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Analyzing the Historic District of Tehran Regarding Walkability Approach (Case Study: Naseri Fortification)

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Abstract

Addressing human needs in urban areas has been one of the most significant factors in the formation and expansion of cities. Between the human needs, walking is one of the most important ones and has been ignored in present-day cities. The main goal of providing pedestrian walkways is to give priority to pedestrians in order to revive civil life. Pedetrianization will play an undeniable role in the revitalization of urban centers by providing a framework for social interactions and allowing citizens to enter a safe and peaceful environment. As the historic district of Tehran, Naseri fortification is one of the most important parts of the city with the capability of gathering, shopping and recreation. In this fortification, we can take the advantage of the existing potential of the historic fabric of Tehran and create a vital, stable and secure space, along with physical and functional revitalization. Walkability is the main approach toward achieving this goal, and accordingly, the present research aims to analyze Naseri fortification of Tehran concerning walkability. The present condition analysis is performed according to the qualitative indicators such as physical-functional, socioeconomic and environmental indicators and additionally, the quantitative indicators such as density of the historical attractions, type of activities, and accessibility to the metro stations. Afterwards, the passages in this area are prioritized through the multi-criteria approach for adding pedestrian walkways based on the obtained results and eventually, the selected passages are identified in order to construct new pedestrian walkways or widen existing sidewalks.

Keywords: Walkability, historic district, Multi-Criteria analysis, Naseri fortification

1. Introduction

Although the existence of large green spaces and widespread driving paths are considered as the criteria for development and vitality of a city in the twentieth century, the full urban walkway areas are regarded as some of the most important leisure spaces as a clear sign of urban design knowledge application in the urban development process in the current century. Therefore, the walkways and pedestrian areas are not only considered as the most important urban public spaces, but also they are essential for continuation of urban life as the memorable and identity-creating elements in modern cities (Kashaniju, 2006).

The lack of pedestrians' presence in urban spaces and reduction of walkability leads to the reduced safety, security and social relationships, environmental problems such as the air and noise pollution, the public health risk, the unidentified spaces and the lack of sense of belonging and gradual deterioration. On the other hand, the walkability has considerable benefits such as the environmental, social, economic, and public health benefits (Hermann et al, 2017) (Ewing and Handy, 2009).

In the recent few decades, modern cities have been struggling to increase the walking share in the urban transport system and have taken some steps towards the walkability. Major cities of Iran have now been encountered with critical conditions. Air pollution, the overweight of a half of population, most citizens' wasted time in traffic, as well as the shocking rate of road deaths have been declining the lifestyle level of big cities of Iran, especially Tehran, and accordingly the officials should pay serious attention to the walkability approach (Tabibian and Ramezani, 2014).

Naseri fortification in Tehran, including the 12th district and a part of the 11th district, reflects the cultural and historical identity of this city as the historical core of Tehran. This fortification has more than 300 monuments such as Golestan Palace, National Garden of Iran, Masoudieh Mansion, Malek Museum etc. Unfortunately, people are now reluctant to visit this region. The present study aimed to bring back the life of this region though the walkability approach and thus reducing pollutants and increasing the vitality and security.

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2. Objectives of the Study and Research Methodology

1. Recognizing the historical, political and economic importance and identity in Naseri fortification of Tehran;
2. Analysis of Naseri fortification of Tehran regarding the walkability approach;
3. Selecting appropriate options for pedestrianization in this fortification.

In this fortification, we can take the advantage of the existing potential of the old and historic fabric of Tehran and create a vital, stable and secure space by functional and identity, along with physical and functional revitalization. Walkability is the main approach toward achieving this goal, and accordingly, this paper aims to analyze Naseri fortification of Tehran concerning walkability approach.

In this paper, the feasibility study on adding pedestrian walkways is performed by assessing the present condition and comparing it with the criteria and principles of walkability based on the literature review. The present condition is analyzed through field and desk studies and designing SWOT tables. The present condition assessment is performed according to the qualitative indicators such as physical-functional, socioeconomic and environmental indicators and moreover, the quantitative indicators such as the density of historical attractions, the identification of type of activities and their dispersion, and measurement of access to the metro stations. Finally, passages are prioritized through the multi-criteria method for pedestrianization.

3. literature Review

A serious and practical attention to the organization of walkways dates back to the late 1940s. In the European cities, this idea was proposed and implemented for excluding the historic boundaries of cities from domination of cars and protecting the ancient textures and performing the social revitalization of urban centers. In the American cities, the tendency to return to urban centers became stronger, and the pedestrian streets called the Malls, which were often in line with commercial purposes in the city centers creating desirable environments for shopping in cities, were established in the early 1960s (Habibi, 2013) (Stoner et al, 2003).

Nowadays, the walkways have different functions. The most important functions include the creation of vitality and improving social interactions, secure areas with mixed applications, recreation or play areas, the habitable environmental elements, tools for protecting cities, the improvement of public and mental health, the promotion of local economy and lower impact on the family economy and lower infrastructural costs (Moeini, 2015) (Habibi, 2001).

In the recent two decades, a large number of studies have been conducted on the pedestrian planning and design. The street-related works and the ways for revitalizing them as the city spaces have been recognized as an independent area of planning and urban design knowledge.

Different definitions have been suggested for walkways. For example, according to (Pakzad, 2007), "walkways are the passages with the highest social role, which are fully dominated by pedestrians and motor vehicles are only used to provide service for the current life in passages. Walkways are the tools for group activities, especially with respect to urban economy, environmental quality and public health".

Regarding this important issue and its increasing impact on the urban life, walkability has been emphasized in most cities and many streets have been regarded as the walkways around the world. Copenhagen in Denmark (Horshowy, 2006), Sydney in Australia (Matan and Newmann, 2012), and Essen in Germany (Reyer et al., 2014) are among the most successful examples in this regard. Moreover, several works have been conducted in this field in Iran. For instance, Tarbiat Walkway of Tabriz (Moradi, 2001) and Jannat Walkway (Ebrahimi, 2001) are among the successful examples.

Copenhagen is one of the large walkable cities in the world. During the recent 40 years when the main street of Copenhagen -Stroget- has become as a full pedestrian area, the urban planners have taken numerous small steps to transform the city from a car-based place to a citizen-oriented environment base on the 10-step plan such as changing the streets to the main fully walkways, gradual reduction of traffic and parking, changing the parking lots to public squares, concentrating and keeping the scale low, respecting the human scale, residing people in the main center, encouraging the student life, adapting urban landscape to seasonal changes, promoting cycling, and increasing the availability of bikes (Horshowy, 2006).

4. Pedestrians' Main Characteristics and Needs

In general, the pedestrians' main characteristics and needs can be classified into two groups including the physical group, which is related to physical and ergonomic aspects and quantitative human dimensions, and mental group which is related to evaluate the qualitative and perceptual aspects. Physically, the pedestrian activity is classified into dynamic behavior such as walking and roaming, and static behavior like sitting, standing and lying (Choi and Sardari, 2012). Walking distance, which is walked by a normal human in normal condition, is about 4-5 km per hour, depending on different objective (psychological and physical) and mental (psychological) conditions (Ewing et al, 2003). Because of the human specific ergonomics, people can adapt themselves to the conditions of walkways, which is exactly against the car movement. The pedestrians' main needs are psychologically summarized into five factors including consistency, shortness, beauty and security, safety and convenience (Mehdizadeh, 2001).

The construction of pedestrian walkways requires locating the correct passages and facilities for the pedestrians. Table 1 summarizes the main criteria for creation, development and maintenance of a walkway (Uhlig, 1979) (Lo, 2009) (Florida Pedestrian Planning and Design Guidelines, 1996).

Table 1
The main criteria for development of a pedestrian walkway

Row	The criterion	Defenition
1	Great focus on the pedestrians	Walkways should relatively include a large number of pedestrians; and the best designed paths are not in fact the walkways when a few people are walking there.
2	Residential density	Living a large number of people in a distance from the pedestrians to walkways or a target area, which connects two (or more) very attractive destinations with a distance of less than 3 to 5 blocks
3	Human-scale dimensions	the width of paths with two or 3 lanes of roadway, the corner street lights with 7-10 meter height, buildings as the body of walkways with 2-5 stories, allocating the ground floor for commercial purposes, and the upper floors for residential ones
4	Various retail sales	Existence of a rich collection of healthy, diverse and local retail sales
5	Traffic calming	Movement of motor vehicles at relatively low speeds, not their removal, driving lines with the width of less than 73.30 or 3.65 meter
6	24-hour activity	The pedestrians' activities after working hours due to the residential densities and commercial activities
7	Narrow areas	The creation of relatively narrow proper width, along the sidewalks
8	Protection against weather	The creation of canopies, shelters or indoor passages in front of buildings along the sidewalks
9	Wide walkways	Walkways with 2.65- 6.65 width, the creation of a balance among the pedestrians and the need to a comfortable living environment
10	Non-disturbing equipment	Putting the disturbing equipment out of sight on the roofs, beside or behind the buildings or back alleys
11	Main active facades of buildings	The main facades and the minimum empty facades of buildings facing the pavement on the street side
12	Balanced rotational radius and passage distances	Low rotational radii of streets, the existence of driver intersection, the creation of small side curve paths to reduce the speed of car turning, and the middle ground for pedestrian walking
13	Proximity	The walking passages from houses to workplaces, schools, parks and shops in the immediate vicinity of each other and less than 500 meters from the houses
14	Blocks with low length	The use of short length of blocks, less than about 170 meters and preferably 65-100 meters
15	Suitable commercial enterprises	Tendency of walkways to ban large retailers and car-based enterprises

5. Study Area

Covering an area of approximately 2,400 hectares, the Naseri fortification is located in districts 11 and 12 of Tehran, limited to Enghelab Street from the north, Karegar Street from the west, 17th Shahrivar Street from the east and Shoush Street from the south. The Safavid Fortification is located at the central part of this area and it can be considered as the most visited site in Tehran. This area plays a major role in intra-urban trips as well as the traffic routes in Tehran. In addition, Tehran Metro has increased the importance of this area. Safavid and Naseri fortifications are fully located within the traffic zone and even and odd zone in the central district of Tehran. Fig. 1 shows the boundaries of the Naseri and Safavid Fortifications in Tehran (Hasanzade et al, 2015).

5.1. The historical background of the formation, expansion and structural development of Tehran and the position of the Naseri fortification

The formation process of Tehran is studied in this section. This section addresses how the city was formed in the Naseri period in order to identify the strategic and identity-giving sites in this area.

Tehran was one of the villages of Rey at the intersection of routes to Qom, Khorasan, Mazandaran, Qazvin, Gilan and Saveh. Due to its main political, commercial, administrative and religious significance, it was always claimed and invaded by rivals. Tehran's special urbanization was in the form of the arrangement of enclosed gardens and the arrangement of underground houses or multiple atriums. The main reason for the fact that the city was not fortificated until 1554 was the security of the underground houses and impenetrability of the enclosed gardens, which made it unconquerable. However, after numerous wars and construction expansion on the ground, the city lost its security and hence the first fortification was built around Tehran during the Safavid period. Major neighborhoods within the fortification included the Bazaar, Oudlajan, Sangolaj, Arg, Chale-Meidan and Chale-Hesar, with four gates for people's movement in the four main directions.

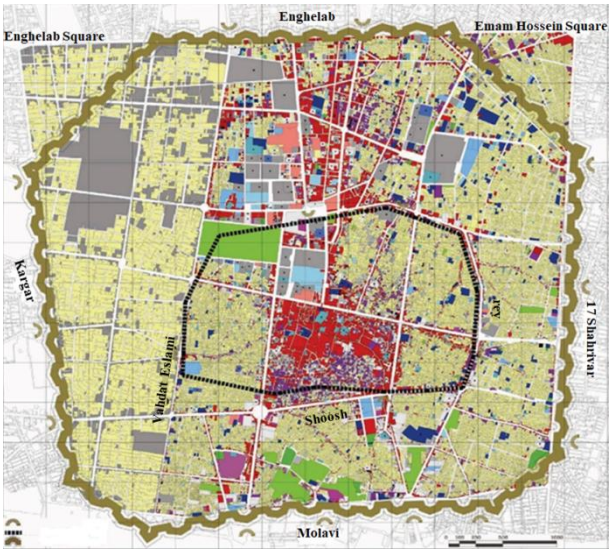

Fig. 1. The boundaries of the Naseri and Safavid Fortifications in Tehran

But in the course of various historical periods and population growth at the time of Nasir al-Din Shah, this fortification was destroyed and a new fortification and a ditch were constructed in the form of an irregular octagon 18.5 km long, modelled on that around Paris. The new fortification had twelve gates decorated and tiled. Fig. 2 shows the main connections of the city to the gates and Tehran's Dar-al-Khalafeh Bazar up to 1893 (Habibi and Maghsoodi, 2002).

In this way, the Naseri fortification was formed as the central and historical part of Tehran. This Fortification is still of great significance for containing more than 300 monuments and cultural buildings. The special features of this district include the presence of important political, administrative, economic and educational centers such as the Office of the Supreme Leader of Iran, Presidential Administrative Center, Islamic Consultative Assembly (Parliament), Guardian Council, Supreme National Security Council, Islamic Council of Tehran, Tehran Municipality, Ministry of Foreign Affairs, Ministry of Economy and Assets, Ministry of Culture and Islamic Guidance, Management and Planning Organization, State Organization for Registration of Deeds and Properties, Tehran Provincial Court, Central Post Office, Administrative Justice Court, Central Bank, Warfare University and Dar Al-Fonoun School. In addition, the embassies of Germany, Italy, France, Russia, Britain, Turkey, Romania and Armenia are located in this area and thus foreign guests are visiting this region. The presence of important economic centers and specialized markets with transurban and transregional activities as well as the Great Bazar of Tehran, as the heart of the country's economy, in this fortification has given a strategic importance to this area.

Fig. 2. The main connections of the city to the gates and Tehran's Dar-al-Khalafeh Bazar up to 1893

5.2. Development prospect of Districts 11 and 12

Development Prospect of District 11: The urban development prospect of District 11 (Website of district 11 of Tehran) is described in the form of 3 areas as outlined below.

- Southern area: "The residence of low- and middle-income urban population, is safe and resilient, has sustainable environment standards, public facilities and services in proportion to the resident population, along with an efficient neighborhood system and a structure on human-scale which improves place attachment."
- Northern area: "A part of the metropolitan center combining diverse urban and residential activities, booming in terms of commodity trading and information exchange, having open spaces as a context for social interaction with an emphasis on the movement and comfort of pedestrians, especially those in the young age group."
- Middle area: "The focus of political, religious, national and transnational activities. An example of the spiritual governance campus in contemporary city."

Development Prospect of District 12: The originality of District 12 can be protected and strengthened more than other regions due to the presence of historical heritage and cultural riches of the city in this old center (Website of district 12 of Tehran).

- District 12 has the ability to be upgraded with these features due to the presence of state, economic and commercial poles.
- The existence of historical sites, complexes, squares and streets in the district enables the transformation of its public spaces into the common courtyard of Tehran's citizens.
- The historical center needs urgent and extensive measures.
- The proximity of residential, work, and recreation areas has provided such an opportunity.

- The presence of major governmental needs and major cultural, social, and economic activities in this district enables the realization of such a vision.

The development prospects of districts 11 and 12 show the importance and necessity of adding pedestrian walkways within the Naseri fortification.

6. Methodology

One of the most important goals of this study is to select some of the study area passages in the central part of Tehran as pedestrian walkways. Therefore, there should be a comprehensive study on all passages of this area to determine the ones suitable for transforming to pedestrian walkways. It is necessary to use multiple criteria to measure the potentials and constraints of each of these passages and it leads to the complexity of evaluation.

Qualitative measurements are evaluated in the 3 groups of physical-functional, socio-economic, and environmental indicators. In this study, the process of measuring the potential of passages is such that in the preliminary analysis of the district, some passages of the region are removed from the alternatives of pedestrianization based on the results of the SWOT tables of 3 qualitative groups, the main elements and historical monuments and the pedestrian and vehicle traffic flow of each passage. Subsequently, the process of selecting pedestrian walkway passages includes a combination of quantitative and qualitative indicators. Qualitative evaluation of these passages is conducted through multi-criteria analysis in terms of physical-functional, socio-economic and environmental indicators. Quantitative evaluation involved the quantitative criteria such as physical and functional layers.

6.1. SWOT tables of indicators and selection of primary options

As discussed in the methodology section, using SWOT Table 2 to SWOT table 7, specific historical elements and pedestrian and vehicle traffic, in the preliminary analysis some passages are excluded from pedestrian walkway alternatives regarding various reasons such as lack of monuments, high traffic flow and lack of alternative routes, low pedestrian traffic, etc. The other 8 passages which remain after the preliminary study, and are the final alternatives are: 1. Jomhouri Street 2. Ferdowsi Street 3. 30th or Tir Street 4. South Laleh Zar Street 5. Mostafa Khomeini Street 6. Imam Khomeini Street 7. Imam Khomeini Sq. 8. Baharestan Sq. As mentioned in the previous section, a comprehensive analysis that covers a combination of quantitative and qualitative indicators is conducted in order to select the final plan for constructing pedestrian walkways.

6.2. Selection of pedestrian walkways

The remaining passages are analyzed by a combination of quantitative and quantitative indicators. The passages are qualitatively evaluated through the multi-criteria analysis in terms of physical-functional, socio-economic, and environmental indicators. The quantitative evaluation of passages is performed through some indicators such as distance to the metro stations and density of the historical monuments.

Table 8 describes the qualitative indicators and their weights in the analysis. As mentioned earlier, the multi-criteria analysis method is used to combine the indicators of each group. In this method, the criteria are combined in such a way that each one can play a certain effect on the target outcome. Each group of 3 criteria has their various sub-groups. Firstly, each of the indicators takes a score of 1-5 with qualitative visits and assessments, which indicates the value of each index. In fact, each sub-index receives a score of 1 to 5 after the field evaluation, the smaller score has a lower value and the larger score has a higher value. In other words, the higher score will show the condition of the indicator is good. Then, the score of each group should be calculated by combining the group indicators.

A weight is thus allocated for each index, indicating its preference over other indicators. After studying the indicators, each index receives 1 as the lowest importance to 10 as the highest importance. In the next step, the numerical value of each indicator is multiplied by its weight. The obtained value indicates the importance of that indicator. In fact, if the value of each indicator is defined by *x* and its weight is called *w*, formula 1 is showed the method for calculating the group scores.

$$\frac{((x1\times w1)+(x2\times w2)+\dots)}{(w1+w2)} \qquad (1)$$

Table 2
The SWOT table of socio-economic study

	Strengths	Weaknesses	Opportunities	Threats
Social	- High mobility of the region in terms of residents' activity - Decrease in population fluctuations in recent years - Low population density in the region (about 164 people per hectare) - The diversity of social and ethnic groups	- Escaping the population in some places and displacing immigrants - The presence of social anomalies and bad reputation in some neighborhoods - The presence of low-income and single-family	- Possibility to attract indigenous population regarding neighborhood prosperity and cultural, tourism and educational activities - Increasing the economic potential of the region by attracting	- The lack of social security and the existence of social anomalies in some neighborhoods - Decrease in the role of collective memories and historical memorials in this area - The concentration of immigrants from the marginal parts to the historic center due to

	- High youth population - The existence of spectacular historical and cultural attractions in terms of attracting the tourist population	immigrants in the adjacent regions - High numbers of immigrants, especially low-income immigrants - Difference in population of day and night - Changing the role of many streets and reducing their attractiveness for the people	tourists to specific cultural and historical parts	proximity to the workplace and low rentals - The vacancy of many tourist and valuable neighborhoods due to intrusive and incompatible activities
Economic	- Abundance of activities and employment opportunities - Bazar importance in urban distribution system - Low unemployment between active population	- The existence of an inappropriate pattern of employment of residents (low in the field of management and strong in the sales and workshop - The existence of relative poverty and low income among the residents in the area despite the large circulation of money in the region - Low prices of land and housing	- Ability to add business and tourism activities in large scale - The possibility of organizing informal jobs in specific spaces - Increasing and attracting investors due to the development opportunities of the area - Increasing in employment opportunities according to the historical center features	- The dominant pattern of separation in the places of residence and work - Domination of the traditional distribution pattern in Bazar activities - The lack of value of the historical center for investors due to the exhaustion texture

Table 3

The goals and strategies of socio-economic study

Goals	Strategies
Enhancing location identity by creating urban spaces	- Creating vibrant and active places for people to spend leisure time - Make easy access to public areas of neighborhoods from peripheral areas - Appropriate lighting for the public regions at night
The vitality of social life	- Creating public areas for various social groups - Use the areas around the walkways for recreational activities - Considering occupational activities in the vicinity of pedestrian walkways - mixed-use development in the area - Creating lively, active and memorable urban spaces in different hours of the day - Prevent incompatible activities in the vicinity of pedestrian walkways
Enhancing safety and security in the public arena	- Providing services and equipment needed for pedestrians - Consider a hierarchy in defining urban spaces - development of active land-uses - Accomedate residential land uses in the upper floors of commercial land uses in the vicinity of the pedestrian walkways - Providing specific pedestrian needs - Creating places for positive and active use on the street in other word, providing “street eyes” - Beautify pedestrian walkways in order to make them more attractive - Providing protective equipments against climate change - the presence of all kinds of people in at different times - reducing the isolation of the area as a frightening factor for users and an opportunity for criminals
Strengthening the society through partnership	- Formation of a supervisory group in neighborhoods for cooperation with city in order to developing pedestrian walkways - Coordinate the implementation of the plan with governmental organizations and NGOs
Identify and extend specific areas along the path	- Provide places for passersby to stop, rest and watch sights - Providing facilities such as wc, shelter, places for sitting and playing
The vitality of behavioral condition	- Creating flexible places with the ability to set up different behavior patterns - mixed-use development around the public spaces - providing behavioral camps for different social and age groups - Eliminate the incompatible land-uses

Table 4

The SWOT table of physical-functional study

	Strengths	Weaknesses	Opportunities	Threats
Physical	- The existence of buildings, edges and valuable historical boundaries - The presence of important official, commercial, and ceremonial centers - The existence of communal spaces from the past with historical memories	- Exhaustion and neglecting valuable historical values - Difficulty in walking and inappropriate urban furniture - Confusion in urban landscape - The old buildings and the risk of earthquake damage -New and old buildings in a neighborhood next to each other and leading to barriers in pedestrian movement	- located in the central part of Tehran - The possibility of reviving the historical values of buildings, spaces and historical collections - The possibility to create pedestrian walkways within historical and urban context - The possibility of reviving spaces, identities and memories, and the transition to modern civil spaces	- The existence of protective areas for historic buildings as a limitation to the physical and physical development of their adjoining estates -The plenty of small real estates in the texture that can only be renovated if combined -Applying some physical changes incompatible with the surrounding environment and historical identity of the buildings
Functional	- A large share of trans-regional land uses - Possibility to found large workshops and warehouses	- Domination of micro business activities among trans-regional land uses - Invasion of workshop and warehouse activities into residential buildings -Congestion of activity, crowds and cars in day and low activity at night	- Possibility of consolidation of compatible trans-regional land uses with the center of city - Ability to attract tourism and cultural activities	- Formation of rival activity centers in Tehran - Not attracting new and non-traditional activities to the city center - Reducing the activities at night compared with other areas that reduces the vitality of the environment

Table 5

The goals and strategies of physical-functional study

Physical goals	Strategies
- Revival of the original historical texture and the latent values in buildings, monuments, public spaces and urban texture **- Strengthening the physical pattern of the metropolitan City Center with regard to the metropolis structure** **- The development of public spaces and pedestrian walkways** **- Enhancing linkages between neighborhoods** **- Encourage people in order to Improve and renovate their buildings**	- Revitalizing the characteristics of urban landscape and identity of the study area - Developing plans for rebuilding and restoration of the texture in valuable historical parts and Preventing the interruptions leading to the loss of the integrity of the old neighborhood - Reconstruction of the urban spaces structure as an interconnected network - Organizing special axes to strengthen the landscape and encourage tourism and pedestrian walking - Aggregating and renovating small real estates
Functional goals	**Strategies**
- Emphasis on official, cultural and tourism activities **- Encouragement of mixed land uses** **- Reduce illegal retail activities and activities incompatible with the credit of the city center** **- Distribution of balanced urban services** **- Providing full coverage of the urban infrastructure network and modernization of worn out facilities**	- Organizing Bazar acticities and its business axes in order to refine incompatible activities - Replace the disturbing activities including workshops, warehouses, manufactures and vendors outside the area - Reducing invalid and small scale business activities - Firstly, Changing the activities of the region in favor of tourism and cultural activities and secondly in favor of private official activities like the embassies through incentive measures - Distribution of urban services in proportion to population and shortages in residential neighborhoods -encourage the growth of mixed-use centers, Especially around metro stations that are accessible to eyeryone

Table 6

The SWOT table of infrastructures and environmental study

	Strengths	**Weaknesses**	**Opportunities**	**Threats**
Infrastructures	- Implementation of restoration and renovation projects in the historical texture	- Heavy traffic flow on the streets leading to the Bazar	- Possibility to move existing bus terminals to the margins of the region	- Danger of increasing surface water contamination in case of covering up the water streams in the streets
	- Developing green, educational, cultural and social spaces in the region corresponding to the regional development plans	- The aging and decay of the electricity and water network in the study area	- Replace the intrusive workshops outside the area	- Possibility of the occurrence of accidents due to The aging and decay of the electricity and water network
	- The construction of 4 multipurpose places regarding crisis managementin order to control and manage the consequences of an earthquake	- Lack of telecommunication capacity network to meet the demand of the region	- Possibility of equipping Shahr park and the other existing parks with cultural and recreational services	- Possibility of destroying historical textures in case of ignoring the physical sensitivity of these spaces in some projects relating to complete coverage of the gas network in the region
	- Launch of BRT Line on Molavi Street	- traffic congestion on the streets		
	- Implementation of Marvi alley projects	- The lack of emergancy facilities for some parts of the area		
		- inadequate system for loading and deloading es[ecially in Bazar district		
Environmental	- The existence of the main sewage network in the region except for some parts	- contaminated water from industrial and industrial units	- Possibility to locate small parks and green spaces in the streets and residential neighborhoods due to increasing per capita green space	- Increasing in dangerous hospitalized pollution and soil and surface water pollution and asa result, the possibility of spreding variety of contagious and chronic diseases in the region
	- Implementation of surface runoff control project in Ferdowsi	- Weakness in the daily management of garbage collection		- Increasing in the amount of noise and air pollution and its devastating effects on the environment and more important is the devastating psychological and physical effects on humans
	- The role of air pollution reduction in Shahr park which is the only large scale green space in the region	- Inexistence of main sewage network in Bazar area		
	- Establishment of two stations for the processing and recycling of dry wastes on the streets of Shush and Molavi	- Soil and surface water pollution due to the presence of domestic absorption wells		
		- Covering on the existing water streams of the region		
		- An imbalance in the distribution of green spaces in the region		
		- Lack of per capita green space in the area		
		- absence of a list regarding plants species which are suitable for planting in the region		

Table 7
The goals and strategies of environmental and infrastructures study

Goals	Strategies
Reduction of soil and water pollution in the region	- Construction of the main sewage network in Bazar area - Provide integrated management of urban and hazardous workshop waste collection - Replacement of workshops regarding the potential of water and soil pollution, especially workshops for the production of chemical and metallic materials - Prevent covering up the street water streams in order to avoid the increase in water pollution
Reducing air pollution in the area	- Planting broad-leaved trees to absorb as much carbon dioxide as possible and produce more oxygen in the air. - Planting trees on the vacant grounds to prevent the existance of dust in the area - Planting rows of trees in the streets and intersections for absorption of lead arising from cars
increase of Per capita green space of the region	- locating small parks and linear green spaces in the streets and vacant grounds of residential areas
Providing the necessary urban infrastructure	- Improving the aging and decay of the electricity and water network - Completion of regional gas network - Increase in the network transmission capacity to meet the needs of the area - Determining the accesses to the crisis management buildings in the area to facilitate emergency services in the earthquake situation
improvement of traffic congestion in the area	- Providing an adaptive public transport system connected to the integrated urban public transport system in order to organize traffic flow in the region - Design a centralized transport system within the context concerning the pedestrian movement and the traffic flow movement - Providing emergency accesses to the streets in the historical texture - Determine the special routes, loading and deloading stations in the area, especially in Bazar area

The studies conducted on the qualitative indicators have covered most necessary indicators for pedestrian movement. Nevertheless, these criteria are measured based on the field observations. Therefore, examine some criteria which are taken from quantitative measurements should be considered as an assessment for the result of qualitative data. The result comparison of these measurements with qualitative measurements can be very important in the final selection of pedestrian walkways. These quantitative criteria include the density of historic attractions (passages and historic monuments), identification of the type of activities, and measurement of access to the metro stations. Finally, a table is created for all the passages based on the analysis of quantitative and qualitative indicators, which indicates all the results of quantitative and qualitative studies and helps to select the final plan of walkways. Fig. 3 illustrates the process used for analysis, which is performed for the 8 walkway candidates.

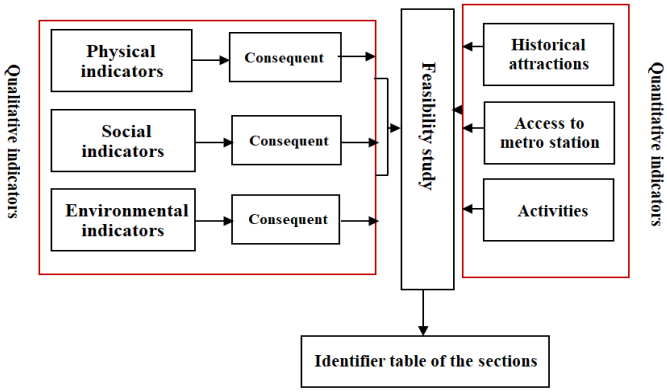

Fig. 3. The process of the analysis

Table 8
The weight of different indicators

Socioeconomic indicators			**Physical-functional indicators**			**Environmental indicators**		
indicators	Sub-indicators	Weight	indicators	Sub-indicators	Weight	indicators	Sub-indicators	Weight
Participation of residents and businesses in the range	Identifying importatnt indicators	8	Penetrability of the area	Physical	7	Attraction of walkways	Vegetation Composition	4
	dentifying famous persons in the region	5	Visual consistency	Physical	5		Vegetation integrity	5
Social Security	population density	4	Restoration of surrounding textures (Local plans, private investments, presence of individuals)	Functional	8	environmental health	The existence of shadows	5
	Exposure of the space	3		Physical	8		light reflection	2
	Existence of abnormal people or behaviors	3	Mixed land use	Functional	8		Dangerous garbage	3
	Usage of places by various social groups	5		Physical	8		Polluting industries	9
Restoration of surrounding textures (Local plans, private investments, presence of individuals)	The presence of famous people in the social and cultural domain	6	Attraction of walkways	Functional	10	Attention to the field of tourism	Park and green space	10
	Social and cultural projects	8		Physical	10		The route of water streams	5
	The existence of memories	6	Facilities for walking	Functional	4	Walkway route	Natural corridor	4
Mixed land use	Variety of activities	8		Physical	4		Intersections	3
	Diversity of groups using space	8	Security	Functional	5			3
Attraction of walkways	The diversity of urban spaces and their activities	4		Physical	4		Sight to the mountain	3
	Possibility of experiencing mixed activities in the area	3	Vitality	Functional	4			
	Variety of Activities and land uses	2	Walkway route	Functional	3			
	Existance of different social groups	3		Physical	3			
Vitality	Variety of users	4	Attention to historical and cultural background	Functional	10			
	Variety of activities and land uses	7		Physical	10			
	Variety of Behavioral problems	5	Attention to the field of tourism	Functional	10			
	The density of the number of pedestrians	7		Physical	10			
Attention to historical and cultural background	The inhabitants convention	8	Capacity and condition of existing parkings	Functional	6			
	Presence of cultural and religious persons	8						
	Presence of Historical Cultural Memories and Events	10						
Attention to the field of tourism	Business tourism	9						
	Special event tourism	5						
	Cultural tourism	9						
	Religious Tourism	10						
	Nostalgic tourism	10						

Jomhuri Islami Street

Jomhuri Islami Street is investigated in the studied area in 3 sections. The first section included the intersection of Hafez Street to Ferdowsi Street. The northern side of sidewalks do not have any large volume of pedestrians; and the main tourist attraction sites in this section of Jomhuri Islami street is generally on the south side, and there is a lower density of travel attraction centers on the north side. Due to the presence of the British Embassy on the northern side, a large number of pedestrians in this area is not available there. In this section of Jomhuri Islami Street, there is a two-way bus line. The situation is totally different from Ferdowsi Street to Saadi Street and the pedestrian traffic is considerable due to the presence of clothing wholesale despite the destruction of Plasco building on both sides of Jomhuri Islami Street, especially near the Ferdowsi-Jomhuri intersection (Istanbul). The number of riding and parked motor cycles is high in this section. The pedestrian traffic is not high from Sa'di Street to Baharestan Square. The one-way bus line is available from east to west in the sections 2 and 3. The amount of traffic flow on these 3 sections is very different, and the traffic flow steadily decreased from the west to the east of the street. Fig. 4 shows the 3 studied sections in Jomhuri Islami Street and the bus rapid transit (BRT) lines.

In order to prepare the results tables, the scores of zero to 1.7, 1.7 to 3.4 and 3.4 to 5 are considered as low, moderate, and high scores for physical, social, and environmental qualitative criteria.

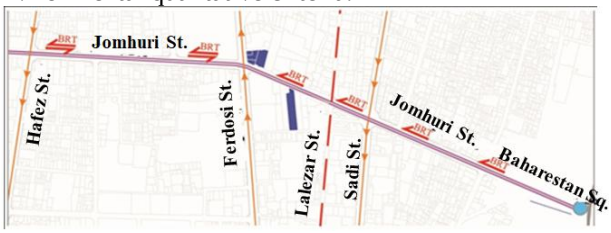

Fig. 4. Jomhuri Islami Street and its sections

Ferdowsi Street

In the study area, Ferdowsi Street is started on Imam Khomeini Square and continued to Istanbul intersection (intersection with Jomhuri Islami Street). This section of street had a high traffic jam, low pedestrian volume, and a few major manufacturing or travel attraction centers. Coin Museum of Sepah bank is located on this street. A two-way BRT line is existed up to Sarhang Sakhaei Street. Due to the very high vehicles traffic flow and relatively low volume of pedestrians and the sufficient width of the sidewalk (about 2.5 to 3 meters) in this passage, the construction of walkway, as a suggested option, can be extremely doubtful. Fig. 5 illustrates Ferdowsi Street location.

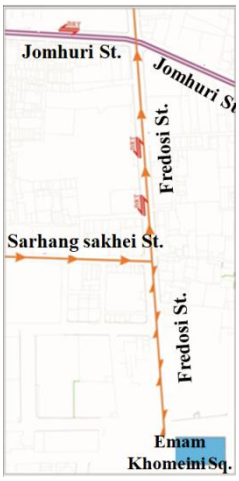

Fig. 5. Ferdowsi Street

30-Tir Street

The existence of historic monuments and valuable architecture adjacent to this street is regarded as an important option for pedestrianization. Important places such as Abgineh Museum, Science and Technology Museum, the old building of National Library of Iran, Research Institute and Cultural Heritage and Tourism, Malek National Library and Museum, and Saint Peters Church are located on this street. In addition, Art Theater and University of Art are on Sarhang Sakhaei Street. The unique features of 30-Tir Street and existence of the historic centers and valuable architecture have been recognized as a possible alternative to walkway. The main effects of 30-Tir Street include the restriction of movement from this street to the northern area, and traffic flow and its direction towards the north to Ferdowsi and Valiasr Street streets. Fig. 6 displays the 30-Tir Street zone.

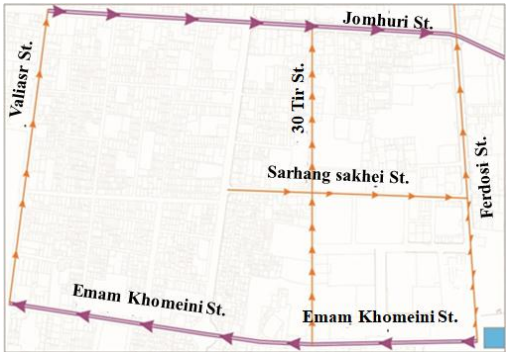

Fig. 6. 30-Tir Street

Southern Lalehzar Street

With regard to the specific circumstances of Southern Lalehzar Street either in terms of active jobs on the street and type of existing traffic on this street including porters and motorists as well as the high volume of pedestrians and inappropriate width of its sidewalks, this street is regarded as one of the main options for pedestrianization in this area. It is essential to take special measures for transport of goods, loading and parking for pedestrians' public safety and non-interference in the business of this

street. The narrow width and height of buildings has resulted in shading and using relatively comfortable air in this area. A variety of places such as several old cinemas, Laleh Zar Café, Café Bazaar, Grand Hotel are available in this street. In the case of pedestrianization, its traffic jam is transferred to the adjacent streets, which seems that a lot of traffic is transferred to Ferdowsi Street since it is in the same direction and adjacent to Lalehzar Street. Fig. 7 shows the Southern Lalehzar Street location.

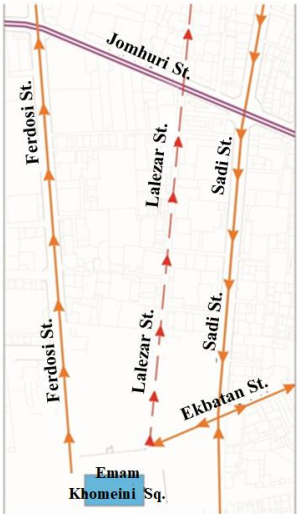

Fig. 7. South Laleh Zar street

Mostafa Khomeini Street

This street includes five lines to the south and a BRT line. It has heavy car and motor traffic and the number of pedestrians is based on the width of sidewalk. Buildings are retreated and the sidewalk is widen in some parts from the intersection of Amir Kabir Street to Sarcheshmeh Crossroad. There are the outlets for construction, sanitary and plastic goods on this street. Fig. 8 illustrates the Mostafa Khomeini Street and its surrounding area. The pedestrianization option of this passage does not seem logical due to the very high vehicle passing and the relatively good width of pavement considering the number of pedestrians, but the final opinion can be expressed after the investigation of all indicators in the final table.

Fig. 8. Mostafa Khomeini street

Imam Khomeini Street

This street is two-way until the intersection of Khayyam Street, while it is one-way afterward. The width of sidewalk is about 2 meters. The famous elements such as the Post Museum, the Gate of the National Garden, The Ministry of Foreign Affairs, the Museum of Ancient Iran, Hassan Abad Square are observed in this street. This street has a relatively high volume of vehicle traffic flow and moderate pedestrian volume. Considering the large number of cars, the pedestrianization can be considered for widening the sidewalks. Imam Khomeini Street area is shown in Fig. 9.

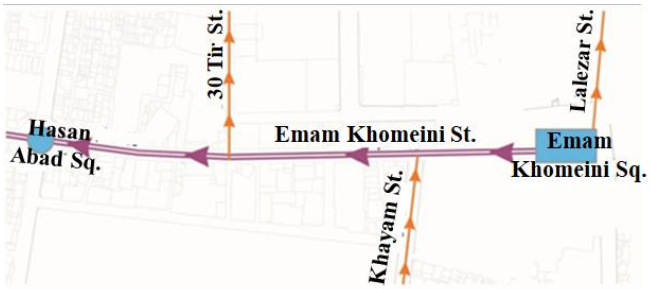

Fig. 9. Imam Khomeini street and Imam Khomeini Sq.

Imam Khomeini Square

Imam Khomeini Square is known as a cultural, commercial memorial place. There is Ministry of Information and Communications Technology in the south of this square, Ostad Sanati Museum in the west, and the audio-visual shops in the north. Lalehzar Street from the northeast of square and Ferdowsi Street from its northwest to the north have access to Jomhuri Islami Street. In addition, there is a taxi terminal on the northern side of this square. There is a need for organization of the zone around Imam Khomeini Square due to the existence of large number of pedestrians because of the metro station, connection to the walkway of Bazaar of Tehran through

Naser Khosrow and Bab Homayoun streets as well as high vehicle flow. The location of Imam Khomeini square is shown in Fig. 9.

Baharestan Square

The existence of the buildings of National Consultative Assembly and Islamic Consultative Assembly in this square is among the main reasons for the importance of this square. The northwest side of this square is the outlet for sale of musical instruments and the building of the Ministry of Culture and Islamic Guidance is located in the northwest of this square. In the case of pedestrianization for Jomhuri Islami Street, this street can end in this square by changing one of lines in the southern side of Baharestan to the walkway and we can take advantage of potential of Ekbatan Street such as Masoudieh building, theaters and street cafes. Baharestan square location is illustrated in Fig. 10.

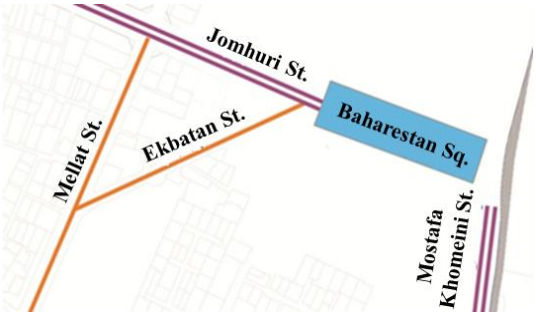

Fig. 10. Baharestan square

Finally, Table 9 indicates the results of the proposed indicators for all of the alternative sections.

Table 9
The table of all the alternative streets regarding the proposed indicators

Section	Jomhuri Islami Street (Hafez to Ferdowsi)	Jomhuri Islami Street (Fredowsi to Sa'di)	Jomhuri Islami Street (Sa'di to Baharestan)	30-Tir street	Ferdowsi street	Southern Lalehzar Street	Mostafa Khomeini street	Emam Khomeini street	Emam Khomeini Square	Baharestan Square
Physical indicator score	High	High	High	Moderate	Moderate	High	Moderate	Moderate	High	Moderate
Social indicator score	Moderate	High	Moderate	High	High	High	Moderate	Moderate	High	Moderate
Environmental indicator score	Low	Low	Low	Low	Moderate	High	Moderate	Moderate	Low	Moderate
Type of activity	Electronic goods	Clothes	Shoes	-	Valves and Electronic goods	Electronic, Telephone and Commercial	Construction materials and Pelastic	official	Electronic goods	-
Type of activity regarding the amount of goods business	High	High	High	Historical-Cultural street	Moderate	High	High	Historical-Cultural street	Moderate	Historical-Cultural street
Access to metro station	250	250	250	750	500	**750**	**750**	250	50	750
Density of historical attractions	Low	Low	Low	High	Moderate	High	Moderate	High	Moderate	High

6.3. Selecting the final plan

After preparation of the results table based on the scores obtained in the previous section, the final analysis is made to decide about each passage. The final plan is selected based on the density of historical monuments as the main criterion along with other criteria such as the construction of an integrated walkway network, the type and density of activity on the passage, easy access to the public transit network, the level of pedestrian and vehicle traffic, and the quality indicators of the passages.

In the previous section, the feasibility evaluation of constructing pedestrian walkway regarding each passage is conducted through qualitative and quantitative analyses. After a thorough study of results table and with regard to the mentioned criteria, the final plan is selected. The plan includes transforming South Laleh Zar and 30-Tir streets to pedestrian walkways, the expansion of the sidewalks of Jomhouri and Imam Khomeini streets and moreover, improving walkability approach in Imam Khomeini Square.

As stated in the previous section, due to the special conditions of the South Laleh Zar Street, including active occupations on the street, the high density of historical monuments and the type of traffic on this street, which is generally motorists and porters, as well as the great number of pedestrians, building a pedestrian walkway on this street can be defendable with regard to different criteria. Due to the unique features of the 30-Tir Street in terms of the presence of valuable historical and architectural monuments, as well as the forecast of the traffic flow to nearby streets on the same direction, it is considered as the second passage for pedestrianization. In this plan, Sarhang Sakhai street remains unchanged, but 30-Tir street is blocked from Imam Khomeini Street to the intersection of Sarhang Sakhai Street and from there to Jomhouri Street and connected to the suggested pedestrian walkways of Imam Khomeini and Jomhouri streets from the south and north, respectively.

Imam Khomeini Square is considered a memorial-commercial-cultural place suitable for creating a continuous pedestrian network with other streets in the district because of the high number of pedestrian flow. It is thus necessary to organize and implement walkability plans for this square.

Deciding on widening of the sidewalks of Jomhouri Street due to the high pedestrian flow and the resulting disturbance should be accounted for with some arrangements. General suggestions are made below on how to change the width of sidewalks in different sections of this street.

- Section 1: as there is a two-way bus line in this section of the street and there is no significant pedestrian flow on the northern side of this section, it can be suggested that a pedestrian walkway is created only in the southern side. Adding a width of 2 meters to the pedestrian walkway while banning vehicle parking at the margin of the street will has the minimum effect on the number of useful traffic lanes as compared to the present condition.
- Section 2: due to the high pedestrian flow and presence of major shopping centers on either side of the street at this section, the pedestrian walkway option can be as follows: a pedestrian walkway can be constructed by reducing the one traffic lane from both sides of the street in order to equalize the number of lanes on both sides of Jomhouri-Ferdowsi junction. Also, the bus lanes at the northern part of this section should be transferred by 2 meters in case of building a pedestrian walkway. This will prevent a serious disturbance in bus services.
- Section 3: creating pedestrian walkway is not justified due to the low flow of pedestrians, but because people and vehicle traffic is balanced, if necessary, a pedestrian walkway can be built in order to create a pedestrian network.

Imam Khomeini Street, as a cultural-historical axis, has a relatively high vehicle traffic flow, so the only option approved is to widen the current sidewalks up to the intersection of 30-Tir Street along with the implementation of some plans to raise pedestrian-related indicators. In addition, with the implementation of this plan, an integrated network of pedestrian walkways will be created in this district.

Fig. 11 is presented the final plan in case of developing pedestrian streets, widening some sidewalks and improving walkability in a square.

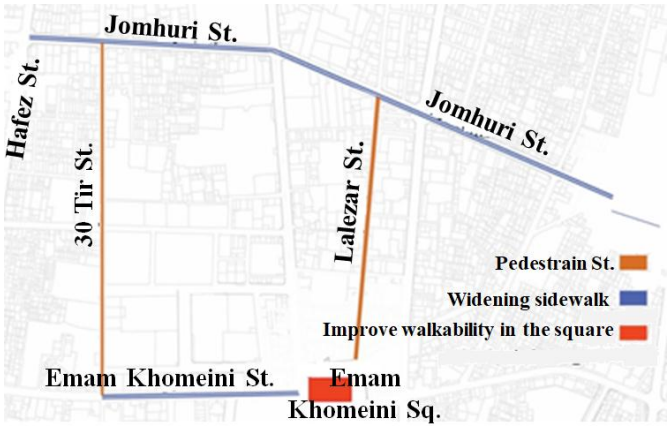

Fig. 11. The final suggested plan

7. Conclusion

In the past, walking was considered as the most important pattern of moving because of low cost or easy accessibility for all people, but following the industrial revolution and the dominance of the automobile in cities, the issue of pedestrianization was forgotten. Following the problem of air pollution, a policy was advocated in the past few decades to reduce the use of private vehicles and fossil fuels. Consequently, an urban planning approach was developed in order to re-establish the issue of the possibility of increasing walkways in the cities. Therefore, planning and designing pedestrian walkways are one of the essential measures that can be effective in revitalization of urban centers.

Walkways can guarantee the durability of life and consequently, the sustainability of old urban centers. Social psychological studies have shown that people need walking and presence in public spaces for social interaction. The pedestrian walkways designed for this purpose are urban pedestrian-specific passages which are forbidden to be used by vehicles except for emergency services or services such as loading and deloading (only during certain hours). The common feature of all walking streets is prioritization of pedestrian usage with the aim of restoring civil life through the construction of a special pedestrian walkway, which, in addition to playing an undeniable role in the urban life revitalization, allows citizens to attend to their chores and enjoy the scenery in a peaceful and safe environment.

Most of the cities in Iran have a great potential to create pedestrian walkway streets. Tehran has also a great potential to create walkways. One of the areas in this city that has the most capacity for pedestrianization is the historical district of the city which is known as Naseri fortification. Naseri fortification is limited to Enghelab Street from the north, Karegar Street from the west, 17-Shahrivar from the east and Shush from the south, and is known as the central historical core of the city. The purpose of this research is to evaluate the present condition of Naseri fortification and analyze the feasibility of walkways.

Methods such as documentary, descriptive and analytical studies have been used in this research. Research on the sources available in the scope of the study is conducted on the literature review. Preparation of maps and field studies are done in the descriptive method. For analyzing the passages, the present condition is assessed and compared with the criteria and principles of pedestrianization that are defined in the study. The current condition is analyzed within the framework of qualitative indicators such as physical-functional, socioeconomic and environmental factors in combination with multi-criteria analysis method and additionally, considering quantitative indicators such as the density of historical attractions, identification of the type of activities and accessibility to the metro stations. The final plan includes transforming South Laleh Zar and 30-Tir streets to pedestrian walkways, the widening of the sidewalks of Jomhouri and Imam Khomeini streets and improving the walkability measures of Imam Khomeini Square.

Given the historic and valuable fabric of the district and its tourist and historical potential, this region requires more attention with regard to pedestrian and vehicle interference. This is achieved by adding new pedestrian walkways that will form a pedestrian network in combination with the present pedestrian walkways. The final plan of this study aims to achieve this goal. Further studies can be conducted on the widening of the sidewalks of Imam Khomeini Street to the Hassan Abad Square, a walkability approach plan for organizing Baharestan Square at the end of Jomhouri Street, and designing the walkways of the district with the aim to create a vibrant and dynamic space, improve the presence and vitality of people, and boom tourism industry in the district.

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