

Original Research Article

The role of urban structure in pedestrian-orientation capability (Case Study: Hamedan City)

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Abstract

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Today, the problem of urban traffic, especially in urban centers, has become an important issue in urban planning. Over the past decades, the overreliance of modern urban planners on motorists' needs, and neglecting organizing spaces followed by the decline of cultural, social, visual and historical values spaces, followed by walking, in these centers have been criticized by many scholars. In this regard, strategies to improve the situation and willing to favorable conditions in the world have been proposed among which (walking movement development) can be noted. Historical square of Hamedan, as one of the country's oldest urban centers, has suffered, in recent years, traffic problems and the decline in its position as a platform for social interaction. In this paper we investigate the benefits of the pedestrian's movement, in the area of the central ring in Hamadan to review the capability of six main streets into walking path and criteria and related indicators of the walking-orientation approach, by the method of hierarchical analysis (AHP) potential. Finally, using the results obtained from pedestrian's movement potentiality in the area of central ring, we examined the capability of transforming six main streets into walking paths to which Bu-ali sina street was introduced as the first priority in this issue.

Keywords: Walking path, Traffic, Potentiality passages, Central Area of City

INTRODUCTION

Following the failure of modern urban planning and the importance of environmental and human development issues, much criticism was raised by modern urban planning experts about modern urban issues. Therefore, the necessity of reconsideration of pedestrians' movement as the safest, most economical and most dynamic way of transferring of pedestrians within urban transportation system has been paid attention to by urban authorities while most cities witness programs of spreading pedestrian-orientation. Today, pedestrian areas are considered as not only the most important areas of urban public realms – as William White, based on studies done on Manhattan streets, called sidewalks,

as a public space (Gotiber, 2005) but basically essential to the continuity of urban life.

Streets and sidewalks which are the most important public places are among the most essential components (Jacobs)

What is more tangible than anything in our cities is the presence of cars and the movement of motor vehicles on the urban fabric. Presence of increasing motor vehicle has brought about traffic, especially in crowded urban centers. The scientific studies carried out in different countries show that the development of motorists' path cannot solve traffic problem while it can ruin the public realm of urban life and disturb the movement in city

centers. Development of pedestrians' movement is the most effective way consistent with sustainable urban planning for the city centers. Hamedan has a radial plan with concentric rings which attract daily activities to the city center and allocation of city center to pedestrians' movement can help to organize the commuting and decentralization and protect the fabric of historical value while recreating the role of historical square of the city as a ground for social interaction. This paper intends to potentiate the feasibility of pedestrian-oriented approach of main streets of city center ring.

Literature review

On international experiences available to allocate certain space for pedestrian movement, the most important strategy experienced is the separation and isolation of the central area by a spiral street and transforming the central area into the walking area. The first action of this kind goes back to the late nineteenth century. During these years, the famous American architect and urban planner Ulmstead" the founder of the field of "dressing down" or "landscape architecture" first applied an idea of isolation of Central Park passages in 1858 in the design and separated the way of motorists and pedestrians (Mehdizadeh,1379)

In the 1970s, the development of mixed uses, pedestrian movement facilities and expansion of public transport in Toronto, Canada entered into force. In France, the development of pedestrian-only streets began from 1975 onwards. Since 1981 the downtown Athens district improvement plan development, based on the implementation and improvement of the physical and social landscape of the city was applied. In the U.S., Freedom walking lane in the heart of Boston city joins together sixteen valuable points (Lang, 1387)

The shared point of global experience gained from the successful implementation of development projects in urban centers is priority to pedestrians' presence with the aim of civil restoring and assigning maximize space to pedestrians and minimizing the required space for vehicles that increased – social activity, strengthening qualitative improvement of the physical environment and the human environment and, consequently, has led to the creation of urban space favorable for formation of civil life.

METHODOLOGY

The method used in this paper, according to the first step through library studies and a literature review with the experiences of Iran and other countries, and thus the theoretical framework to help effective and evaluate potential ways to measure pedestrians' motion be extracted is descriptive – analytic. Then, the case study-

context method in the field of the study area is used, and evaluation criteria and indicators derived from the theoretical framework of streets in the area of the study are reviewed to explore potential pathways for implementing pedestrians' motion using Analytic Hierarchy Process (AHP).

Definitions and concepts

Pedestrians

In Iran traffic rules, pedestrian refers to "a person who shall use any motor and a non-motor vehicle " (Ministry of Interior of Iran,1388)

Sidewalk

Sidewalk is a path parallel with motorists' path but separated (urbanization and housing ministry of Iran, 1375)

According to the regulations defined by traffic organization in Iran, walking path is "the part of the street which is located along the street dedicated for pedestrians (Ministry of Interior)"

Walking passage

Due to the high volume of pedestrian traffic in city centers, the walking passages are dedicated solely to the pedestrian crossing. The pedestrian crossing is usually laminated in construction materials other than concrete, such as asphalt and cobbles. If this parallel approach has been also done by passing vehicles, it is necessary to consider the distance between crossing pedestrians and bus vehicles at least 1.5 meters designed, and this distance is usually caused by trees, or stream,

Walking alleys

Walking alleys are the streets where vehicle traffic is eliminated or confined. Although emergency vehicles have access to the service and delivery trucks are allowed to travel at certain times of the day (Pakzad) (Figure 1)

Brief introduction of study area

Hamadan is Iran's first political capital was built about 700 BC and is one of the oldest cities in the world in terms of continuity of urban settlement.



Figure 1. Case of walking alleys

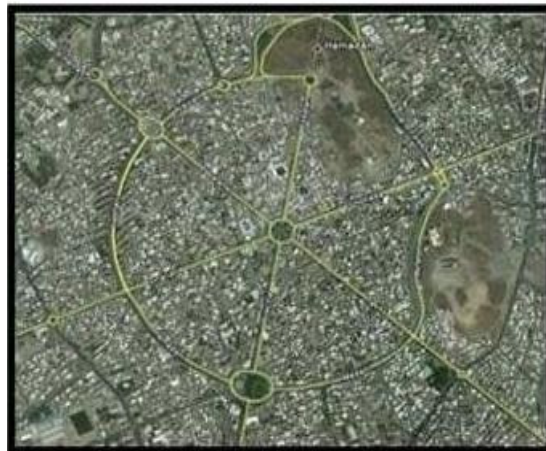


Figure 2. Central ring of Hamedan city

The current map of the city was designed in the years 1925-1928 by Austrian engineer Karl Frisch which was the first urban design in the new planning system in Iran. According to the compiled map, Hamedan city was planned to have a central square with a radius of 80 meters, 30 meters wide and 6 radial streets which are completely geometric, and in order to not interfere with passing traffic to the metropolitan area, concentric rings of different intervals with the growth in construction formed annular radial Hamedan city map.

The buildings around the central square were taken from the Baroque architectural style and due to proximity with the old market of town of exposure of numerous commercial applications can act as a platform for social interaction.

However, in recent years with the increase in vehicle traffic, there has emerged a major disruption in the functional roles. Hamedan central ring contains Imam Khomeini square, six main Streets, including Bu-ali sina,

Takhti, Shohada, Ecbatana, Baba Taher, Shariati and the Boulevard of 45 meters. (Figure 2).

Investigating the influential indicators on potentiality of ways for pedestrians' movement

Different people have not similar goal of walking and studies show different purposes such as "achieving the target for work-purchase or public activity, for recreation and enjoyment of the urban environment, or a combination of two referred to".

On the other hand, walking is not merely a physical activity, but it has psychological impact as well. Walking can be a complex activity that affects not only the body but also the mind.

Hence, it is advisable to identify effective measures to increase pedestrian mobility in the environment. The following criteria will be dealt separately. Table 1

Table 1. Criteria and indicators of feasibility for pedestrians` movement.

Criteria	Indicators	Explanations
Land use	Trade use	retailing, wholesales, public offices, services, banks, hotels, restaurant
	Educational use	nurseries, kindergarten, elementary school, highschool, higher educational centers ,
	Health and therapeutic use	infirmaries, emergency centers, hospitals, other therapeutic enters: laboratories, radiology, injection centers, public baths, public toilets
	Recreational use	parks and green spaces, cinema and theaters, sport centers
	Utilities use	.mosques and religious centers, libraries
Safety and traffic	Separating pedestrians from the roadway	.water streams and curbs, garden with green space, fence
	Traffic congestion	.traffic density is inversely related to traffic safety
	Pavement width	Standard width of sidewalks in residential areas is 1.5 meters in compact streets and .8 in branched m and in the arteries 2.4 meters.
	Width of walking paths	Middle / lower roadway width / projection at the junction and walking tracks / narrowing street span, taking lower the radius of turning right / put pedestrians crossing before the entrance aperture.
Security	Access control	Preventing t unknown person (controlled by the Guardian).(
	Long sight line	0long sight lines 300-350 m, increases pedestrian visibility
	Hiding places	Hiding places increase negative effects on the sense of security / dark underground / long narrow road / abandoned area / vacant parks / streets in low light / dense woodland.
	Lighting	Rate for suitable light is from 2 to 5 lux.
	Police presence and police car	special places for police surveillance.
	Working and living environment.	a considerable number of shops, stores, restaurants, cafes and public places to attract people and build effective working and living environment.
Attraction and comfort	Slope	Optimal slope 7/1% , allowable slope is lower than %5 / unallowed slope is more than 5%.
	Network integration	Accessibility and mobility / providing more direct and continuous routes / reduced travel times / distances suitable for short trips create / increase the number of connections and reducing network and thereby increase the block length leading to associate the selected route and increase the attractiveness way to go in.
	signs	Creating route legibility and increasing the attraction of walkways.
	Pavement width	.Reducing the width of the sidewalk due to adjacent building / reducing pavement width of streets occupied by facilities (urban furniture) / decreasing the width of the sidewalk due to pedestrian stops (due to the presence of vendors and shops etc) / decreasing sidewalk width of the wave-induced mass / decreasing the width of the sidewalk to stop and park motor and nonmotor vehicles.
	Flooring	Asphalt / Portland cement / concrete / mosaic.
	Prolonged obstruction on the sidewalk	Poles / ladders / urban furniture light.
	Annoying side elevation	Cooler air duct protruding from the facade of buildings / foliage at a height of pedestrian / poles of branching gas, chimneys slammed to the floor of some buildings that did not keep the sidewalk / projections of buildings lower than heights authorized / elements and devices installed and hung from the balconies of buildings / billboards, cable without protective / risk of falls at construction sites under construction.
	Parking and public transportation stations.	Creating and facilitating equitable access to a range of walking.

Sources: (Ministry of interior-kenfoakhar, 381-pakzad,1390)

represents selected criteria and indicators for the feasibility study of pedestrians` movement.

Assessment of criteria and indicators affecting the feasibility of paths for pedestrians` movement using AHP

AHP was first proposed in 1980 by Thomas L. Saati and

has already had numerous applications in various disciplines. AHP begins with the identification and prioritization of elements. These elements of decision making including objectives, criteria, or specifications and possible options which can be used in prioritization. Identification process of elements and their relationship which result in a hierarchical structure is called "the building up of hierarchy. This is because the hierarchical structure of decision (options and decision criteria) can

Table 2. The 9-quantity hourly scale for binary comparison of criteria

Score	Definition	Explanation
1	Of equal importance	Two criteria are equally important in achieving the goal
3	Importance Slightly higher	Experience shows that to achieve the goal , i is more important than j
5	More importance	Experience shows that i is much more important than j
7	Much more importance	Figure, I is proven to be much more important than j
9	The absolute importance	It is proven I is Much more important than j
8,6,4,2	Intermediate values	When there is a moderate case

Source: Zebardast

be summarized at various levels. AHP process is as follows - Building Hierarchy 2 – Determining the importance of criteria and sub criteria 3 - Determination of importance coefficient of options. 5- Determining the final score of options 5- Evaluating consistency in judgments (zebardast)

Building hierarchy

In the first step, we determine the hierarchical structure of the issue as shown in Figure (1) is shown. In this Figure, we have a hierarchy consisting of four levels: goal, criteria, sub-criteria, and subcriteria. Transforming a subject or issue into a "hierarchical structure" is the most important part of the AHP. Because, in this part, with the analysis of the complicated issues, AHP turns them into a simple form, which is consistent with the human`s mind and nature. In other word, AHP expresses the complex issues by turning them into particular issues which are linked hierarchically in which the connection of the main problem with the lowest level of analysis is clear. (zebardast)

Determining the weight of criteria and subcriteria

To determine the coefficient of importance coefficient (weights) of criteria and sub- criteria, we compare them together. For example, to evaluate this issue that is feasibility of paths for pedestrians` movement, the criterion whether " land use "is more important" or "traffic safety", the judgment is based on the 9 hourly quantitative comparison table of 4-13, which is given below . Based on it and according to the purpose of investigation, superiority rate of I criteria to criterion j, is determined. All measures are mutually compared. Because there are four criteria on the issue, there should be six judgments, for the performance of which the Delphi method is used for the expert judgment. (Table 2)

Comparisons between each two are recorded in a matrix of 4 x 4, which is called "binary comparison matrix of criteria". Elements of this matrix are all positive with

respect to the "reversed terms" in AHP (if the importance of land is 5 times as much as that of the traffic safety, the importance of traffic safety will be 2 times as much as the land use).

Below, the binary comparison matrix of criteria and criteria matrix for the problem are presented to calculate importance coefficient (weight) of criteria, four main methods of least squares, logarithmic least-squares, eigenvector and approximation methods are discussed. Of the above methods, the eigenvector method has been widely used. But if the matrix is of the larger size, the calculation of values and eigenvalues will be time consuming. Therefore, Saati has presented four approximation methods of sum of rows, sum of columns, the arithmetic mean and the geometric mean. In this study, the geometric mean method has been used due to greater precision. In this method, to calculate the weights of criteria, first we obtain the geometric mean of rows and normalize them. Following, a sample of calculations to determine the criteria weight is presented.

- As can be seen, the sum of coefficients of the four criteria (the second level of the hierarchy) is equal to one indicating the relative importance of the criteria.

To obtain the coefficient of importance (weight) of criteria, the same steps above to obtain a coefficient of importance (weights) of the criteria are done.

In the present study, the coefficient of importance (weight) are obtained by the application of software Expert Choice which is applied AHP software and the weights of all criteria and sub-criteria were calculated from the above mentioned methods. In Table 5 the calculated weights for all criteria and sub criteria are listed. (Figure 1 and 2)

Summarizing the assessment of passages related to criteria and indicators

In this section, initially, the weights of criteria and indicators derived from the theoretical framework were evaluated for the potential feasibility study of each of the passages for pedestrians` movement by the analytic hierarchy process. Then, each of the passages in the

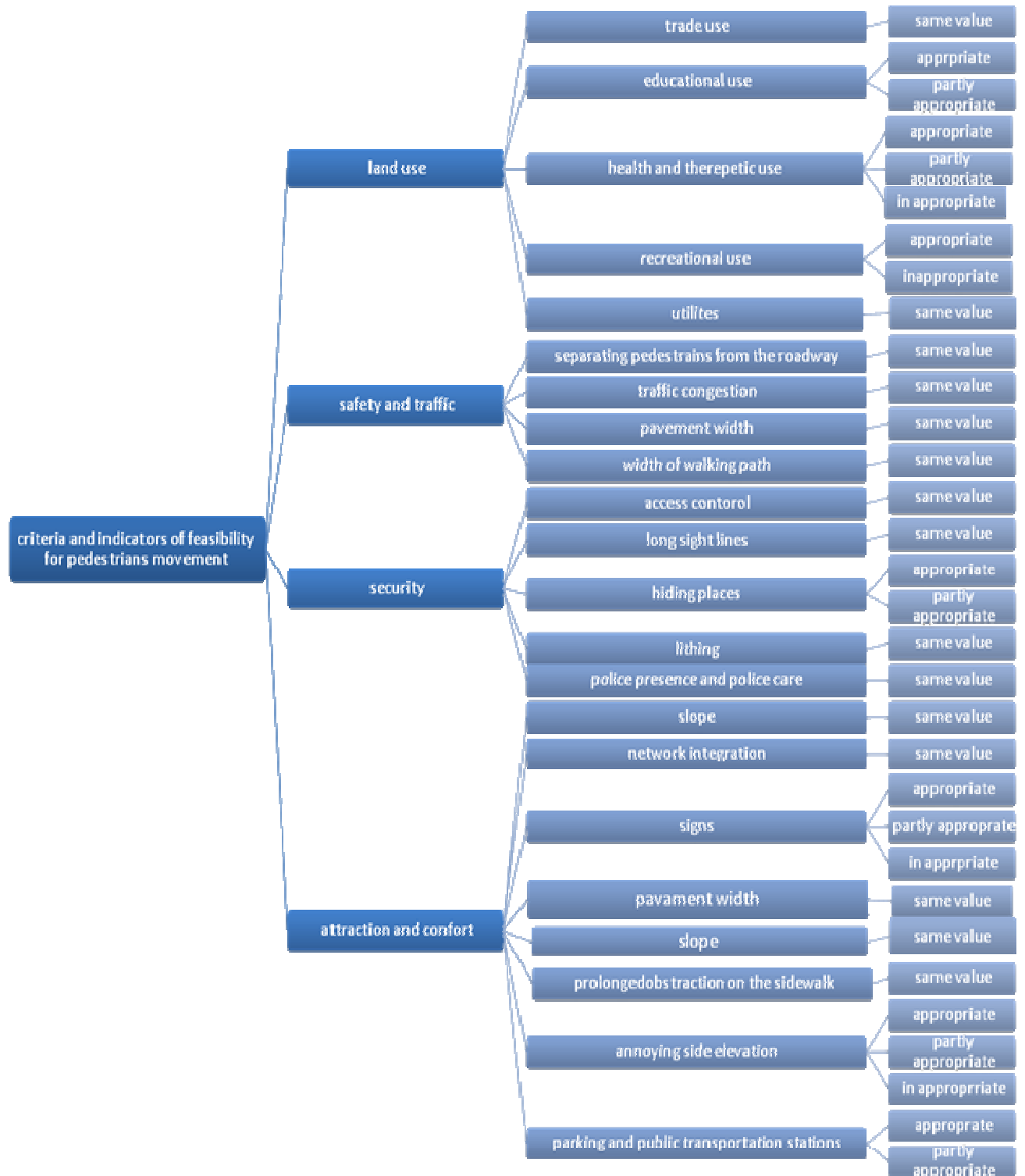


Figure 1. Criterias and indictors

study area (population of interest) was analyzed based on indicators of business uses, education use, health care use, use of recreational facilities and the passing of time, the use of public facilities, sidewalks separated

from the roadway surface, density of traffic, suitable walking path width, access control, lines of sight, hiding places, street lighting, police presence and police cars, slope of network continuity, signs, flooring sidewalk,

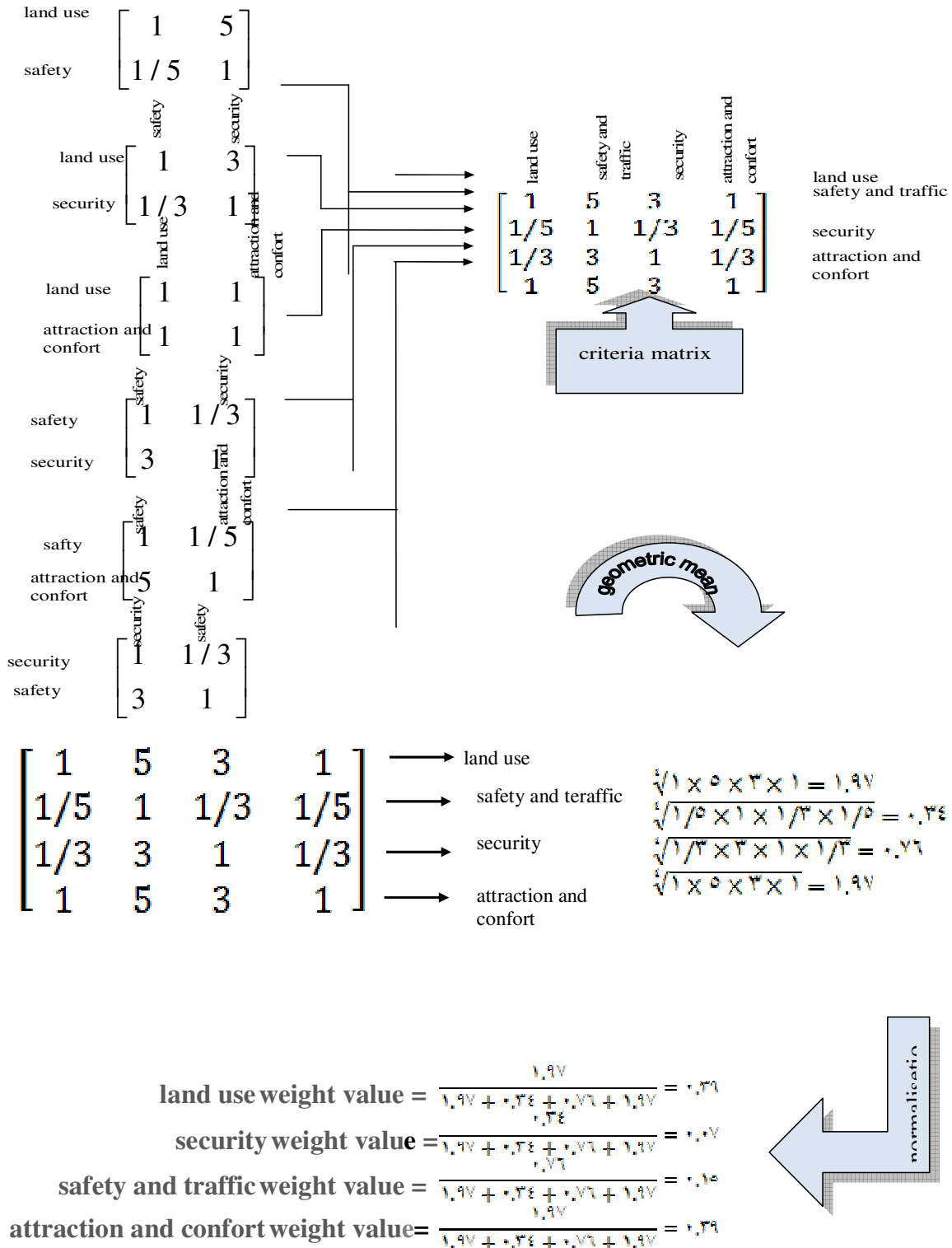


Figure 2. Hierarchical structure of criteria and indicators related to potential survey of passages for movement pedestrians

blocking the sidewalk, the effects of intruder in height and parking and public transport stations, as described in Table 3 qualitatively and quantitatively with the status of

each of the pathways associated with the specified parameters.

- As can be seen, the total coefficient of the four criteria

Table 3. Summary of the assessment of pathways related to criteria and indicators

Criteria	Indicators	Situation passages	Explanations	
Land use	Trade use	- appropriate Same value	Commercial use of multiple X-line on either side of the crossing and the performance scale	:1390 (pakzad) (288,283 -82 :1381 (kenfoakhar) (193,153,83 (Ozer, 2007: 4-6,7)
	Educational use	Appropriate	Multiplicity of educational uses on both sides of the crossing structure and their functional scale	:1381 (khanfoakhar) (83-82 (Ozer, 2007: 4-6)
		Inappropriate	The lack of education user and religious user	
	Health and therapeutic use	Appropriate	multiplicity of health care Uses on both sides of the crossing structure and their performance scale	(Ozer, 2007: 4-6)
		Inappropriate	The lack of cases discussed above	
	Recreational use	Appropriate	multiplicity of recreational facilities and living uses	:1390 (pakzad) (284,288 -82 :1381 (kenfakhar) (83 (Ozer, 2007: 4-6,7)
		Inappropriate	The lack of cases above	
Utilities use	-appropriate- Same value	multiplicity of public facilities uses on both sides of the crossing structure and their performance scale	83- :1381 (kenfakhar) (82 (Ozer, 2007: 4-6)	
Safety and traffic	Separating pedestrians from the roadway	Partly appropriate- Same value	appropriate=water streams and curbs,garden with green space,fence	:1381 (kanfoakhar) (192-191 (ministry of interior 1388 :17-19)
	Traffic congestion	inappropriate- Same value	. High density = more than 300 cars per hour per lane	:1381 (kenfoakhar) (105 (Ozer, 2007: 8)
	Pavement width	Partly appropriate- same value	Standard width of sidewalks in residential areas is 1.5 meters in compact streets and .8 in branched m and in the arteries 2.4 meters. Obstacles on the pavement	(291 :1390 (pakzad) :1381 (kanfoakhar) (141-140,111-103 Department of) Housing and Urban :1375 (Development (28-25
	Width of walking paths	Appropriate- same value	The lack of a median reduction of roadway width, projection and walking tracks at the junction, take the narrow streets with small openings to get the turning radius of right, putting pedestrians crossing the intersection before the entrance aperture	:1381 (kanfoakhar) (123-114 (47-32 :1375 () (Department of Housing and Urban Development (1388 : 28)
Security	Access control	-appropriate- Same value	Preventing unknown person (controlled by the Guardian).((Ozer, 2007: 10)
	Long sight line	Appropriate- same value	300-350 m long sight lines due to direct passages, the form Raster texture and lack of sharp corners and winding passages, and long arc	

Table 3. Continue

	Hiding places	Appropriate	Lack of Hiding places increase negative effects on the sense of security / dark underground / long narrow road / abandoned area / vacant parks / streets in low light / dense woodland.	(287 :1390 ,pakzad) (Ozer, 2007: 10)
		Partly appropriate	Some of cases above	
	Lighting	appropriate-Same value	Rate for suitable light is from 2 to 5 lux.	:1390 ,pakzad) (300-299-289-288-283 ·ministry of interior) (20 :1388 (Department of Housing and Urban Development ‘ ‘ 1375 : 30)
	Police presence and police car	Appropriat-same value	special places for police surveillance.	(Ozer, 2007: 11)
	Working and living environment.	Same value	a considerable number of shops, stores, restaurants, cafes and public places to attract people and build effective working and living environment.	
Attraction and comfort	Slope	Appropriat e-same value	Optimal slope 7/1% , allowable slope is lower than %5 / unallowed slope is more than 5%.	(296 :1390 ,pakzad Department of)) Housing and Urban :1375 ‘ Development (25-24·10 (ministry of interior 1388 :15·27)
	Network integration	Appropriate-same value	Accessibility and mobility / providing more direct and continuous routes / reduced travel times / distances suitable for short trips create / increase the number of connections and reducing network and thereby increase the block length leading to associate the selected route and increase the attractiveness way to go in.	:1390 ,pakzad (288·285 Department of) Housing and Urban :1375 ‘ Development (5 (Ozer, 2007: 6)
	Signs	Appropriate	Creating route legibility and increasing the attraction of walkways	-285 :1390 ,pakzad (295·289·286 :1381 ·kenfoakhar) (131 Department of) Housing and Urban :1375 ‘ Development (32-31 (ministry of interior ‘ 1388 :16)
		Partly appropriate		
	Pavement width		.Reducing the width of the sidewalk due to adjacent building / reducing pavement width of streets occupied by facilities (urban furniture) / decreasing the width of the sidewalk due to pedestrian stops (due to the presence of vendors and shops etc) / decreasing sidewalk width of the wave-induced mass / decreasing the width of the sidewalk to stop and park motor and nonmotor vehicles.	

Table 3. Continue

	Flooring		Asphalt / Portland cement / concrete / mosaic.	-285 :1390 ,pakzad) (295.289.286 :1138 ,kenfoakhar) (131 Department of) Housing and Urban :1375 ,Development (32-31 (ministry of interior , 1388 :16)
	Prolonged obstruction on the sidewalk	Partly appropriate	Poles / ladders / urban furniture light.	:1390 ,pakzad) (290.289 -63 :1381 ,kenfoakhr) (142.128.69.64 Department of) Housing and Urban :1375 , Development (53-52.25.5
		In appropriate	Height difference (one-step) and urban furniture	
	Annoying side elevation	Inappropriate	Cooler air duct protruding from the facade of buildings / foliage at a height of pedestrian / poles of branching gas, chimneys slammed to the floor of some buildings that did not keep the sidewalk / projections of buildings lower than heights authorized / elements and devices installed and hung from the balconies of buildings / billboards, cable without protective / risk of falls at construction sites under construction.	:1390 ,pakzad) (298.294 ,ministry of interior) (29 :1388 (borjian ,1385 :46.52)
		Partly appropriate	Few number of cases above	
		Appropriate	Lack of cases above	
	Parking and public transportation stations.		Access to bus and taxi stations within a radius of 200 meters / access to public parking within a radius of 200 meters	:1390 ,pakzad) (294-293.280 :1381 ,kenofakhar) (189.165 (ministry of interior , 1388 :30.36-37)
			Access to bus and taxi stations within a radius of 200 meters	

(the second level of the hierarchy) is equal to one indicates the relative importance of the criteria.

To obtain the coefficient of importance (weight) sub, the same steps above to obtain a coefficient of importance (weights) of the criteria we do. In the present study, the coefficient of importance (weight) of the application software, Expert Choice AHP is used and the weights of all criteria and sub-criteria were calculated from the above mentioned methods. In Table 5 the calculated weight for all criteria and sub criteria are listed.

Assessing the criteria and indicators affecting the potentiality of paths for pedestrians' movement in the passages of study area (population of interest)

To assess the criteria and indicators in the study area, regarding the regulations and urban management issues and land use laws along with other definitions, using the validated resources about pedestrians' movement, pavement and the history and literature within and outside the country, the status of each criterion and sub-criterion in the study in proper, relatively proper, and improper state was considered. Certainly, in the analysis

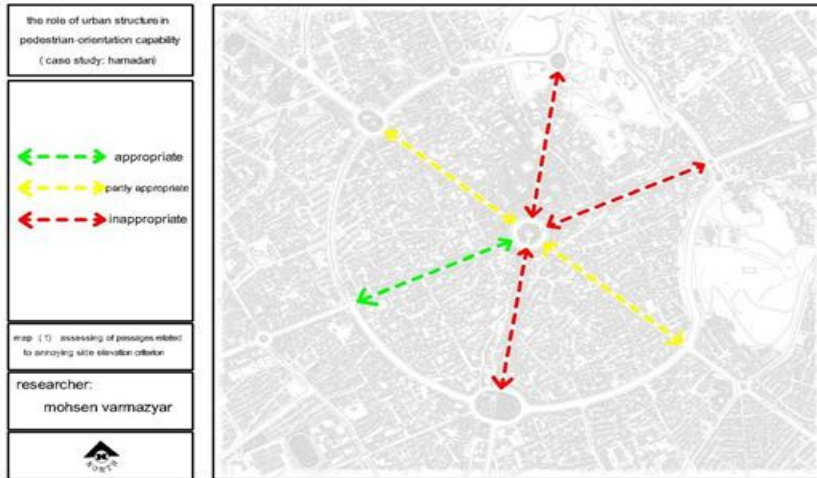


Figure 3. Assessing of passages related to health criterion

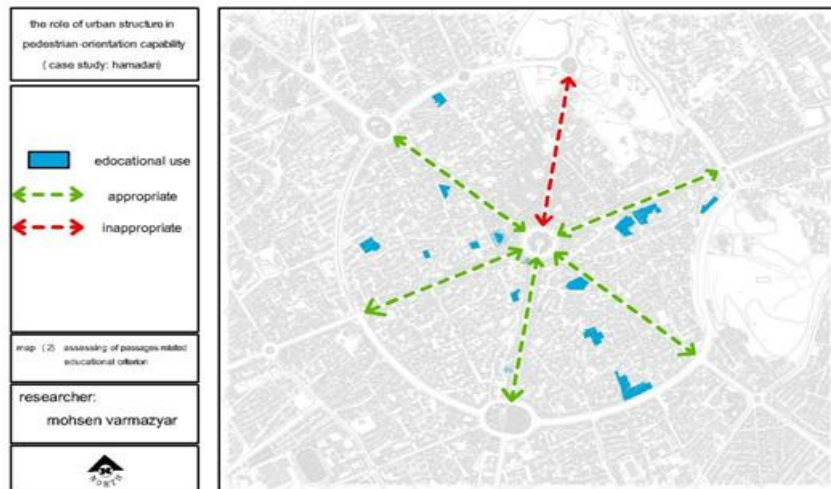


Figure 4. Assessing of passages related to educational and religious criterion

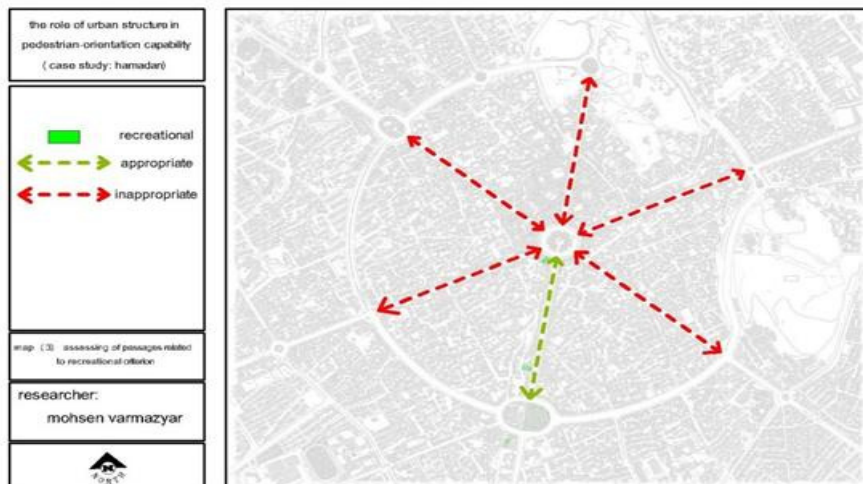


Figure 5. Assessing of passages related to recreational criterion

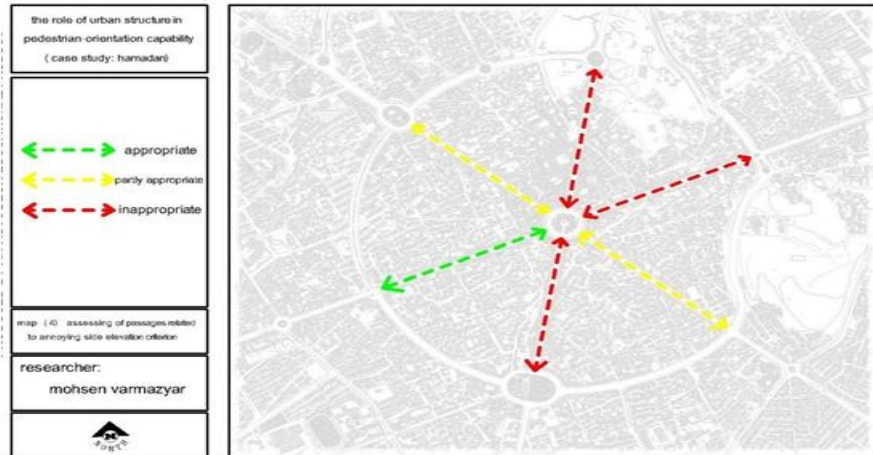


Figure 6. Assessing of passages related to Annoying side elevation criterion

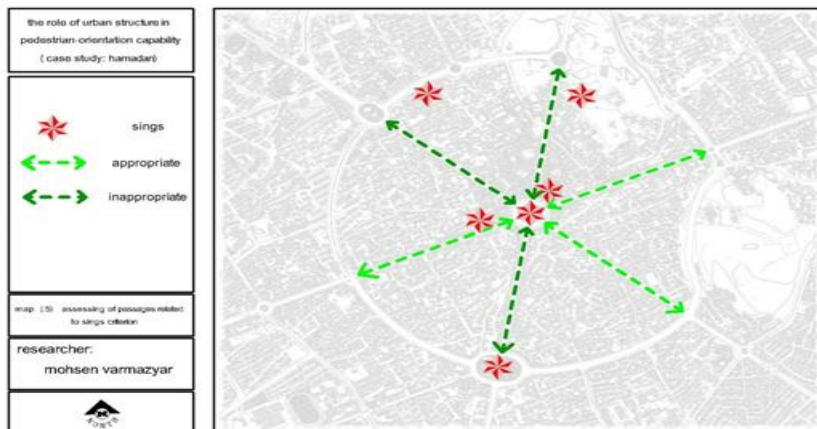


Figure 7. Assessing of passages related to sings criterion

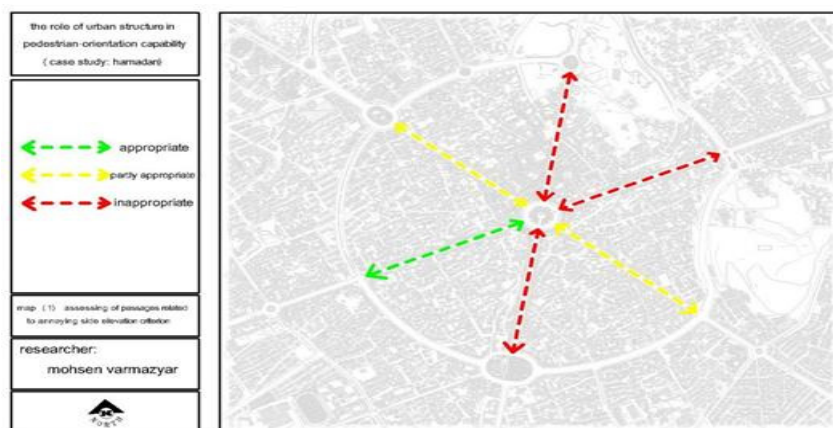


Figure 8. Assessing passages related to parking and public transport stations criterion

some indicators were of equal value. In this sector due to the wide standards and criteria of the study,

different criteria in the study options are mentioned. (Figure 3 -8)

Table 5. The output of weights for each of indicators

(Second level) Weight value	(Third level) Indicators weight value	(Forth level) Indicators weight value
0.39 =Land use	0.54 =Trad use	1 =Same value
	0.10= Educational use	0.78 = appropriate
		0.22 = Partly appropriate
	0.03 = Helth and therep eutic use	0.74 = appropriate
		0.21 = Partly appropriate
	0.27 =Recreational use	0.06 = Inappropriate
1= Same value		
0.07 =Safety and teraffic	0.06 =Utilites use	1 = Same value
	Separation pedestrians from the road	1 = Same value
	0.53 =way	
	0.18 =Traffic congesion	1 = Same value
	0.20 =Parement width	1 = Same value
0.15 =security	0.09 =Width of walking path	1 = Same value
	0.13 = Acess contorol	1 = Same value
	0.06 =Long sight lines	1 = Same value
		0.06 =Hiding places
		0.22 = Partly appropriate
	0.43 = lighting	1 = Same value
0.32 =Police presence and police care	1 = Same value	
0.39 =Attraction and confort	0.27 = slope	1 = Same value
	0.18 =Network integration	1 = Same value
	0.05 = signs	0.78 = appropriate
		0.22 = Partly appropriate
	0.07 = flooring	1 = Same value
	=Prolonged obstration on the sid walk	1 = Same value
	0.05	
	0.03 =Annoying side elevation	0.73 = Partly appropriate
0.21 = Partly appropriate		
Parking and public trasportation	0.06 =Inappropriate	
	0.78 = appropriate	
0.35 =station	0.22= Partly appropriate	

Summarizing the criteria and their situation in study area for potentiality of pedestrians` movement.

This section summarizes the criteria and sub-criteria weights associated with the potentiality of the pedestrians` movement in the range of study of the central ring in Hamedan. The output of weights for each of indicators is presented in Table 5 in details and in Table (6) the final score associated with the main criteria for potentiality of pedestrians` movement is given.

Potentiality of criteria related to pedestrians` movement in the study area

With the sum of the weighted values obtained for each of the pathways associated with indicators of business

uses, education uses, health care use, and the passing time and the use of recreational facilities, public facilities, urban uses, final scores for each area of study pathways (the population of interest) associated with land use criteria were obtained.

Potentiality of pathways of study area for pedestrians` movement related to traffic safety criterion

Figure (9) shows rating pathways related to criteria land use. Regarding the criterion of land use, Avicenna Street has received higher scores than other places due to leisure and medical applications. In other passages, this index is at the same level. Reason of similarity is the diversity of the business uses and other uses on 6 street.

Table 6. Final score associated with the main criteria for potentiality of pedestrian movement

(Second level) criteria	(Third level) indicators	Final indicators value
Land use	Trad use	0.2106=Same value
	Educational use	0.03036=appropriat
		0.00854=inappropriate
	Health and therapeutic use	0.00854 = appropriate
		0.00245 =Partly appropriate
	Recreational	0.0007= inappropriate
		0.09477=appropriate
Utilities use	0.01053=inappropriate	
Security of traffic	0.0634=Same value	
	Separating pedestr	0.0371=Same value
	Traffic congestion	0.0126=Same value
	Pavement width	0.014= Same value
Security	Width of walking path	0.0063 = Same value
	Access control	0.0195 = Same value
	Long sight line	0.0090 = Same value
	Hiding places	0.00702 = appropriat
		0.00198 =Partly appropriate
	Lithing	0.0645= Same value
	Police presence and police care	0.048= Same value
Attraction and comfortable	Slope	0.1053= Same value
	Network integration	0.0701= Same value
	Signs	0.0152 = appropriat
		0.00429 =Partly appropriate
	Flooring	0.0273 = Same value
	Prolonged obstruction on the sidewalk	0.0195= Same value
	Annoying side elevation	0.08541 = appropriate
		0.02451 = Partly appropriate
		0.00702 = inappropriate
	Parking and public transportation stations	0.00702 = inappropriate
0.0956 = appropriate		
	0.03003 = Partly appropriate	

Potentiality of pathways of study area for pedestrians' movement related to traffic safety

Summing the weighted values for each of pathways related to criteria of separation of motorists' path and pedestrians', traffic density, suitable width of sidewalk, final scores of each pathway related to traffic safety was obtained. Figure (10) shows rating passages in connection with a measure of traffic safety. Road safety measures in connection with any of the six main streets were the same and they have not obtained high scores. It should be noted these results are due to equal width crossing streets, the equal volume of vehicles passing, and wholly equal width of the sidewalks and streets due to the geometry of the situation and the use and their role in urban communication.

Potentiality of pathways in study area for pedestrians' movement related to security criterion

With the weighted sum of the values obtained for each of the passages in connection with access control indicator,

long sight lines, hiding places, street lighting and police and police cars, final score for each pathway of study area (intended population) in connection with security can be achieved. Figure (11) shows the rating pathways in relation to road safety.

In conjunction with the safety criterion, Bu-Ali sina, Takhti and Shariati Avenue very little distance have higher scores than the three other streets.

The score difference is related to a more appropriate condition of the streets in dealing with hiding places, resulted from lower number of connected streets with insufficient light and the tortuous paths.

In conjunction with other indicators, such as lighting, sight lines and access control, street geometries show similar situation in terms of scores for this criterion.

Potentiality of pathways in study area for pedestrians' movement related to attraction and comfort criterion

With the weighted sum of the values obtained for each of the passages in connection with slope , network

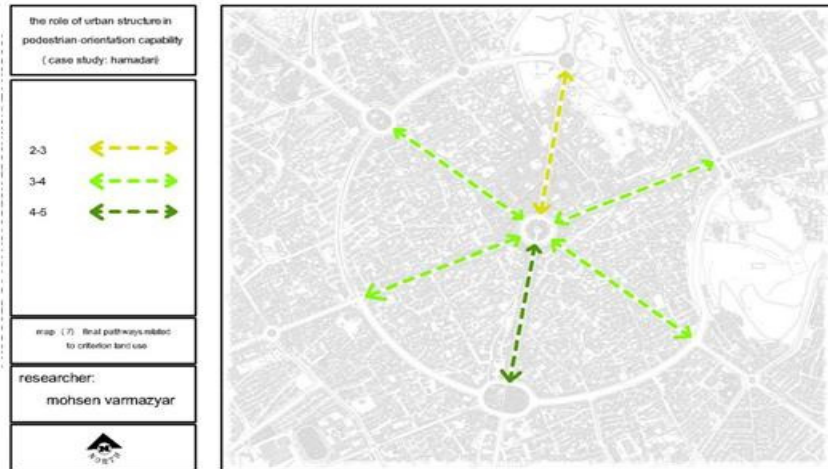


Figure 9. Final rating pathways related to criteria land use

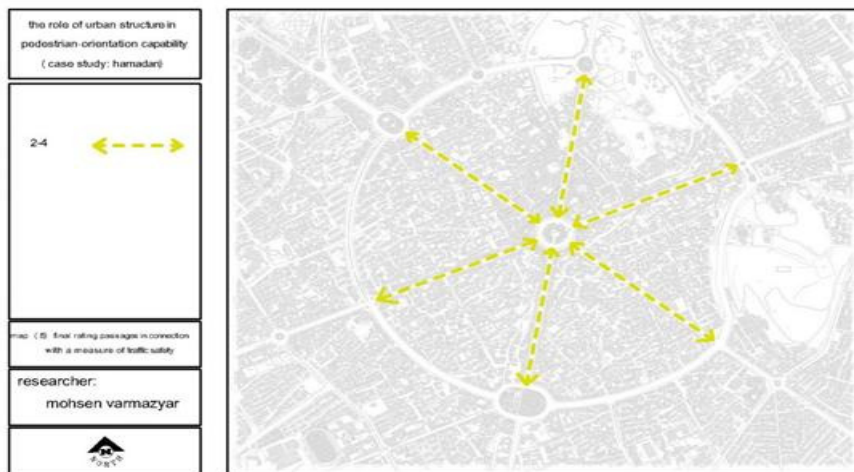


Figure 10. Final rating passages in connection with a measure of traffic safety

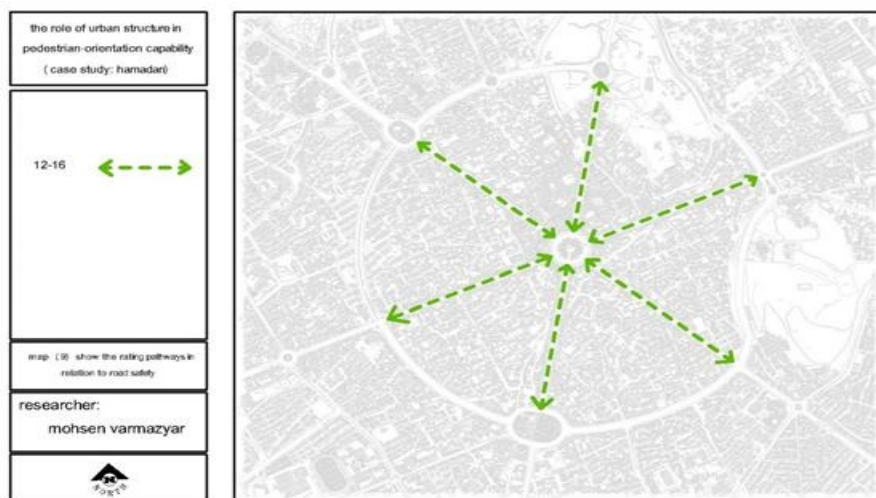


Figure 11. Shows the rating pathways in relation to road safety

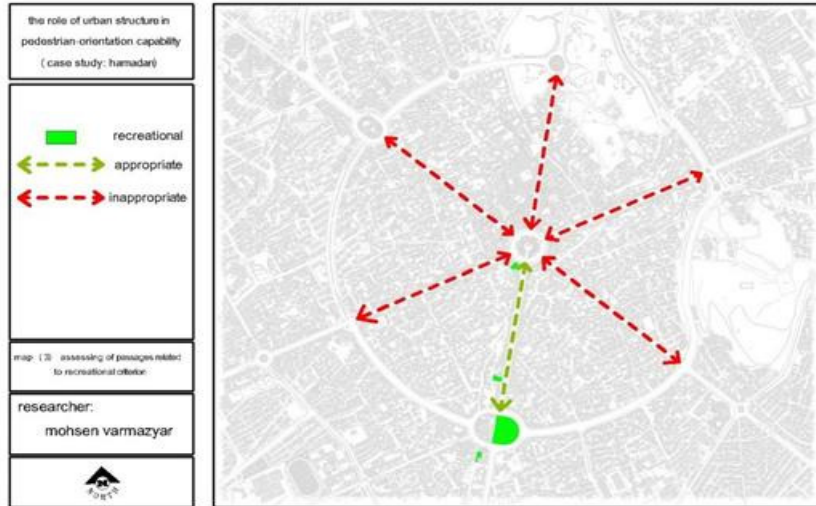


Figure 12. Shows rating passages in connection with a measure of comfort and attraction.

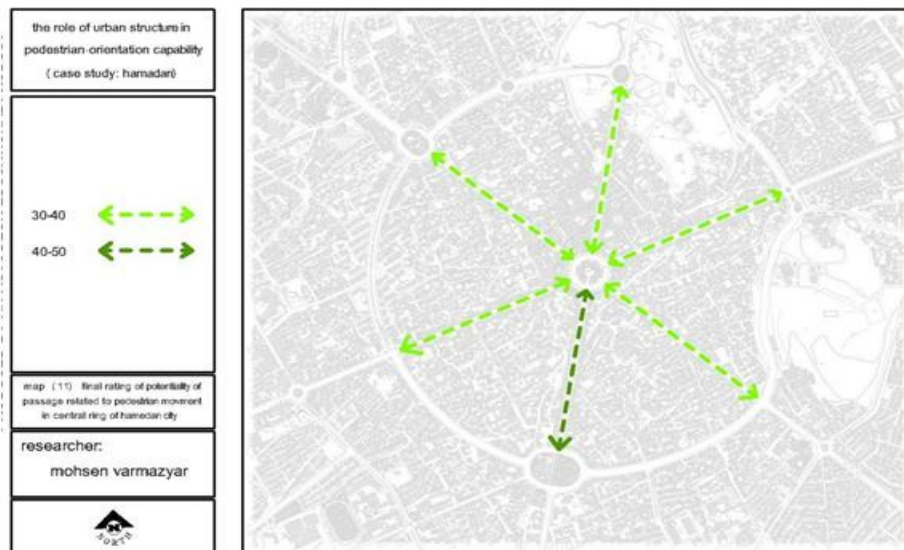


Figure 13. Final rating of potentiality of passages related to pedestrians movement in central ring of Hamedan city.

integration, signs, flooring, sidewalk, blocking the sidewalk, side elevation and parking nuisance and public transport stations, the final score for each pathway of study area (the target population) in connection with the attraction and comfort are obtained. Figure (12) shows rating passages in connection with a measure of comfort and attraction.

Shariati Avenue, according to the proper position on the annoying side elevation and the floored Parking, had the greatest score and Bu-ali sina and Ecbatana street parking , due to the presence of floored parking tand powerful signs of Bu-ali tomb and Hegmataneh Hill in relation to the criterion of comfort and attraction, have

obtained the greatest scores.

CONCLUSION

Summing the weighted values obtained from hierarchical analysis within the central ring consisting of central square and 6 main streets in the study area and investigating the criteria and indicators extracted from theoretical foundations of building sidewalks showed that the situation was good in 4 criteria and the streets of downtown area have the cap[ability to transform into walking path. In fact, the ring system of central area of

Hamedan allows us to prevent the vehicles entering the area and reduce the rate of traffic. Among the streets, Bu-Ali Sina street is assigned the greatest score in terms of criteria and indicators of potentiality for pedestrians' movement. (Figure 13)

REFERENCES

- Adroit E (1380). "Application of analytic hierarchy process in urban and regional planning", J. Fine Arts, No. 10.
- Ahmadi. H, Maliha F (1387). "With emphasis on the implementation of sustainable urban development in Asia " , Journal of Environmental Science and Technology , No. 3 , Tehran .
- Azkiya M, Door Thresholds AR (1382). "Methods of Applied Research", Tehran, Kayhan published.
- Barabadi M (1383). Municipalities Magazine, Issue 16.
- Beer TR, Katherine H (1381). "Environmental Planning for land development", translated by Seyyed Hossein Bahrain and Kayvan Karimi, Tehran, Tehran University publications.
- Borjjan M, Joghataii B (1385). "Right in public places and commercial (for people with disabilities),"Permanent Secretariat Right Places Urban Society - Culture - Art Iranian disabled, the contemporary arts publications.
- Bost J (1372). "Research methods in education and behavioral sciences",translated by Hasan Pasha Sharifi and N. Taleghani, first edition, Tehran, emissions growth.
- Businessman Abbas Sarmad Z, Hejazi E (1376)."Research Methods in the Behavioral Sciences", Tehran, Nshrag.h.
- Cocoon A, A Atai, Sina ZA (1391). "The effect of spatial interaction on spatial equilibrium in urban structure BOJNURD by using space technology", J. Human Geography, No. 79.
- Dirt G (1378). "The dissertation research approach", first edition, Tehran, in cooperation with the Cultural Center of Scientific Research Publishing tact.
- Ebrahimi V (1380). "Janet walk Mashhad , look elsewhere " , J. Municipalities, No. 29, Tehran.
- Forkenbrock, David and Weisbrod G (2001). "Guidebook for Assessing the Social and Economic Effects of Transportation Projects", NCHRP Report 456, TRB (www.trb.org).
- Gray LR, Diehl LP (1992). "Research Methods for Business and Management", Maxwell Macmillan International Editions.
- Habibi, Seyed M (1378). "Civil society and urban life," Art Bulletin, No. 7, Tehran.
- Habibi, Seyed M (1378). "Walking the path of tourism", Fine Art Magazine, Issue 9, Tehran.
- Hsynyvn S (1383). "Introduction to the Design and Implementation", J. Municipalities, the sixth year, No. 61.
- Jacobs J (1386). "The Death and Life of Great American Cities", translations and wish Platonic HR Forum, Tehran, Tehran University.
- Jvtyn K, Kenneth C, Lal B (1381). "Traffic Transport Engineering (Volume II: Traffic) ", Translated doctor Mahmoud Book, Publications Office, University of publication.
- Khakee A (1998). "Evaluation and Planning : inseparable concepts", Town Planning Review, Vol. 59, No. 4.
- Krambeck H (2006). "The Global Walkability Index", Massachusetts Institute of Technology Dept. of Civil and Environmental Engineering & Dept. Urban Studies and Planning Cambridge, Massachusetts, USA.
- Lee C (1973). "Models in Planning", Oxford : Pergamon Press.
- Mantri A (2008). "A GIS Based Approach to Measure Walkability of a Neighborhood", A thesis submitted to Division of Research and Advanced Studies of the University of Cincinnati.
- Montgomery, Brittany and Roberts P (2008). "Walk Urban, Demand, Constraints and Measurement of the Urban Pedestrian Environment", WASHINGTON, D.C.
- Monument RM (1386). "Positioning urban parks using GIS analysis tools and analytic hierarchy process AHP", MS Thesis, School of Art and Architecture, Islamic Azad University of Tehran.
- Ozer O (2007). "Waiking initiatives : a quantitative movement analysis", Faculty of Architecture, ITU.
- Pakzad J (1385). "Design Guidelines publicly in Iran", Ministry of Housing and Urban Development, Department of Planning and Architecture .
- Pakzad J (1390). "Design Guidelines publicly in Iran", Fifth Edition, Department of Housing and Urban Development, Department of Planning and Architecture .
- Pious A (1376). "Modeling of location research centers, utilities, urban models and GIS" ,PhD thesis, Tarbiat Modarres University, Tehran.
- Polemical T (1383). "Walking the path of strengthening the relationship between humans and the urban environment " , Master's thesis , University of Fine Arts of Tehran University.
- Pour BF (1389). "Walk, strengthening the relationship between humans and the urban environment " , J. Urban Queries, No. 31 , Tehran.
- Pour GS (1390). "Effective index to enhance the pedestrian -oriented residential environment - commercial (Case Study: Yousef Abad District , Tehran) ," Master's thesis , School of Art and Architecture, University central Tehran Branch.
- Ramati R (1981). "How to save your own street", Carden city, Dolfin Book, NewYork.
- Rismanchian H (1390). "Analysis of discontinuities in the spatial structure of Tehran worn texture by using space", J. Garden, No. 17.
- Sabrmnsh A (1388). "The impact of the implementation plan for sustainable urban development approach based on energy efficiency, "MS Thesis , School of Art and Architecture, Islamic Azad University of Tehran .
- Saghafy PA (1388). "The Importance and Role walk on sustainable urban transport network", Ninth Conference on Transportation and Traffic Engineering of Iran.
- Saghafy PA (1388). "Walk; Efficient tool to promote safety and security in urban design implements " , Ninth Conference on Transportation and Traffic Engineering of Iran.
- Shaly J (1378). "Introduction to GIS in Geography and Urban Planning", Proceedings of the symposium on research and development capabilities in the field of geography.
- Shkvyy H (1377). "New perspectives in urban geography,"the publication, Tehran.
- Stantec Consulting Ltd, September, (2009). "Proposed Walkability Strategy for Edmonton", In Association with Glattling Jackson Kercher Anglin, Inc.Project for Public Spaces.
- Tybalz F (1375). "Human-centered towns: improving the public environment in towns and cities", translated by Hasan meeting and turquoise polemic, first edition, Tehran, Tehran University Press.
- Wright L (2007). "Car free development", Osaka University.