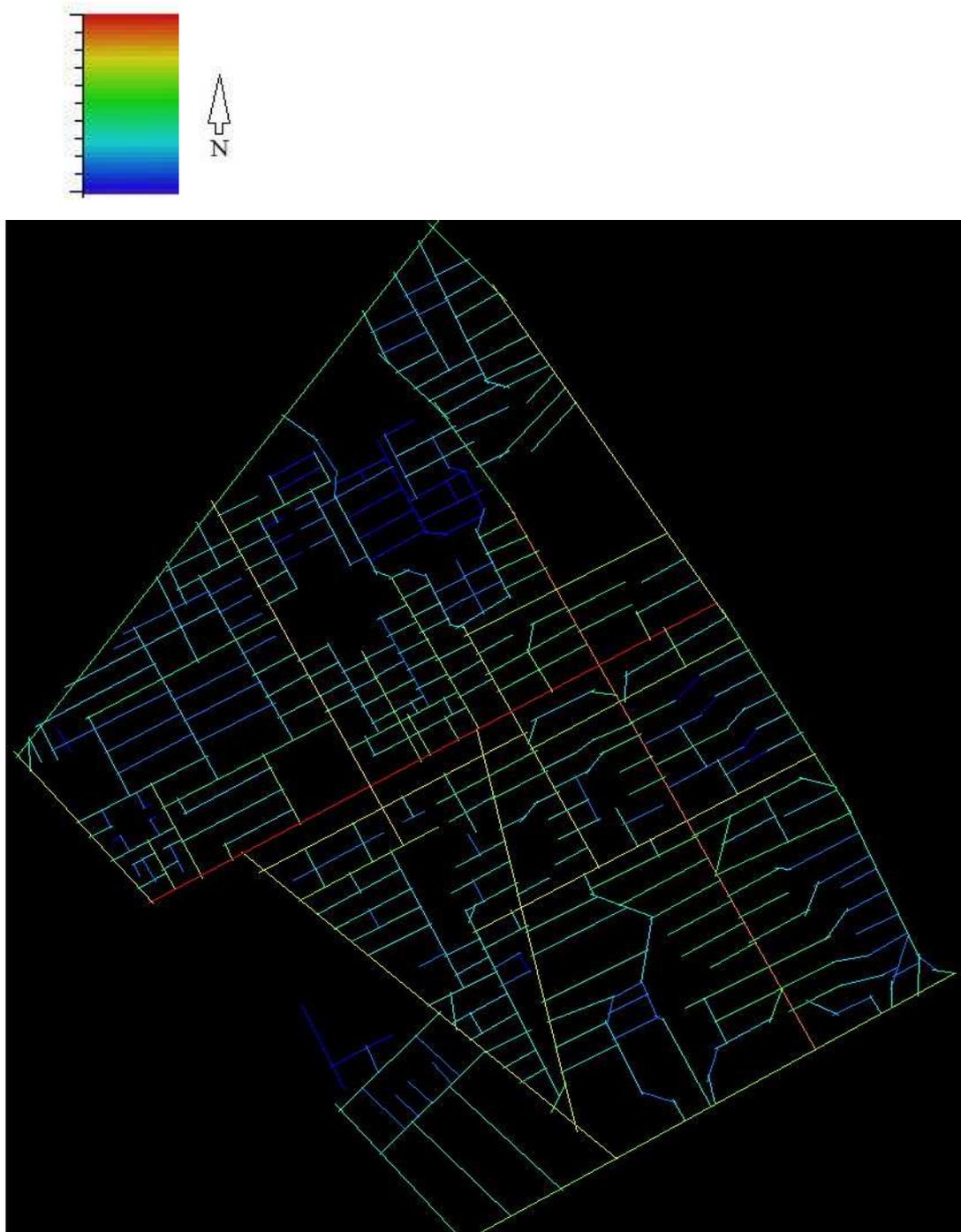


Fig. 7-25: The integration of Emamshahr in west of Yazd.

The main issue that is considerable in this case is the direction of the urban travels. At least from the Space Syntax maps, there is no evidence that the inside-neighborhood travels have been promoted as a result of the street construction. In contrast, the residents are drawn out of the neighborhoods towards the streets. As a consequence there are old, not-so-lively neighborhoods in the back of the newer street edges. When passing from the neighborhood and stepping into the street, it is as if the passenger enters a different world. The environment and the number of the people that are met are extremely different. The neighborhood and the street are from different times. But now it is impossible for the neighborhood residents to live without the streets.

Apart from the better accessibility that is resulted in each part of Yazd by the new network in the recent decades, the sustainable urban form that encouraged people to use the local centers has been weakened. Consequently the importance of the neighborhood centers has been lowered. On the other hand, because there are no attractive local centers that draw people to themselves, people are more attracted to use the main streets and accordingly drive automobiles more. High rate of car use directly leads to high environmental pollution. A great part of the urban pollutions of the Iranian cities is caused by urban transportation. Yazd is not an exception. Of course there are some industrial functions around the city. But controlling the air and sound pollution produced by the cars will have a major effect on the total pollutions of the city.

Of course a high level of accessibility is needed for every city. However as seen in case of Yazd, the accessibility and sustainability do not have positive correlation with each other. After the emergence of automobile, it was tried to create the infrastructure for taking advantage of this new tool. Now after some decades the positive influence of car on the level of accessibility of the city is apparent. But the sustainability of the city has been affected by this new transportation mode. Higher accessibility in newer developments shows how high mobility has received attention by the planners and the governmental authorities. However it seems that the human-oriented concepts have been neglected in the urban planning of cities like Yazd. Implementation of new strategies for promotion of more human oriented planning is

needed to create a balance between the accessibility and the sustainability. Such strategies originate from the interactions of the built environment and urban issues like transportation, environment, and the social human relations.

7-5- The hierarchy of the routes

Like the route network of other traditional cities, the core of Yazd obeys a hierarchy of routes and streets. The most used streets are the main streets of the center of the city, bazaar, and the routes that connect the neighborhood centers. These routes usually are wider than other routes. Less used streets are the secondary routes that are mainly located in the neighborhoods. This type of streets does not have city-level importance, but their function is to connect the main routes to the houses and semi-private spaces. Such streets work like the modern collectors that transfer the traffic of the neighborhoods to the main streets.

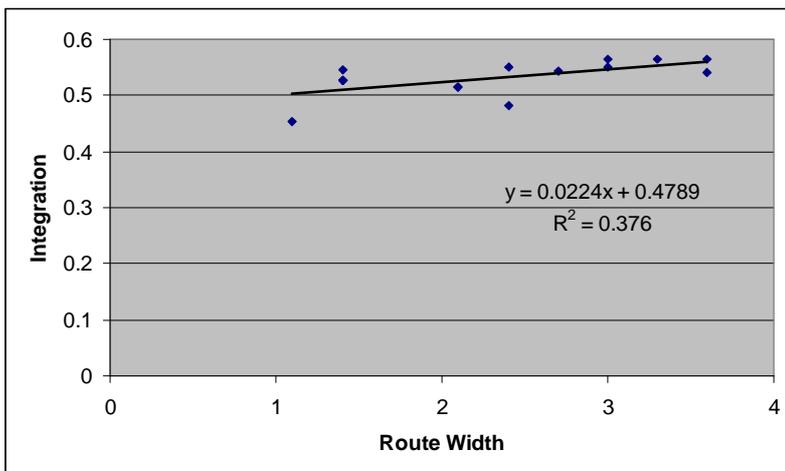


Fig. 7-26: The correlation of route width and integration in Do-Menar neighborhood in historical core of Yazd.

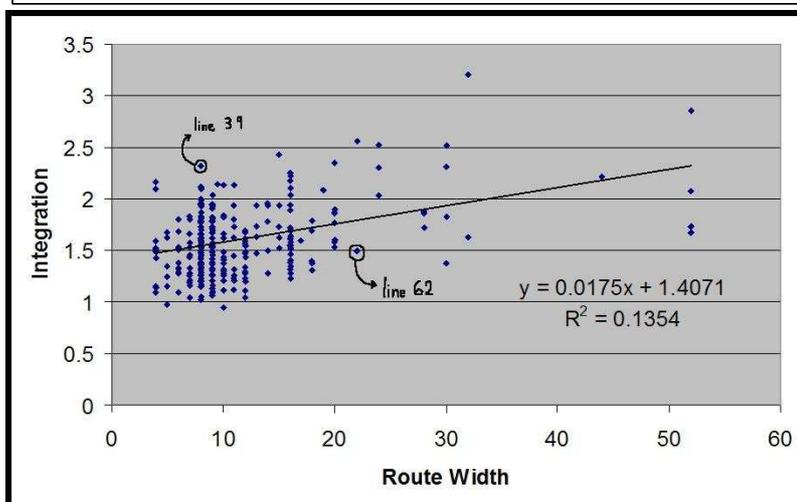


Fig. 7-27: The correlation of route width and integration in Emamshahr new development in the west of Yazd city



Fig. 7-28: Location of two streets in Emamshahr, Yazd; one with high width and low integration (line 62) and the other with low width and high integration (line 39).

The third type that is particularly seen in the traditional textures is the semi-private space. There are notable spaces of this kind in the historical parts of Yazd. There are often one, two, or more doors opening to private spaces in each of these semi-private, dead-end allies.

The traditional routes of Yazd are usually in proportion to their traffic. For example in Fahadan neighborhood unit, the streets and allies are narrow in the depth of the neighborhoods and in the vicinity of the semi-private spaces. At this places the width of the allies are usually between 1.4 meter and 2 meters. As the passenger walks through the routes and gets near the neighborhood center, the streets become wider. At these streets, the widths are from 2 to 2.6 meters. Then comes the streets that are directly oriented to the city center have a width of between 2.6 to 5 meters. The widest widths are observed in the neighborhood center that in some parts reaches 20 meters.

The same is observed in Do-Menar neighborhood (neighborhood unit number 10); as going from the main traditional routes that have more traffic to the depth of the neighborhood, the width of the streets and allied becomes less. Again in this neighborhood unit the width of the main streets vary between 2.4 to 3.6 meters. The width of the secondary routes is between 1.4 and 2.4 meters and the narrow semi-private spaces have a width of 1.1 to 1.4 meter.

This neighborhood unit is a good case for measuring the proportion of the passing traffic with the width of the routes. The question is that are the route width suitable for the passing traffic? The routes of the neighborhood unit are all traditional and no new streets for passing cars have been built in it and also the majority of the routes have not been widened. For having an estimation of the passing traffic, either motorized or non-motorized, we use the result of the Space Syntax analysis of the historical core of the city without the main automobile streets.

The width and integration of 15 routes of Do-Menar were measured. Fig. 7-26 indicates the correlation trend of route width and integration of the neighborhood unit. The R-squared factor can be a good measure for comparison with a new part of the city. This measure is equal to 0.376 for the neighborhood unit and the meaning is that the relation is not complete because it is not 1 or near it, but there is a relative relation between the integration and the width of the streets. The relative result that can be gained is that most of the main streets Do-Menar that have high integration are wider than the allies and streets that less people pass through them.

To have a good comparison between the new and old urban textures, Emamshahr is taken as observation area and the same procedure is undertaken. The number of the axial lines is 360. The widths of the streets were measured and the calculation was done by use of the integration results of the Space Syntax analysis. According to Fig. the R-squared value of 0.1354 was the result. The result shows that in comparison with the traditional routes the width of the new streets of Emamshahr have less relevance to their traffic. There are streets with a width of between 16 and 30 meters that have low integration. For instance, line number 62 has a width of 22 meters and integration of 1.489.

The width of this street is much more than the average width of the whole area that is 10.95 while its integration is less than the average, which is 1.598. On the other hand, as seen in Fig. 7-27, line number 39 with a width of 8 meters has one of the highest integration values. Its value is equal to 2.318, which is well above the average of 1.598.

The comparison of the correlation between the route width and integration of Do-Menar and Emamshahr shows that the correlation factor of the traditional

neighborhood unit (0.376) is higher than the one for a new development in the new parts of Yazd city (0.1354).

The study of the hierarchy of the historical core of Yazd and comparing it with the new development of Emamshahr shows the necessity of revisiting the concept of hierarchy in the new developments. The main problem that is raised is how efficiently the periphery lands are used. As seen in the case of Emamshahr, it is rather common in the new urban planning to see wide streets with low motorized or non-motorized usage. Sometimes very wide new streets are built in the places that do not really need such large routes (like line 62 in Emamshahr). The result is high land consumption in many new developments. Such consumption of the resources leads to an unsustainable way of development for sure. In contrast streets like line 39 can produce traffic congestion. The lesson that is learnt from the core of Yazd is that having a precise estimation of the hierarchy and the traffic needs will lead to better land consumption and traffic flow. The above observation about Yazd does not indicate good balance between the land consumption and the traffic needs, and that does not result in sustainability.

Chapter Eight

8- Kashan

Kashan is one of the oldest settlements of central Iran. The city is located in the northern part of Esfahan Province. So it is located in the south of Tehran and the north of the city of Esfahan. At present about 270000 residents live in the city. So it is considered as one of the biggest cities of Esfahan province after Esfahan city. Geographically, the city is located in the longitude: 51, 27 degrees and latitude: 33, 59 degrees. The climate of the city is hot-arid and semi-desert. The hot-arid winds blow from the northeast, where Dasht-e-Kavir (the central desert of Iran) lies. The winters of Kashan are usually cold and the summers are hot. Like many other cities of the region, Kashan has always had water problem. The scarcity of water has forced people to think of creative ways of finding water. 130 Qanats (underground water canals) have been used around the city, 40 to 50 of which are still working. The previous residents have effectively brought the needed water from the underground water sources of around the city to the city centre. The heights of Zagros Mountains in the west of the city have caused mild climate in the western lands, but the winds of the southeast makes the weather of Kashan unbearable in some months of the year. That is why the mild-weathered settlements around Kashan like Fin and Ghamsar are located near the mountains and heights.



Fig. 8-1. Location of Kashan in Iran.

8-1-Urban growth and boundaries

The location that today is called Kashan has been settled for thousands of years. The oldest point of Kashan is the Sialk Hills (Tepe Sialk) that has been one of the first urban civilizations of Iran. The historical site consists of two main hills that are in 600 meters distance from each other. The clay artworks that have been found in the site are now in Louvre Museum and the Iranian museums. According to Fig. 8-2, the hills are located in the west of the modern city of Kashan. Naji-Abad developments that will be later considered are exactly in the north of the Sialk Hills. The researchers estimate that Sialk civilization has been active since the sixth millennium B.C. to the first millennium B.C.

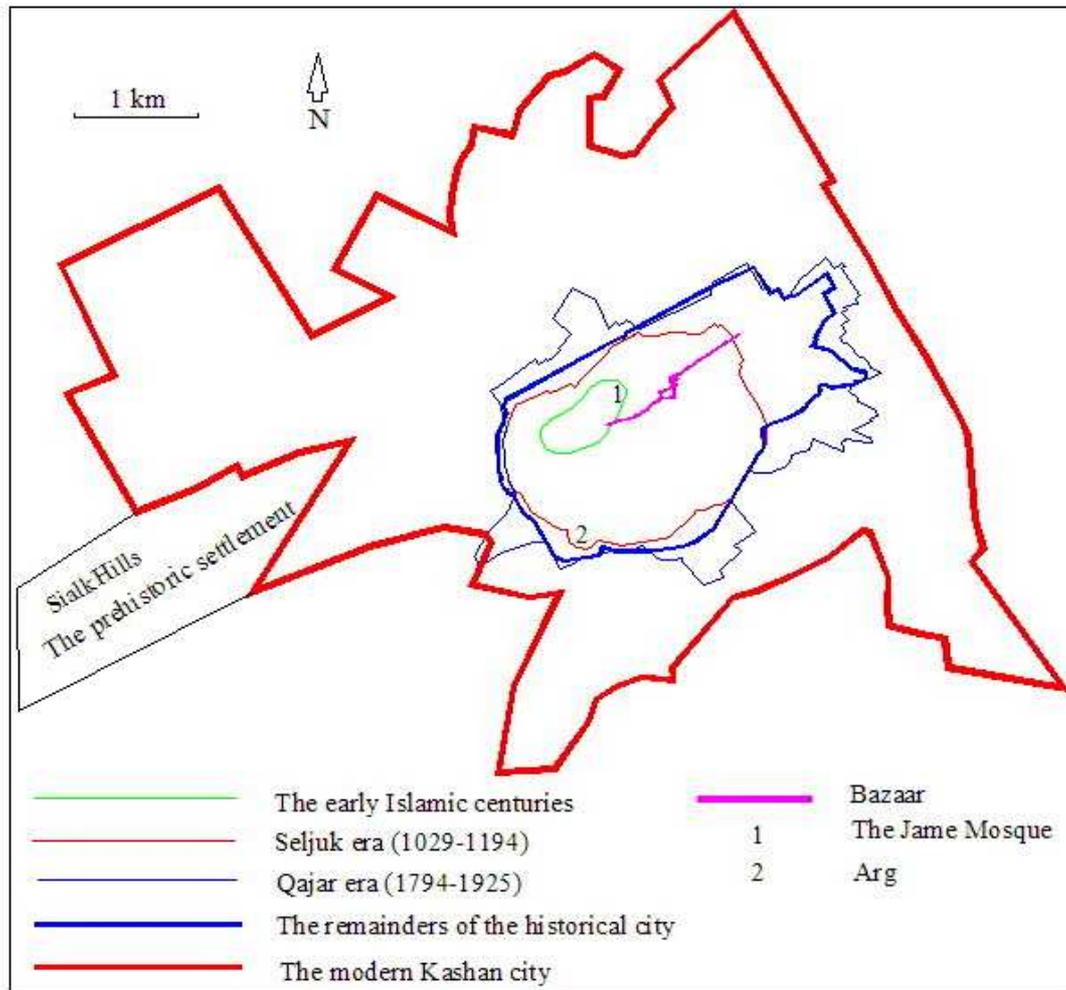


Fig. 8-2: The growth of the city of Kashan through historical periods.

Since that time to the Arab invasion, the region has been settled but the time for settlement of the people exactly in the place that today the city center of Kashan is located has been the first decade after the Arabs captured the central Iran. In other words, the residents of the region settled in the place of the contemporary city center of Kashan and built walls around themselves in the first Islamic centuries. The exact point is thought to be in the northwest of the city center, where now the neighborhood of Taher-o-Mansur is located. The city is estimated to have an area of 24 hectares at this time.

Historical Period	Area (ha)
The Early Islamic Era	24
Seljuk Era (1029-1194)	267.3
Qajar Era (1794-1925)	511
The contemporary dense urban areas	2250
The contemporary city including urban areas and the low-density peripheral areas	4470

Table 8-1: The area of Kashan in different historical eras.

One of the most prominent eras for the development of the city was the Seljuk period 1029–1194. More than half of the historical core of the city that we now know was developed in that time. The area of the city reached 267 hectares. The Arg of the city was built and the defensive wall was constructed to protect the city. A part of both is still remaining. The presence of the Arg in the southwest of the city had caused the richer residents built their houses in that part. So there are still some samples of fabulous courtyard houses with peaces of valuable artworks on the interior of the physical structure. Building such houses continued in the Safavid era that is the most renowned era of the Iranian urbanism during the recent centuries.

Today some excellent courtyard houses in southwest of the core of Kashan are preserved as good Iranian architecture. Boujerdiha and Tabatabayiha houses are two of the examples.

However considering the area of the city through the history, one can observe that the growth of the city up to the Seljuk era has been faster than the centuries between 11th to 19th centuries. The reason can be the natural disasters and the Mongols. Four

great earthquakes have decreased the growth of the city; two in the 11th century and two in the 18th century. As a result the bazaar and the Jame mosque of Kashesna were destructed by the earthquakes and were rebuilt. Also Mongol invasion was a strong obstacle against the development of Kashan. The destruction of the city by the Mongols has been pervasive.



Fig. 8-3: Left: The bazaar of Kashan. Right: Timcheh of Aminodoleh in the east of Bazaar (where the developments are newer), constructed in the last years of nineteenth century. (Timcheh: a roofed part of bazaar, in which new goods were imported by caravans and merchants and wholesalers dealt with retailers). Photographs by the author.



Fig. 8-4: The house of Boroujerdiha; located in the southwest of the core, was constructed in mid nineteenth century. The photograph is taken from the winter rooms towards the summer rooms, which have the unique Badgirs over them. Image by the author.

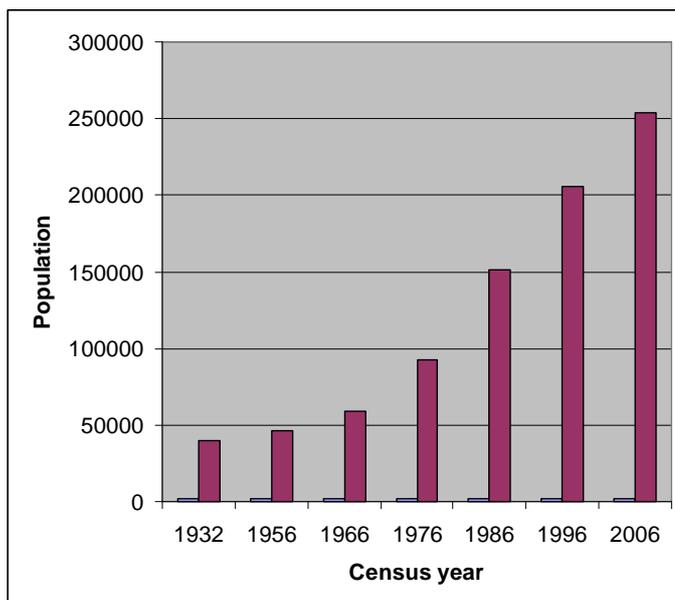
The area of the city in the end of Qajar era (1794-1925) has been 511 hectares. The area that is studied as the historical core in this research is a smaller area of the Qajar city, because many parts of the city have not remained and today can not be called a historical core.



Fig. 8-5: The minaret of the Jameh mosque of Kashan; along with its dome, the mosque is a main landmark of the core. The present mosque was built in 12th century but some evidence have been found that shows it was first constructed in the 7th century. Image: by the author.

The first official census of Kashan's population was conducted in the year 1932. At that time the population of the city was announced to be 40000 people. Since the residents of the city were almost living

within the limitations of the Qajar city, so the population density of the city can be estimated to be 78.2 residents per hectares. The population of the city started to increase as the country faced modernization. According to the censuses of 1956, 1966, 1976, 1986, 1996, and 2006, the population of the city has been 45955, 58468, 92777, 151532, 205886, and 253731 people. An apparent change in the slope of the



population growth of the city is observed in the year 1966.

Fig. 8-6: The population growth of the city of Kashan between 1932 and 2006.

The population of Kashan without the residents of the nearby villages has been estimated to be 253731 people. This population has mainly been accommodated in the urban areas that, according to Table 8-1, have an area of 4470 hectares. Hence the city has had a population growth of 634% and an area growth of 875% in 74 years.

The above calculation is based on the 2250 hectares of dense urban developments and 1170 hectares of low-density developments that previously had been the villages around the city. The latter type of developments is now a part of the official area of the services of the municipality of Kashan and is considered as a part of the city.

Although the urban sprawl of the city is in lower level than that of Yazd, however the development growth during the last decades has been more than the population growth.

It can be concluded from the above consideration that urban sprawl can be seen in the growth pattern of Kashan. Higher level of area growth than the one for the population growth can be a sign of the main characteristic of the sprawling urban settings. The area growth has been 38% more than the population growth, and most of this discrepancy has occurred in the last 3 decades.

Nevertheless the sprawl that occurred in Kashan is different from the one that happened in Yazd. What happened in Kashan is the weaker appearance of the Yazdi urban sprawl. But still the existing mild sprawl is against the sustainability notion and can have negative environmental outcomes.

8-2-Neighborhood organization

Like other historical cities of Iran and according to the Iranian urban planning norms, the core is divided into some major neighborhoods (Barzan), each of them is parted to some neighborhood units. Generally, 7 main neighborhoods and 44 neighborhood units are recognized in the historical core of Kashan. Based on the common method in the Iranian revitalization plans, the core is divided into neighborhoods by the use of the main streets. In other words, the boundaries of the

old neighborhoods are defined by the new streets. The result of such division can be seen in Fig. 8-7 and Table 8-2.

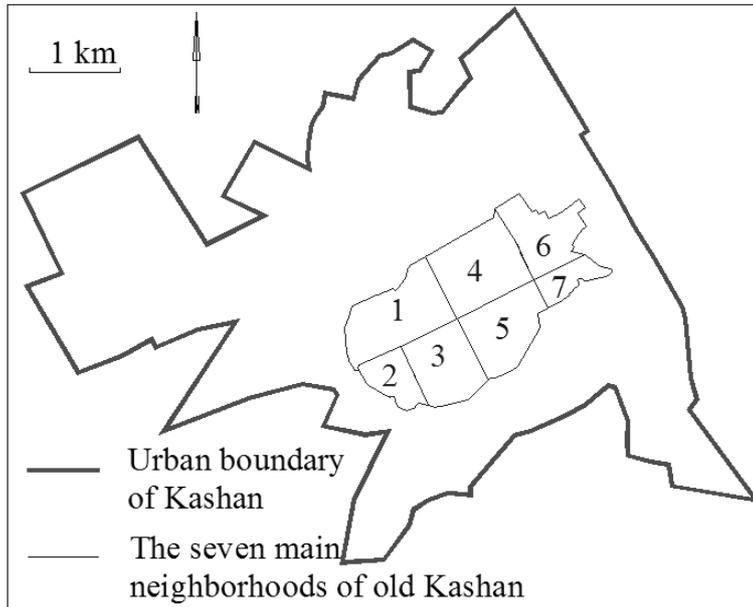


Fig. 8-7: The main neighborhoods of the core of Kashan. This system of identifying the neighborhoods is usually used in revitalization plans.

Each of the main neighborhoods included a few neighborhood units. Of course some of the neighborhood units located on the boundary separating two major neighborhoods, because the separation of the neighborhoods is a new notion and has been just developed according to the new streets, but the neighborhood units were the place that the residents knew as their living realm.

No. In Fig. 8-7	Neighborhood Name	Area (Hectares)
1	Taher-o-Mansur	77.8
2	Soltan-Mir-Ahmad	29.1
3	Darb-Esfahan	57.2
4	Bazaar	76.2
5	Mohtasham	61
6	Posht-Mashhad-e-Bala	51.6
7	Posht-Mashhad-e-Paein	22.2
	Sum	375.1

Table 8-2: The main neighborhoods of Kashan and their areas.

A central idea of the neighborhood units of Kashan is gotten from the research done by Tarh-o-Manzar consulting engineers about the revitalization of the core of Kashan (Tarh-o-Manzar, 2003) and then the main idea was developed more and the areas of the units were calculated. Table 8-3 and Fig. 8-8 show the 44 neighborhood units of the old city. The area of the neighborhood units are different and range between 1.8 hectares to 24.4 hectares. The smallest one is Arabha neighborhood unit (Neighborhood unit 39 in east of the city). The largest neighborhood unit has been Soltan-Mir-Ahmad, which is indicated by number 15 in Fig. 8-8. Soltan-Mir-Ahmad was located in southwest of the city and attached to the city castle (Arg). A part of the unit was taken by Arg so this part did not have a residential function. There are still the remainders of the defensive wall of the city in this neighborhood and around the Arg and also in the next door neighborhood unit called Serefereh and Sadreh. The wall dates back to Seljuk era (1029-1194). The second large unit was Meidan-e-Amir neighborhood that has the number 36 and was in the northeast of the city.

Although the minorities, like the religious minorities or immigrants of out of the city had the possibility to live closely with the majority of Moslem native people, but there were neighborhood units that were accommodated by some of these minorities. These units were named according to the reason of their differentiation. For example Arabha unit was especially settled by an Arab minority, or Kalimiha (number 24) was accommodated by a Jewish group, and a group of Turkic immigrants lived in Tork-Abad (number 11).

It seems that along with the growth of the city to northeast, the neighborhoods of that part of the city are newer. Even now by considering the neighborhoods of the city, it becomes apparent that the western neighborhood units are older and more prominent. There are also more historical elements like old buildings and routes in the western parts. Most of the historical houses that have been bought from the owners, renovated and reopened as museum and precious heritage are located in Soltan-Mir-Ahmad and Darb-Esfahan neighborhoods (no. 3 and 4 in Fig. 8-8).

The bazaar of the city is located in neighborhood units number 9 and 23 called Panakhl and Bazaar. The bazaar has developed from west to east as the city developed to east, and as time passed by it became the center of the social activities

of the people in newer neighborhoods. Each neighborhood embraces a few neighborhood units.

Neighborhood Name	Unit Area (Hectares)	No. in Fig. 8-8
Baba-Vali	7.3	1
Golchaghan	3.2	2
Vali-Soltan	9.3	3
Taher-o-Mansur	4.6	4
Darb-Bagh	6.4	5
Meidan-e-Kohneh	10	6
Malek-Abad	5.8	7
Darvazeh-Fin	14.7	8
Panakhl	3.7	9
Garijeh	11.2	10
Tork-Abad	4.8	11
Ghasem-Beig	3.8	12
Surijan	6.3	13

Neighborhood Unit Name	Area (Hectares)	No. in Fig. 8-8
Pamenar	8.2	14
Soltan-Mir-Ahmad	24.4	15
Kushk-e-Safi	4.1	16
Taghi-Khan	4.7	17
Mirza-Moghim-Vazir	17.1	18
Serefereh and Sadreh	13.2	19
Panjeh-Shah	16.5	20
Haj-Jamal	11.6	21
Zavieh	3.1	22
Bazaar	13.9	23
Kalimiha	14.1	24
Darb-Zanjir	3.3	25
Kalhor	7.8	26

Area (Hectares)	No. in Fig. 8-8
9.1	27
11.2	28
4.1	29
4.1	30
4.9	31
2.9	32
4.3	33
2.9	34
6.9	35
23	36
4.8	37
3.2	38
1.8	39

Neighborhood Unit Name	Neighborhood Unit
Paghapan	
Sarpelleh	
Mohtasham	
Posht-Emarat	
Darb-e-Yalan	
Si-Ghand	
Sar-Sang	
Papak	
Chel-Dokhtaran	
Meidan-e-Amir	
Kolangeh	
Darvazeh-Ghadir	
Arabha	

Neighborhood Unit Name	Area (Hectares)	No. in Fig. 8-8
Gozar	6.8	40
Baghcheh-Shahi	9.3	41
Darb-Howz	6.3	42
Meidangah-e-Agha	13	43
Emarat	5.2	44

Table 8-3: The neighborhood units of the historical core of Kashan and their areas.

The neighborhood units have all of the characteristics that were explained in chapter 4 about the neighborhoods. They include a group of families that know each other and live in a near distance from each other. If we have a closer look to a part of the neighborhood unit, for instance a semi-private space like a dead-end alley, we observe that the neighbors of such spaces have close relationships and social interactions with each other. So each of the neighborhood units can be divided into smaller parts, in which the people have closer relations with each other.

The basis of each neighborhood unit is a route. The name of the neighborhood unit is often gotten from the name of the main route. The main elements of the neighborhood units like Ab Anbar, mosque, Hosseinieh, and so on usually have the same name that defines to which unit they belong.

To consider the characteristics of the neighborhood units of Kashan, three of them are briefly considered here.

The first neighborhood that is observed is called Darb-e-Yalan (no. 31). The basis of the unit is Darb-e-Yalan Route, which is showed in Fig. 8-9. Two centers are defined for the unit. The first one is a social center that consists of Darb-e-Yalan

Mosque that had the social centrality of the unit. The second center included the shops that were located in the geometric center of the unit, where other routes joined the place and every one could easily reach them.

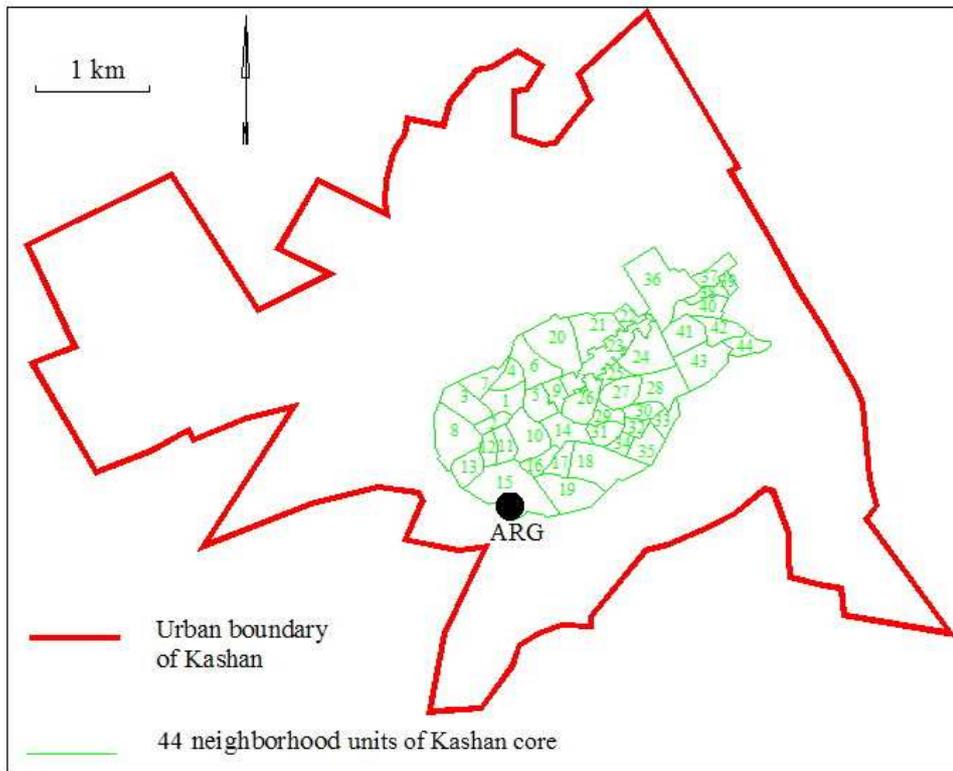


Fig. 8-8: The old neighborhood units of Kashan and its modern urban boundaries.

Such places were used by the residents to meet each other and socialize with each other. The longest way from one of the houses to the shops was 180 meters. The longest way to the mosque was 280 meters. Of course the residents of the southern house could use the mosque of Papak neighborhood unit (no. 34), which was quite near. The area of the unit is 4.9 hectares and contains more than 100 houses.

The other two units are attached together so that the inter-relations could be shown. Kushk-e-Safi (no. 16) and Taghi-Khan (no.17) are the two neighboring units that both are located in the major neighborhood of Darb-Esfahan.

The first one, which lays in the east, has an area of 4.1 hectares and the second one is as small as 4.7 hectares. As can be seen in Fig. 8-10, the buildings of each unit are

arrayed around a center. In Kush-e-Safi, the main route has the same name and has a southeast-northwest direction.

The center of this unit contains an Ab Anbar and some small shops exactly in the center of the unit where the main route has an intersection with a secondary route. Every resident of the unit had easy access to the center. The distance from the farthest house of the unit to the center was 325 meters. There are 80 to 90 houses in the unit. The eastern unit is shaped around the southeast-northwest oriented Taghi-Khan Route. There is a 180-meters distance from the farthest house to the center, which contains some shops. The center is located in almost the geometric center of the unit, where two secondary routes join it. There are more than 100 houses in the unit.

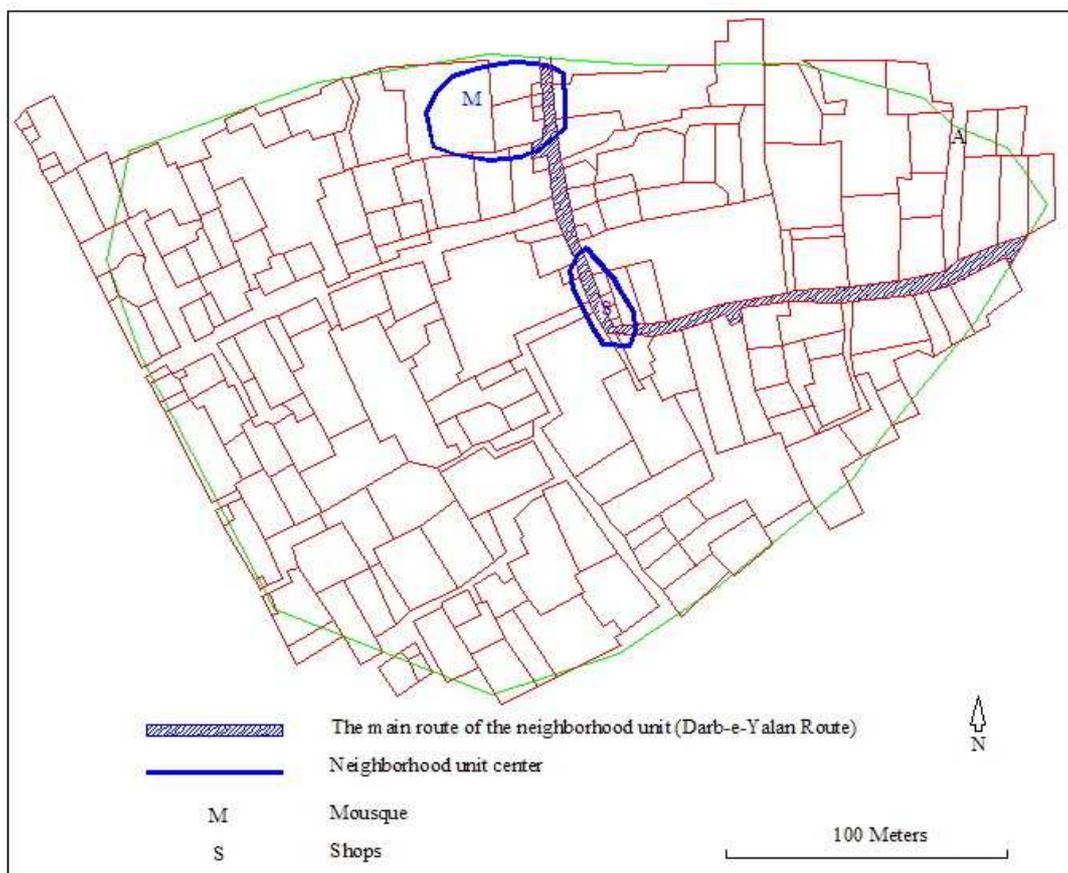


Fig. 8-9: Illustration of urban texture of Darb-e-Yalan neighborhood unit and its centers. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. (2003)

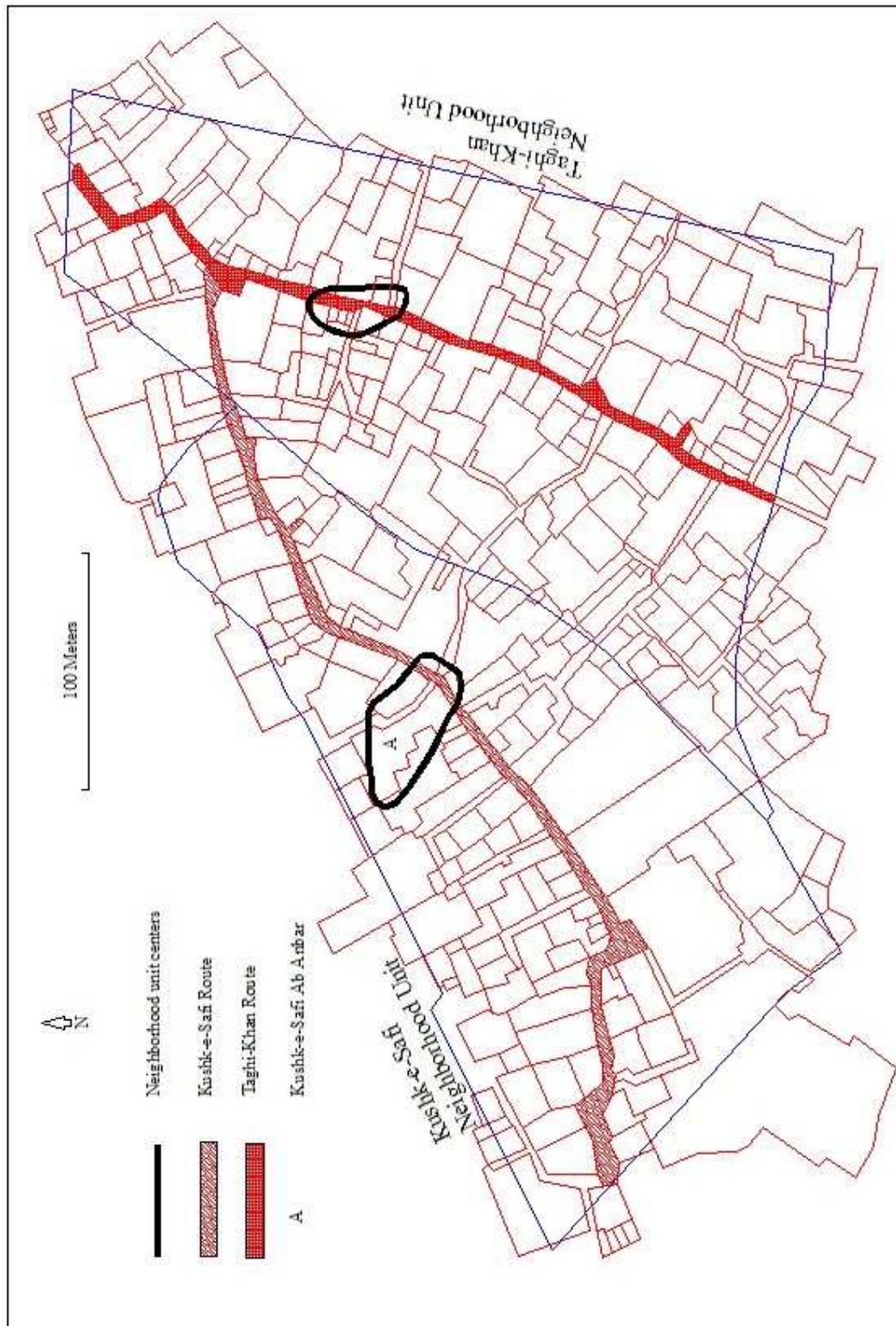


Fig. 8-10: Illustration of the urban texture of Kushk-e-Safi and Taghi-Khan neighborhood units. map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. (2003).

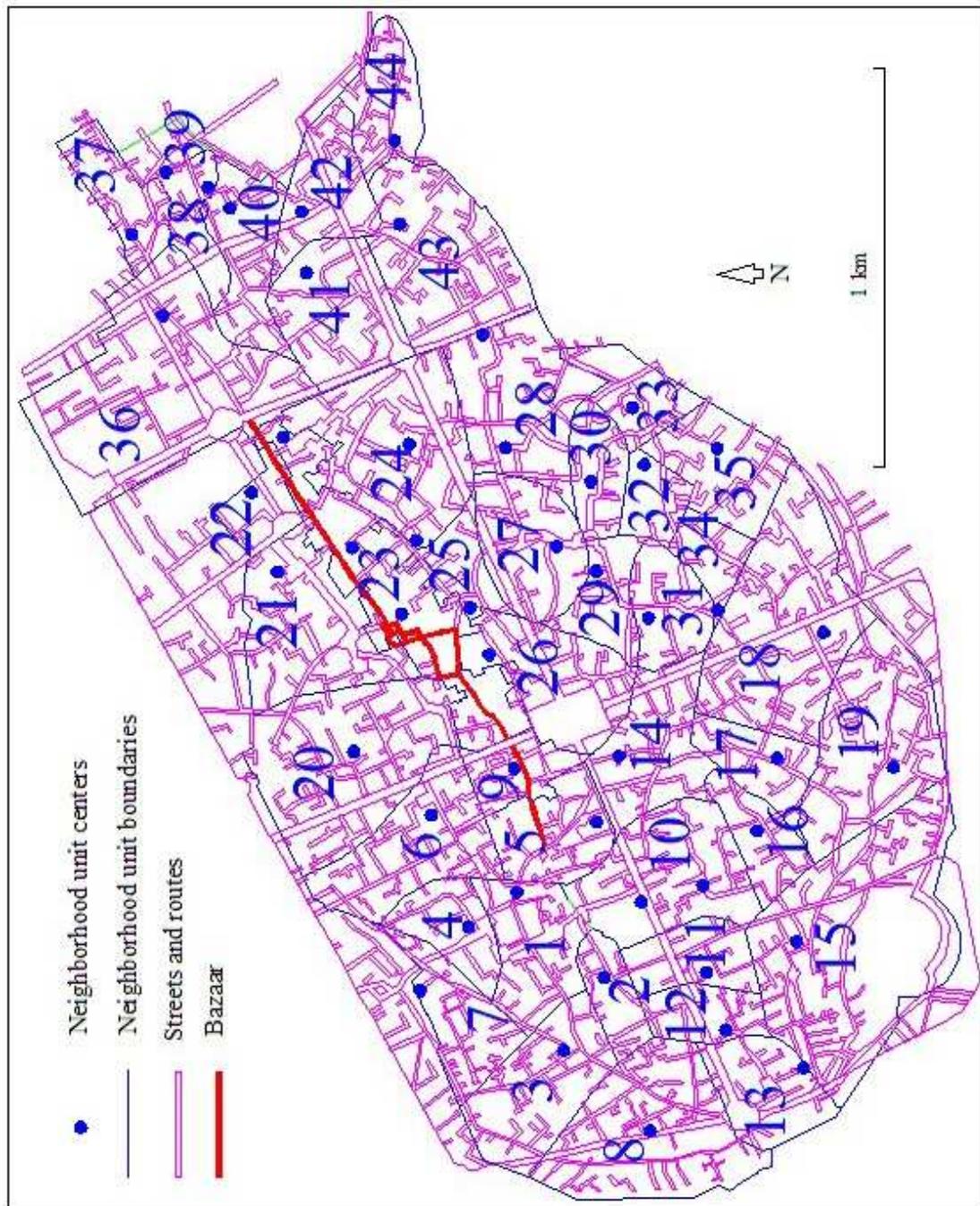


Fig. 8-11: The Neighborhood unit centers of old Kashan. Reproduced by the author from the base map of the streets of Kashan by Iranshenasi publishing co.

Drawing boundaries around a group of houses necessarily did not mean that the people would not use the amenities of the other units. For example, about the two

neighboring units of Kush-e-Safi and Taghi-Khan, the residents of each unit had accessibility to each other's centers.

The farthest house in the eastern part of Kushk-e-Safi had a distance of 630 meters from the center of Taghi-Khan. In the meantime, the distance between the two centers was 300 meters. Similarly it is easy to find at least one center of activities for each neighborhood unit. The centers necessarily do not have all of the amenities like Ab Anbar, mosque, shops, socializing spaces, Hosseinieh, and Tekkieh. But in each neighborhood unit one or more of these facilities were built. Fig. 8-11 shows the location of all of the neighborhood units of the old city.

The consideration of the neighborhoods and the neighborhood units of Kashan gives good understanding of how small communities were shaped by limited number of households. Of course not all of the neighborhood units had all the amenities and facilities. But units were located so close to each other that it was actually not necessary for them to have all the facilities.

Another aspect of sustainable urbanism that is apparent in Kashan is the walking distances in the neighborhood units. The distances that are shown in this section are comparable to the lengths that are mentioned by the western researchers as the walkable distance of the traditional cities of their cultures. This is not surprising, because the mobility issues have indirectly affected the organic urban form in all cultures. It has been important for the residents of such communities to easily reach one of the public - but not semi-public or semi-private - hubs of the city. Therefore walkable distances of the core of Kashan are not different from the ones in southern Europe or northern Africa.

The numbers that are found in this study such as walking distances, unit areas, and the number of houses per neighborhood unit show how human-scaled the units have been. The number of houses especially confirms the study of previous Iranian researchers that had estimated that each unit has had an average of 100 to 300 buildings. The small units that were studied have had about 100 houses, so it is natural for the larger ones like Meidan-e-Amir (no. 36) with 23 hectares and Mirza-Moghim-Vazir with 17.1 hectares (no. 18) to have 200 to 300 houses.

8-3-The typology of the urban developments

The development patterns of the city can be divided into four main types. The mentioned types are classified according to the historical era and the morphology of the developments. The categorized development types can be seen on the Google map of the city in Fig. 8-12 where the approximate boundaries of the growth of the city during the past decades are indicated.

The first type is seen in the historical core. The buildings of this part are densely attached together. Most of the houses are old and one story. The dominant type of the houses has been court-yard pattern, which is being replaced by the new forms as the houses are reconstructed through time. The Badgirs are seen in the skyline of the city, but the number of them is not as much as in Yazd. Regardless of the developments of the recent two or three decades, the historical core is located in the center of the city the developments of the later eras are laid around it. The curved routes of the core make the central spaces seem unreachable for the strangers. This is the defensive nature of such textures. Although the streets have changed the old organization of the neighborhoods, but the life still continues in the old parts and the bazaar and its surrounding spaces are very busy and livable. The core is the commercial center of the city and the region. The neighborhood of Bazaar (no. 4 in Fig. 8-7) plays the role of the Central Business District of the city and a number of the governmental organizations, banks branches, and private companies are located there. This major neighborhood has not lost importance after the industrialization of the post-World-War era. The local industries have been weakened, but the activities of the neighborhood have not been faded. Three samples of the urban textures of such neighborhoods are shown in figures 8-14, 8-15, and 8-16. The location of the related neighborhood units are shown in figures 8-12 and 8-13.

The second pattern that is observed in the texture of Kashan is related to the areas developed after 1950s to 1980. An example of such developments is shown in Fig. 8-14. The location of this part of the city is indicated by no. 2 in Fig. 8-12. The urban developments of this era have lower density than the city core. The streets are more suitable for driving while they are wider and have fewer curves. Nonetheless

the structure of the streets is still not based on a complete grid-iron network. The houses are arrayed in urban blocks that do not have symmetrical shape. However the buildings are located more regularly than the organic placement. Hence the resulted public spaces are straighter.

The courtyard houses are not seen in this new order of the houses. The dead-end allies are still seen frequently are a major part of the urban spaces.

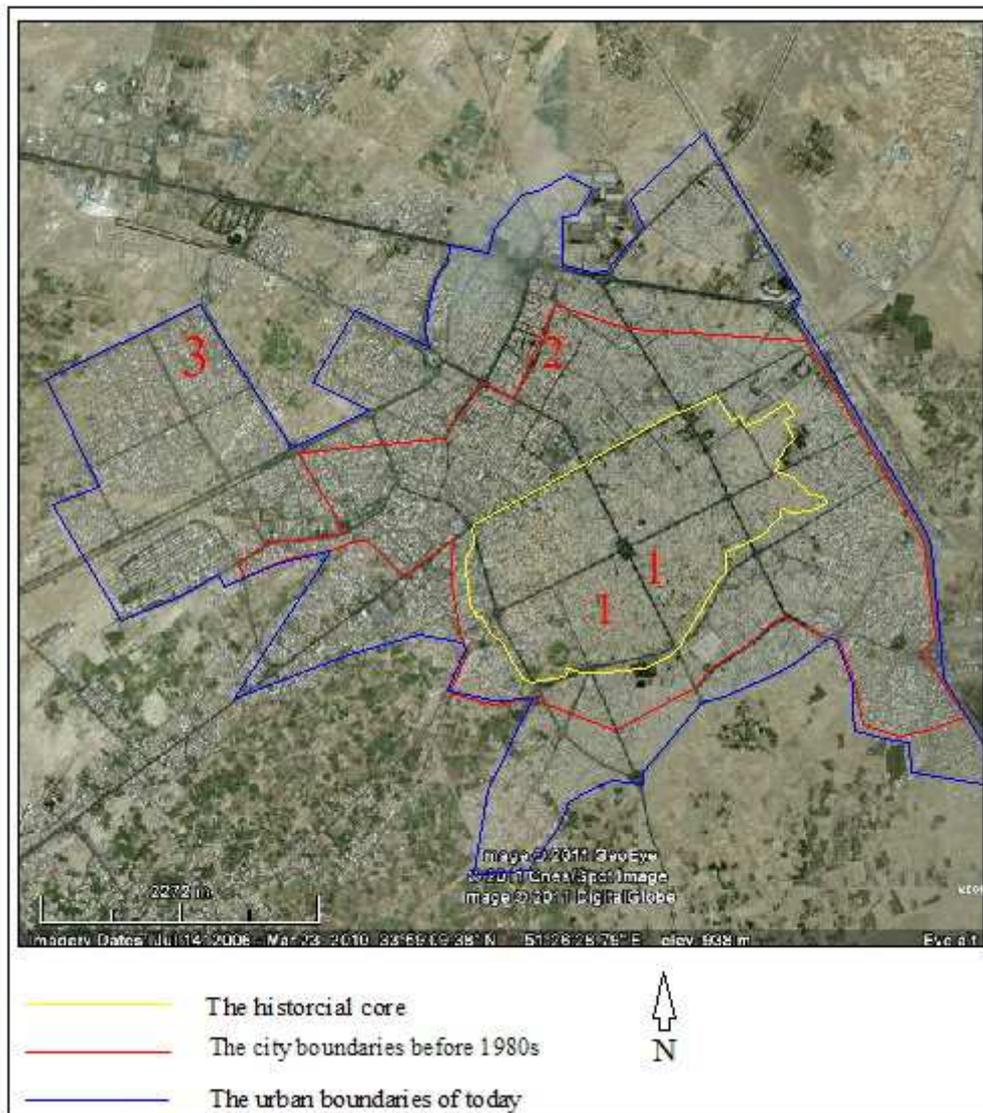


Fig. 8-12: The typology of urban developments in different time periods.

The most recent type of the urban pattern is seen around the particularly in the newly developed area called Naji-Abad. Such parts are developed after 1980. Some of the

streets of this type of development are slightly curved but still suitable for automobiles. However the streets of Naji-Abad are mostly ordered in a grid-iron pattern. In newer textures like Naji-Abad, not all of the lots are built, so some leapfrog are seen in the development. Fig. 8-15, which is located in place of no. 3 in Fig. 8-12 shows the development pattern of northern Naji-Abad. In this figure, the lots that have not been built so far are observable. As the largest example of the new parts of the city, Naji-Abad is constructed in the west of the city and has a limited connection with the main body of the city. This region provides with the utmost suitability for automobile driving with its quite straight streets.

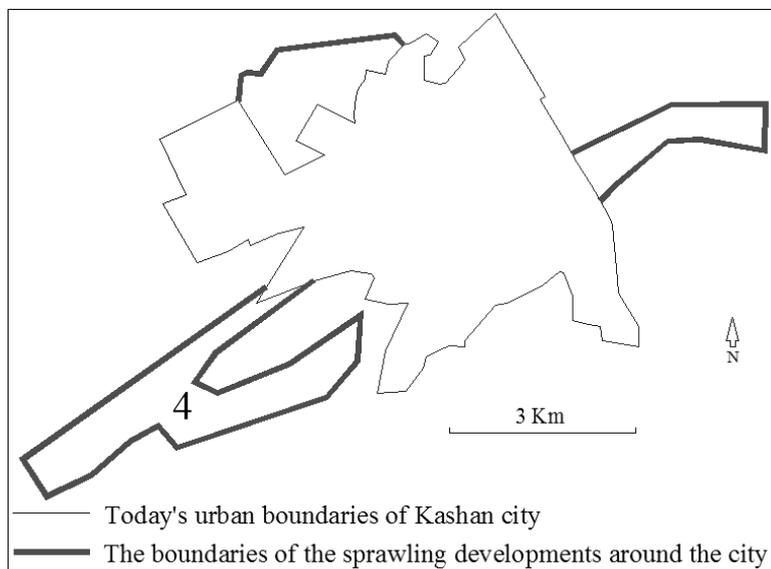


Fig. 8-13: The sprawling developments around the city boundaries.

The fourth type the development of the city is seen in the suburbs, where has previously been villages. These settlements are officially a part of the city. The houses of these parts are placed around the curved or straight countryside roads. The construction density is low and the houses are located between the private gardens. Fig. 8-16 shows an example of such villages in the southwest of the city, where is signed by no. 4 in Fig. 8-13. The gardens are not presented in this layout and only the buildings and the small yards are drawn.

The sprawling parts are found in the northern, southwestern and eastern parts. Most of the villages are located in the south and southwest of the city. Lathar, Hasan-Abad, Safi-Abad, and Yahya-Abad are some of them.

Also Fin-e-Bozorg and Fin-e-Kuchak are two large and historical villages that include some small villages. Fig. 8-16 is the indication of the central part of Fin-e-Bozorg. This village has 5.2 kilometer distance to the city center and 2 kilometer distance from the nearest boundary of the dense parts of the city. The sprawl direction of the city is directed towards the historical Fin Garden, which is an icon of the Iranian designed gardens in the southwest of the city. This region is located in 7.5 kilometer distance from the city center.

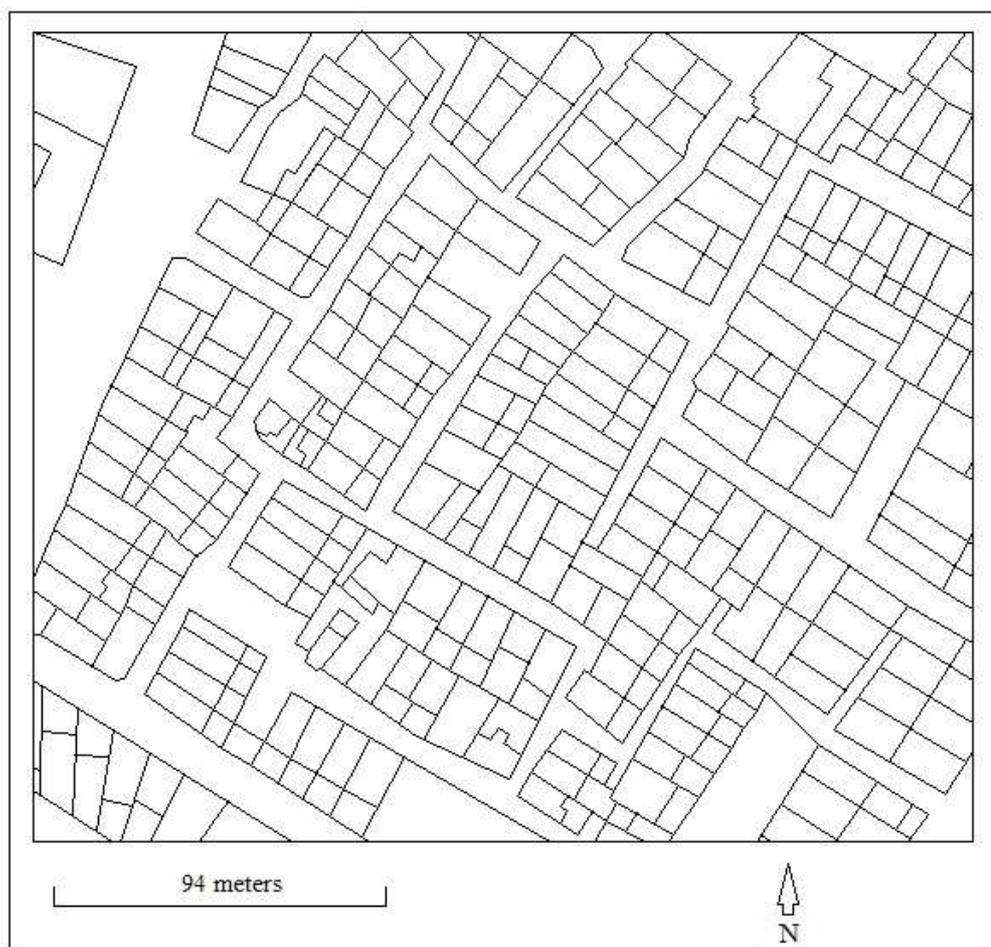


Fig. 8-14: A sample of urban textures of before 1980 indicated by “2” in Fig. 8-12. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. (2003)

What the morphological study of the urban patterns of Kashan’s different eras shows is another aspect of urban sprawl. As getting far from the city center, the dispersed settings are seen more.

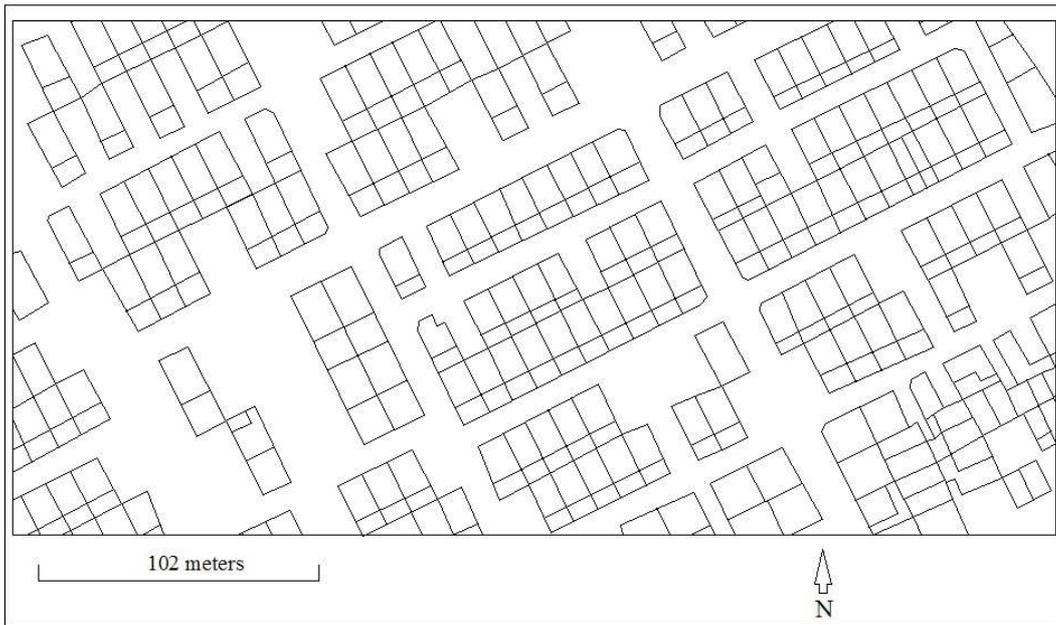


Fig. 8-15: A sample of urban textures of today's Kashan indicated by "3" in Fig. 8-12. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co.(2003)

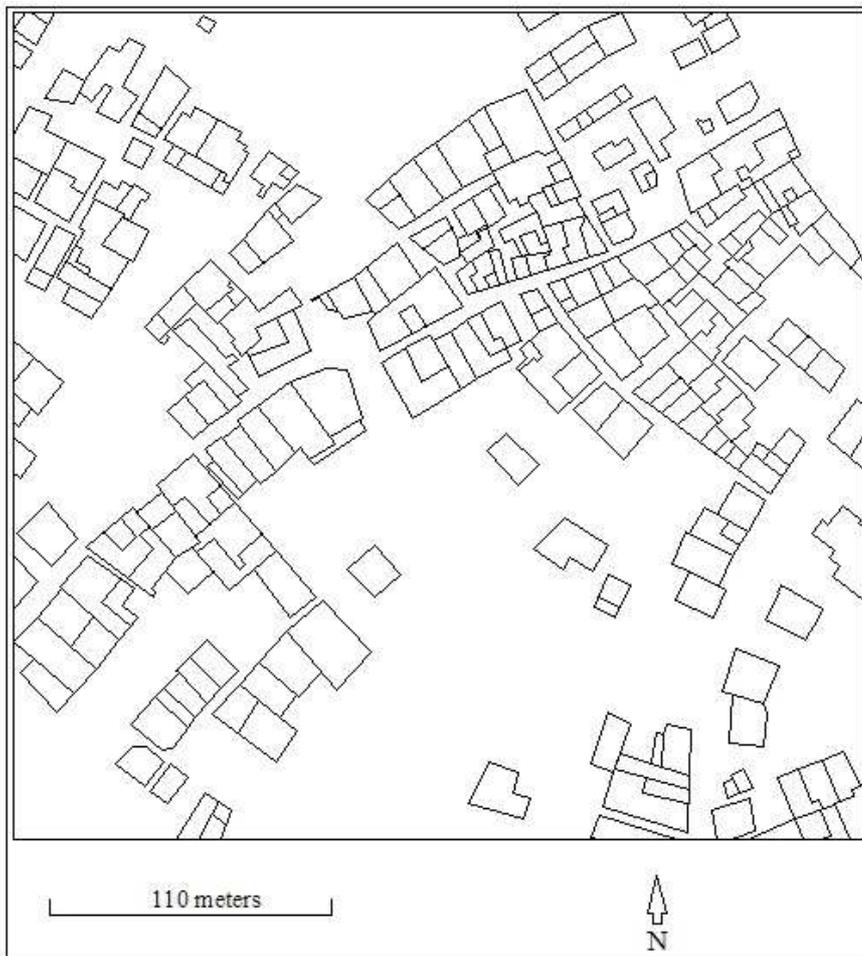


Fig. 8-16: A sample of urban textures of sprawling developments of Kashan indicated by "3" in Fig. 8-13. Map adopted and developed by the author from one of the maps of Tarh-o-Manzar Consulting Engineers Co. (2003)

Leapfrog development that is one of the urban sprawl specifications is obviously seen in the developments of after 1980 and also the villages that are today very near to the city. The study shows that as time goes by, the sprawl effect lays stronger influences on the fabric of the city. The rise in the production of automobile has caused higher car ownership. Also urban policies such as land and housing policies have intensified the sprawl problem. Today it looks usual for Kashanis to get on the car (but not bus) and drive to the southeastern mild-weathered points like Fin.

8-4-Accessibility

The accessibility of the historical part of Kashan can be measured in two levels; the neighborhood unit and the city. The accessibility of the neighborhood units is the availability of amenities for the residents of each unit. In other words, it is the accessibility of people to the neighborhood unit center. On the other hand, the city-level accessibility that is studied here is how people accessed every other part of the city.

As discussed about three neighborhood units of Kashan, the unit centers could consist of all of some of the living and social amenities. The people of each neighborhood unit could provide the needed living materials within their unit or from the next door centers. Due to the small area of the units, the distance between the centers was quite short. So people could raise the needs that they could not provide from their own unit center.

Table 8-4 shows the distance from the farthest house of each neighborhood center to the unit center. The organic structure of the units was so that the public facilities were located in walking distances. The maximum distance between the living places and the unit centers is related to Meidan-e-Amir (no. 36) in the east of the study area. The distance from the center for this unit is 808 meters. With an area of 23 hectares, this unit is one of the largest units of the old city. The nearest distance to center is for Taghi-Khan, which was considered before. This unit is one of the small ones. Therefore the distance to its center is only 180 meters.

The walking distance between the farthest house to the center	No. in Fig. 8-8
444	27
300	28
281	29
594	30
280	31
362	32
314	33
357	34
825	35
808	36
484	37
255	38
238	39

Neighborhood Unit Name	The walking distance between the farthest house to the center	No. in Fig. 8-8
Pamenar	552	14
Soltan-Mir-Ahmad	705	15
Kushk-e-Safi	325	16
Taghi-Khan	180	17
Mirza-Moghim-Vazir	663	18
Serefereh and Sadreh	440	19
Panjeh-Shah	430	20
Haj-Jamal	768	21
Zavieh	228	22
Bazaar	396	23
Kalimiha	418	24
Darb-Zanjir	358	25
Kalhor	521	26

Neighborhood Unit Name	The walking distance between the farthest house to the center	No. in Fig. 8-8
Baba-Vali	532	1
Golchaghan	383	2
Vali-Soltan	649	3
Taher-o-Mansur	323	4
Darb-Bagh	375	5
Meidan-e-Kohneh	665	6
Malek-Abad	480	7
Darvazeh-Fin	655	8
Panakhl	261	9
Garijeh	629	10
Tork-Abad	365	11
Ghasem-Beig	360	12
Surijan	319	13

Neighborhood Unit Name	Unit
Paghapan	
Sarpelleh	
Mohtasham	
Posht-Emarat	
Darb-e-Yalan	
Si-Ghand	
Sar-Sang	
Papak	
Chel-Dokhtaran	
Meidan-e-Amir	
Kolangeh	
Darvazeh-Ghadir	
Arabha	

Neighborhood Unit Name	The walking distance between the farthest house to the center	No. in Fig. 8-8
Gozar	579	40
Baghcheh-Shahi	378	41
Darb-Howz	491	42
Meidangah-e-Agha	762	43
Emarat	481	44

Table 8-4: The distance between the farthest house of the neighborhood units of Kashan and their centers.

The second type of accessibility that is measured in this research is accessibility to any part of the city from one point. In order to measure this type of accessibility, SS theory is applied. In case of Yazd (chapter 7) Depthmap was used. For considering the accessibility of Kashan, WebMapatHome, which is also a software developed by UCL is applied.

A primary goal for using Space Syntax is to show how the automobile streets affected the organic texture of Kashan. So the axial maps of the core of the city with all the new streets were drawn in Auto Cad and the DXF file were exported to the environment of WebMapatHome. The core consisted of 1794 axial lines. Then the same map was used, but this time the main automobile streets and roundabouts were omitted and it was tried to rebuild the organization of the late-nineteenth century of the city. The second map was built of 1728 lines. Five indicators of the Space Syntax theory including integration, connectivity, mean depth, total depth, and RA were measured for each of the maps.

Fig. 8-17 shows the axial maps and the areas and neighborhood units that are to be studied. The results of the analysis of the integration of the city show that the mean integration of the whole city was increased after the streets were built through the neighborhoods. The same happened to the connectivity. The mean depth and the total depth were lowered in the latter city of Kashan. Figures 8-18, 8-19, 8-20, and 8-21 show the differences in integration, connectivity and mean depth of the city after construction of the new streets. Like the indication of the results of the Space Syntax analysis of Yazd, the warmer the colors of the line are, the higher the values of their Space Syntax are. So the higher values are related to the red colors and then come the orange, yellow, green, light blue, and dark blue.

The mean values for the five indicators of the core of the city before and after the construction of the streets can be seen in Table 8-5. The integration of the city was obviously increased after the streets were built and the connectivity was promoted slightly. The physical meaning of the integration and connectivity result of the Space Syntax analysis is that the mobility through the city streets became easier. The mobility includes both motorized and non-motorized movement. People could easily access the narrow allies of the city center. Also this analysis shows that the mobility has become more after the streets were built.

In the meantime, the depth of most of the places of the city became less. Therefore the houses that were previously located in the depth of the city became accessible from all of the points in or out of the city. It seems natural because the security like centuries ago was not necessary anymore. As stated before, the curved, narrow streets with elements like arcs in some places were used to stop the attacking powers.

A passenger who entered the city gained the possibility to reach the depth of the texture via the new streets. Nevertheless these conclusions are all derived in the scale of city. When each part of the city like the neighborhood units, the bazaar of other parts are considered partially, sometimes different results are gotten.

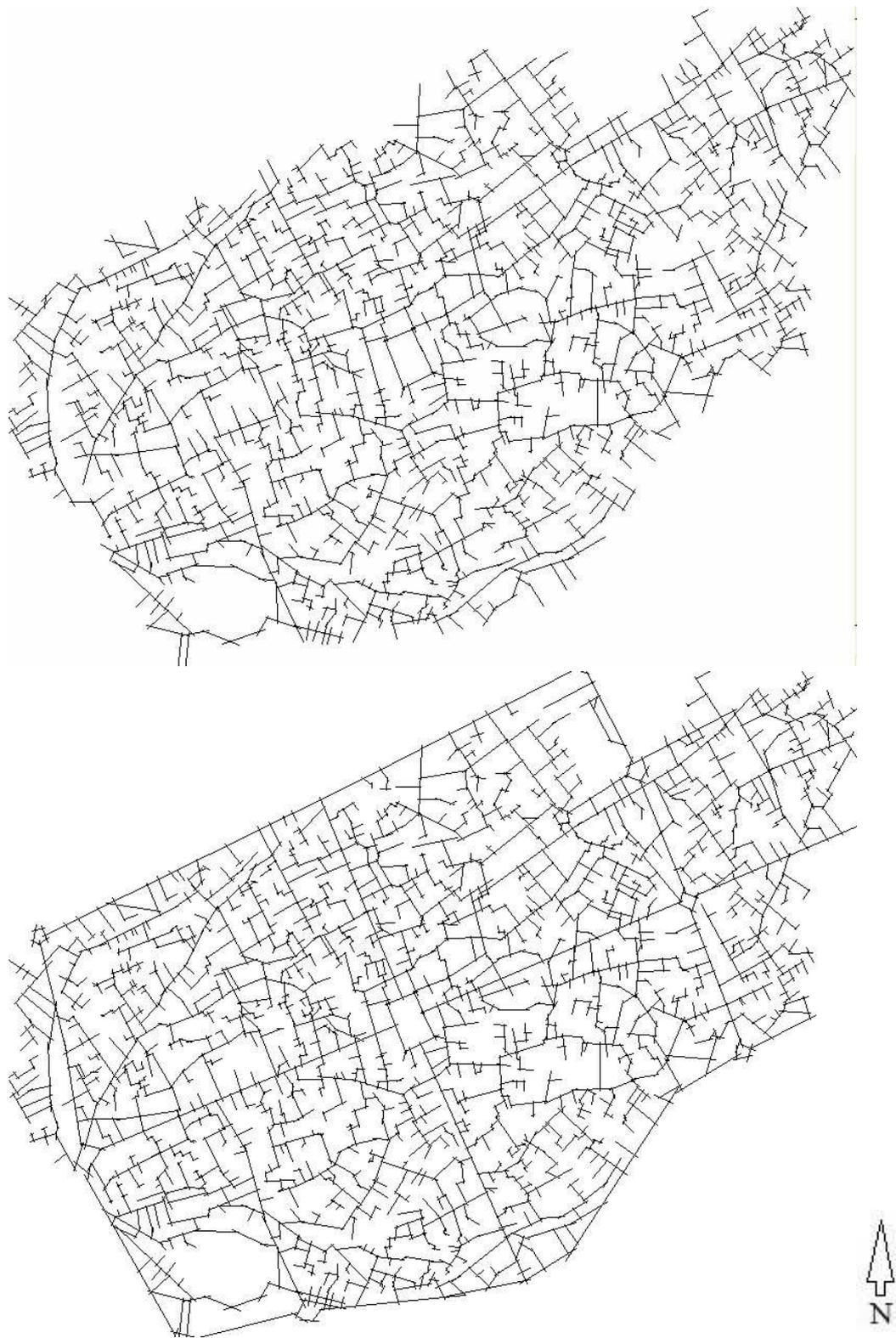


Fig. 8-17: The axial maps of the city before and after the construction of the new streets.

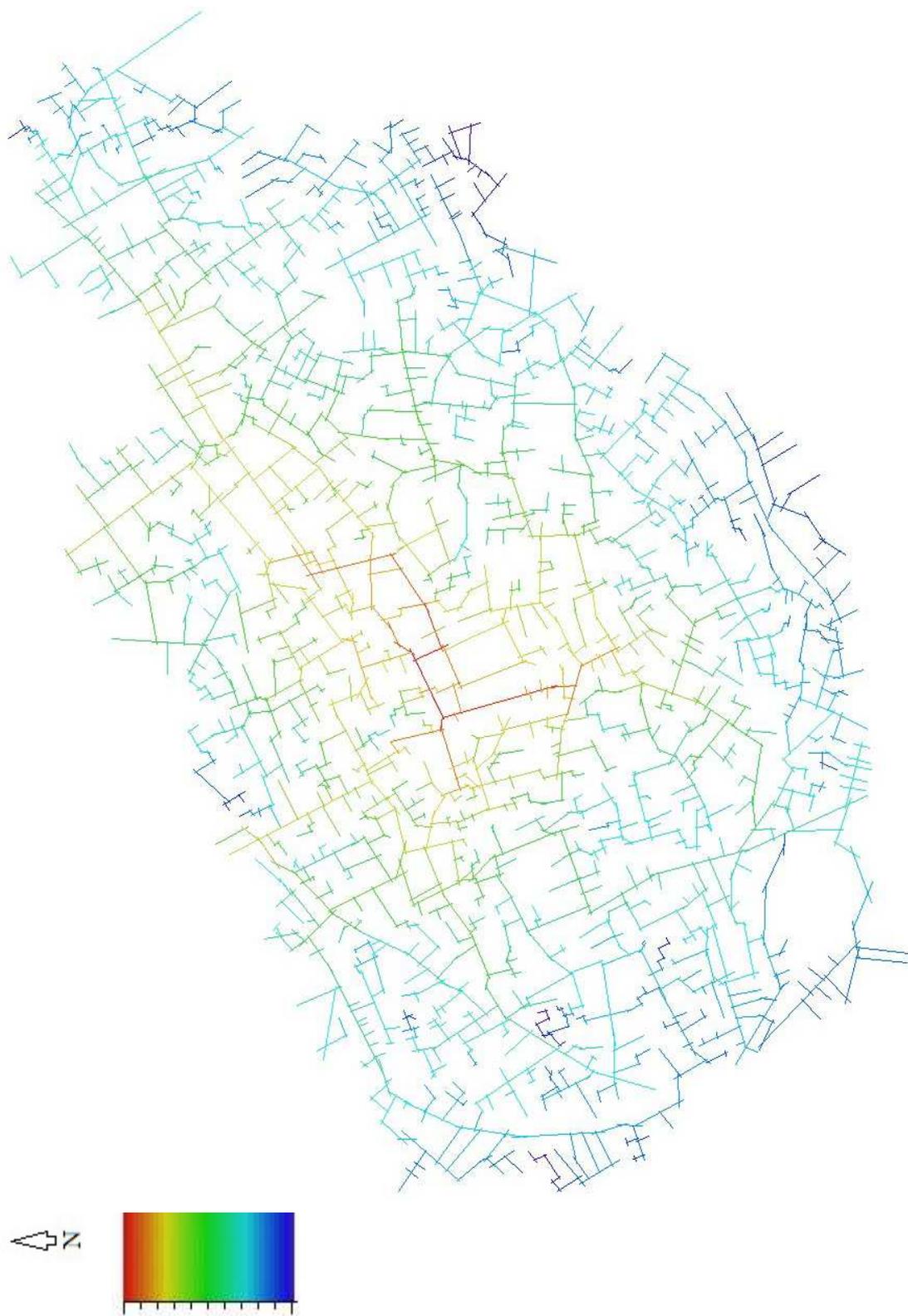


Fig. 8-18: Integration of Kashan's routes before the construction of the automobile streets.



Fig. 8-19: Integration of Kashan's routes just after construction of the automobile streets.

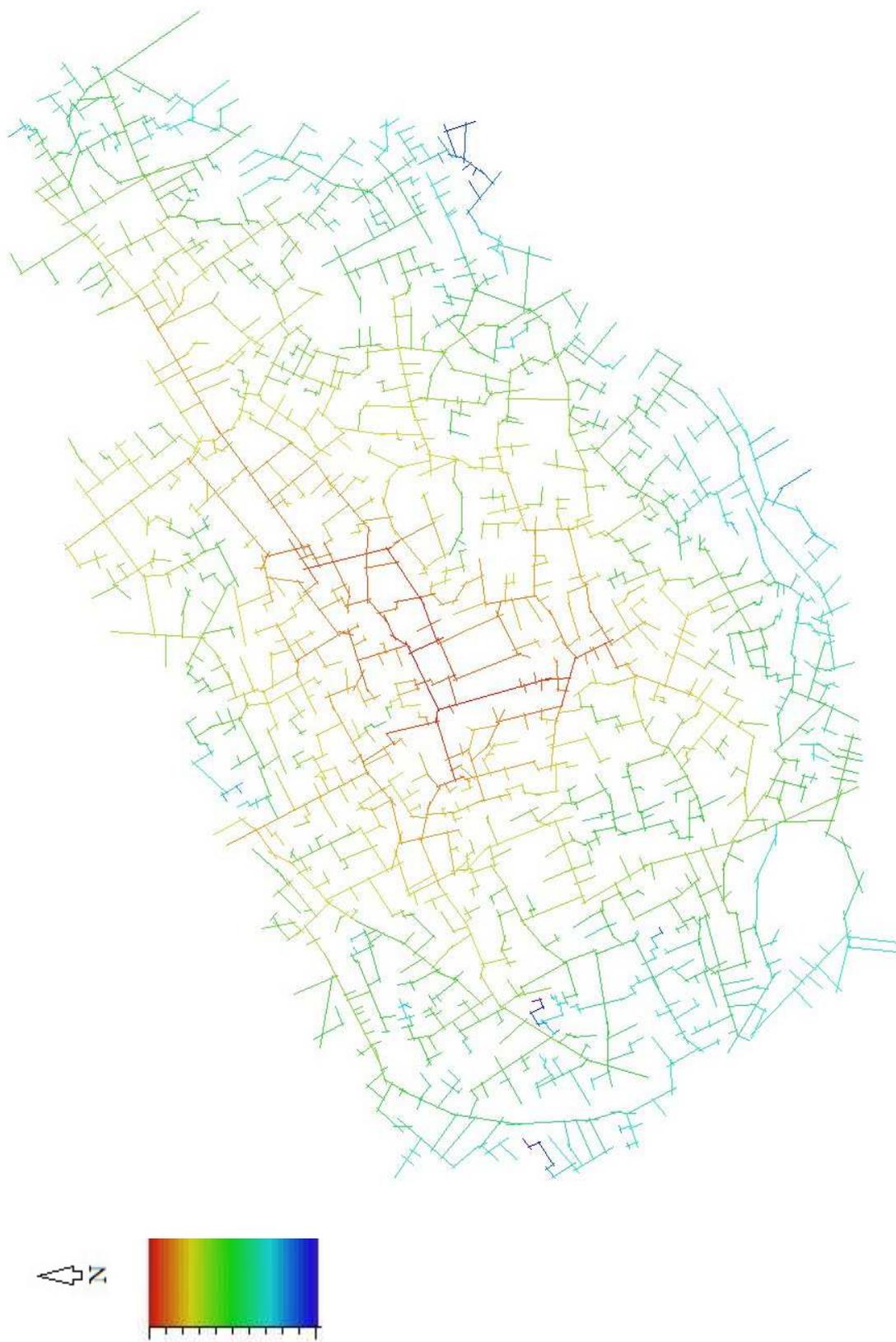


Fig. 8-20: Mean depth of Kashan's routes before the construction of the automobile streets.

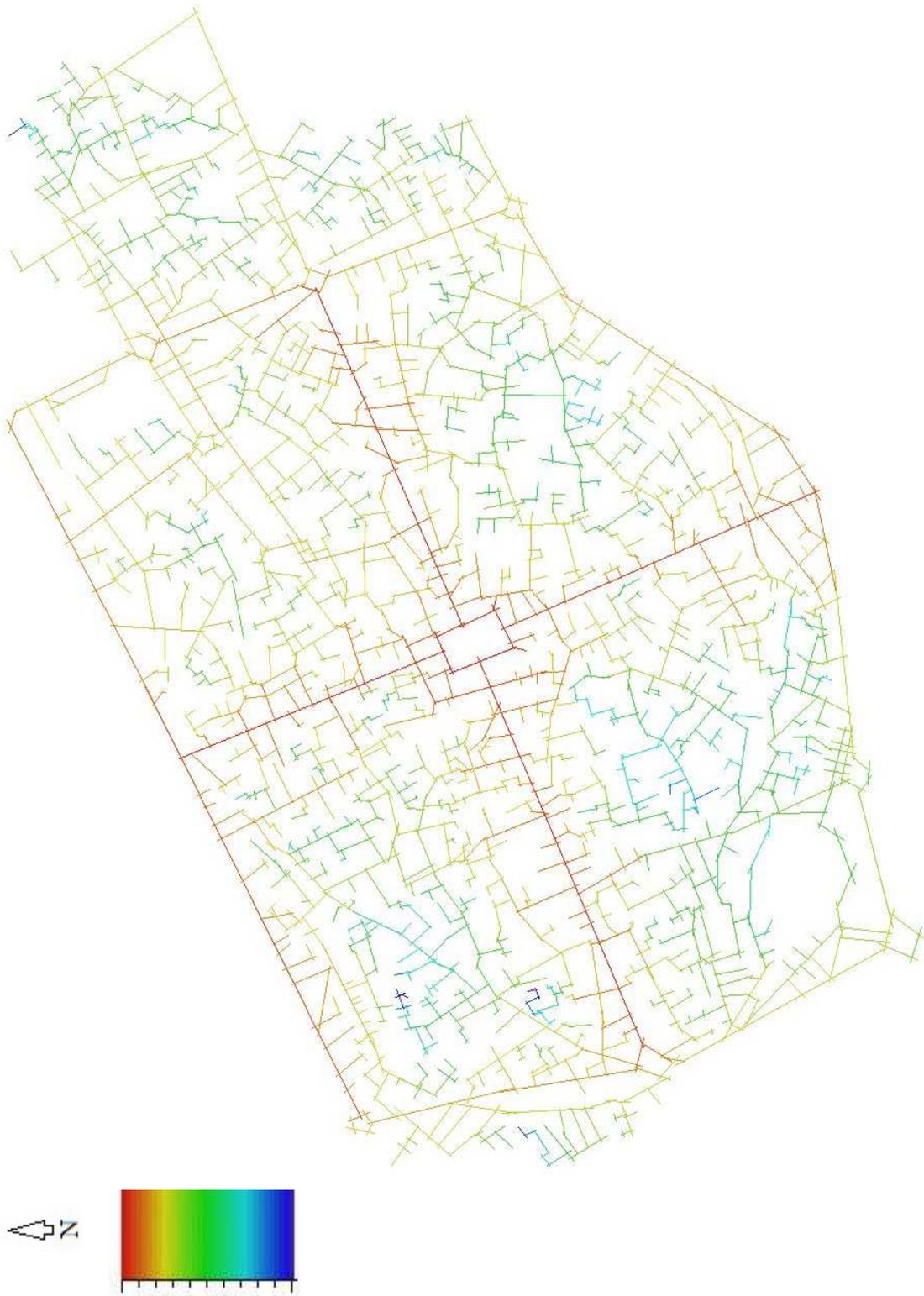


Fig. 8-21: Mean depth of Kashan's routes just after the construction of the automobile streets.

	Area (hectares)	Number of lines	Integration	Conne- ctivity	Mean depth	Total depth	RRA
The core of Kashan- before constructions of streets		1728	0.397	2.331	22.220	38375	0.0245
- after constructions of streets		1794	0.747	2.459	12.468	22356	0.0127

Table 8-5: The Space Syntax indicators for the historical core of Kashan, before and after the construction of the automobile streets.

For example, the mobility in the bazaar of the city before and after the modification of the form of the city can be studied.

The same calculations can be done for each neighborhood or neighborhood unit of the city. Four neighborhood units and the bazaar of the city are chosen to be analyzed. The neighborhood units are Kushk-e-Safi (no. 16), Taghi-Khan (no.17), Darb-e-Yalan (no. 31), and Taher-o-Mansur (no. 4). Tables 8-6, 8-7, 8-8, 8-9, and 8-10, show the change in the mobility after the new wide streets were built in 1950s in Kashan.

	Area (hectares)	Number of lines	Integration	Conne- ctivity	Mean depth	Total depth	RRA
Kushk-e-Safi neighborhood unit- before constructions of streets	4.1	23	0.392	2.47	21.974	37950	0.0243
Kushk-e-Safi neighborhood unit- after constructions of streets	4.1	23	0.524	2.52	16.823	30164	0.0176

Table 8-6: Comparison of the Space Syntax indicators of Kushk-e-Safi neighborhood unit of Kashan, before and after the construction of the new streets.

	Area (hectares)	Number of lines	Integration	Conne- ctivity	Mean depth	Total depth	RRA
Taghi-Khan neighborhood unit- before constructions of streets	4.7	23	0.454	2.36	19.155	33081	0.0210
Taghi-Khan neighborhood unit- after constructions of streets	4.7	23	0.668	2.86	13.632	24442	0.0141

Table 8-7: Comparison of the Space Syntax indicators of Taghi-Khan neighborhood unit of Kashan, before and after the construction of the new streets.

	Area (hectares)	Number of lines	Integration	Conne- ctivity	Mean depth	Total depth	RRA
Darb-e-Yalan neighborhood unit- before constructions of streets	4.9	20	0.453	2.4	19.124	33027	0.0210
Darb-e-Yalan neighborhood unit- after constructions of streets	4.9	20	0.719	2.4	12.537	22479	0.0128

Table 8-8. Comparison of the Space Syntax indicators of Darb-e-Yalan neighborhood unit of Kashan, before and after the construction of the new streets.

As seen in the above tables, the integration and the connectivity of all the cases, even the bazaar, increased after the city was shaped to a new form with the construction of the new streets. Also the depths of the spaces were decreased and the houses became very near to the main streets and the shops on the edges. The reaction of the old texture of Kashan against street building differed slightly from the one for Yazd. In Kashan the mobility of the people was promoted by the streets. Nevertheless it is not possible to claim that the neighborhoods of Kashan became

more livable and vibrant. In fact the reason for the indication of such results in the above tables is that the neighborhood centers lost importance to the streets.

	Area (hectares)	Number of lines	Integration	Connectivity	Mean depth	Total depth	RRA
Taher-o-Mansur neighborhood unit- before constructions of streets	4.6	26	0.425	2.19	20.363	35168	0.0224
Taher-o-Mansur neighborhood unit- after constructions of streets	4.6	26	0.635	2.19	14.146	25364	0.0243

Table 8-9. Comparison of the Space Syntax indicators of Taher-o-Mansur neighborhood unit of Kashan, before and after the construction of the new streets.

	Number of lines	Integration	Connectivity	Mean depth	Total depth	RRA
Bazaar- before constructions of streets	15	0.557	4.66	15.713	27137	0.0170
Bazaar- after constructions of streets	15	0.906	4.93	10.147	18194	0.0102

Table 8-10: Comparison of the Space Syntax indicators of the bazaar of Kashan, before and after the construction of the new streets.

The people went to the shops neighborhood centers less when they had new shops in the newly built streets around their houses. The map of the integration of the new Kashan shows that the integration values of the main streets are much more than the local old streets that are also used by car drivers. This includes both pedestrian use and car use. In other words, the neighborhood centers are not a vibrant hub for the social activities for the residents any more and the high values for the integration of the new texture are related to the rush of people from neighborhoods to the streets.

Unlike Yazd, the Bazaar and city center of Kashan experienced higher mobility after the automobile streets were built. So the reaction of the urban texture of Kashan was different with that of Yazd. The reason for this difference is unknown and can be a subject for a research.

For having a better understanding of the mobility caused by the built environment in the traditional and the new urban forms of the city, the Space Syntax indicators of the city center and a new development in eastern side of the city were compared. The new development called Naji-Abad has been built in after 1980s and generally has the characteristics of the new urban developments of the Iranian cities. The structure of the area is based on grid-iron network. This part of the city is taken as an example of the new developments because it has limited attachments to the city from the southeast, so it can be used for Space Syntax analysis and the picking it out of the texture of the city does not have a negative effect on the results. The axial map of Naji-Abad consists of 1584 lines that are located in an area of 386 hectares.

The measurement of the Space Syntax indicators of the development shows that the created urban form does produce higher mobility than the city of 1950s. However, according to Table 8-11, the integration of Naji-Abad is lower than the present city center of Kashan.

	Area (hectares)	Number of lines	Integration	Conne- ctivity	Mean depth	Total depth	RRA
Naji-Abad	386	1584	0.529	2.45	13.724	1586	0.452

Table 8-11: The measurement of the Space Syntax indicators for Naji-Abad, Kashan.

The above study tells us that the global accessibility of the city is now higher than before and this is absolutely a good quality that promotes mobility. The integration and connectivity of the city as a whole, the city center and many other parts of the city has been improved. Also the depths of most of the places are decreased. These improvements altogether result in better accessibility. But it should be noted that this good quality can have harsh results when combined with some other impacts like sprawled developments, higher car ownership than before, almost available car fuel and services, deficient public transport, and far away amenities. The result is

“driving more” and that is the unsustainable side of generating high accessibility while other infrastructures are not provided. As seen in previous parts of the consideration of Kashan, the new developments do not contain the traditional morphology, in which every neighborhood unit had a facility-rich center. So people move far to do their activities. When the public transit is rather poor and the cars are available and almost cheap, using personal car becomes the first choice of every one. Of course the price of car is not cheaper than the developed countries.

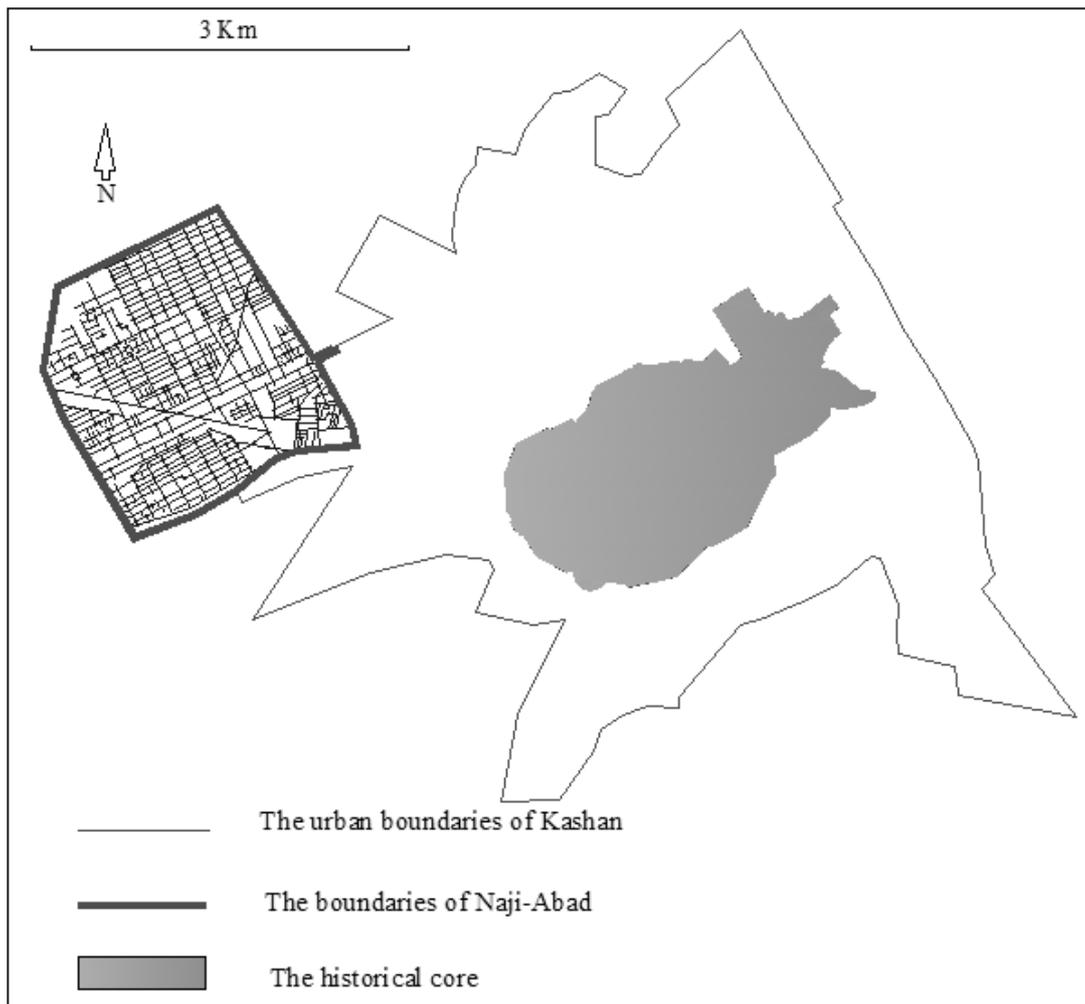


Fig. 8-22: The location of Naji-Abad in the western part of Kashan.

Even if the per capita income of households and the quality of the cars are put under consideration, it becomes clear that the car price is very expensive in Iran. However the amount of car production of the country is the factor that makes it available to

many of the people. During the past years, the domestic market has been a good target for the Iranian automobile producers and assemblers because the car import from the foreign countries is controlled by the government and the market can not be saturated by the foreign cheaper and better cars. Therefore the people invest a large amount of money to buy a middle class car to be able to have the mobility as they want. When just one quality is improved and other consequences that should work with the improved factor are stagnating or exacerbating. Such failing qualities are normally, as mentioned before, related to the urban form and transportation policies. When considering all these together, it is concluded that high accessibility in addition to all the mentioned trends are pushing people to use cars.

8-5-The hierarchy of the public and semi-private spaces

The open spaces and streets of Kashan are set according to an integrated logic of hierarchy. The most public space of the city has been the bazaar, which has remained the financial center of the city and its most crowded urban space. The bazaar functioned as the center of all the activities of all the people and the city has had an organic concentric structure. Before the eleventh century, the bazaar of the city had been in the center of Taher-o-Mansur neighborhood (no. 1 in Fig. 8-7), but after the city was developed, the new bazaar was constructed towards east and northeast. This place is still quite vibrant and lively and attracts many urban travels from all parts of the new and old city. It is just similar to the previous times when the people of different neighborhoods met each other in the bazaar.

The main routes of the streets had the second importance in the hierarchy of the city streets. The passengers walked through the main passages between the neighborhood unit centers. These routes were in some cases wide streets with the scale of the old times, and in some cases they were routes with normal width and a lot of curves and turns. The examples of the first group of the routes are found in neighborhood unit 1 (Baba-Vakil) and the second type of passages are seen in the neighborhood units number 17 and 18 (Taghi-Khan and Mirza-Moghim-Vazir).

The third type of streets consists of the routes that had a secondary importance in the network of the routes. These streets functioned as collectors and their main function was to be a way for reaching to the main streets or access from the main streets to the houses. The privacy level decreases from public to semi-public as the passenger enters the secondary routes from the main routes.

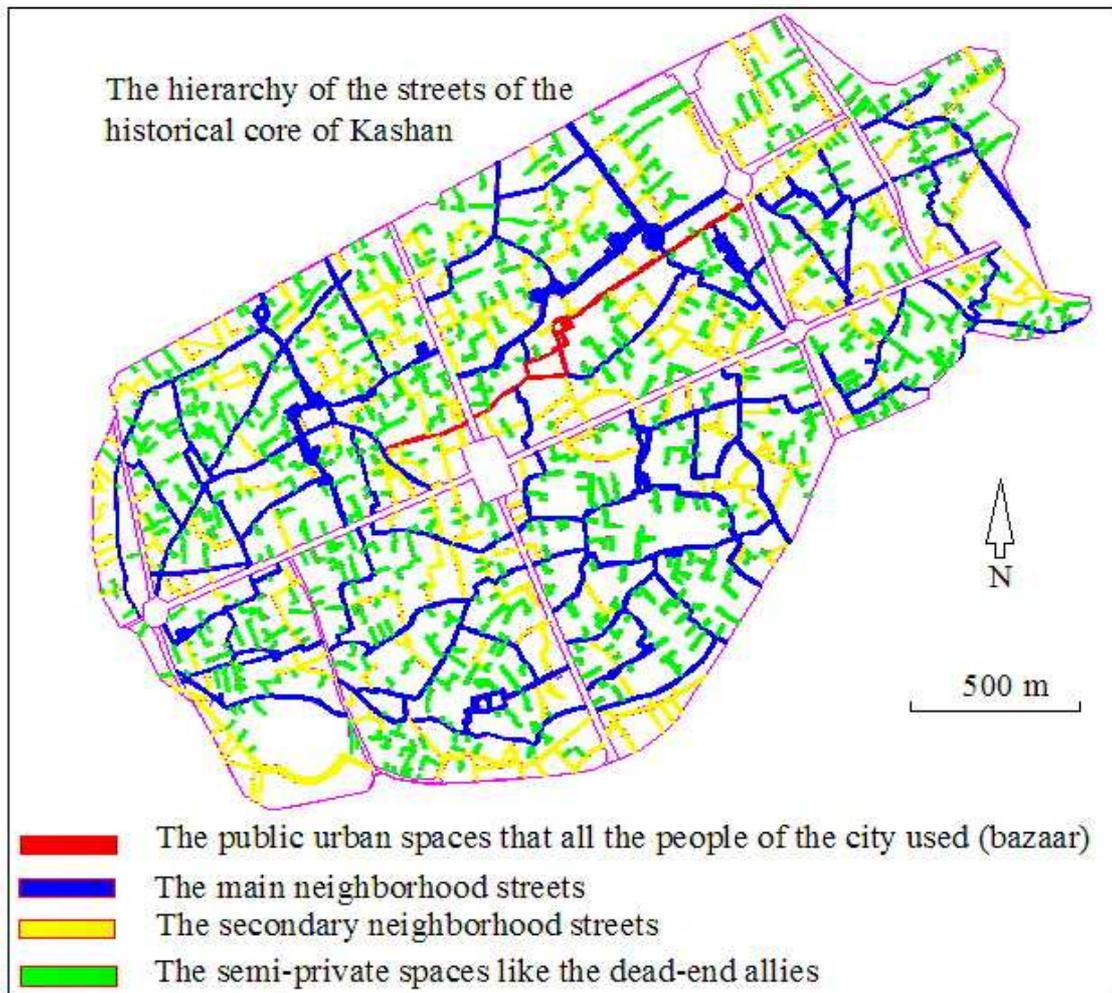


Fig. 8-23: The hierarchy of the old streets of Kashan. Reproduced by the author from the base map of the streets of Kashan by Iranshenasi publishing co.

The lowest level of publicity was seen in the dead-end allies. These spaces were in-between spaces that separated the public and private spaces. With a glance to the map of street hierarchy in the core of Kashan (Fig. 8-23), it becomes obvious that there were a large number of these allies in the core of the city.

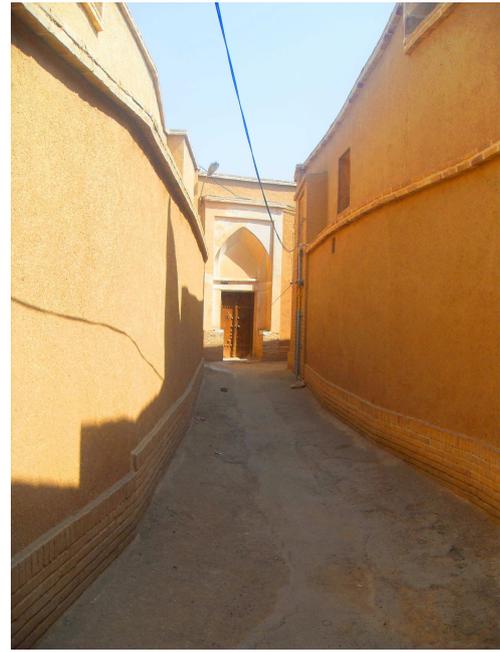


Fig. 8-24: Two secondary routes in the core of Kashan. In the left hand an arc is seen over the passage. Previously such arcs were used to show the level of privacy or the boundaries between the neighborhood units. In the right hand side picture a house door opens directly into a public space without any semi-public space in between. Images by the author.

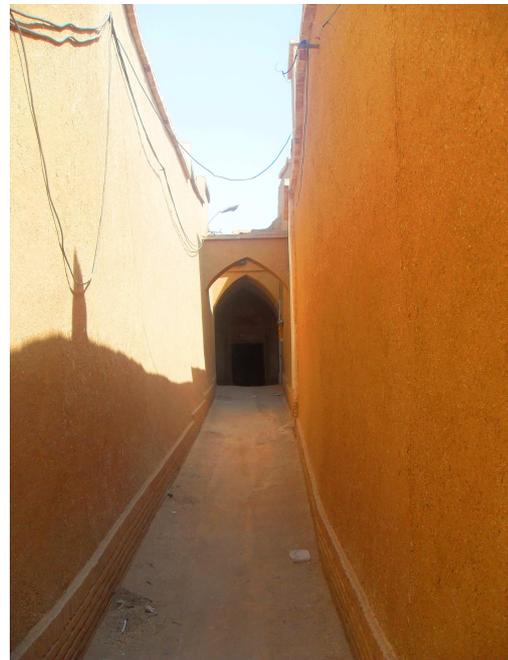
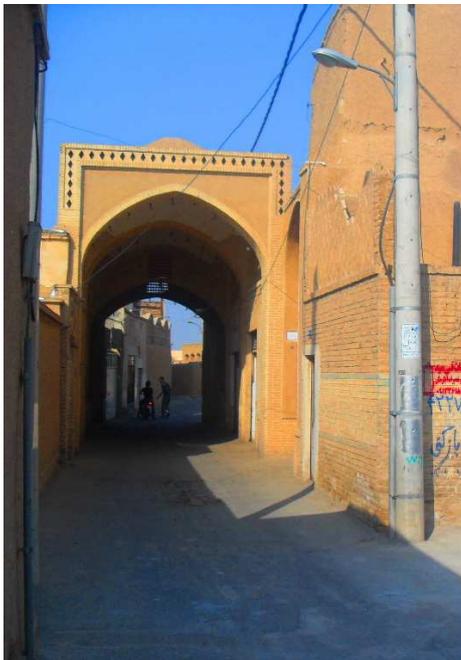


Fig. 8-25: Left: A small neighborhood unit center with some shops in a roofed public space at an intersection of a secondary route with a main route. The width of the main route, which is about four meters, is seen in the picture. Right: A house in the end of a dead-end alley is seen. The arcs warn the strangers that the place is a semi-private space. Images by the author.

These spaces had the maximum depth in the network of the city. However in many cases it is easy to reach the main neighborhood routes from these allies. The study of the hierarchy of the streets of the two types of settings of Kashan illustrates the difference in using the land in the organic city and in the new city. In the traditional city the land is used to build houses and streets very carefully and with limitations. That is mainly because of the security and climate reasons that were explained in a previous chapter. Also in the past decades it was not essential to have wider streets than for example 4 meters because there were no motorized vehicles. But in the new city the lands are allocated to streets much more open-handedly.

When comparing the width of the streets with the traffic, this generosity seems too much. Allocating a 22 meters street as a street inside a residential neighborhood that is not even a secondary street means bad land consumption. On the other hand, construction of narrow streets in trafficked parts of the city is because of poor urban transportation planning and analysis.

8-6-Public open spaces

The objective of this part is to consider the abundance of the gathering places and the accessibility of the public open spaces other than the streets in the historical core of Kashan and also the new development of Naji-Abad. The aim is to study the main function of the open spaces, which seem to have different basis in the traditional texture and the new developments. It is intended to have a social view in the consideration and conclusion.

As stated in the study of the neighborhood organization of Kashan, many of the neighborhood unit centers were a place that people could have social interaction with each other. Such social behavior was done in a space that had enough room for standing and sitting. These spaces were mostly a part of the streets, for instance, a part of the street that were wider than the other parts in front of neighborhood buildings like Ab Anbar, neighborhood shops, or other monuments could be a social public space. This type of space could also be in bazaar, where its main axes connected each other, at the entrance of the mosques, where there was open space

and people could meet each other in it. There was enough space for the neighbors to have a talk.

Of course these social do not have similarity to the European plazas in terms of form. These spaces have rarely a symmetric form and were mostly shaped organically. Also the measures of the spaces like this are different from the European squares. Except some planned spaces like Naghshe-Jahan in Esfahan, the Iranian public open spaces have normally small sizes and are human-scaled. The spaces that are considered here are small social spaces that can be considered as Meidan, which was explained in the chapter on the urbanism of Iran previously.

In case of the public open spaces of Kashan, no planned rectangular Meidan is observed because Kashan has always been a secondary city and has never been a rival for the large cities like Esfahan, Tehran, and Shiraz. So almost all of the open spaces are organic and no governmental Meidans are seen. Also no sign of old military or commercial public spaces is found. What is seen and studied are neighborhood spaces. Nevertheless the spaces seem to be the same thing that the people needed because the social needs of the residents were raised by such places.

However the new wave of quick change in the Iranian cities affected the life social habits. The new urban form was shaped based on the needs of automobile. So the new Meidans and the open spaces were built to be used by both walking and driving ones. A perfect example of such spaces is the square of Kamal-ol-Molk in the center of the core, which is an automobile square that has a large green space in the middle. The green space is mainly an urban park between four streets. The square is constructed at the connection of four main streets of the core called Mohtasham, Fazel-Naraghi, Baba-Afzal, and Sharif. The main concept that was introduced to the Iranian cities at this age was “roundabout” that was especially working for the automobiles. Kashan had also the experience of having such squares. The social function of these spaces is very weak and is fundamentally under the influence of the movement of the cars. In other words the function of mobility is rather dominant on the social function. During the past decades the urban constructions has been under the influence of the idea that having a roundabout can be a solution for the traffic congestion problem. But after the traffic became stronger in many cities, the

roundabouts had been no different from the intersections and the cars could not move in them freely. Several roundabouts are seen in the core of Kashan. Most of the intersections have changed to circular or elliptic roundabouts. Just four main intersections do not contain a roundabout.

Another type of the social public space that seen in Kashan, is the urban park. Such spaces were introduced in the twentieth century and usually have no similarity to the traditional Iranian gardens. Their function is based on the social relations and entertainment and the major element of all of them is green space. During the past two decades the municipal planning attitude has been to convert the function of the unbuilt urban lands and the uses that are bought from the private sector by the municipalities, to green space and small urban parks. The main aim has been to increase the per capita area of green space of the cities.

This trend has also been executed in Kashan. An example is the urban park that is built in the south west of the core, outside of the old Arg of the city. Although the urban parks are effective in improving the quality of life and the social relationships, but the style of the social interactions that are offered by the traditional urban open spaces is missing in them. The number of the parks is not so high in the core of Kashan. So people that travel to them come from different parts of the core and usually do not know each other. So this is different from the neighborhood unit public spaces that were used by the people of the same neighborhood daily, so the people that met each other in them possibly knew each other previously. Also another function that is not found in the urban parks is retail. Small shops were a part of many old neighborhood unit centers, and when the people gather in a center, it could have positive impact on the local retail. However there is often no retail in the urban parks.

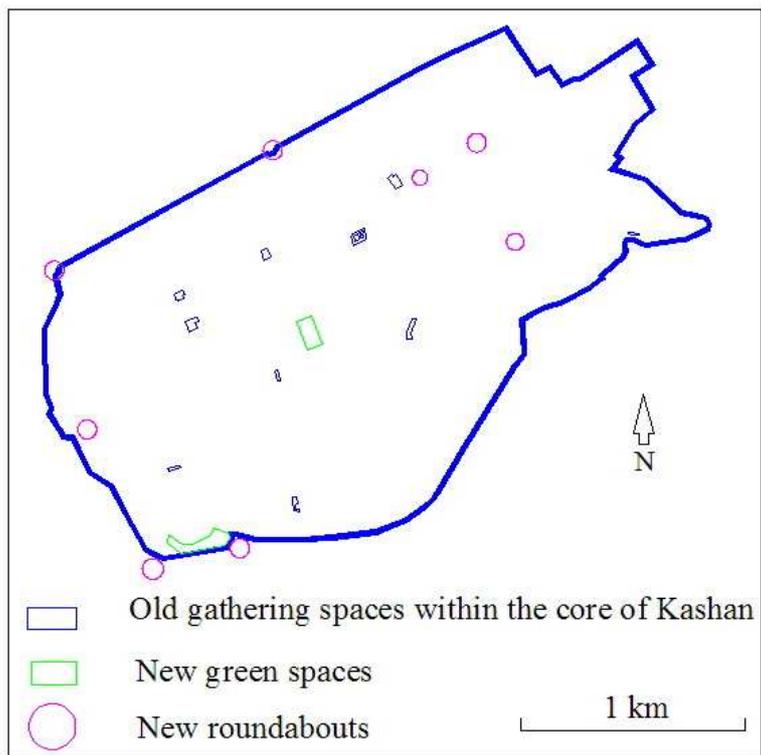


Fig. 8-26: The public open space of the core of Kashan. Illustration of the old gathering social spaces against the new automobile-oriented spaces and the green spaces.

Fig. 8-27: The Public open spaces in Naji-Abad, Kashan. The main spaces of this kind are urban parks and roundabouts.

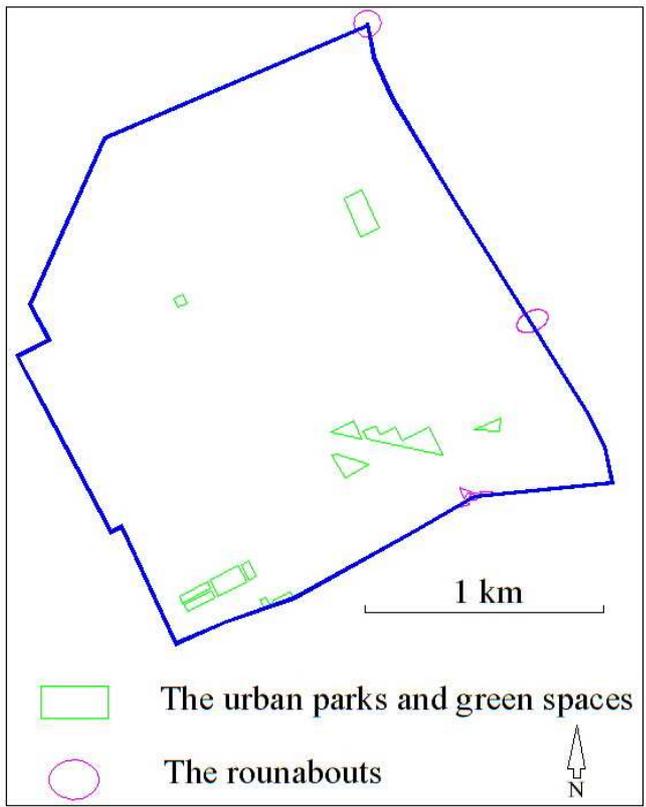


Fig. 8-26 illustrates the public open spaces of the core of Kashan. The three types of the spaces that were explained above are shown in the core. These spaces are meant to have social importance in the daily life. What is going to be indicated in this

figure is not the number of spaces, but is the accessibility of them for the residents. Most of the neighborhood gathering spaces are related to the older neighborhood unit centers that are located in the western parts of the core. The eastern parts that were built in the nineteenth century have weaker quality of this kind. The strong presence of the roundabouts is also observable.

To have a comparison of the difference of the traditional settings with the new developments, Naji-Abad is taken as example. Fig. 8-27 shows the social spaces of the development. Except one urban park in the northern part and a number of small pieces of land that have been developed as green space, there is no sign of car-free places in which the resident can have social interactions. In fact the grid-iron structure of the streets is the dominant form and very little social and cultural uses are found in the area.

This description is the usual view of the new Iranian planning. The pedestrian Meidan seems to be completely forgotten. Although some efforts have been made to change the use of some streets to pedestrian ones in cities like Tehran, Tabriz, and Mashhad, but the number of such experiences is really little. Nonetheless changing the use of streets remains only in the shape of creating pedestrian streets. Setting up new pedestrian plazas has been very rare. Apart from the pedestrian plazas, the main thing that this part of the study focuses on is promoting public social spaces that are located near the neighborhood centers. Such spaces can have major role in increasing the attractiveness of the neighborhood unit centers and could attract urban travels. Lack of places, in which people can meet each other in the residential areas can result in both social and mobility problems. In case proper spaces in the level of city and neighborhood are developed in areas like Naji-Abad, it is expected that less urban travels are distributed to the main streets and more travels will be targeted to the neighborhood centers. So having more of such spaces will lead to better traffic conditions. Also with having more pedestrian social spaces, better and more social interactions are expected.

Chapter Nine

9- Ideas to improve the Iranian urban planning

9-1-Introduction

Chapter 9 connects the literature review of the characteristics of the traditional Iranian city (chapter 5) and the findings of the observation on Yazd and Kashan (chapters 7 and 8) with the contemporary urban problems (chapter 1). As seen in the following diagram, it is intended to find solutions by analyzing the existing problems and the usable traditional specifications. However before that, the main findings of the observation are explained briefly. These findings are the points that are used in description of the problems or suggesting the solutions.

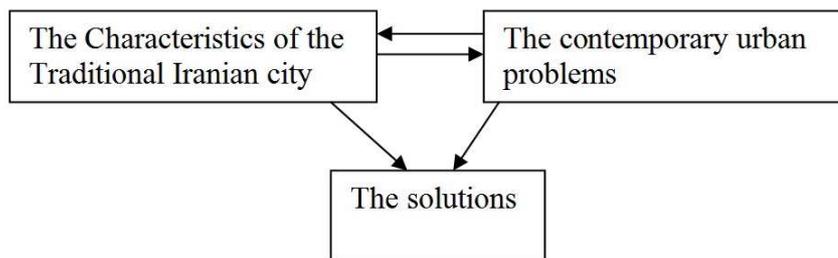


Fig. 9-1: The relationship between the main elements of the analysis chapter

The chapter consists of four main parts. Firstly, the conclusions of the observation are described. It tries to explain the points that are important to find the solutions of the problems. Then the characteristics of the traditional city that were discussed in the 5th chapter and the observations chapters are discussed. The problems of the today's cities are briefly introduced and at last the recommendations that are resulted from all the previous chapters will be presented.

The solutions are recommendations that are derived from the traditional urbanism of the central cities like Yazd and Kashan. Such cities have hot-arid climate and have a population of 400000 and 270000 people. Therefore the recommendations can be generalized for the cities with the same size and climate. As a consequence, it is

possible to give a population limitation of the target cities as; the cities with a population of between 50000 and 500000 people, which includes the small medium-sized cities (50000-100000 people), medium-sized cities (100000-250000 people) and medium large cities (250000-500000 people). However in case of the pure urban form and neighborhood-related issues cities with all sizes can be the target group. In case of geography and climate, the cities that are located in the warm and dry places are targeted. Cities with such climate can be found in the central and southern regions that have fewer mountains. Fig. 9-2 shows the regions that are targeted more than others. Nevertheless many of the recommendations can be helpful for the cities in other parts.



Fig. 9-2: The geographical limitations for the target cities, for which most of the recommendations of the study are suggested.

The research questions are answered in this chapter. Two main research questions and one sub-question were asked in the beginning chapter. At the starting point of each part the question that is going to be answered is brought up again. Also the hypotheses will be discussed according to the results of this study in the beginning of the next chapter.

The relationship between the urban problems, the traditional urban characteristics, and the solutions are shown in Fig. 9-3. Each solution or strategy is suggested according to one or more urban problems and urban characteristics. The article numbers of the research methods that are used to consider the urban problems are

indicated in the diagram. This dissertation claims that the solutions and strategies that are seen in the middle column of the diagram are the themes that are neglected in the new Iranian urban planning. Therefore the future plannings should focus on them more than before. The only solution that does not have any common roots in the traditional city is transport strategies. Due to the importance of the usage of the public transportation by people, it is necessary that the transport strategies be implemented even if there are no relations with the traditional city.

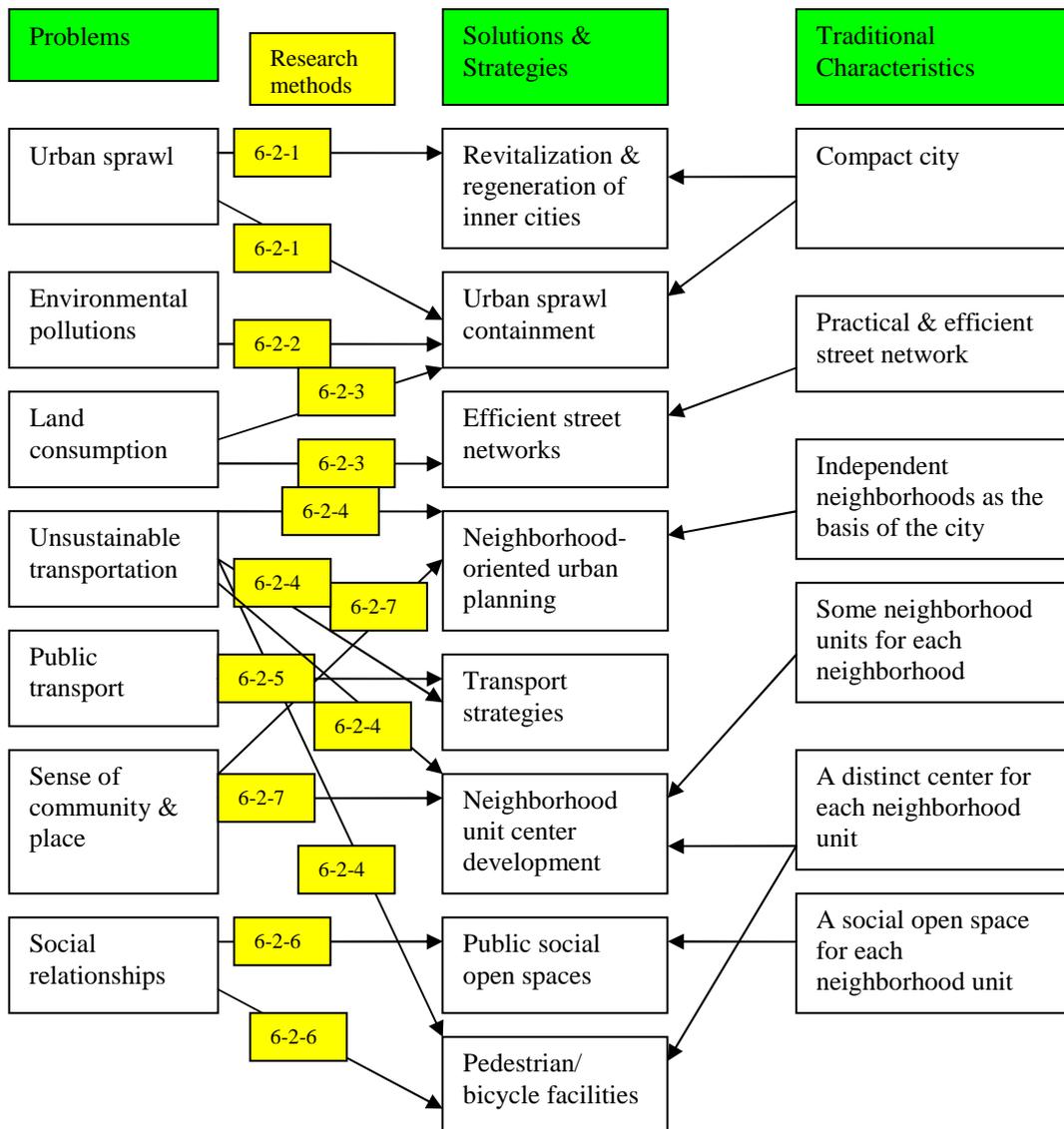


Fig. 9-3: Illustration of the connections between the urban problems, the traditional characteristics, and the solutions, according to the research methods.

9-2-The lessons learnt from the observation

This part contains the conclusions drawn from the observation chapters. The case study cities were considered in a similar format and the results were almost the same. Here the findings are shown in a questions-and-answers form.

9-2-1-Is there urban sprawl in the case study cities?

The studied cities both show the main characteristics of urban sprawl. The main specifications of the sprawling urban settings were explained in chapter 4. As a reminder, it can be added that the western urban sprawl is defined as the developments that have most of these characteristics: leapfrog or scattered development, commercial strip development, low density, large expanses of single-use development, poor accessibility, and lack of functional (public) open space.

As stated in the case of Yazd, the urban sprawl that is observed is not like the suburban sprawl of the North-American cities or even the European ones. The sprawl that is seen is in form of fast urban growth with lower density than the one that the cities previously had. The above-mentioned characteristics are defined by the western urban researchers mostly based on the western cities. But it is possible to use them as the general guidance for identification of urban sprawl in different cultures.

The main characteristics that both case study cities have that make it easy to consider them as sprawling cities is the discrepancy between the rate of population growth and the one for area growth. This difference is much bigger in Yazd than in Kashan. However both cities show high amount of this ratio. In other words, the area growth of the cities during the recent decades has been more than the population growth. A part of it has been because of the change of life style of the residents and considered to be natural as times goes by. When the car was brought to the Iranian city, it was necessary to change the urban form to ease the use of the newcomer. It was not possible to have the same dense traditional urban settings. However the main reason can be the governmental strategies that let many people have pieces of

land in the periphery of the cities to build their own houses. So the easiest way was to prepare the land with a grid-iron network of streets and let every one build the dream house. The result of such developments has been residential districts with weak infrastructure, public social spaces, and public services. Naji-Abad in Kashan is still a large developed land that is almost out of the developed area of the city. The matter that is especially surprising is the speed of the sprawl in such cities. In case of the speed of the sprawl, Yazd has had a harsh condition. During the past 30 years, the area of the city has been multiplied, while the population growth has been normal.

The case study cities show scattered leapfrog developments in the new parts of the cities like Shahedieh in Yazd and Naji-Abad in Kashan. Although the studied districts are almost completely built parts of the cities, but still there are parts that are not built up and are remaining as bare land. Such lands are seen in the maps related to the typology of the urban form of the case study cities. But most of the bare urban lands are seen in between the built neighborhoods where there are no plans for the developments. Southwest and north of Kashan and northwest and southeast of Yazd contain such lands. The northern peripheries of Kashan include the lands that have no defined uses and located along the road that leads to an industrial function. The unbuilt lands of the southeast are not really bare but they are the gardens outside the villages. The leapfrog developments in the peripheries of Yazd are located along the roads to Tehran in the northwest and to Kerman and Bandar-Abas in the southeast.

No observations or measurement of density was made in this study. However it is obvious that the new developments are more scattered than the traditional urban fabric. The urban spaces like streets and allies are wider and this makes the spaces between the buildings vaster.

Another aspect of urban sprawl that is seen in the two cities is single use developments. There is such urban form in the studied areas, particularly in Naji-Abad and Emam-Shahr. Most parts of the developed areas of these expanses are allocated to the residential function and the service functions are rarely seen.

The urban sprawl aspect that is strongly seen in Yazd and Kashan is lack of public open spaces. This was graphically shown in case of Naji-Abad of Kashan. The normal scene that is seen in the Iranian cities is large areas of residential function with very little space, in which people can socialize. Lack of public open spaces like pedestrian plazas or at least pedestrian neighborhood centers, in which people can socialize, is really felt.

Nevertheless other urban sprawl aspects like commercial strip development and accessibility are different. The commercial strip development can not be raised as a problem in the investigated cities. Such problem seems to exist in the western cities. Also the accessibility not only is not a problem, but also has good conditions in the new developments. As seen in the chapter 7 and 8, the accessibility of the new developments is more than the one for the historical cores. So it is not possible to say that the accessibility of the periphery of the historical cities of central Iran is less than the cores.

However it is possible to consider the urban growth of the cities of the region as urban sprawl. But the differences of the Iranian sprawl with the western sprawl should be taken into account.

9-2-2-Is there urban shrinkage in the case study cities?

According to the consideration of the population growth of the city of Yazd, it can be claimed that there is urban shrinkage in the city. The population of the city had declined in some years and at the best conditions, it has not increased. The decline in the population of the city is the result of the social problems that have occurred in the city due to the short-comings of the urban form. The people are not pleased with living in the city core because of the low accessibility and old structure of the buildings. Little renovations have been executed during the past years. Therefore the core has witnessed migrations from the center to other parts of the city or to other cities. The new residents have lower income and are from lower social class. Also there has been lack of planning fundamental urban infrastructure for the center

because of low budget and executive problems. Thus the urban shrinkage that is seen in the city includes both population and infrastructure shrinkage.

9-2-3-What is the role of neighborhood in the traditional city?

The traditional Iranian city is based on two major concepts; in the scale of city, the main concept is the commercial core that is called bazaar, and in a smaller scale, the main realm is the neighborhood. The Iranian city has long tradition of neighborhoods. The residents identify themselves firstly by the name of their neighborhood and then by their city.

The observation chapters showed that the historical cores have certain neighborhoods and neighborhood units. Each neighborhood unit was functioning as a small community. The outcome of such arrangement is functional and social results. The functional results include simplicity of mobility and retail merchandise throughout the city. The social aspects that were more important in the previous ages were strong sense of belonging to the place.

The idea that this dissertation is going to remind the planning bodies of Iran is that the traditional urbanism of Iran has been neighborhood oriented. This notion is not new and has been re-introduced before. However it has been neglected through the past years.

9-2-4-How is the flow of mobility in the traditional city?

There are two main flows of mobility in the traditional city. The first one is from all of the places in the city to the center of the city that is the bazaar. The people did not attend this flow every day, except the ones who worked there, so this was not a daily flow for most of the residents. The locations of the bazaars of Yazd and Kashan were shown in the previous chapters. The bazaars were the unique hub of the city and every one from every part of the city had accessibility to it for special needs.

The second type of the mobility happened inside the neighborhoods. The study of the neighborhood units and their centers showed that the most of the daily needs of

the people were raised in the neighborhood unit centers. If there were any deficiency in some of the neighborhood unit centers, it was easy to use the centers of the nearby units.

Generally it can be said that there was a vibrant hub in the center of the city, but it was not necessary for every one to travel there to raise the daily needs and it was possible to have short trips in a small range around the residential unit.

9-2-5-What relationship is there between the built environment and the social interactions?

The traditional urban form encourages people to have social interaction with each other. This was done by directing the residents' flow to certain hubs like neighborhood unit centers and the social public places. In addition to the unit centers that were already explained, the social public spaces had absolutely great effect on the face-to-face contact of the residents. These places included religious buildings like Hosseinieh, Tekkieh, Mosque and the open spaces in front of them, and also small open spaces in some of the neighborhood units. As seen about Kashan, the number of such spaces in the historical core of Kashan is not comparable to the new development of Naji-Abad. There is no public open space in the new urban fabric, in which the residents can socialize. Apart from Kashan, the spaces, in which people can gather together, are located in roofed malls and shopping centers or in the streets. So the main view that is seen in such places is shopping and the presence of automobile with sound and air pollution. These places are automobile streets that are designed for the motorized traffic and also people have some social activities like shopping in the walkways as a secondary function. There are also large automobile-oriented open spaces that even do not contain the function of shopping. Such spaces are roundabouts that are called squares but many of them are just intersection of roads and have nothing to do with the human social affairs. The main idea that rises from the observation is lack of social open public spaces in the new settings.

9-2-6-Which city is more accessible and which is more sustainable, the contemporary or the traditional city?

This theme was raised as a sub-question of this study. The Space Syntax analysis of Yazd and Kashan shows that the accessibility in the newer parts with grid-iron street network is higher than the organic traditional urban form. This conclusion is drawn by consideration of the Space Syntax measures like integration, connectivity, mean and total depths, and RA/RRA. But the high accessibility of the new settings that is calculated based on the urban form can lead to unsustainable results with special conditions. These conditions are lack of neighborhood amenities, far away destinies, increasing car ownership, almost available car services and fuel, lack of pedestrian/bike facilities, and lack of cultural guidance to sustainable transportation modes by the public media. The promotion of accessibility and neglecting about the above deficiencies can result in high car usage even for reaching the nearby destinations.

The unsustainable transportation that leads to environmental pollutions has been brought up as a problem after the public use of automobile and the change of the life style of the people. As seen before, the traditional urban form used to distribute the urban travels among the unit centers. So the short-distance urban travels could be done on foot or by bike.

So we see how the accessibility of the new urban form stands against the sustainability of the traditional city. What the observation shows is the unbalanced planning during the recent decades to reach higher accessibility while other sustainable notions and strategies especially sustainable transport is neglected.

9-2-7-How is the sense of community and place enhanced in the traditional city?

The traditional neighborhood unit centers had the public amenities within them that were used by the neighborhood residents. The residents had a sense of belonging to the center and the whole neighborhood unit and felt responsibility to protect and

preserve the neighborhood unit and its center. As seen in Yazd and Kashan, the main elements of the centers, like the mosque, Ab Anbar, Hosseinieh, etc. were called with the same name of the neighborhood units. The meaning that is transferred from that is the neighborhood facilities belonged to the residents of the neighborhood. So this aroused a sense of belonging to the neighborhood. Also the people participated in taking decisions for the management of their neighborhood.

There is a reciprocal relationship between the urban form and the social issues associated with the neighborhood problems. The people have the sense of belonging to their neighborhood so they build facilities for their own community. On the other side, they have special facilities for their neighborhood so they feel close relativity to them. In well-developed samples of this kind, we see strong nostalgia between the residents and every corner of the neighborhood.

9-2-8-How is the hierarchy of the street network in the traditional and the modern city?

There are public, semi-public/semi-private, and private spaces in the traditional city. According to the hierarchy of Kashan, which was shown in chapter 8, there is similar hierarchy in the street network of the traditional city.

The main streets connect the neighborhood unit centers together. The secondary streets are the other public routes that had neighborhood-level importance. The third level of the routes is the dead-end allies.

These allies led to the houses and played the role of the semi-private urban space. The traditional street network locates some of the houses in depth of the network. Such houses are far from the traffic of the main streets, but because of short distances from the house to the main routes or the neighborhood centers, the residents had no problem like being far from the important points.

The tree-like hierarchy of the street network of Kashan leads to better land consumption than in the new developments. This was shown by calculation of the coefficient correlation between the movement (indicated by the Space Syntax integration) and the width of the streets. It was concluded that the width of the

streets in the traditional city had better correlation with the motorized and non-motorized mobility.

In the modern parts there are very wide streets that few people pass through them or oppositely there are narrow streets that have heavy volume of traffic. In this case the traditional network shows higher suitability. This can apparently be concluded from the Space Syntax analysis of the network of Naji-Abad in Kashan.

9-2-9-How did the modern technology affect the traditional urban form and life style?

Although the new technology and life style are undoubtedly useful phenomena, but the way they were applied in the case study cities was not so appropriate. There is a relationship between preparation of the street network of the traditional cities for automobile use and the present urban shrinkage and the life style in the historical cores.

The observation has shown the improvement of accessibility in the core of Yazd and Kashan after the new automobile streets were built in the cores between 1930s and 1950s. Also the urban shrinkage in Yazd was considered. Therefore in conclusion, the following can be derived.

As a consequence of the construction of the new automobile streets, the urban form of the traditional city was changed and the accessibility was increased. So people had more new options for movement. An example of the change in the urban form that was studied in the two case study cities was the transfer of the neighborhood hubs from inside the neighborhood units to the streets. The residents were drawn to the streets to do their daily activities. Also they used cars so they had access to farther places. Naturally people were amused of this new life style that embraced faster life with farther horizons. During the later decades when the newer quarters with different urban form were built, not only the people were willing to live in them, but also living in the dense fabric of the core seemed hard. So the flow of migration to other parts of the city or other cities started (like what we saw about

Yazd) and new poor migrants took the place. Thus urban decay and shrinkage in terms of population, infrastructure, and social issues happened.

The modern technology that was supposed to have good impact on the urban life brought bad results because of misusing. One more time here the process of urban decay and shrinkage is identified. Such process explains that the urban shrinkage in the Iranian historical city exists and its nature is almost like the one that happened in the western city during the twentieth century.

9-3-The characteristics of the traditional Iranian city

This chapter is the answer to the following research question:

“Which characteristics of the traditional Iranian urbanism can we use to solve some of the modern urban problems of the country?”

The main characteristics of the traditional Iranian city that were observed in the case studies are presented here. These specifications are common in most of the cities that were not planned, particularly the historical ones. Such characteristics are seen more in the cities of the central and southern parts of Iran. The objective of defining these specifications in this study is to use them as a solution to some of the contemporary urban problems.

Similar formulations have already been addressed in the neo-traditional trends in other countries, such as the North American New Urbanism. The difference of the present formulation with the western ones is that the emphasis of the presented set of characteristics is just on urban design, while the foreign ones focused both on urban design and architecture.

-The traditional city is a compact dense city:

From a descriptive view, the traditional Iranian city is a compact city. This explanation is not a case of measuring the density of the urban fabrics and comparing them together. But this idea is based on the layout arrangement of the

buildings that are attached tightly together. Such building organization was shown in Fahadan in Yazd and Kushk-e-Safi, Taghi-Khan, and Taher-o-Mansur in Kashan. The dispersed settings in the old cities of central Iran are rare. As seen in chapter 5, the main reason of such structure is climate, security, religion, and mobility.

The car is brought to the urban life and living near to the urban facilities does not have the meaning and importance that it carried centuries ago. The same is true about security and it can not be a reason for building dense cities any more. However the climate of the region is becoming tougher because of the climate change and although the life style of the people is somehow changed, but a great part of the religious beliefs of the people still exists. Hence we see that a part of reasons for having a compact city in the region is still remaining.

-There is practical street network hierarchy:

There is a practical hierarchy in the street network of the Iranian city. This hierarchy was examined in the section related to the level of privacy of the urban spaces of Yazd. This hierarchy results in correlation between the width of the streets and their traffic. Therefore better consumption of land is done and the general result is the compactness of the city.

-The city includes neighborhoods with independent potentials and identities:

The traditional Iranian city consists of neighborhoods that have independent identities and are almost self-sufficient. The whole city is divided into a few parts by these neighborhoods. However all of these parts are dependent to a commercial and cultural hub called bazaar, which includes common central facilities.

Each neighborhood usually has an area of less than 100 hectares. The neighborhood organization of the both case study cities were observed in chapters 7 and 8. A reason for relative self-sufficiency of the neighborhoods is the presence of the amenities in the neighborhood unit centers.

-Every neighborhood consists of a few neighborhood units:

Each neighborhood is made up of smaller communities that are called neighborhood units. Each neighborhood unit includes 100, 200 or at most 300 buildings, and an area of at most 25 or 30 hectares. The neighborhood units were managed by the residents.

The evidences of the organization and the size of the neighborhood units were presented in the parts of the observation that were in relation to the organization of the neighborhoods.

-Each neighborhood unit has a distinct center:

Each neighborhood unit has a distinct center that carries the function of giving service to the residents. The center consists of cultural buildings, shopping places, and other local infrastructures. The neighborhood unit residents are responsible for keeping and preserving the center. Again the basis of this claim that each neighborhood has a distinct center can be found in the parts related to the organization of the neighborhood of Yazd and Kashan.

-Many neighborhoods and neighborhood units contain social open spaces:

Many of the neighborhood unit centers contain public open spaces that are used by the unit residents to socialize or gather together. The first function of such spaces is not necessarily passing the traffic but they are used to do the social activities. As seen in the case study chapters and also the literature review of chapter 5, the social meeting points can be Hosseinieh and Tekkieh that are basically religious spaces but gradually got more social functions.

9-4-Recommendations derived from the traditional urbanism

This part is the answer to the following research question:

“How can the effective traditional city characteristics be applied to ease some of the modern problems?”

Some methods are suggested for the problems that were raised in chapter 1. One or two recommendations or methods are suggested for each urban problem. These methods have roots in the traditional urbanism. Two types of questions are answered about each suggestion. The first question is “what is the nature of the suggestion?” and the second one is “how can the suggestion be helpful?”. Answering the “what” questions is easier and is just connecting the questions and answers together. The aim of answering the “what” questions is to remind the planning body that there are answers in the same place that the problems are and the solutions should not necessarily come from the western planning. The “how” questions are harder to answer. The way that is applied here is to explain simple ideas that can help the Iranian planning body ease the complexity of the modern problems. 33 ideas are suggested. It has been attempted to offer practical ideas. The ideas are just examples of how the strategies can be implemented. It is obvious that the methods of implementing the suggested strategies are not limited to the mentioned practical ideas and undoubtedly all of them can be developed and improved. The number of the ideas related to each solution can be seen in Table 9-1.

Solutions & strategies	Article number	Ideas	Number of ideas
Revitalization & regeneration in inner cities	9-4-1	1-9	9
Urban sprawl containment	9-4-2	10-13	4
Efficient street network	9-4-3	14-16	3
Neighborhood-oriented urban planning	9-4-4	17-21	5
Transport strategies	9-4-5	22-25	4
Neighborhood unit center development	9-4-6	26-29	4
Public social open spaces	9-4-7	30-32	3
Pedestrian/bicycle facilities	9-4-8	33	1

Table. 9-1: The number of ideas suggested for executing each strategy

9-4-1-Revitalization and regeneration of the inner cores

This part is in accordance to the “compact form of the traditional city” that was resulted from the observation and also the “urban sprawl” problem that was explained in chapter 1. (See Fig. 9-3)

What?

The suggestion of focusing on revitalization and regeneration plans originates from the interactions of urban sprawl and urban shrinkage. Such plans are being done on some of the historical cores but many aspects of these plans remain as just theoretical views and are not practically implemented. As seen about the case study cities, both urban sprawl and urban shrinkage exist in the contemporary cities of Iran. These two function together. The unlivable conditions of the inner cities results in migrations from the cores to the new developments in the urban fringe. This has negative influence on the urban sprawl. People select places that contain cheaper houses with better accessibility. A place with the mentioned specifications can be in a new development. On the other hand, the planning strategies that support fast and sprawled growth can make the urban shrinkage faster. This exactly happened in the first decade after the 1979 revolution, when vast pieces of land were distributed between the residents to build their own houses. As a consequence many people migrated from the inner cities to the fringe to have a better house of theirs in a new urban environment. This meant that wrong strategies for outer urban growth made the inner city shrink. The revitalization and regeneration of the inner cities should be done simultaneously with the urban sprawl containment. The result will be better quality of life in the historical cores and stopping the migration rate from the cores to the periphery. Also the change of the social class from and the income of the residents will be stopped. Generally the outcome of the implementation of the plans should be an efficient settlement that conserves the dignity of the residents and is good place for their progression.

How?

The gentrification/revitalization plans should have the following objectives. These partial ideas are suggested based on the present urban conditions of the studied cities and also other cities in the central part of Iran. The aim is to promote the physical form, finance, attractiveness, and infrastructure of the cores, so that the residents of these areas are encouraged to continue living there. The ultimate goal is to increase the quality of the historical cores.

- Idea 1 (Physical /attraction): Using natural materials like stone will help an attractive view of the historical streets and routes. It also reminds the visitors the difference between the core and the other parts of the city. At present the narrow paths of the cores have asphalt as pavement. This is exactly the same material for all other streets. Since the width of the old streets are very little, there are no separate walkways. Thus having a stone surface will be effective in reducing the speed of the cars. The difference between the materials of the surfaces to inform the passengers about the surface that they are moving on is a concept that is often forgotten in the urban design of Iran.

-Idea 2 (physical): Many of the buildings of the old cores are not stable against earthquake because their main construction method is using bearing walls and no structural framework. Most of the houses that were built before 50 years ago need reinforcement against earthquake. This needs participation of the owners of the houses. Their participation is another matter that is discussed later. But the reinforcement of the buildings within long periods of time will assure the residents about the quality of their houses. It will help improving the quality of the built environment and inviting people stay in the cores in the future in advance and it will stop the decrease in the price of the houses.

Idea 3 (Physical): In many places there are still undeveloped lands in the boundaries of the cities. Such lands are the best ground for developing new residential quarters with affordable housing. So the idea is to develop infill projects instead of new

developing new projects on the edge of the cities. This will make the cities more compact and contain the urban sprawl.

-Idea 4 (infrastructure): There is health related infrastructure problems in many cores. The water pipeline networks are old and need to be renewed. In most of the old cities there is no sewage system. To increase the quality of life in the historical cores, renewing the water pipelines and the sewage systems will be essential.

-Idea 5 (physical/financial): Most of the very old houses that corrupt the urban landscape of the cores are not renovated because of the financial difficulties of their owners. This is directly affecting the urban landscape of the cores. An urban environment with corrupted landscape can hardly produce high quality of life. Financial methods that can help the poor house owners in renovation of their houses are needed. Low rate and long-term loans for the renovation of the houses can be a solution. The financial assistances should be so that having an old house in the core becomes an opportunity instead of a threat.

-Idea 6 (physical): The main touchable thing that remains from the historical cores through history is the physical body. Without good preservation of the urban fabric, we can not say that the city is old or historical. Hence the identical elements of the cores like the body of the streets and allies, Ab Anbars, Badgirs, the old houses and so on should be renovated and preserved. This has been partially done in some cites, especially in Yazd and Esfahan. However the look of the governmental organizations that execute these plans is mainly oriented to the architectural elements like the old houses.

An example of such view is seen in the preservation of the old city of Kashan, in which most of the effort is put on keeping the old houses like Borujerdiha and Tabatabayiha. A better idea is that the preservation plans address the whole city instead of the buildings. With this view the first step will be the preservation of the body of the core like the body of the streets and the allies and then comes the renovation of the meaningful buildings that can serve the city as landmarks and

vistas. This will have good results in terms of creating better urban environment for the residents and making the best of attracting the finances from tourism.

Idea 7 (physical/financial): There are elements that have been very important in the old times like the Ab Anbars and Qanats. These have been the infrastructures that used to support life. However today there is no need for their real applications. Many of these Ab Anbars are collapsing because no renovations have been done on them. The Qanats under the bazaar of Yazd are used as sewers and the sewage of the buildings is drained into them. These functions are very capable of being reused in form of new functions like museums, theatre saloons, cultural centers, etc. The façade of such constructions will not be changed, while the application of the inside is new. As a consequence, attractive landscape will be resulted and also sources of jobs and income will be created for the cores.

Idea 8 (attractiveness/financial): A practical method for improving tourism in the cores and developing the financial condition of the residents is to improve new hotels in the historical parts of the cities. At present many of the hotels of the cities similar to Yazd and Kashan are located outside the center. Any possibility that may have positive influence on the financial development of the declining urban cores should be used. The old houses can be reused for establishing new hotels. Increasing the diversity of the people that visit the cores will affect the cultural atmosphere. Another good effect will be providing with new jobs within the cores.

Idea 9 (attractiveness/financial): The last suggestion related to gentrification and revitalization of the cores is about establishing tourist-attracting shops in the neighborhood centers. Opening such shops that sell stuffs related to the history and identity of the city seems a private matter, but institutions like the Iranian Cultural Heritage, Tourism, and Handicrafts Organization can provide with support for establishing these centers. This will lead to more jobs and higher incomes in the cores. Also better presentation of the cultural heritage of the historical cities can be resulted.

9-4-2-Urban sprawl containment

This recommendation is in relation with 3 of the urban problems that were described in chapter 1: urban sprawl, environmental pollutions, and land consumption. It is also suggested based on the traditional specification of “compact city” (Fig. 9-3).

What?

In the first glance it seems that urban sprawl does not exist in the Iranian cities or it is too small to be studied. However the observation chapters of this study showed that urban sprawl has become a significant urban growth trend in the cities of central Iran. The two cities that were considered are both experiencing sprawl; Yazd is highly sprawled and Kashan is less dispersed. According to chapter 4, such trend leads to more motorized travels and more polluted environment. Apart from the environmental pollutions, high land consumption is an inefficient way using the environmental resources. The example of the high rate of the destruction of the agricultural lands of around Mashhad showed how this trend can harm the urban edges. The high amount of the costs of improving infrastructure is another problem. What is essentially needed for the contemporary planning of the medium-sized cities are urban sprawl containment policies. Of course the target of this study is the medium-sized cities of the center of south of the country. The larger cities seem to need another type of strategies, particularly in case of sprawl. Previously strict policies for containment of the sprawl of Tehran were tested. This containment for a dense mega-city of about 13 million people with poor distribution of urban travels was a complete failure. It caused low quality of life because of highly congested traffic and polluted environment. Nevertheless, the present methods for containment of sprawl are suggested just for mid-sized cities and in case all other problems like public transportation, sustainable mobility, and concentric pattern of Iranian cities are solved, the offered strategies can be helpful. Otherwise the failure of Tehran will be repeated.

How?

Idea 10: An old administrative urban problem of Iran has been the difference between the plans and the actual implementations. As stated before a development plan, especially in the larger cities, of which 50% is implemented is considered as successful. This makes the outer growth of the cities different from the predicted boundaries. Still stricter implementations of the plans are necessary.

Idea 11: Like the United States the urban governance of Iran contains Urban Growth Boundaries (UGB) and Urban Service Areas (USA). Both of these areas are often different from the predicted growth boundaries of the development plans. Sometimes the urban authorities try to control the new unplanned developments by giving no municipal services to these new areas. Consequently the poor residential areas that were built without permission outside the urban boundaries become slums as time goes by. Thus the municipal services to these areas should not be stopped while there should be limitations and differentiations between the services that are given to the residential areas outside and inside the planned boundaries.

Idea 12: Although cities like Kashan and Yazd are growing in a dispersed shape, but there are still undeveloped lands inside their urban boundaries. Such areas are specially seen in Kashan and also in less abundance in the north and northwest of Yazd. The urban planning of Iran should change the direction of developments from outside the urban boundaries to inside. Separate partial development plans for each undeveloped land can be implemented. Such lands are particularly suitable for developing affordable housing projects. This is the same as idea 3 (infill projects) that is a way for executing regeneration and revitalization strategy. Hence this idea will work for both regeneration and urban sprawl strategies.

Idea 13: The urban infrastructure can be good tool to control the growth of the cities. This is true about the transportation facilities especially when the people largely rely on the public transit. A special way of defining the growth area of the cities is using light rail trains or powerful regular bus lines across the area of the city. As a result

most of the new residential developments of the future are expected to develop around the lands that are covered by the network of the public transit. However this idea works with other policies like increasing the price of driving personal cars, developing powerful public transit systems, and affordable fares.

9-4-3-Efficient street networks

Enhancing the efficiency of the street networks is suggested according to the same quality in the traditional city and it aims to ease the urban problem of “land consumption” (Fig. 9-3).

What?

The efficiency of the network of the new developments was compared with the traditional network in chapter 7. Under the influence of transportation engineering, the new urban planning of Iran has led the street networks to a wide automobile-oriented one. Giving automobiles enough way to move is a positive point, but this should not result in neglecting the humans. This is a part of this study that was emphasized as the necessary balance between the accessibility and sustainability. In many streets of urban Iran the walkways have been made narrow to let automobiles pass. Also the general conditions of the parts of the street networks that are related to non-motorized travel are neglected. The general idea about the street is that the wider is the better. This is to give more space to the cars to move. That is why the streets of the larger cities of Iran look wider than the streets of many European countries. Construction of wide streets is done even in the local neighborhood spaces where there is no need for them. This is done because it is expected that the number of cars will be much more than today in the future. It is quite normal to see 22-meters streets with no traffic or 12-meters allies with heavy outsider traffic.

The wide street network construction is an outcome of the motorization notion. According to this idea there is no way for sustainable transport modes and public transit. The result of propagating this idea is that the governmental automobile manufacturers can sell their under-standard products. This is having huge impacts on

the environment and land and the life style of the people. Vast lands are being consumed because of this automobile-oriented land-use planning. It has become an acceptable idea that about one third of the area of the city should be allocated to streets that are mainly used for car traffic.

The concept that this study suggests is to allocate lands to street building more efficiently based on the prediction of the future traffic. This will prevent building narrow streets for busy places or wide streets in places with little traffic. It is expected that good results for land consumption and traffic congestion will be gained.



Fig. 9-4: A deserted wide main street in the city of Naein in the center of Iran (Esfahan Province) in the morning of a week day. Photograph taken by the author in summer 2010.

Fig. 9-5: A secondary street in Naein with 12 meters width. Photograph taken by the author in summer 2010.



How?

Idea 14: As seen in the study of the street network of the center of Yazd and the new neighborhood of Emam-Shahr in chapter 7, there is better correlation between the traffic and the width of the streets in a traditional network than in a new development. The width of the streets should be in proportion to the predicted traffic. The idea of “wide streets for every where” does not work. It is suggested that the tools like Space Syntax theory be used as tool for prediction of the future traffic. This is considered to be good tool to prevent mistake in allocating extra land for construction of streets or building new narrow streets with lots of traffic problems. The target of this suggestion is mainly for new developments. Expectedly it will reduce the trial and error procedure that is seen in the street construction of Iran.

Idea 15: The Iranian cities need transformation towards human-oriented urban environment. More human-oriented elements in the development plans are needed. The examples of such elements are pedestrian/bike friendly facilities, and plazas. These spaces can be constructed in the city centers or neighborhood centers. The belief that supports these spaces and facilities is that the city is not a place just for the automobiles or it is not just for having better mobility.

Idea 16: In general one of the goals of this study is to find an acceptable balance between sustainability and accessibility. Most of the recommendations of the study are about promoting sustainability because is shown in the observation part that the sustainability elements were neglected just to have better accessibility. However in each case the accessibility is a positive concept and should be promoted. A suggestion that can increase the accessibility of the networks is to decrease the length of the blocks. This is seen in a traditional city; several short routes. Regarding the existing conditions of the urban form in Iran, 100 meters seems a reasonable distance for the length of a block.

9-4-4-Neighborhood-oriented urban planning

This concept is suggested as a response to two new shortcomings: “unsustainable transportation and lack of sense of community and place. It also refers to the notion that was observed in Yazd and Kashan and also other cities, titled “Independent neighborhoods as the basis of the city” (Fig. 9-3).

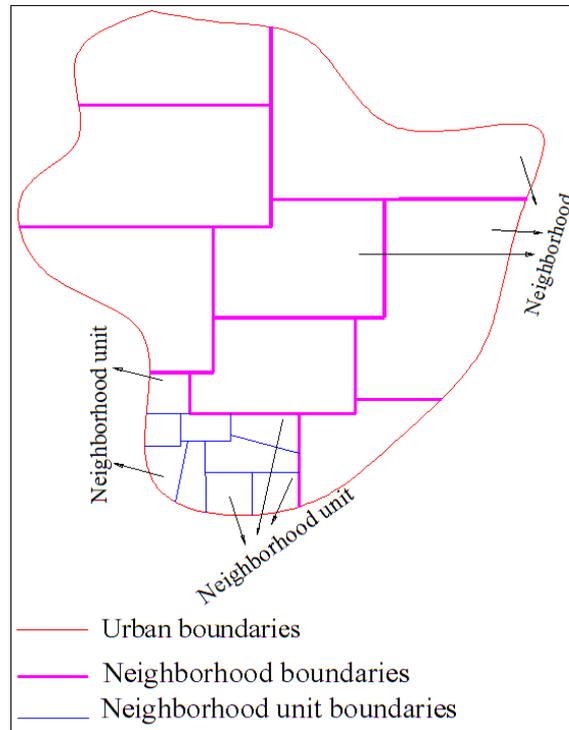
What?

As discussed in the chapter related to the characteristics of the Iranian urbanism (chapter 5) and according to the indication of the specifications of the neighborhoods in Yazd and Kashan (chapters 7 and 8), the Iranian city has been directed to have centralized urban facilities and services after the mid-twentieth century. The traditional structure of the cities that was based on the almost-self-sufficient neighborhoods was changed. Instead, the residential quarters that were dependent on the city as a whole were replaced. Such quarters have deficiencies in comparison to the traditional neighborhoods. These deficiencies include the social issues like social relationships, identity, and sense of community. These areas also direct most of the urban travels to the main streets and the city centers.

The concept that is suggested here is to replace the conventional centralized planning that focuses on the city with localization. The conventional centralized city places the city center as the hub of every activity and every part of the city is dependent on it in terms of jobs, services, and identity. What are needed are neighborhoods with independent identity that are self sufficient and self contained in many cases. Each neighborhood should include a number of smaller areas called neighborhood units (Fig. 9-6). The boundaries of these parts can be defined so that the residents know which unit they belong. The advantages will be both physical and social; like better urban travel distributions, higher levels of social interactions, promoting sense of community and participation.

If we can reach the goal of making local almost-independent communities within the cities, it will be a great step toward solving the urban problems of the corrupted Iranian cities.

Fig. 9-6: Schematic illustration of the suggested organization for the neighborhoods and the neighborhood units.



How?

Idea 17: The first step is to define the boundaries of the neighborhoods and let the residents of the neighborhoods and every resident of the city know about the neighborhoods and their identity. The beliefs of the residents and the edges like the main streets are the fundamental factors in determining the boundaries of the new neighborhoods. The visual informants like tableaus and signs at the entrance of the neighborhoods can be effective to inform the residents which neighborhood they belong. It is better to define the neighborhoods as official boundaries. So the neighborhood boundaries can have similarities to the official zones of the districts.

Idea 18: The names of the neighborhood and the facilities inside them are very important. The residents of the neighborhoods should be aware of the name and identity of their settlement and be proud of it. The facilities, services and institutes and companies inside one neighborhood can be named as the title of the neighborhood. The result will be higher sense of community among the residents.

Idea 19: Increase in participation of the residents in the current activities of the neighborhoods is desirable. Every possible activity that leads into higher participation among the residents can increase the sense of community and every community that have high sense of community can expect high participation. The suggestion of this study is to establish neighborhood and neighborhood unit councils to preserve and keep each neighborhood and neighborhood unit. The organizations can be branches of the city councils but they should be nonprofit institutions. In other words the participants should be volunteers from the same neighborhood.

Idea 20: The area of each neighborhood should be less than 100 hectares for medium-sized cities or 120 hectares for large cities. For small towns it can be less. It is necessary that the area of the neighborhoods be less than the area of the official districts. They should also be large enough to contain some units within.

Idea 21: Each neighborhood unit should have a maximum area of 30 hectares. Again the area of the units is dependent on the size of the city and the districts. The best size for the units is the size that makes the best sense of community in the residents and can give the best possibilities to the planner to design the unit center facilities.

9-4-5-Transport strategies

Transport strategies are discussed as an answer to the unsustainable transportation and public transport problems. They do not have any links to the traditional city but they are suggested as a complement to the traditional-based solutions.

What?

Every urban design effort without effective urban transportation strategies will come undone. The transport strategies are often set and implemented by the governmental sector. On the other hand the transportation strategies that are not supported by the urban form will have weak results. The strategies that are focused here can lead to less personal automobile use and less environmental pollutions.

The transport strategies that are discussed here are the ones that enhance the sustainable and public transportation. Such strategies will decline the automobile-oriented side of the new urban planning. Also, as an outcome, the people are encouraged to use public transportation. In case of time, implementation of these strategies should be the last step of a series of general urban planning strategies. In other words, they should be implemented after all other solutions related to the urban form so that the residents will not be put under financial pressure. This solution is exceptionally not in relationship with the traditional city. However due to the ineffectiveness of the neo-traditional development in mid-sized cities without good transport strategies, these ideas are brought here.

How?

Idea 22: putting a strong public transport system to work is a fundamental strategy to promote the quality of urban life in the large and mid-sized cities of Iran. As mentioned before Tehran Metro is successful but it is not enough. Light rail systems like the street trains (Strassenbahn) in Germany or the Streetcars in North America can be the winning card. For many mid-sized cities of the central parts of the country, it is much easier to establish such systems than in the large cities. In such cities a network of about 20 kilometers is enough for the whole city. Apart from the influence of these networks and also LRT and BRT systems in defining the urban boundaries and containing the urban sprawl, they can be effective in stopping people relying just on cars.

Idea 23: As long as using personal car is cheap, every one prefers to drive. So every other factor is all right the last step can be making car driving expensive. Other factors can be distribution of the jobs in the city, making the neighborhoods travel-attractive, increasing the residential quarters attractive, providing suitable public transit, and construction of safe and secure pedestrian and bike facilities. But a more important factor that is preliminary to any other action, is improving the level of income per capita of the country. At present due to the political conflicts the ratio of the income of the Iranian households to their costs is increasing. Therefore making

car driving expensive without providing the necessary preconditions is useless and aims at ruining the urban culture and atmosphere. The example of making car use expensive happened in 2007 when the program of rationing the car fuel was executed in the whole country and the price of gasoline was increased by 500% in 4 years. Although the government claimed that it had reduced car use but in fact it did not have any serious influence because the people did not have any other option to replace cars. Nevertheless making car use expensive in any form like increasing the fuel price can be good strategy in normal conditions to push people to use more sustainable modes of transport. This should be again emphasized that this strategy is suggested as the last step of a chain of strategies, so this will be a long-term solution.

Idea 24: An effective method that can have a positive impact in pushing people to use public transport is to give the employees fare reduction to use the public transport. This can be done by the governmental organizations and offices. The people that will benefit from this strategy are the lower middle-class and the poor governmental employees. The pattern that can be followed is the one that the new development of Potsdam-Kirchsteigfeld in Germany implemented. As reviewed in chapter 3, a reduction of 35% was offered to the commuters to use public transport to Potsdam center. Of course the infrastructure of the public transportation should be complete and then this strategy can be executed.

Idea 25: A similar strategy is to limit the allowed time to use each car. At present there is no rule for such limitation. Therefore the average car age in Iran is high in comparison with the developed countries. This is better seen in the small or far-away cities. Some years ago, a governmental decree was to limit the age of the cars in use to 30 years and allocate loans to the owners of such cars to make them able to buy new ones. Nevertheless this remained optional to the owners and never became obligatory. Limiting the car age to 15 or 20 years will make car use less.

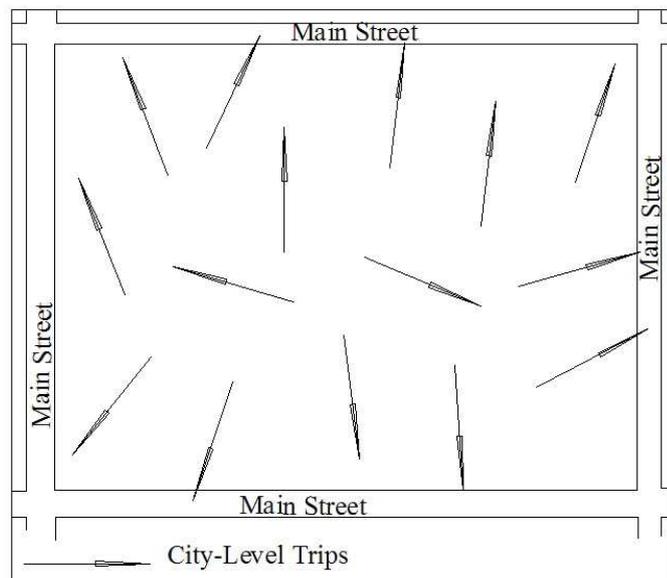
9-4-6-Neighborhood unit center development

This solution is discussed according to two urban problems; unsustainable transportation and lack of sense of community and place. It also has roots in two traditional qualities: “Some neighborhood units for each neighborhood” and “a distinct center for each neighborhood unit” (Fig. 9-3).

What?

As a part of the localization-related suggestions, the neighborhood units should contain a distinct and recognizable center. Based on the area of the units they can have two centers. The center should comprise of shops, a small urban park, pedestrian space, banks, local offices, internet cafes, schools, playgrounds, and spaces, in which people can sit and socialize. The idea of having centers for each neighborhood unit comes from the traditional urbanism. Nevertheless the central facilities should be the amenities that the modern people need.

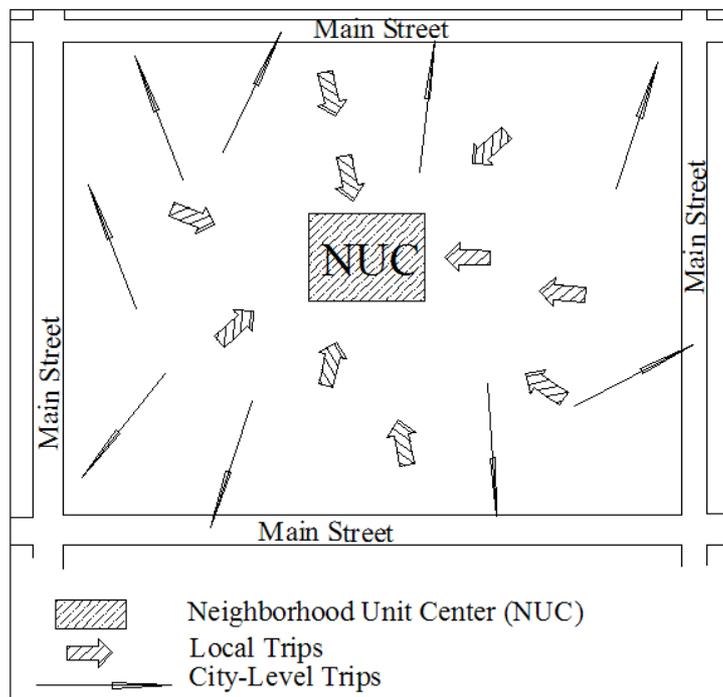
Fig. 9-7: The schematic illustration of the existing conditions in the residential quarters in terms of directing the travels to other parts of the city.



The attitude of people about living in a neighborhood unit is important. It can be the subject of an independent research. Unfortunately there are no cross-sectional comparative researches on people’s privilege of living in the traditional or modern quarters. It seems that the attitude of the Iranian city dwellers is more about the infrastructure of the living place than the form of the neighborhood. Of course this

can be tested in a separate study. However it is not likely that they have any problem with the neighborhood organization that is suggested here. There are some reasons for it. Firstly, it is obvious that today's people need to feel they live the modern way. Therefore essentially that it is not necessary that the suggested neighborhoods have any visual appearances common with the traditional neighborhood. The subject that is discussed here is the function. What is suggested here is neighborhood with old basis of function but with new looks. Secondly, when there is an attractive center that contains the creativity and entertainment amenities very near to the residences, why do people refuse to visit there and provide the daily needs? Also why should they get on the car and go to bazaar, city center, shopping malls and so on? The NUCs that are introduced here can be an advantage for any neighborhood unit. Thirdly, the notion of the neighborhood planning should be implemented within the framework of the existing street network. Therefore the basis of the contemporary city will remain. Any attempt to change the existing system will completely fail.

Fig. 9-8: The suggested pattern for the neighborhood unit. The NUC can supposedly draw the non-commute local travels to the center of the neighborhood unit.



How?

Idea 26: NUC should be attractive for the neighborhood residents. Lack of attractiveness is a problem in the existing residential quarters. The unattractiveness can cause many non-commute urban travels be directed into other parts of the city

and make the city-level traffic congestion worse. Fig. 9-7 shows the schematic existing condition of the urban travels that are attracted by the city-level destinations.

If the NUC is attractive enough to keep the residents inside the neighborhood unit, then it will be effective in calming the urban traffic. The winning card is that these short trips can be done on foot or by bike. Fig. 9-8 illustrates the ability of an attractive NUC to draw the local non-commute urban travels.

Idea 27: The current planning attitude about placing the retail uses in the master plans is to put them on the edge of the streets, especially the main ones to attract most of the customers. This happens not only in the main streets, but also in the residential quarters.

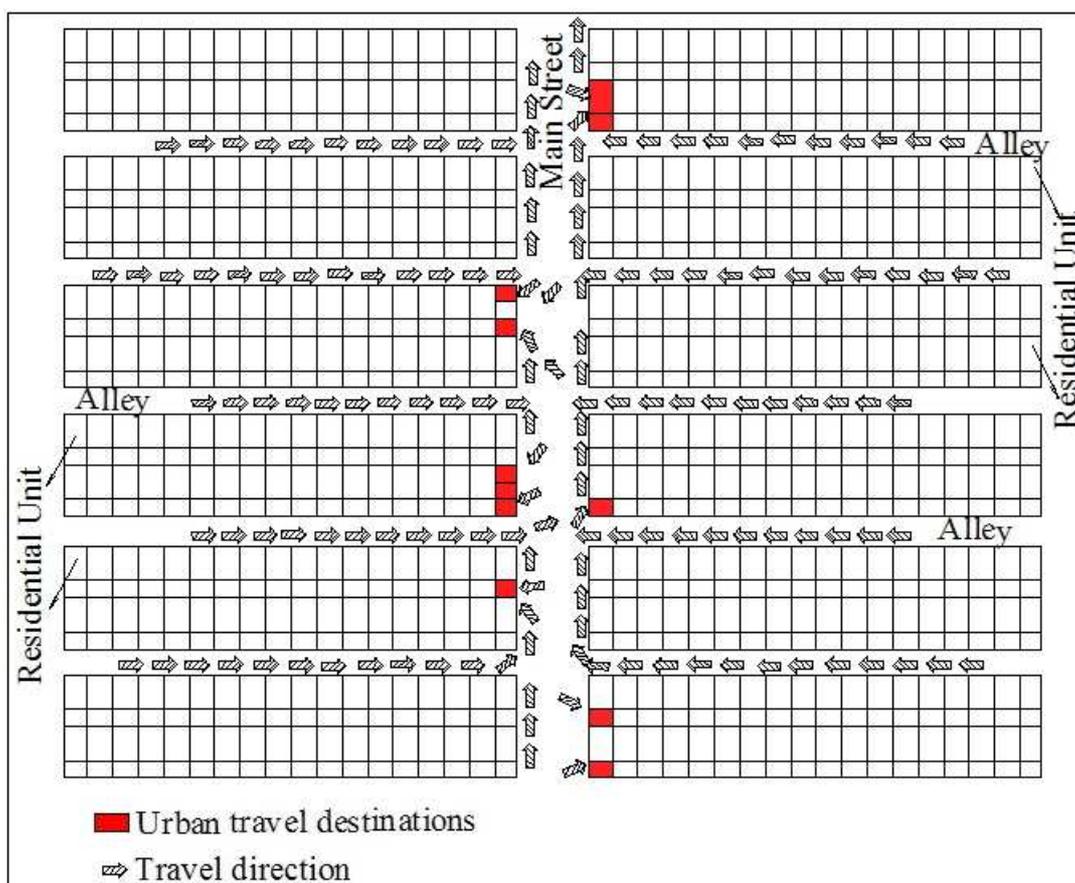


Fig. 9-9: The existing travel pattern in the residential quarters. The local travels are done by moving to the main street and access the dispersed travel destinations.

This results in pushing people to go to the main streets to do a simple local activity and make small traffic jams. The suggestion of this study for promoting a more sustainable transportation is to place the retail uses of each unit in a central form at the center (Fig. 9-9).

Idea 28: The area that is needed to construct a center for each neighborhood unit is not so much. There are small bare lands that are usually converted to small green spaces as soon as the municipalities own them. Such lands in addition to the unbuilt lots can be good ground for establishing new centers.

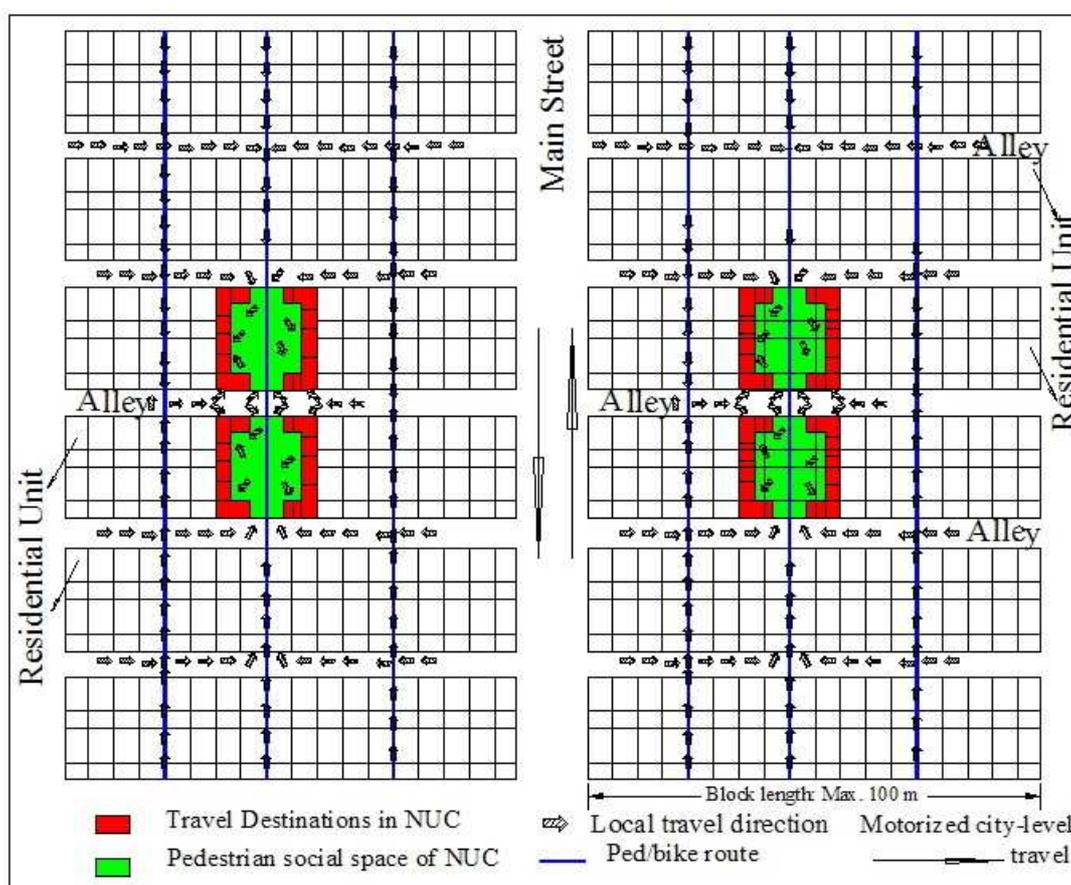


Fig. 9-10: The suggested pattern for the development of neighborhood unit center (NUC) designed for about 300 buildings. The local travels are directed to the center of the neighborhood unit where there are the minimum amenities for the daily needs and also a pedestrian social space that is separated from the automobile routes. The local travels are made through pedestrian/bike routes.

Idea 29: The place of the neighborhood unit center (NUC) should be in a walking distance from the farthest house on the edge of the neighborhood unit. According to

the observation of the walking distances of the neighborhood units of Kashan, the natural walking distances can be less than 800 meters. In this way the residents of the farthest places of the unit can easily have access to the center (Fig. 9-10).

This concept directly comes from the traditional Iranian city. It is more or less the same in most of the western ideas that have already been discussed. That is because one of the reasons that shape the dense traditional forms was mobility and 800 meters was reasonable distance for walking in many cultures. As we saw about the New Urbanism in chapter 2, the distance of half a mile was addressed.

9-4-7-Public social open spaces

This solution concept is a reaction to a problem regarding lack of urban spaces suitable for “social relationships”. This notion has origins in the statement that was derived from the observation: there is “a social open space for each neighborhood unit” (Fig. 9-3).

What?

As shown about the traditional urban form of Kashan and the new development of Naji-Abad, the new urban planning lacks the human-oriented public open spaces. The spaces that exist are roundabouts or squares that have a green space in the middle and mainly transfer the cars through it. However the spaces that are needed should have different specifications. Such spaces should be pedestrian open spaces with possibilities for people to have a rest far from the busy streets. The nature of these spaces is different from the urban parks that have the green spaces as the main function. Shopping, creative activities, and entertainment are the basic functions that should be found in these spaces. The social open spaces can be categorized into two types; the city-level spaces and the neighborhood-level ones.

How?

Idea 30: The neighborhood-level social open spaces should be located in the NUC. (Fig. 9-10) People of a small community can socialize in such space.

Fig. 9-11: Hafez st. (Tehran) that crossed Shapur Intersection on the north-south axis was transferred to the underground level. Picture taken by the author from south to north in summer 2010.



Fig. 9-13: Some parts of the intersection became free and changed to pedestrian space after the project was completed. Picture taken by the author from northeast to southwest in summer 2010.

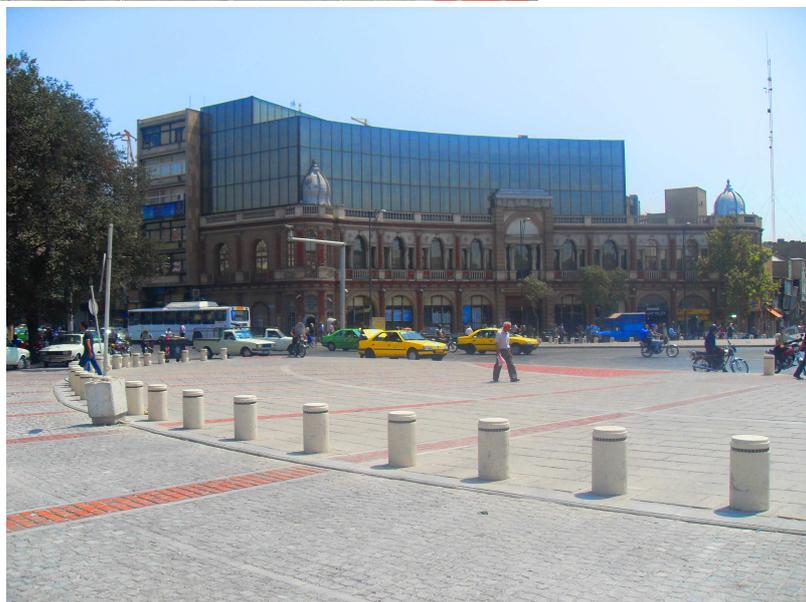


Fig. 9-12: After the project was complete, the east-west street was the only source of motorized traffic in Shapur Intersection. Picture taken by the author from northeast to southwest in summer 2010.

The area is not so large. The space is almost separated from the allies and streets, in which the cars move, so that the sound pollution of the space is less. The visual attractions are very important to bring the people to the center. The surface can be covered by stone or other natural materials. It should be different from the asphalted surfaces of the streets to remind the people that the space has various functions.

Idea 31: The city-level social open spaces are very rare in the contemporary Iranian cities. The necessity of having such spaces is completely felt. Apart from the privilege of the motorized traffic to the social activities, the fundamental problem is that there are no spaces for planning the social spaces especially in the center of the large cities.

The idea that is suggested here is transferring the streets of some of the main intersections to the underground to provide space for social pedestrian spaces. This idea has origin in a recent project that was done in a main intersection in the center of Tehran called Shapur Intersection.

The north-south street of the intersection was transferred to the underground level, so the east-west street has no intersection with the other street. The previous asphalt surface was changed with paved stone. The new appearance of the place is different from the previously busy space. In Case the second street is relocated to the downward levels, it is possible to create a pedestrian space in the busy city center of Tehran.

The idea can be implemented for other cities too, particularly the dense and crowded cities that can not provide suitable spaces in the city center. However the technical problem that is passing the two streets over each other in the underground levels should be overcome.

Idea 32: An application of the social open spaces is to promote the sense of community and place. Designing visual and architectural elements is very important in strengthening these types of feelings. These elements have especially the possibility to transfer the senses to the visitor when they are unique.

The suggested social spaces, either they are neighborhood spaces or the main social spaces, should comprise of unique elements and landmarks. Even the pedestrian centers of NUCs should not contain similar and common elements. This uniqueness gives the neighborhood resident a sense of community and transfers a sense of place to one-time visitor.

9-4-8- Pedestrian/bicycle facilities

This recommendation is an answer to two urban problems: “unsustainable transportation” and “lack of suitable spaces for social relationships”. It is also according to this finding of the observation: there is “a distinct center for each neighborhood unit” (Fig. 9-3).

What?

Sustainable urban travel modes are part of transportation and urban planning that have been totally forgotten in Iran. While, as we saw in the last chapters, the transportation of the traditional city was naturally based on it. Some limited efforts has been made to generate pedestrian facilities in some of the larger cities like Tehran, Mashhad, Tabriz, and Shiraz like change the function of the streets to pedestrian streets. Nevertheless the bicycle planning attempts remain limited to the recent bike rental developments in Tehran. The number of practiced plans for urban bicycle routes is almost zero. There are some bicycle routes developed in some urban parks like Chitgar Park in the west of Tehran, but the routes in the urban parks are not a part of the urban transportation network. Developing biking culture in the mid-sized and larger cities of Iran is really hard planning task. This study is not specialized in Pedestrian/bicycle planning but an idea that is related to the NUC is explained. This idea is added to the concept of maximum walking distance of 800 meters that was explained above.

How?

Idea 33: The idea that is suggested here is on construction of new narrow pedestrian/bike routes in the scale of neighborhood. The layout is shown in Fig. 9-10. The routes that can have a width of about 3 meters pass from between the lots and connect each other. Therefore a network of narrow routes connects every place in the neighborhood unit to the center. The network of every neighborhood unit should be connected to the ones of the next-door networks. The houses of around the routes should have windows to face the routes to provide higher social security. This idea can be addressed in the future designs of the new developments.

Chapter Ten

10-Summary and conclusion

This chapter is intended to give a report of the results of this dissertation. The summary outlines the previous chapters and the procedure of the research and the conclusion section is a brief list of the results. At the end the research topics that seem open to the researcher is introduced for the future work of other scholars.

10-1-Summary

In order to find the possible uses of the traditional urbanism in solving the modern urban problems, some of the contemporary urban problems that were likely to be partly or completely solved were targeted in chapter 1. The two research questions that were going to be answered were 1) which characteristics of the traditional Iranian urbanism can we use to solve some of the modern urban problems of the country? and 2) How can the effective traditional city characteristics be applied to ease some of the modern problems?

Before studying the Iranian cities, the similar experiences in other countries and cultures were considered. The neo-traditional trends, practices, and built communities were discussed so that the nature of the research is determined. For example it was explained how the compact and traditional urban form was used to control urban sprawl in North America. Apart from the practical background, the theoretical aspects were reviewed. These theoretical bases were the interactions of built environment with urban transportation and environment.

Before starting the main body of the research, the previous researches on the traditional urbanism including urban form, the main elements of the Iranian city, and the historical views of the urban growth were discussed. Also some of the neighborhood infrastructures were described to make the foreign reader familiar with the Middle Eastern urban architecture.

The main research methods that were used were direct observation, literature review, and Space Syntax theory. The theoretical bases and applications of SS were explained in chapter 6.

Two case study cities were selected to be studied; Yazd and Kashan that both are located in the center of Iran. The studied cities contain a population of 400000 and 270000 so the results are generalized for the cities with the same range of population in similar climates and geographical conditions. Such cities are mostly mid-sized cities or small large cities in the south, east, and center of the country and also some parts of the western provinces. The historical urban growth, population growth, the typology of the constructions in the historical core and the new developments, mobility flows in the new and old textures, neighborhood organization, Neighborhood unit centers, and the hierarchy of the street networks of the two cities were studied.

The first research question was answered by defining the main characteristics of the traditional Iranian city. To answer the second question, solutions in form of general strategies were discussed. Each of the suggested strategies can be implemented via some practical ideas. The study was started by the following hypothesis: “There are tips in the traditional Iranian city that have the capability to be used in contemporary Iranian cities to improve the related conditions of urban transportation, environment, energy use, and land consumption”. At the final stage of the work, it became apparent that the hypothesis is true because the possibilities and circumstances of using the traditional specifications and values became clear.

10-2-Conclusion

10-2-1-The findings of the observation

Before traveling to Iran to do the fieldwork, a series of literature study was done. The direct observation was conducted in Yazd and Kashan in summer 2010. Later the observation was continued in shape of literature review and Spaces Syntax analysis. The following are the main raw findings of the study:

- There are urban sprawl in Yazd and Kashan. The shape of the sprawl of the cities are different from the western countries but two of the most important specifications of urban sprawl (fast boundary growth in comparison with the population growth, and also leapfrog development) are seen in the nature of the urban development of the cities.
- The historical cores of the cities are shrinking. The urban decay and shrinkage are seen in the infrastructure, demographics and social conditions of the cores. The populations of the cores are constant or decreasing.
- The historical cores are organized on the basis of the neighborhoods and neighborhood units. The neighborhoods have independent identities and are almost self-contained and inward-looking. The neighborhood units are based on the units that are accessible from all parts of the unit.
- The NUCs can absorb the urban travels from the unit or the neighboring units. So many of the daily travels can be done on foot.
- Many every-day social activities were previously done in the social public spaces of the neighborhoods that were situated in the NUCs. As shown about Kashan, these spaces were accessible from many traditional neighborhood units but they are very few in the new developments.
- There is not a balance between the accessibility and sustainability in the two case study cities. The accessibility is higher in the urban form. But this has caused the lifestyle become too much car-oriented. This can be unsustainable because reasons like weak fuel quality, poor car engines, destinations outside the walkable distances, poor public transportation, and unattractive local spaces. There has been too much ambition for promoting the accessibility, while the more human and environment-oriented ways like sustainable transportation modes have been neglected in the new urban planning of Iran.
- There is strong sense of community and place in the traditional neighborhoods. This sense is enhanced by the unique identity of the urban amenities of the NUCs. The new developments lack the sense because there is no such uniqueness in their physical elements. There is too much

similarity in the grid-iron network of these quarters. Also the traditional residents had a sense of belonging to their place of living and the amenities they used. Because the place, in which they lived, was an independent city within a city.

- There was a harmony between the traditional street network hierarchy and the traffic of the streets. This harmony is higher in the traditional urban form of Yazd than in a new development of the city. As a result there are some wide streets with low traffic or narrow streets with heavy traffic in the new developments. Another result is that in the mid-sized cities vast lands are under street construction without real traffic-related reason.
- The construction of the wide streets between 1930s and 1950s in Yazd and Kashan has cause the people withdrawn from the NUCs and turn to the streets to do the daily activities. Therefore the NUCs have become deserted and the bazaars have lost commercial importance. However the streets have had a great triumph over the traditional spaces. These were shown through the Space Syntax analysis. As a result the transportation became more car-oriented because the destination changed to far away ones instead of local destinations. Also the social neighborhood spaces lost importance to the city-level streets. Thus the construction of the streets affected on the social issues and urban transportation.

10-2-2-Characteristics of the traditional Iranian city and their relationship with the hypothesis

This part of the dissertation is an answer to the first research question: “Which characteristics of the traditional Iranian urbanism can we use to solve some of the modern urban problems of the country?”.

The observation of the two case study cities results in determination of some general characteristics of the traditional Iranian city. These specifications that may be found in the traditional cities of some other parts of the world are summarized as the following:

- The traditional city is a compact dense city.
- There is practical street network hierarchy.
- The city includes neighborhoods with independent potentials and identities.
- Every neighborhood consists of a few neighborhood units.
- Each neighborhood unit has a distinct center.
- Many neighborhoods and neighborhood units contain social open spaces.

As seen in chapter 1, the hypothesis of the research is: “There are characteristics in the traditional Iranian city that have the capability to be used in contemporary Iranian cities to improve the related conditions of urban transportation, environment, energy use, and land consumption”. Chapters 5, 7 and 8 have links to the hypothesis. The characteristics of the traditional city were analyzed in these parts and their possibility to be used in the modern-day society was discussed in Chapter 9. This is not possible and meant to solve all the new urban problems, but if just a percentage of the problems are eased by using the traditional values, then it would be a success. It is assumed that the two key points of the hypothesis that are “the traditional characteristics” and the “capabilities” are well discussed in this thesis.

10-2-3-Recommendations and strategies

This part is a general answer to the second research question: “How can the effective traditional city characteristics be applied to ease some of the modern problems?”.

According to the contemporary urban problems (chapter 1), research methods (chapter 6), and the characteristics of the traditional city (derived from chapters 5, 7 and 8) the following concepts that are claimed to be neglected in the new planning of the country are suggested to be emphasized more:

- Revitalization and regeneration of the inner cores
- Urban sprawl containment
- Efficient street networks

- Neighborhood-oriented urban planning
- Transport strategies
- Neighborhood unit center development
- Public social open spaces
- Pedestrian/bicycle facilities

10-2-4-Practical ideas

This part is the detailed answer to the second research question: “How can the effective traditional city characteristics be applied to ease some of the modern problems? “.

Each of the recommendations and strategies were discussed over in case of the nature and also the circumstances of implementing them. In answer to the how-question of “how can the strategies be implemented?” some practical ideas were suggested. Some of these ideas are executive ideas in the local level, while others need much time and effort to be implemented. Of course each of the suggested hints can be developed more in special studies and more similar ones can be thought of.

- Idea 1: Use natural floor material for the historical core streets and especially pedestrian routes.
- Idea 2: Stabilization of the buildings of the cores against earthquake.
- Idea 3: Execution of new infill projects to the cores to gain higher densities of the central cities.
- Idea 4: Improvement of the health-related infrastructures like pipelines and sanitation systems.
- Idea 5: Allocation of low-rate and long-term loans for the house owners of the cores for renovation of the houses.
- Idea 6: Preservation of the historical public physical elements such as allies and routes as well as the architectural elements.
- Idea 7: Adaptive reuse of the old elements that do not function today as the old times, such as Ab Anbar and Qanat. The new functions can be cultural.

- Idea 8: Improve hotel construction in the cores in order to promote the financial conditions of the cores.
- Idea 9: Establishing tourist-attracting shops for selling stuffs related to the history and culture of the city.
- Idea 10: Strict implementation of the master plans in order to control the growth in accordance to the predicted plans.
- Idea 11: Limited municipal services to the developments outside the Urban Service Areas (USAs) to control the developments outside the master plans.
- Idea 12: Development of affordable housing projects in the unbuilt areas within the central cities.
- Idea 13: Use infrastructure, especially transportation infrastructure, to control the growth of the city.
- Idea 14: Use prediction tools like Space Syntax to have better understanding of the future traffic of the street network to prevent using too much land for street construction.
- Idea 15: Use more human-oriented urban facilities like pedestrian routes and plazas, particularly in the scale of neighborhood.
- Idea 16: Design short urban blocks of about 100 meters for the new developments.
- Idea 17: Define physical boundaries and unique identities for the neighborhoods and let the residents know about it.
- Idea 18: There should be similarities between the name of the neighborhoods and the neighborhood units and the amenities inside them.
- Idea 19: Enhance the responsibility of the residents to manage the neighborhood units. Promote the local participation.
- Idea 20: The area of each neighborhood should be less than 100 hectares for medium-sized cities or 120 hectares for large cities.
- Idea 21: Each neighborhood unit should have a maximum area of 30 hectares.
- Idea 22: A small network of public transport like light rail BRT is essential for the mid-sized cities.

- Idea 23: Making the car use expensive by increasing the fuel price. This is done as the last step when every other strategy is implemented completely.
- Idea 24: Give employees fare reduction to encourage them to commute by public transportation.
- Idea 25: Limit allowance time to use each car to 20 or 15 years.
- Idea 26: Each neighborhood unit should have an attractive center that draws the unit residents to the center. Designing eye-catching physical elements are very important.
- Idea 27: The NUC should contain all the retail centers and shops of the surroundings so that the residents are drawn to them.
- Idea 28: The small unbuilt lots that are found in many neighborhoods are suitable for construction of NUCs. They are especially suitable when they are in the geometric center of the unit.
- Idea 29: The center should be in the walkable distance 800 meters from the edge of the neighborhood unit so that the people can easily access it on foot.
- Idea 30: Each NUC has a pedestrian social public space that is separated from the automobile streets and is defined by special flooring.
- Idea 31: Each mid-sized city should have at least one city-level open social space that does not have the transportation function and is special for social activities.
- Idea 32: Design unique physical and visual elements in the public spaces in city and neighborhood level to give the visitors or residents sense of place or community.
- Idea 33: Design narrow routes of 3 meters between the buildings of the neighborhoods perpendicular to the allies. These pedestrian and bicycle routes lead to the NUCs and are overlooked from the windows of the houses.

10-3-Ideas for more research

There were challenges in conducting the present research. This was mostly because of two main factors; 1) lack of empirical data and study on the interactions of

different urban forms with transportation and environment 2) lack of similar studies on the uses of the traditional urbanism of Iran in the modern urban planning. Therefore the following research topics that have the nature of the above shortcomings are suggested.

- Cross-sectional comparison between the urban travel production/distribution of compact or traditional neighborhoods with new dispersed urban form: after 1990 many examples of such studies were conducted in the western countries. However there is a lack of similar comparisons between the new and old or the compact and dispersed urban textures of Iran. The aim should be defining the impacts of different urban forms on the travel behavior. The question that is to be answered is “is it true that the compact urban form has positive effects on the travel behavior in case of the Iranian cities?”. The research can be done focusing on urban travel generation and mode choice.
- Comparative study of travel behavior in new neighborhoods with distinct center with neighborhoods with destinations on the main streets: This type of study is a part of the previous suggested research in the level of neighborhood. It is meant to compare the travel behavior in a neighborhood with central structure, as a sample of the traditional neighborhood, on the one hand, and a modern neighborhood that leads the traffic to the main streets, on the other hand. The comparison is to be made by the difference in the pedestrian and automobile travels.
- Consideration of the impacts of size and the form of the Iranian cities on the environmental footprint: This study is absolutely absent in the Iranian urban studies. It is not exactly known how the urban form of the Iranian cities affect the environment in a macro level. It is also aimed to define how much the area of the pollutions produced by the urban life is.
- The methods of measurement of attractiveness of the neighborhood centers and the related cultural barriers: The ability of the neighborhood centers to draw the local people is another interesting theme. This can be studies apart from the transportation issues. The suggested research measures the role of

attractiveness of the neighborhood centers in successful neighborhoods and neighborhoods with weaknesses. The attractiveness that is meant here includes social relations, visual attractiveness, local retail, etc.

- The urban design patterns and layouts for implementation of pedestrian and bike routes within the texture of the Iranian cities: In the past years, pedestrian streets have been noted by the planning bodies more than before. However this trend has been mainly in the form of single streets in different parts of the city. In other words, the new pedestrian streets, which are shaped by pedestrianization of the formerly automobile streets, are not connected to each other and do not form a network. Therefore there is no similarity between the pedestrian network of the historical core of the European cities and the new pedestrian streets of the Iranian cities. There is even less progress in plannings related to bicycle routes. In this case the urban planning of Iran needs fundamental studies. Practical layouts for implementing bicycle routes in the dense streets of the larger cities are specially needed. The future researches should clarify how it is possible to develop bicycle routes with minimum reduction of the street traffic capacity.
- The cultural obstacles against bicycling in the Iranian cities: The cultural and religious trends have shown to be barriers against bicycling in Iran. A suggested research can be on the social barriers against bicycling, especially for the women. The study should show ways to improve bicycling infrastructure for women. In a more general view, it can be considered that how bicycling as a transportation mode can be improved in a traditional community that is passing through to a wealthier society. In this society having a car means social prestige. The research that is introduced here has a background of urban sociology. In the meantime it deals with planning and urban transportation. It should show creative methods to reintroduce bicycling as a major way of transport to the people, who have the financial ability to buy car.
- The specifications of the Iranian urban sprawl and comparison with the western suburban sprawl: Again there are very few studies about urban

sprawl. This topic has not largely drawn the attention of the researchers, so it is not possible to conclude from the literature about the nature and consequences of the urban sprawl of the Iranian cities. Although the present research has shown some negative results of the urban sprawl, but more observations and evidences are needed to determine the border between natural urban growth and the uncontrolled growth that leads to many deficiencies in quality of life. As mentioned in this study, the Iranian urban sprawl should be studied with a look to the local problems because there are differences between the western sprawl and the Iranian one. A research that is suggested here considers the growth of selected Iranian cities compared to their population during the past decades.

- The public attitude of people about living in neighborhood units with centralized centers: During the past years the general attitude for living in open automobile-oriented neighborhoods and modern apartments has been promoted. The city dwellers seem to be escaping from the traditional neighborhoods of the historical cores. In common sense, living in traditional neighborhood is equal to having an old house, maybe a courtyard house, in narrow alleys of the central parts of the cities. These alleys are hardly usable for the automobiles. Similarly there are other infrastructural problems in such neighborhoods. The question that can be answered in the suggested research is that if a new traditional neighborhood is built and all the infrastructural problems are solved, then what is the public attitude of the people against living in them? It should be cleared for the interviewees that these neighborhoods are newly built, but the arrangement and basic concepts are traditional.
- Defining polycentric and monocentric forms in the modern Iranian cities: It is important to have a realistic view of the structure of the Iranian cities. As mentioned before a combination of efficient public transit with concentric city structure can have good results for the urban transportation. At present it seems that the construction of powerful public transport networks is not aimed or economic. Therefore the dominant transport mode will be personal

car. In this case, it is better not to direct all travels to the city center of a concentric city. The Iranian small and medium-sized cities generally seem to have concentric form. Nevertheless Tehran needs more research. In absence of good public transport, tens of thousands of daily automobile travels are directed to the central districts of the city. Nonetheless, as seen in chapter one, Bertaud (2003) defines Tehran as a polycentric city like Atlanta. This is the result of a foreign research. Similar studies are necessary to have better imagination of the real form of the Iranian metropolises.

- Empirical study of the role of job decentralization in urban transportation: The researches that clear the reciprocal impacts of urban travels and centralization of jobs are rather rare. The aim of the suggested study is to define how the jobs are distributed in the cities, and how the placement of the jobs is in relation with the urban travels is. As a ground for research, new places that attract commuters can be focused and the commuters can be interviewed. It is believed that decentralization of jobs in car-oriented cities like Tehran will have positive results for the urban transportation.
- Space Syntax analysis of the reasons for the difference in the reaction of the urban forms of Yazd and Kashan after the construction of the new streets: As seen in chapter 7 and 8, the mobility of bazaars and the city centers in Yazd and Kashan to the new streets were different. The mobility of Yazdi bazaar and city center decreased, while the bazaar and city center of Kashan gained higher mobility. The question is what characteristics the regions of Kashan had that made it possible to take advantage of the new conditions, when the new streets were built.

Bibliography

- Abravanel, M. D. and Mancini, P. K. (1980), *Attitudinal and Demographic Constraints*, Urban Revitalization, Beverly Hills: Sage.
- ACEA, European Automobile Manufacturers Association (2008), *The Automobile Industry Pocket Guide*, Brussels.
- Afshar, M. (2000), *Consideration of the Thermal Island of the City of Tehran*, Master Thesis, Islamic Azad University, Tehran.
- Alberti, M. (1999), 'Urban Patterns and Environmental Performance: What Do We Know?', *Journal of Planning Education and Research* 19: 151-163.
- Alberti, M. (2005), 'The Effects of Urban Patterns on Ecosystem Function', *International Regional Science Review* 28, 2: 168-192.
- Alberti, M. and Marzluff, J. and Shulenberger, E. and Bradley, G. and Ryan, C. and Zumbrunnen. C. (2003), 'Integrating Humans into Ecology: Opportunities and Challenges for Studying Urban Ecosystems', *Bioscience* 53(12): 1169-79.
- Aldous, T., (ed.) (1995), *Economics of Urban Villages*, Urban villages forum, London.
- Anderson, W. P. and Kanaroglou, P. S. and Miller E. J. (1996), 'Urban Form, Energy and Environment: A Review of Issues, Evidence and Policy', *Urban Studies*, 33; 7.
- Arabinejad, G. (1999), 'The Role of Iranians in Water Preservation', *the First International Conference on Culture and Natural Heritage*, The Iranian Institute for Cultural Heritage.
- Arlington County (Virginia) Department of Community Planning, Housing and Development (CPHD) (2005), *Development in the Metro corridors (1960–2005): Development summary for the Rosslyn Metro station area*, Arlington County Department of Community Planning, Housing and Development, Arlington, VA.

- Armanshahr Consulting Engineers (2007), *Strategic Plan for the Historical Urban Texture of Yazd*, Urban Development and Revitalization Organization, Tehran.
- Azad Armaki, T. (2006), *Localization and the Process of the Growth of Tehran*, Challenges and Strategies, Tehran.
- Azami, A. (2005), 'Badgir in traditional Iranian architecture', *International Conference "Passive and Low Energy Cooling for the Built Environment*, May 2005, Santorini, Greece.
- Ball, K. and Bauman, A. and Leslie, E. and Owen, N. (2001), 'Perceived Environmental Aesthetics and Convenience and Company are associated with Walking for Exercise among Australian Adults', *Preventive Medicine* 33 (5): 434-40.
- Baran, P. K. and Smith, W. R. and Toker, U. (2007), 'The Space Syntax and Crime: evidence from a suburban community', *Proceedings of 6th International Space Syntax Symposium, Istanbul, 2007*.
- Barros, A. P. and Silva, P. C. and Holanda, F. and Medeiros, V. and Fortes, J. A. (2009), 'Transport Mobility at the University of Brasilia, Brazil', *7th International Space Syntax Symposium, Stockholm: KTH, 2009*.
- Basiri, M. S. (2007), *The Province of Kerman in a Glance*, Kermanology Centre, Tehran.
- Beaziey, E. and Harverson, M., (1982), *Living with the Desert*, Aris & Phillips, England.
- Becker, A. P. (1951), 'Housing in England and Wales during the Business Depression of the 1930s', *Economic History Review, Series 2, Vol. 3*, 321-341.
- Behnam, I. (1972), 'The First Human Communities in the Iranian Land', *Art and People (Honar-o-Mardom)*, Vol. 116, pp 89.
- Beissinger, S. and Osborne, D. (1982), 'Effects of Urbanisation on Avian Community Organization', *Condor* 84: 75-83.
- Bell, W. (1958), 'Social Choice, Life Styles, and Suburban Residence', 225-247, in Dorbriner, W., ed., *The Suburban Community*, New York: G. P. Putnam.

- Bento, A. M. and Cropper, M. L. and Mobarak A. M. and Vinha, K. (2003), *The Impact of Urban Structure on Travel Demand in the United States*, World Bank Group Working Paper, World Bank.
- Berger, B. M. (1960), *Working Class Suburb: A Study of Auto Workers in Suburbia*, Berkeley, CA.: University of California Press.
- Berman, M. (1996), 'The Transportation Effects of Neo-Traditional Development', *Journal of Planning Literature*, 10(4), pp. 347-363.
- Bertaud, A. (2003), *Tehran spatial structure: Constraints and Opportunities for Future Development*, Report to the National Land and Housing Organization, National Housing Committee, Ministry of Housing and Urban Development, Iran.
- Blair, R. B. (2001), 'Birds and Butterflies along Urban Gradients in two Ecoregions of the U.S.', In *Biotic homogenization*, ed. Lockwood, J. L. and McKinney, M. L. 33-56. Norwell, MA: Kluwer.
- Boarnet, M. and Crane, R. (1997), 'L.A. story: A reality check for transit-based housing', *Journal of the American Planning Association* 63 (2): 189-204.
- Bolger, D. and Alberts, A. and Sauvajot, R. and Potenza, P. and McCalvin, C. and Tran, D. and Mazzoni, S. and Soulé, M. (1997), 'Response of Rodents to Habitat Fragmentation in Coastal Southern California', *Ecological Applications* 7: 552-63.
- Booth, M. L. and Bauman, A. and Owen, N. and Gore, C. J. (1997), 'Physical Activity Preferences, Preferred Sources of Assistance, and Perceived Barriers to Increased Activity among Physically Inactive Australians', *Preventive Medicine* 26:131-37.
- Bowley, M. (1945), *Housing and the State, 1919-1944*, London, Allen and Unwin.
- Boyden, S. and Millar, S. and Newcombe, K. and O'Neill, B. (1981), *The Ecology of a City and its People: The Case of Hong Kong*, Canberra, Australia: Australian National University Press.

- *Brandevoort Master Plan* (1996), Paul van Beek landschappen BNT, Krier · Kohl Architekten, Wissing stedenbouw en ruimtelijke vormgeving, Grontmij Noord-Brabant.
- Breheny, M. J. (1992), 'The Contradictions of the Compact City: a Review' in: Breheny, M. J. (ed.), *Sustainable Development and Urban Form*, p.138, London Pion Lmt.
- Broadbent, G. (1990), *Emerging Concepts in Urban Design*, London and New York; Van Nostrand Reinhold (International).
- Brown A. L. and Khattak A. J. and Rodriguez D. A. (2008), 'Neighbourhood Types, Travel and Body Mass: A Study of New Urbanist and Suburban Neighbourhoods in the US', *Urban Studies* 2008; 45; 963.
- Bruegmann, R. (2005), *Sprawl, A Compact History*, The University of Chicago Press, Chicago and London.
- Brunsing, J. and Unbehaum, W. and Wixforth, J. (2000), 'Potsdam-Kirchsteigfeld Urban Extension and Public Transport in East Germany', *TRANSLAND - in-depth case study*.
- Bundesamt für Bauwesen und Raumordnung (1998), *Stadt-Landschaft. Informationen zur Raumentwicklung* 7/8.
- Calthorpe, P. (1993), *The next American metropolis: Ecology, community, and the American dream*, New York: Princeton Architectural Press.
- Cannadine, D. (1980), *Lords and Landlords: The Aristocracy and the Towns, 1774-1967*, Leicester: Leicester University Press.
- Carpenter, A. and Peponis, J. (2009), 'Poverty and Connectivity: Crossing the Tracks', *Proceedings of the 7th International Space Syntax Symposium, Stockholm: KTH, 2009*.
- Cervero, R. and Kockelman, K. (1997), 'Travel Demand and the Three Ds: Density, Diversity, and Design', *Transportation Research D*, 2, pp. 199–219.
- Cervero, R. and Radisch, C. (1995), *Travel Choices in Pedestrian versus Automobile Oriented Neighborhoods*, the University of California Transportation Center, UCTC No. 281.

- Christoforidis, A. (1994), 'New Alternatives to the Suburb: Neo-Traditional Developments', *Journal of Planning Literature* 1994; 8; 429
- Clark, D. L. (1983), 'Improbable Los Angeles' in *Sunbelt Cities: Politics and Growth since World War II*, ed. Bernard, R. M. and Rice, B. R., Austin: University of Texas Press, 268-308.
- Conroy Dalton, R. (2007), 'Social exclusion and transportation in Peachtree City, Georgia', *Progress in Planning*, 67 (3), pp. 264 - 286.
- Danby, M. (1963), *The Grammar of Architectural Design*, Oxford University Press, London.
- de Chennai, C. (2003), *Les Industries Quittent Aussui l'île de France*, Le Monde, January 18, 2003.
- Dehkhoda, A. (1998), *Dehkhoda Dictionary*, University of Tehran Press, Tehran.
- Deldar, N. and Tahsildoost, M. (2007), 'To Restate Traditional Sustainable Solution, Iranian Traditional Natural Ventilation', *2nd PALENC Conference and 28th AIVC Conference on Building Low Energy Cooling and Advanced Ventilation Technologies in the 21st Century, September 2007, Crete island, Greece*.
- Department of the Environment (1997), *PPGI General Policy and Principles*, London: DoE.
- Dittmar, H. and Poticha, S. (2004), 'Defining Transit-Oriented development: The New Reginal Building Block', pp. 19-39, in Dittmar, H. and Ohland, G. (ed.), *The New Transit Town, Best Practices in Transit-Oriented Development*, Island Press.
- Dobriner, W. M. (1963), *Class in Suburbia*, Englewood Cliffs, New Jersey: Prentice Hall, Inc.
- Douglas, I. (1983), *The Urban Environment*, Baltimore, Md: Edward Arnold.
- Downie, L. (1974), *Mortgage on America*, New York: Praeger, pp. 154-172.
- Droege, P. (2002), 'Renewable Energy and the City: Urban Life in an Age of Fossil Depletion and Climate Change', *Bulletin of Science, Technology and Society*, 22; 87.

- Duany, A. (2001), *Suburban Nation, the Rise of Sprawl and the Decline of the American Dream*, New York, NY, North Point Press.
- Duany, A., and Plater-Zyberk, E. (1992), 'The Second Coming of the American Small Town', *Plan Canada, May*, pp. 6-13.
- EDAW (1997), *Crown Street Regeneration Project Mid-Term Review: Final Report*, Glasgow: EDAW.
- Ellin, N. (1996), *Postmodern Urbanism*, Cambridge, Massachusetts; Blackwell Publishers.
- EQUATIONS (2010), *Envisioning Tourism in India*, Focus Communications, Bengaluru, India.
- Erkul, F. K. (2009), *A Cross-Cultural Analysis of New Urbanist Neighborhoods in the US and Turkey: Neighborhood Form, Community Life, and Resident Experiences*, PhD dissertation, University of Michigan.
- Ewing, R. (1997), 'Is Los Angeles-Style Sprawl Desirable?', *Journal of the American Planning Association*, Vol. 63, no. 1: 2-4.
- Ewing, R. and Haliyur P. and Page G. (1994), 'Getting around a Traditional City, a Suburban PUD, and Everything In-Between', *Washington, D.C. Paper presented at the 73rd Annual Meeting of the Transportation Research Board*.
- Ewing, R. and Schmid, T. and Killingsworth, R. and, Zlot, A. and Raudenbush, S. (2003), 'Relationship between Urban Sprawl and Physical Activity, Obesity, and Morbidity', *the Science of Health Promotion*, Vol. 18, No. 1, pp. 47-57.
- Falamaki, M. (2005), *From Venice to Shiraz: a Review of the Urban Renovation Experiences*, Faza Publications, Tehran.
- Farr, D. (2008), *Sustainable Urbanism: Urban Design with Nature*, Hoboken, New Jersey, John Willey & sons, Inc.
- Fathy, H. (1986), *Natural Energy and Vernacular Architecture: Principles and Examples with Reference to Hot Arid Climates*, Chicago.
- Feagin, J. R. and Parker, R. (1989), *Building the American Cities: the Urban Real Estate Game*, Prentice-Hall.

- Federal Transit Administration (1999), *Building Livable Communities with Transit*, Office of Planning.
- Fehrs and Peers Associates, (1992), *Metropolitan Transportation Commission Bay Area Trip Rate Survey Analysis*, Oakland. Metropolitan Transportation Commission.
- Fishman, R.(1987), *Bourgeois Utopias: The Rise and Fall of Suburbia*, New York: Basic Books.
- Fogelson, R. M. (1967), *The Fragmented Metropolis: Los Angeles, 1850-1930*, Cambridge, Mass.: Harvard University Press.
- Fogelson, R. M. (1993), *The Fragmented Metropolis: Los Angeles, 1850-1930* Berkeley, Los Angeles; London: University of California Press.
- Forsyth, A.(2005), *Reforming Suburbia: the Planned Communities of Irvine, Columbia, and the Woodlands*, University of California Press.
- Foster, M. (1975), 'The Model-T, the Hard Sell, and Los Angeles's Urban Growth', *Pacific Historical Review* 44, no. 4, 464.
- Frank, L. (1994), 'The Impacts of Mixed Use and Density on the Utilization of Three Modes of Travel: The Single Occupant Vehicle, Transit, and Walking', Washington, D.C.: *Paper presented at the 73rd Annual Meeting of the Transportation Research Board*.
- Frank, L. (1998), 'Improving Air Quality through Growth Management and Travel Reduction Strategies', *Journal of Urban Planning and Development* 124(1): 11-32.
- Frank, L. (2000), 'Land Use and Transportation Interaction: Implications on Public Health and Quality of Life', *Journal of Planning Education and Research* 20: 6-22.
- Frank, L. and Stone, B. and Bachman, W. (2000), 'Linking Land Use with Household Vehicle Emissions in the Central Puget Sound: Methodological Framework and Findings', *Transportation Research Part D*, 5: 173-196.
- Frank, L. D. and Engelke, P. (2005), 'Multiple Impacts of the Built Environment on Public Health: Walkable Places and the Exposure to Air Pollution', *International Regional Science Review* 2005; 28; 193

- Frank, L. D. and Engelke, P. O. (2000), *How Land Use and Transportation Systems Impact Public Health: A Literature Review of the Relationship between Physical Activity and Built Form*, ACES: Active Community Environments Initiative Working Paper No.1.
- Frank, L. D. and Engelke, P. O. (2001), 'The Built Environment and Human Activity Patterns: Exploring the Impacts of Urban Form on Public Health', *Journal of Planning Literature*, Vol. 16, No.2.
- Franklin, B. and Tait, M. (2002), 'Constructing an Image: The Urban Village Concept in the UK', *Planning Theory* 2002; 1; 250-272.
- Freie Planungsgruppe Berlin (1999) *Experimenteller Wohnungs- und Städtebau: Fallbeispiel Potsdam-Kirchsteigfeld*, Unpublished Report for the Federal ExWoSt Programme.
- Frost, L. (2001), 'The History of American Cities and Suburbs: an Outsider's View', *Journal of Urban History*, 27; 362.
- Fulton, W B. (1991), *The New Urbanism, Hope or Hype for American Communities?*, Cambridge, Mass., Lincoln Institute of Land Policy.
- Gallup, George and Associates (1972), *The Gallup Poll*, Washington Post, (December 12).
- Gavin, A. (2004), 'Renewal of Central Beirut: The BCD Master Plan and the Shaping of Architectural Form', in Abed, J. (ed.), 'Architecture Re-introduced: New Projects in Societies in Change', *Proceedings of the Regional seminar organized by the Aga Khan Award for Architecture held in the Department of Architecture and Design at the American University of Beirut in November 1999*.
- Gavin, A. (2009), 'Remaking Beirut', in Charlesworth, E. (ed.), *City Edge: Case Studies in Contemporary Urbanism*, First published 2005, Architectural Press, Burlington.
- Geddes, P. (1915), *Cities in Evolution*, London: William & Norgate.
- Germeraad, P. W. (1993), 'Islamic traditions and contemporary open space design in Arab-Muslim settlements in the Middle East', *Landscape and Urban Planning* 23, 97-106.

- Ghobadian, A. (1985), 'The Water of Yazd and the Role of the Deep Wells', *Nedaye-Yazd, Vol. 1, No. 5 to No. 12*.
- Giles-Corti, B. and Donovan, R. J. (2002), 'The Relative Influence of Individual, Social and Physical Environment Determinants of Physical Activity', *Social Science and Medicine 54 (12): 1793-812*.
- Gillham, O. (2002), *From the Limitless City: A primer on the Urban Sprawl Debate*, Washington: Island Press.
- Girardet, H. (1999), *Creating Sustainable Cities*, Schumacher Briefings (Vol. 2), Devon, UK: Green Books.
- Gomez-Ibanez, J. A. (1991), 'A Global Review of Automobile Dependence: Review of Cities and Automobile Dependence: An International Sourcebook', by Newman, P. W. G. and Kenworthy, J. R., *Journal of the American Planning Association, 57; 376*.
- Gordon, P. and Richardson, H. (2001), 'The Geography of Transportation and Land Use', in *Smarter Growth: Market-Based Strategies for Land Use Planning in the Twenty-First Century*, ed. Holcombe, R. et al., Westport, CT: Greenwood Press, 36-39.
- Gordon, P. and Richardson, H. W. (1989), 'Gasoline Consumption and Cities: A Reply', *Journal of the American Planning Association, 55; 342*.
- Gosling, D. (2003), *The Evolution of American Urban Design: A Chronological Anthology*, John Wiley & Sons, Ltd, Chichester, England.
- Grantoski, E. A. and Dandamaev, M. A. (2006), *The History of Iran, since Ancient Times to Today*, translated by Keshavarzi, K. Morvarid Publications, Tehran.
- Grauman Wolf, S. (1976), *Urban Village, Population, Accommodation, and Family Structure in Germantown, Pennsylvania, 1683-1800*, Princeton University Press.
- *Great Islamic Encyclopedia*, the Center for the Great Islamic Encyclopedia (CGIE), Tehran, Iran.

- Grimm, N. B. and Grove, J. M. and Pickett, S. T. A. and Redman, C. L. (2000), 'Integrated Approaches to Long-Term Studies of Urban Ecological Systems', *BioScience* 50: 571-84.
- Habibi, M. (2009), *De la Cite A la Ville*, University of Tehran Press, Tehran.
- Hadden, J. K. and Barton, J. (1973), 'The Image That Will Not Die: Thoughts on the History of Anti-Urban Ideology', in the Masotti, L. H. and Hadden, J. K. (ed) *Urbanization of the Suburbs*, 79-119, Beverly Hills, California: Sage Publications, Inc.
- Haeng W. S. and Young O. K. and Ah H. K. (2007), 'A Study on the Correlation between Pedestrian Network and Pedestrian Volume according to Land Use Pattern', *Proceedings of 6th International Space Syntax Symposium, Istanbul, 2007*.
- Handy, S. (1993), 'Regional Versus Local Accessibility: Neo-traditional Development and Its Implications for Non-Work Travel', *Built Environment* 18, 4:256-67.
- Handy, S. (2005), 'Smart Growth and the Transportation-Land Use Connection: What Does the Research Tell Us?', *International Regional Science Review* 28 (2), 146 – 167.
- Handy, S. and Boarnet M. G. and Ewing, R. and Killingsworth R. E. (2002), 'How the Built Environment Affects Physical Activity: Views from Urban Planning', *American Journal of Preventive Medicine* 23 (2S): 64-73.
- Handy, S. L. (1996), 'Understanding the Link between Urban Form and Nonwork Travel Behavior', *Journal of Planning Education Research*, 15:183–198.
- Harris, R. and Lewis, R. (2001), 'The Geography of North American Cities and Suburbs, 1900-1950: A new Synthesis', *Journal of Urban History* 27, no.3: 265.
- Hesamian, F. and Etemad, G. and Haeri, M. R. (1998), *Urbanization in Iran*, Agah Publications, Tehran.

- Hess, P. M. and Moudon, A. V. and Snyder, M. C. and Stanilov, K. (1999), 'Site Design and Pedestrian Travel', *Transportation Research Record*, 1674, pp. 9-19.
- Hillier, B. and Hanson, J. (1984), *The Social Logic of Space*, Cambridge: Cambridge University Press.
- Hillenbrand, R. (2001), *Islamic Architecture: Form, Function, and Meaning*, translated by Ayatollahzadeh Shirazi, B., Rozaneh Publications, Tehran.
- Hillier, B. (1986), 'City of Alice's Dreams', *The Architects' Journal*, 184.
- Hillier, B. (1988), 'Against Enclosure', in Teymur, N and Markus, T. and Woody, T. (ed.), *Rehumanizing Housing*, Butterworth, London.
- Hillier, B. (1993), 'Specifically Architectural Theory: A Partial Account of the Ascent from Building as Cultural Transmission to Architecture as Theoretical Concretion', *Harvard Architecture Review*, 9, 8-27.
- Hillier, B. (1996), *Space Is the Machine*, Cambridge: Cambridge University Press.
- Hillier, B. (1999), 'The Hidden Geometry of Deformed Grids: Or, Why Space Syntax Works, When It Looks as Though It Shouldn't', *Environment and Planning B: Planning and Design*, 26, pp.169-191.
- Hillier, B. (2002), 'A Theory of the City as Object: or How Spatial Laws Mediate the Social Construction of Urban Space', *Urban Design International*, 7, pp. 153-179.
- Hillier, B. (2005a), 'Between Social Physics and Phenomenology: Notes Towards and Urban Synthesis', *Proceedings of the Fifth Space Syntax Symposium, Vol. 1, Technological University of Delft*.
- Hillier, B. (2005b), 'The Art of Place and the Science of Space', *World Architecture*, 11, 185, pp. 96-102.
- Hillier, B. and Hanson, J. (1984), *The Social Logic of Space*, Cambridge University Press, Cambridge.
- Hillier, B. and Hanson, J. and Peponis, J. (1987), *Syntactic Analysis of Settlement*, Architecture and Behaviour, Vol. 3, Department of Architecture, Federal Institute of Technology, Switzerland.

- Hirst, E. and Moyers, J. (1973), 'Efficiency of Energy use in the United States', *Science* 179; 1299.
- Holden, E. and Norland, I. T. (2005), 'Three challenges for the Compact City as a Sustainable Urban Form: Household Consumption of Energy and Transport in Eight Residential Areas in the Greater Oslo Region', *Urban Studies*, 42; 2145.
- Howard, E. (1898), *Garden City of To-morrow*, London, U.K.: Sonnenschein.
- HRH, the Prince of Wales (1989), *A Vision of Britain: a Personal View of Architecture*, Doubleday, London.
- Ibn Balkhi (1921), *The Farsnama of Ebnu 'l Balkhi*, ed. Le Strange G. and Nicholson R., Cambridge University Press, London.
- International Institute for Environment and Development (1995), *Citizens Action to Lighten Britain's Ecological Footprint*, London, U.K.: International Institute for Environment and Development.
- Iranian Fuel Conservation Company (2007), *Transportation Energy Data Book, 2007*, National Iranian Oil Company, Tehran.
- Iranshenasi Publishing co., the Urban/Tourism Map of Kashan, 1/15000, Tehran.
- Jabareen, Y. R. (2006), 'Sustainable Urban Forms: Their Typologies, Models, and Concepts', *Journal of Planning Education and Research* 2006; 26; 38.
- Jackson, K. T. (1991), *Semi-Detached London: Suburban Development, Life and Transport*, Second Edition, Ditcot: Wild Swan Publications.
- Jenks, M. and Williams, K. and Wilson, E. eds. (1996), *The Compact City: A Sustainable Urban Form*, London: U.K., E & FN Spon.
- Jiang, B. and Claramunt, C. (2002), 'Integration of Space Syntax into GIS: New Perspectives for Urban Morphology', *Transactions in GIS*, Vol. 6 (3), pp. 295-309.
- Jiang, B. and Claramunt, C. and Klarqvist, B. (2000), 'Integration of space syntax into GIS for modelling urban spaces', *International Journal of*

Applied Earth Observation and Geoinformation, Vol. 2, Issues 3-4, 2000, pp. 161-171.

- Jun, C. and Kwon, J. H. and Choi, Y. and Lee, I. (2006), 'An Alternative Measure of Public Transport Accessibility Based on Space Syntax', *Proceedings of the 1st international conference on Advances in hybrid information technology*, pp. 281–291.
- Kalantari Khalilabad, H. and Hatami Nejad, H. (2006), *Renovation Planning of Historical Area of Yazd*, Fara Gostar Publications, Tehran.
- Katz, P. (1994), *The New Urbanism, Towards an Architecture of Community*, New York, McGraw-Hill.
- Keil, R. (1998), *Los Angeles: Globalization, Urbanization, and Social Struggles*, John Wiley and Sons, Chichester, West Sussex, England.
- Keyes, D. L. (1977), 'Land Use and Energy Conservation: Is There a Link to Exploit?', In eds. Burby, R. J. and Fleming Bell, A., *Energy and the Community*, Cambridge: Ballinger.
- Keyes, D. L. (1982), 'Energy for Travel: The Influence of Urban Development Patterns', *Transport Research, Vol. 16A, no. 1*; 65.
- Khaksari, A. and Shakibamanesh, A. and Ghorbanian, M. (2007), *Urban Districts in Iran*, Institute for Humanities and Cultural Studies, Tehran.
- Kheirabadi, M. (1993), *Iranian Cities: Formation and Development*, University of Texas Press.
- Kishimoto, T. and Kawasaki, S. and Nagata, N. and Tanaka, R. (2007), 'Optimal Location of Route and Stops of Public Transportation', *Proceedings of 6th International Space Syntax Symposium, Istanbul, 2007*.
- Ktsanes, T. and Reissman, L. (1960), 'Suburbia: A New Home for Values', *Social Problems 7 (Winter)*: 187-95.
- Kulash, W. (1990), 'Traditional Neighborhood Development: Will the Traffic Work?', *Journal of Planning Education and Research, Vol. 15, No. 2*, 117-126.
- Lang, J. (1994), *Urban Design, the American Experience*, New York; Van Nostrand Reinhold.

- Law, S. and Zhao, Y. (2009), 'Exploring Multi-layered Hyper Dense Urban Environments through Spatial Analysis', *Proceedings of the 7th International Space Syntax Symposium, Stockholm: KTH, 2009.*
- Levinson, H. and F. Wynn (1963), 'Effects of Density on Urban Transportation Requirements', *Highway Research Record 2: 38-64.*
- Liu, F. (2003), 'Quantifying Travel and Air Quality Benefits of Smart Growth in the State Implementation Plan', *Transportation Research Board Annual Meeting, TRB.*
- Local Initiatives Support Corporation (2009), *Case Studies for Transit-Oriented Development*, Briefing Report no. 3, Prepared by Reconnecting America.
- Logan, J. R. and Golden, R. M. (1986), 'Suburbs and Satellites: two Decades of Change', *American Sociological Review 51: 430-431.*
- Lynch, K. (1961), 'The Patterns of the Metropolis', *Daedalus, 90(1):79-98.*
- Mahmoodi, M. (2009), *Badgir, the Symbol of the Iranian Architecture*, Yazda Publications, Tehran.
- Mahyari, A. (1996), *The Wind Catcher: A Passive Cooling Device for Hot Arid Climate*, PhD Dissertation, Department of Architectural and Design Science, the University of Sydney.
- Marchand, B. (1986), *The Emergence of Los Angeles*, London, Pion.
- Marzluff, J. and Gehlbach, F. and Manuwal, D. (1998), 'Urban Environments: Influences on Avifauna and Challenges for the Avian Conservationist', In *Avian Conservation: Research and Management*, ed. Marzluff, J. and Sallabanks, R., Washington, DC: Island.
- Maserrat, H. (2010), *Cisterns of Yazd*, Yazda Publications, Tehran
- Mashhadizadeh Dehaghani, N. (1994), *An Analysis of the Specifications of the Urban Planning in Iran*, Iran Science and Technology University Press, Tehran.
- McKinney, M. L. (2002), 'Urbanization, Biodiversity, and Conservation', *BioScience 52: 883-90.*

- McNally, M. G. and Kulkarni, A. (1997), 'Assessment of Influence of Land Use-Transportation System on Travel Behavior', *Transportation Research Record, Vol. 1607, pp. 105-115.*
- McNally, M. G. and Rayan S. (1993), 'A Comparative Assessment of Travel Characteristics for Neo-Traditional Developments', *72nd Annual Meeting of the Transportation Research Board.*
- Medley, K. and McDonnel, M. and Pickett, S. (1995), 'Forest-Landscape Structure along an Urban-to-Rural Gradient', *Professional Geographer 47(2): 159-168.*
- Memarian, G. (1993), *A Book on the Desert Architecture: A look through the Architecture of the Ab Anbars of Yazd*, Iran University of Science and Technology, Tehran.
- Meybeck, M. (1998), 'Man and River Interface: Multiple Impacts Onwater and Particulates Chemistry Illustrated in the Seine River Basin', *Hydrobiologia 373-374: 1-20.*
- Mofidi , S. (2008). 'Analysis on Typology and Architecture of Wind Catcher and Finding the Best Type', *Honarhay-e-ziba, vol. 36.*
- Mohammadi, H. (2006), 'The Relationship between the Climatic Elements and the Air Pollutants of the Tehran with the Fatality Rate of the Respiratory Diseases', *The Geographical Research, Vol. 58, pp. 48-65, published in Tehran.*
- Mortada, H. (2003), *Traditional Islamic principles of built environment*, RoutledgeCurzon, New York.
- Movahed, A. and Masoudi Rad, M. and Dowlatshahi, S. (2008), 'Consideration of the Social and Cultural Issues for Regeneration of the Old Urban Texture: Case Study: Nehzat-Abad of Ahwaz', *The First Conference on Regeneration and Revitalization of Urban Distressed Areas, 10-11 December 2008.*
- National Center for Chronic Disease Prevention and Health Promotion (2004), *Behavioral Risk Factor Surveillance System*, Center for Disease Control and Prevention, Atlanta, GA.

- Negahban, E. (1986), 'Urbanism and Urbanization since the Fourth Millennium B.C. to the First Millennium B.C.', in Kiani Y. (ed.), *A Quick Look to the Urbanism and Urbanization in Iran*, Jahad-e-Daneshgahi Press, Tehran.
- Newman, P. W. G. and Kenworthy, J. R. (1989), 'Gasoline Consumption and Cities: a Comparison of US Cities with a Global Survey', *Journal of the American Planning Association*, 55(1); 24.
- Nilon, C. H. and Pais, R. C. (1997), 'Terrestrial Vertebrates in Urban Ecosystems: Developing Hypotheses for the Gwynns Falls Watersheds in Baltimore, Maryland', *Urban Ecosystems*, 1:247-257.
- Nolen, J. (1927), *New Towns for Old*, Mrashal Jones Incorporated.
- Nourbakhsh, H. (2002), 'Water Reservoirs in Persian Gulf Coasts', *The Culture of the Iranian People (Farhang-e-Mardom-e-Iran)*, Vol. 1, No. 2, 78-91.
- Nowzari, E. (1992), 'Berkeh-Kal the largest Ab Anbar of Iran', *Journal of Geographical Research (Iran)*, Vol. 7, No. 24.
- Nubani, L. and Wineman, J. (2005), 'The Role of Space Syntax in Identifying the Relationship between Space and Crime', *Proceedings of the 5th Space Syntax Symposium, Delft, 2005*.
- Omernik, J. M. (1976), *The Influence of Land Use on Stream Nutrient Levels*, EPA-600/3-76-014, Washington, DC: U.S. Environmental Protection Agency.
- Onisto, L. K. and Krause, E. and Wackernagel, M. (1998), *How big is Toronto's Ecological Footprint?*, Toronto, Canada: Centre for Sustainability Studies and the City of Toronto.
- Organisation Internationale des Constructeurs d'Automobiles (OICA), *2010 Provisional Production Statistics*.
- Osmond, P. (2005), 'Evaluating urban ambience – an investigation into quantifying the qualities of the walkable city', *presented at Walk21-VI "Everyday Walking Culture", The 6th International Conference on Walking in the 21st Century, Zurich, Switzerland*.

- Osmond, P. (2007), 'Quantifying the Qualitative: an Evaluation of Urban Ambience', *Proceedings of 6th International Space Syntax Symposium, Istanbul, 2007*.
- Owens, S. (1984), 'Energy Demand and Spatial Structure', In *Energy Policy and Land Use Planning*, eds. Cope, D. R. and Hills, P. R. and James, P., 215-240, Oxford, U.K.: Pergamon Press.
- Owens, S. (1986), *Energy, Planning and Urban Form*, London, U.K.: Pion.
- Owens, S. and Rickaby, P. (1992), 'Settlements and Energy Revisited', *Built Environment 18(4): 247-252*.
- Palen, J. J. (1975), *The Urban World*, McGraw-Hill, Inc.
- Parker T., McKeever, M., Arrington, G. B., Smith-Heimer, J. (2002), *Statewide Transit-Oriented Development study: Factors for Success in California*, Final Report, California Department of Transportation.
- Pate, R. R. and Pratt, M. R. and Blair, S. N. and Haskell, W. L. and Macera, C. A. and Bouchard, C. and Buchner, D. and Ettinger, W. and Heath, G.W. and King, A. C. and Kriska, A. and Leon, A. S. and Marcus, B. H. and Morris, J. and Paffenberger, R. S. Jr., and Patrick, K. and Pollock, M. L. and Rippe, J. M. and Sallis, J. and and Wilmore, J. H. (1995), 'Physical Activity and Public Health: A Recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine', *Journal of American Medical Association 273:402-7*.
- Peponis, J. and Allen, D. and Haynie, D. and Scoppa, M. and Zhang, Z. (2007), 'Measuring the Configuration of Street Networks: the Spatial profiles of 118 Urban Areas in the 12 Most Populated Metropolitan Regions in the US', *Proceedings of 6th International Space Syntax Symposium, Istanbul, 2007*.
- Peponis, J. and Bafna, S. and Zhang, Z. (2008), 'The connectivity of streets: reach and directional distance', *Environment and Planning B: Planning and Design 35(5) 881 – 901*.
- Pickett, S. T. A. and Cadenasso, M. L. and Grove, J. M. and Nilon, C. H. and Pouyat, R. V. and Zipperer, W. C. and Costanza, R. (2001), 'Urban

- Ecological Systems: Linking Terrestrial Ecological, Physical, and Socioeconomic Components of Metropolitan Areas', *Annual Review of Ecology and Systematics* 32: 127-57.
- Pinelo, J. and Heitor, T, (2005), 'The spatial Congruence Effect: Exploring the Relationship Between Spatial Variables and Functional Vitality on Lisbon's Prime Office Location', *Space Syntax 5th International Symposium, Delft University, Delft, The Netherlands, June 2005*.
 - Polo, M. (1984), *Il Milione di Marco Polo*, translated by Sajjadi, M. and Di Giovanni Romano, A., Gooyesh Publications, Tehran.
 - Poshtiban, M. and Banaei Khosroushahi, R. and Poshtiban, S. (2007), 'Intelligent Windcatcher- A Combination of Modern and Traditional Technology', *24th International Symposium on Automation & Robotics in Construction (ISARC 2007)*, Construction Automation Group, I.I.T. Madras.
 - Pour Ahmad, A. (1998), 'The Role of the Climate and the Geographical Structure in the Air Pollution of Tehran', *The Geographical Research, Vol. 34, pp. 38-53, published in Tehran*.
 - Pour Ebrahim, H. (1992), *The Geography of Gonabad*, Marandiz-e-Gonabad Publications, Mashhad.
 - Pratt, M. and Macera, C.A. and Blanton, C. (1999), 'Levels of Physical Activity and Inactivity in Children and Adults in the United States: Current Evidence and Research Issues', *Med Sci Sports Exerc. 1999; 31 (suppl 11): S526-S533*.
 - Pushkarev, B. and J. Zupan. (1977), *Public Transportation and Land Use Policy*, Bloomington: Indiana University Press.
 - Rford, N. and Ragland D. R. (2003), *Space Syntax: An Innovative Pedestrian Volume Modeling Tool for Pedestrian*, Institute of Transportation Studies U.C. Berkeley Traffic Safety Center, University of California, Berkeley, Paper UCB-TSC-RR-2003-11.
 - Rahdari, H. and Zargarzadeh, M. A. and Nozari, H. and Soltani, L. (2009), 'Gasoline Rationing Plan in Iran: A Symptomatic Solution', *The 27th*

International Conference of the System Dynamics Society, July 26-30, 2009, Albuquerque, New Mexico, USA.

- Rapoport, A. (1987), 'Pedestrian Street Use: Culture and Perception', In *Public Streets for Public Use*, Anne Moudon, ed. New York: Van Nostrand Reinhold.
- Rapoport, E. H. (1993), 'The Process of Plant Colonization in Small Settlements and Large Cities'. In *Humans as Components of Ecosystems*, ed. McDonnell, M. J. and Pickett, S. T. A., 190-207. New York: Springer-Verlag.
- Rees, W. E. (1996), 'Revisiting Carrying Capacity: Area-Based Indicators of Sustainability', *Population and Environment 17: 195-215*.
- Roaf, S. (1988), *The Windcatchers of Yazd*, PhD Thesis, Oxford Polytechnic, Oxford.
- Robert Adam Architects (2006), *Coed Darcy Master Plan*, Area 1 Design Statement.
- Roberts, J. S. (1977), 'Energy Conservation and Land-Use: Prospects and Procedures', in Burby, R. J. and Fleming Bell, A. (Eds), *Energy and the Community*, Cambridge: Ballinger.
- Rolando, A. and Pulcher, G. and Giuso, A. (1997), 'Avian Community Structure along an Urbanization Gradient', *Italian Journal of Zoology 64: 341-49*.
- Rosenthal, F. (1978), 'Poetry and Architecture: the Badhanj', *Journal of Arabic Literature, Vol. VIII, 1-19*.
- Roshan Zamir, S. and Ikani, M. H. (2011), 'Consideration of the Air Pollution of Tehran', *The 8th International Energy Conference, 24-25 May 2011, Tehran, Iran*.
- Saelens, B. E. and Sallis, J. F. and Frank, L. D. (2003), 'Environmental Correlates of Walking and Cycling: Findings from the Transportation, Urban Design, and Planning Literatures', *Ann Behav Med. 2003; 25: 80-91*.

- Safavi, S. Y. and Alijani, B. (2003), 'A Consideration of the Geographical Factors in the Air Pollution of Tehran', *The Geographical Research*, Vol. 58, pp. 99-111, published in Tehran.
- Sajjadi, M. (1986), 'Shahr-e-Sukhte', in Kiani Y. (ed.), *A Quick Look to the Urbanism and Urbanization in Iran*, Jahad-e-Daneshgahi Press, Tehran.
- Sauter, D. and Wedderburn, M. (2008), 'Measuring Walking: Towards Internationally Standardised Monitoring Methods of Walking and Public Space', *8th International Conference on Survey Methods in Transport, Annecy, France, 2008*.
- Sen. A. (1998), *Highways and Urban Decentralization*, Urban Transportation Center, University of Illinois at Chicago.
- Shamaei, A. (2001), *The Effects of the Physical Development of the City of Yazd on its Historical Texture: Strategies for Organization and Revitalization*, PhD Dissertation, University of Tehran, Tehran.
- Shamaei, A. (2003), 'The Inharmonious Spatial/Physical Growth of the City of Yazd and its Influences on the Ecological Structure of the City', *Geographical Research (Iranian Journal)*, Vol. 46, pp. 19-37.
- Shpuza, E. and Peponis, J. (2008), 'The effect of floorplate shape upon office layout integration', *Environment and Planning B*, vol. 35(2) pp. 318 – 336.
- Siksna, A. (1997), 'The Evolution of Block Size and Form in North American and Australian City Centers', *Urban Morphology*, 1:1, pp. 19-34.
- Siroux. M. (1970), *The Caravanserais of Iran and the Small Buildings in between the Roads*, translated from French by Behnam I., National Iranian Organization of Historic Preservation, Tehran.
- Sohrabi, M. (2007), *City and Urbanism in Iran: Urban Sociology*, Shapurkhasht Publications, Khoram Abad, Iran.
- Solomon, Inc. (1992), *A Specific Plan for Communications Hill*, Prepared for the City of San Jose.
- Soltanzadeh, H. (2001), *The Iranian Bazaars*, Cultural Research Bureau, Tehran.

- Soltanzadeh, H. (2006), *Urban Spaces in the Historical Texture of Iran*, Cultural Research Office, Tehran.
- Song, Y. (2005), Smart Growth and Urban Development Pattern: A Comparative Study, *International Regional Science Review* 2005; 28; 239.
- Sotoudeh, M. (1977), *Iran and Islam Encyclopedia*, Book Translation and Publishing Institute, Tehran.
- Southworth, M. and Owens, P. M. (1993), The Evolving Metropolis Studies of Community, Neighborhood, and Street Form at the Urban Edge, *Journal of the American Planning Association*, vol. 59, pp. 271-287.
- Ståhle, A. and Marcus, L. (2010), 'Compact Sprawl Experiments: Four Strategic Densification Scenarios for Two Modernist Suburbs in Stockholm', *Journal of Space Syntax*, Volume 1, Issue 1, pp. 59-76.
- Starr, K. (1990), *Material Dreams: Southern California through the 1920's*, New York: Oxford University Press.
- Statistical Center of Iran, *The Detailed Results of the Population and Housing of the City of Kashan, 1956-2006*.
- Stefan, A. M. (2005), *The New Urbanism Movement: The Case of Sweden*, Master Thesis, Blekinge Tekniska Högskola, Sweden.
- Still, T. (2002), 'Transit-oriented development: Reshaping America's metropolitan landscape', *On Common Ground*, winter, pp. 44-47.
- Stone, B. and Mednick, A. C. and Holloway T. and Spak S. N. (2007), 'Is Compact Growth Good for Air Quality', *Journal of American Planning Association*, 73(4):404-418.
- Stone, R. O. (1967), 'A Desert Glossary', *Earth-Science Reviews*, Vol. 3, pp 211-268.
- Studiengesellschaft Nahverkehr (1993), *Verkehrsentwicklungsplan Stadt Potsdam*, Sachstandsbericht, Berlin.
- Sucher, D. (2003), *City Comforts: How to Build an Urban Village*, Revised Edition, City Comfort Inc.

- Tarh-o-Manzar Consulting Engineers Co. (2003), *The Strategic Plan for Conservation, Gentrification and Revitalization of the Historical Core of Kashan*, Vol. 2.
- Taylor, N. (1973), *The Village in the City; Towards a New Society*, Temple Smith.
- The Transportation Information and Statistics bureau (2007), *The Comprehensive Statistical Book of the National Transportation for the year 2006*, The Iranian Ministry of Roads, Tehran.
- Thompson-Fawcett, M. (2000), 'The contribution of Urban Villages to Sustainable Development', in Williams, K. and Burton, E, and Jenks, M. (ed.), *Achieving Sustainable Urban Form*, Spon Press, pp.275-287.
- Troped, P. J. and Saunders, R. P. and Pate, R. R. and Reininger, B. and Ureda J. R. and Thompson, S. J. (2001), 'Associations between self-reported and objective physical environmental factors and use of a community rail-trail', *Preventive Medicine* 32 (2): 191-200.
- Turkington, R. (1999), 'British 'Corporation Suburbia': The Changing Fortunes of Norris Green, Liverpool', 56-75, in Harris, R. and Larkham, P. J. (ed.), *Changing Suburbs: Foundation, Form and Function*, London, E & FN Spon.
- United States Bureau of the Census: 1970, Census of Population, (1972) *General Social and Economic Characteristics*, Final Report, PC(1)-c-1, Washington, D.C.
- United States Environmental Protection Agency (2001), *Our Built and Natural: A Technical Review of the Interactions between Land Use, Transportation and Environmental Quality*, EPA 231-R-01-002.
- Untermann, R. (1987), 'Changing Design Standards for Streets and Roads', In *Public Streets for Public Use*, Anne Moudon, ed. New York: Van Nostrand Reinhold.
- Urban Planning and Sustainability Research Group of the Municipality of Mashhad (2010), *The Effects of the Urban Sprawl of the City of Mashhad*

- with Regards to the Sustainability (Water and Soil)*, Municipality of Mashhad, Iran.
- Urban Village Forum (1992), *Urban Villages: A Concept for Creating Mixed Use Urban Developments on a Sustainable Scale*.
 - Varjavand, P. (2000), 'Ab Anbarha' in *The Architecture of Islamic Iran*, ed. Kiani, M. Y., SAMT, Tehran, 154-165.
 - Wernick, B. G. and Cook, K. E. and Schreier, H. (1998), 'Land Use and Streamwater Nitrate-N Dynamics in an Urban-Rural Fringe Watershed', *Journal of the American Water Resources Association* 34: 639-50.
 - White, R. and Whitney, J. (1992), 'Cities and the Environment: An Overview', In *Sustainable Cities: Urbanization and the Environment in International Perspective*, eds. Stern, R. and White, R. and Whitney, J., 8-51, Oxford, U.K.: Westview Press.
 - Whitehand, J. W. R. and Carr, C. M. H. (1999), 'England's Garden Suburbs: Development and Change', 76-90, in Harris, R. and Larkham, P. J. (ed.), *Changing Suburbs: Foundation, Form and Function*, London, E & FN Spon.
 - Wiegandt, C. (2004), 'Mixed Land Use in Germany: Chances, Benefits, and Constraints', *International Planning Symposium on Incentives, Regulations, and Plans- The Role of States and Nation-States in Smart Growth Planning, September 30- October 1, 2004*.
 - World Bank (2005), *Islamic Republic of Iran, Transport Sector Review and Strategy Note*, Report no. 34600-IRN, Finance, Private Sector and Infrastructure Department, Middle East and North Africa Region.
 - Zampieri, F. L. and Rigatti, D. and Ugalde, C. (2009), 'Evaluated Model of Pedestrian Movement Based on Space Syntax, Performance Measures and Artificial Neural Nets', *Proceedings of the 7th International Space Syntax Symposium, Stockholm: KTH, 2009*.