Ecological Approaches in Planning for Sustainable Streers (Case Study: Enqelab Street)

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Abstract: The streets located in metropolises have been designed for facilitating thepassage of vehicles. Due to the increase of the number of the vehicles and the limited capacity of passage, the qualitative level of streets is decreasing. The relationship between the streets with the environment and society has been forgotten and therefore undesirable and unstable conditions for life in the street and the surrounding texture have occurred. The street through making key, spatial and social relationships in city can play the most important role in revitalizing urban spaces. Ecologic streets through considering social, economic and environmental needs of the considered society, try to create the context of the presence of all the individuals. The existence of the criteria of the ecologic streets,inclusive streets and streets with visual and sensory qualities and sustainable development in city requires the process of designing urban ecologic street. The purpose of presenting this article is to consider effective criteria in planning ecologic street which is obtained through performing field studies and using library and internet-based documents. The strengths, weaknesses, opportunities and threats of Enqelab have been extracted and classified in Expert Choice Software and finally through using SWOT matrix has been analyzed. Accordingly, the defensive approach in planning Enqelab has been obtained. Therefore, the determined strategies show the critical position of Enqelab street ecologically that should be considered in urban planning.

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INTRODUCTION

Nowadays cities require new interventions and the most important of them is creating a harmonious life with nature. Therefore, the Ecologic city with its names has a special position in the processes of planning and designing[1]. The cities should be considered as eco-systems in which the natural cycle of physical processes of resources exists. For maintaining the quality of urban environment it is necessary to manage the urban activities.

The main physical streams stem from the cities and there are some streams that influence the city. Such issues should be considered and most importantly these streams should be harmonious with other environmental networks of the earth. Ecologic cities are designed according to social, economic and ecological considerations whose aim is the reduction of energy, water and food consumption, air pollution and the wasting of thermal energy in order to create a suitable environment for individuals to work and live[2]. Regarding the prioritization of the issue of

reducing the consumption of un-renewable energies and optimization of their consumption, the issue of transportation and urban communicational network have special importance[3]. Urban cities cover almost 75% of the cities and suggest the social, economic and cultural structure and therefore are of great importance. Therefore, correct and basic designing as well as spread of them cause more improvement of social and cultural life quality of human beings[4]. From the perspective of pragmatists, the spatial street is one that directs, divides and reinforces the structure of city. Those who put a great emphasis on environmental understanding consider the ways as the most important organized factor in mental mapping of human being[5]. Street through making suitable, spatial, social and key relationships in city can play the most

important role I revitalizing the urban spaces but this issue does not happen unless the space of street is physically stable, harmonious with nature and away from any pollution[3]. The various types of environmental pollutions, the reduction of safety level of pedestrians, the increase of wastes resulted from driving accidents, the increase of greenhouse gases, the low level of environmental desirability exist in all the cities of the country, especially, metropolises, so that, they have decreased the quality of life in urban environments. The present paper tries to present some approaches for ecologic planning of Enqelab street through using the AHP technique and SWOT analysis.

Literature review: Table 1 presents the background of the research regarding the considered issue.

Table 1: Research background

| Scientific results	Authors/Year	Title
Through using analytical-descriptive method, the various technical texts have been investigated, the effective criteria have been identified and therefore, the desirability of the urban space regarding the capability of revitalizing the environment has been investigated	Kokabee *et al.*[7]	The collective life in the public space of green way, an attiude on cultural-social variety regarding the issue of space, the case study: linear park of the long garden of Shiraz
Through using analytical-descriptive method and in order to reach the stability and vitality of the city, some principles for designing urban streets have been presented	Behnaz Aminadeh Framarz Daei Nejad in 2003	Environmental considerations in designing and optimizing urban streets
Through using comparative-inductive and by comparing the development of sustainability indices in ecological planning approaches, some new indices for sustainable planning of natural environments and green network of urban ways have been obtained	Shahindokht Bargh Jelve Naghmeye Mobarghaei Dinan in 2011	The development of sustainability indices of greenway network based on ecological principles of earth face
Through using analytical AHP method and Geographical Information System (GIS), some approaches for green programming of urban ways have been presented that result in creating a greenway with 11.5 km long	Olia Vatanparast Jafar Oladi Morteza Akbari in 2012	The investigation of the way of planning urban green ways (Case study: Reigon 11 of the metropolis of Mashhad)
Based on analytical-descriptive method, the importance level of effective factors based on experts opinion and collecting information from the studied streets, through field surveys and completing questionnaire in each street as well as analyzing data based on AHP method, it became clear that the Keshavarz street compared with Fatemi and Enghelab streets has a more desirable quality	Morab *et al.*[4]	Comparatative study of the quality of urban streets of Tehran based on the criteria of an outstanding street (Case study: Enghelab, Keshavarz and Fatemi streets)
Through using an overall review of six methods of evaluating environment sustainability including IOA, LCA, EF and CF, energy analysis as well as cost and benefit analysis, a comprehensive approach has been presented that can solve the problems faced with the mentioned approaches in an ecologic city	Dong *et al.*[2]	A review on eco-city evaluation methods and highlight for integration
Various approaches for creating ecologic cities have been investigated. These approaches include the use of national approaches, the presence of local officers and interaction with citizens whose aim is to increase the effectiveness, enjoyment and economic level in creating ecologic city	Hu *et al.*[1]	Transformation toward an eco-city: lessons from three Asian cities
A conceptual idea for the relationship among variety, Eco-system processes, ecosystem services and the role of human being in urban landscape have been presented and it became clear that as the urban landscape changes by the passage of time, such relationships also changes	Wu[9]	Urban ecology and sustainability: The state of-the-science and future directions
Through considering the programs of various countries in designing ecologic cities it was concluded that a composite program can deliver more desirable results	Jong *et al.*[5]	Developing robust organizational frameworks for Sino-Foreign eco-cities: comparing Sino-Dutch Shenzhen low Carbon city with other initiatives
In this study the researchers have concluded that in urban ecology, consensus be very effective because the process of decision making should be based on complicated as well as social, economic and ecologic relationships	McPhearson *et al.*[10]	Advancing urban ecology toward a Science of cities
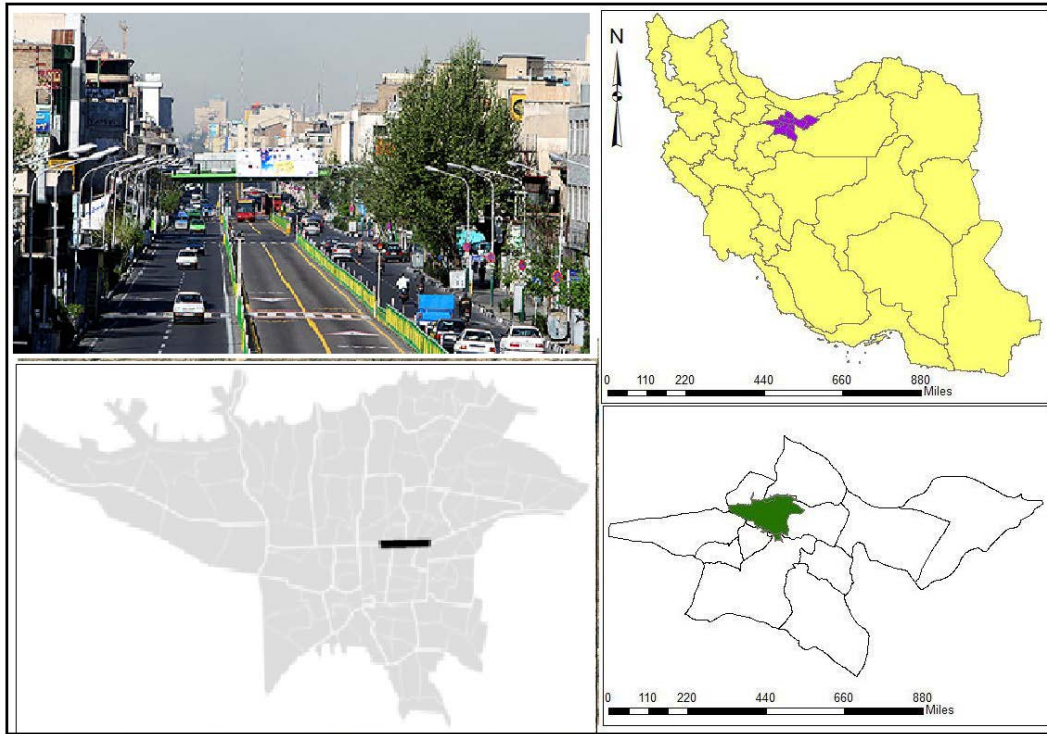
Fig. 1: Enqelab street

The necessity of the research: Tehran city is a metropolis that with its increasing population and construction volume is not free from this rule. The construction and development of Tehran city due to the low level of availability of suitable grounds for reaching this purpose has caused the confrontation of development with the natural structure of the city and the main elements in the natural composition of Tehran for satisfying the needs of urban centers and places as well as public places like streets have underwent some losses and destructions. Also, a main part of environmental problems should be considered as the result of such undesirable traffic-based conditions. Historical investigations for the development of Tehran city show that constructing and widening of new streets have been considered as the most important tools of urban renovation. Wide and direct streets at the heart of organic and twisted textures introduce a new frame of city. Many of present passageways of Tehran without undergoing the gradual evolution and based on individual decision making processes have been created and therefore the lack of existence of lawful hierarchies has caused traffic-based disorders. These disorders have caused environmental disorders in the streets of city. One of such streets is Enqelab street of Tehran that is considered one of important streets of Tehran due to presence of some

dormitories and colleges as well as large stores. This street is considered one of main streets in Tehran for individuals to march in important national formalities but suffers to a large extent from the mentioned problems.

Case study: Enqelab street is a major trunk route in Tehran, Iran connecting Enqelab square to Imam Hossein square. The street's full name is Enqelab-e Islami (Islamic revolution street) and it was named in honour of the Islamic Revolution of 1979. Its former name was Shah Reza street after Rezā Shāh, the founder of the Pahlavi Dynasty (Fig. 1).

MATERIALS AND METHODS

The theoretical frame of this research through using the library approach and making a review on technical texts related to this street. This research is evaluation-based and regarding the style of performance is analytical-descriptive in which the effective factors in reaching the ecologic street have been presented. Also, the identified and effective factors have been classified in four criteria, so that, through identifying the related indices with each criterion and classifying them, the possibility of evaluating and prioritizing them for

reaching an ecologic street can come into existence. In this method, the AHP approach has been used for determining the weights of the criteria and their shares in accessing the ecologic street. For performing the analysis in such a way, the Expert Choice Software has been used. For collecting the required information, the paired comparisons of criteria and sub-criteria through the help of 34 persons of experts and faculty members who are experienced in urban planning, environment designing, green space designing and environment engineering have been performed and their basis of evaluation is their studies and experiences. Finally, the importance level of each of criterion has been obtained. For evaluating the internal factors, the IFE matrix and also for evaluating the external factors, the EFE matrix have been used. In this stage, the final and obtained score from each of mentioned matrices shows the type of organization status relative to internal and external factors of ecologic planning. In the next stage, through using the list of main strengths, weaknesses, opportunities and threats of this street, the SWOT matrix was created. Then, through SO, TO, ST and WT strategies were determined through comparing internal strengths with external opportunities, internal weaknesses with external opportunities, internal strengths with external threats and internal weaknesses with external threats, respectively. In the last stage, the attractiveness and priority of selected strategies through using the evaluation matrix of internal and external factors and creating SWOT matrix were determined.

Criteria for ecologic planning: Based on library studies, the review of related literature and the studies of other researchers for ecologic planning of Enqelab street, three ecological, environmental and anthropological criteria have been considered. The anthropological criterion has three economic, social-political and cultural branches that have been presented in a table. Finally, through using these criteria the main internal and external factors have been extracted and used in SWOT Table 2.

Analytic Hierarchy Process (AHP): AHP is considered as versatile and powerful decision-making technique for complex situations which have contradictory and various measures. This technique was invented by Iraqi scholar Tommy al Saati in the 1970s for the first time. The basis of this pattern in the decision-making process is pair-based comparisons. The value-based basics of analyzer considering available information about alternatives are integrated and have create a set of measuring priorities for the process of evaluation. In the process of measuring capabilities based on AHP technique, after determining the necessary criteria and sub-criteria and also their importance coefficients, the

Table 2: The criteria and sub-criteria of ecological planning

Criteria	Sub-criteria
Ecologoical	Water and soil
	Green areas
	Topography
	Climate
Environmental	Network infrastructure (landfill, water, power, telephone,…)
	Applications
	Pollutants
	BRT lines
	Structural elements
	Economic locations
	Vendors
Social-political	Population density
	Political movements
	Applications
	Meeting places and gatherings of people
Cultural	Identity elements
	Sense of Place
	Collective memory

process of evaluation is performed based on the competence of each option (sub-criteria). This process was performed on three stages of constituting hierarchies which are the most important part of AHP technique. In this stage effective criteria and sub-criteria in the process of evaluation are determined. Determination of the importance coefficients of criteria and sub-criteria was implemented through preference judgments of experts, pair comparison method and examination of the compatibility of judgments based on the compatibility rate. Compatibility rate should be <0.1 in order to consider judgments acceptable. In the study, firstly, effective criteria and sub-criteria in visual pollution management were identified. In the next stage, the weight of each criterion and sub-criterion was calculated. There are many approaches to determine importance coefficients of criteria and the most common is pair comparison presented by Saaty which has been considered as a suitable approach to weight criteria in AHP system in which calculating and weighting criteria have been performed by using the Expert Choice Software.

SWOT analysis: A SWOT analysis is a technique commonly used to assist in identifying strategic direction for an organization or practice. SWOT model is a classic strategic analysis tool for strategic management, first proposed by Ken Andrews. The benefits of such an analysis tool is that it can better balance all internal and external aspects of enterprises, ensuring that analysis is more comprehensive. The strengths and weaknesses of a system are determined by internal elements whereas external forces dictate opportunities and threats. Strengths can be defined as any available resource that can be used to improve it performance. Weaknesses are flaws/short

Table 3: Internal Factors Evaluation Matrix (IFE)

Internal factors evaluation	Factor	Score	Final
Strengths			
Place of business	0.042	3	0.126
Cultural space	0.057	3	0.171
Collective memory	0.029	3	0.087
A place for political events	0.095	2	0.19
Coordinated users	0.04	3	0.12
The presence of indicator elements	0.034	3	0.102
Weakness			
The vendors	0.089	2	0.178
Lack of proportionality space	0.084	2	0.168
Lack of parking	0.066	3	0.198
Lack of green spots	0.038	3	0.114
Pollutions	0.061	3	0.183
Lack of identity	0.062	3	0.186
The loss of spatial order	0.095	2	0.19
The loss of human scale	0.089	2	0.178
Exhaustion of old tissue	0.098	2	0.196
Human-machine interface	0.016	4	0.064
Total	1		2.451

Table 4: External Factors Evaluation matrix (EFE)

External factors evaluation	Factor	Score	Final
Opportunities			
The possibility of increased use of public transport	0.1	3	0.3
Use ability of the cultural space	0.046	3	0.138
Ability to create jobs	0.011	3	0.033
Allows for increased flexibility in space	0.021	3	0.063
Create vitality in space	0.025	3	0.075
Threats			
Wasteful Construction	0.603	2	1.206
Reducing benefits of space	0.015	4	0.06
Increase crime	0.024	4	0.096
Increase diseases	0.033	3	0.099
Create confusion in the environment	0.022	4	0.088
Total	1		2.158

comings of any system that may cause to lose a competitive advantage, efficiency or financial resources[6].

Formation of Internal Factors Evaluation (IFE) Matrix and External Factors Evaluation (EFE): Internal factors being investigated, the most important factors are listed. The number of these factors should be in in the range of (10, 20). These factors should include the most important strength and weakness points of the organization. Providing such a matrix includes the following stages:

- At first, strength and weakness points are written
- Each of these factors has been assigned a coefficient (From 0 as non-important to 1 as very important)
- Each factor is given a number from 1 through 4. Scores 1, 2, 3 and four represent basic weakness, little weakness, strength point and very powerful strength of discussed factors respectively.
- To determine the final score for each factor, the coefficient of each factor is multiplied by its score
- The sum of final scores of each factor is calculated and the final score of organization is determined
- In the matrix of internal factors evaluation, if the final score is >2.5, the strength points will be more than weakness points and if the final score is <2.5, the strength points will be less than weakness points, respectively

In Table 3 and 4, the most important external and internal factors have been listed. In Table 3 internal factors of managing ecologic planning of Tehran at Enqelab street have been considered and presented in a

matrix of internal factors evaluation (Table 3 and 4). Classification of strengths and points is as follows: 4 represents strong strength, 3 represents weak strength, 1 represents severe weakness and 2 represents low weakness. Then by multiplying the weight in the amount of degree, the weight-based score is obtained. By summing up the weight scores, the total score related to internal factors is obtained, so that, the average of this score is 2.5 and its maximum amount is 4. Now if this number is >2.5, it means that ecological planing is in a desirable condition from the perspective of internal factors.

In Table 4 or external factors evaluation matrix the most important opportunities and threats points of Enqelab street have brought from the perspective of ecological planning. Rating opportunities and threats is as follows: excellent opportunity, weak opportunities 1, 2 and 3 as well as very serious threat to its score is 1 and score of less threate is 4. By summing up the weight scores, the total score related to external factors is obtained, so that, the average of this score is 2.5 and its maximum amount is 4.

RESULTS AND DISCUSSION

Criteria analysis and extraction of the internal and external factors evaluation: According to the above Based on the developed criteria For strategic planning that is based on field studies have collected tables of the Internal and External Factors Evaluation are provided following.

Based on Table 5 and 6, after beating scores in coefficients the total internal factors evaluation is equal to 2.451 and the total external factors evaluation is equal to 2.158. So, the weaknesses are more than strengths. As well as opportunities are more than and that means the defensive position of Enqelab from the perspective of ecological planning. After analyzing the internal and external factors, the overall weight to each factor is shown in Table 5 and Fig. 2.

Table 5: IFEM and EFEM total weight

Criteria	Weight	Sum
Strengths	0.299	1
Weaknesses	0.701	
Opportunities	0.203	1
Threats	0.697	

Table 6: SWOT matrix for ecological planning in Enqelab street

|	Internal environment	
Strategies	Strengths(S), (SO) Strategy	Weaknesses(W), (WO) Strategy
External environment		
Opportunities (O)	The possibility of employment with a focus on commercial location (S_1O_3)	Create vitality in space with increasing green spots) W_4O_5)
	Create vitality in space with the help of cultural space (S_2O_5)	Create vitality in space by increasing the spatial proportions (W_2O_5)
	Ability to increase flexibility in space due to the presence of indicator elements (S_6O_4)	Improve the performance of public transport to reduce pollutions (W_5O_1)
	The possibility of create jobs due to the homogeneity users (S_5O_3)	Increased flexibility in space by reducing human-machine interface ($W_{10}O_4$)
	Create vitality in space with emphasis on indicator elements (S_6O_5)	Ability to create jobs by restoring old buildings W_9O_3
Threats (T)	(ST) Strategy	(WT) Strategy
	Increase the benefits of space with emphasis on indicator elements (S_6T_2)	Reduce diseases with focus on reducing pollution (W_5T_4)
	Reduce confusion in the environment with the help of cultural space (S_2T_5)	Reduce excessive construction to enhance the spatial order (W_7T_1)
	Reduce crime with promotion of Collective memory (S_3T_3)	Reducing confusion in the environment by promoting green spots (W_4T_5)
		Reduce confusion in the environment by reducing the vendors (W_1T_5)
		Reduce crime by increasing the sense of identity (W_3T_6)
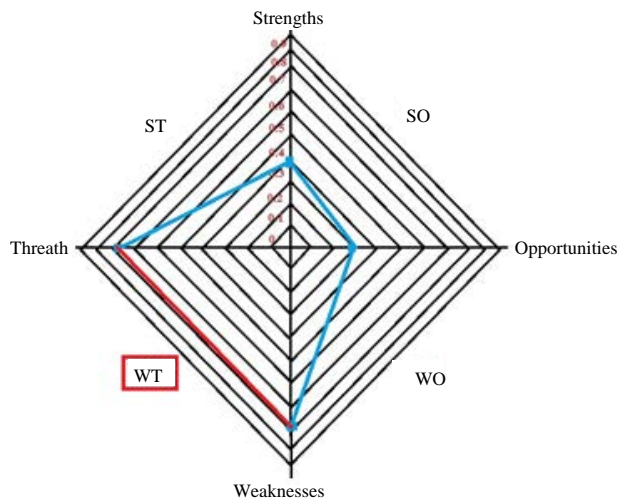
Fig. 2: Strategy tending based on IFEM and EFEM

CONCLUSION

In this research, after investigating the results, the effective factors in reaching an ecological street have been identified. These effective factors for reaching the desired objective and based on a theoretical frame have been classified into three ecological, environmental and anthropological criteria and the paired comparisons among them were performed by the related experts. Then these criteria were weighted by using AHP method. Finally, after determining the weights of each of criteria and sub-criteria performed by the experts of paired comparisons, the process of prioritizing them was performed. These paired comparisons and weights were obtained by experts and Choice Expert Software. In this research, the evaluation of the benefits of SWOT analysis in ecological planning of Enqelab street was performed and accordingly the process of analyzing the present position of these streets has been performed. By using the SWOT matrix, decision makers are forced to think carefully about the effect of the factors and analyze the current position deeper and more exact than ever.

Therefore, based on the performed analyses and the evaluation matrix of internal and external factors of Enqelab and because the obtained score from internal factors is 2.451 and the obtained factors from external factors is 2.158, based on the principles of ecologic planning, the strategic status of Enqelab street is considered defensive because and the weaknesses and threats are more than strengths and opportunities, respectively. Therefore, the determined strategies in Table 5 show the critical status of Enqelab street based on ecologic principles that should be considered in urban planning.

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