

Offering and Classifying Ecological Strategies and Principles Based on Four Cs Regulations, in order to Achieve Sustainable Urbanization; Case Study: Old Shahr-E-Kord Texture

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ABSTRACT: Neglecting environmental and domestic issues meanwhile becoming modern is a problem which its effects have been revealed more and more especially in last decades. Here, ancient structures of cities, having been changed to a barren and a threat to environment and urban ecosystems because of neglecting and paying no attention to them are affected the most. In other words, because of neglecting ecological rules and standards they were regarded consciously or unconsciously. Today, even though renovation plans were approved and accomplished in some cases, they not only ignored environmental and ecological rules but also damaged their surroundings seriously. In general, these damages include unsuitable constructions, increase of energy, water and soil consumption, high production of carbon and its distribution in the atmosphere, damage to the nature of the region. Ancient structure of Shahr-e-kord which is the origin of this city in some way is not an exception. In addition to mentioned issues, neighborhoods lost their relationship with the region and the residents of the neighborhood migrated from the structure; the purpose of this research is rebuilding and renovation of this structure by defining a frame for ecological rules and by getting the urban ecology. In this regard, this research uses field analysis to identify and analyze the region. Furthermore, rules of urban ecology and ecological city, expressed in different theories, are extracted from books and are applied to rebuilding of ancient structure of Shahr-e-kord in order to start and motivate the development of other urban structures.

Keywords: Ecologic Principle, Four Cs, Shahr-e-Kord Old Urban Texture, Urban Ecology, Urban Design

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INTRODUCTION

Since Rachel Carson published "*Silent Spring*" in 1962, the flourishing literature resulted in anxiety about the situation of biosphere _ protection system of the earth which is exhausting quickly (Moughtin, 2007, u-z). The writer of the mentioned book described the damages caused by applying herbicide and pesticides in agricultural activities and the book did have an important role in composition of green policies. Authors of other books try to show what an unpleasant future humans will have if they consume earth, weather, etc. the most. Such an unpleasant future when common resources will be destroyed. Thereby, anxieties about environmental issues were given more and more significance so that official organizations did not neglect such issues anymore. This problem is more important when recent interference in ancient structure of cities not only damaged the ecosystem and environmental relations of inside and outside of cities seriously, but also destroyed the best region for city planning and being related to the nature. Thus residents and officials planned to overreach the neighbor environment to make people still live in the same city. But such empty structures in addition to fatigue challenge the ecosystem of the region, too. It is important that although these textures have been forgotten, ecological potential there are better ecological potentials than other

parts of cities. If their strengths and opportunities are discovered and take steps in line with environmental issues, not only will return to its previous identity, but also it can be a model or pattern for future development.

Ancient and fatigue structure of Shahr-e-kord, a city in cold region is trying to renovate. In this regard, the main purpose of this research is presentation and classification of ecological planning rules and developing and generalizing of them to other parts of the city. There are other minor goals beside this main purpose:

- Recognition of natural structure of the regions in order to develop environmental qualities.
- Decreasing energy consumption in buildings and urban structures, applying clean energy and its optimal consumption as one of the urban ecological rules.
- Developing the quality of environmental planning of the region.

LITERATURE REVIEW

Historical procedure of urban ecology in west civilization goes back to the relationship between natural environment and artificial one in Vitruvius time; this procedure continued in the movement of *Beautiful city* and Estain's thoughts about modern American cities, too. Many researches were done on solar energy as a substitute for fossil fuel in 50th and at the beginning of

60th decade. This was the first time that science and modern technology considered solar energy, wind, heat and other natural renewable sources of energy. At that time, "Paolo Soleri" made the word "Archeology" with combination of words architecture and ecology and started to make societies without automobiles (Shahrokhi, 2010). Subsequently, the first universal wave of environment formed and the word "sustainability" became fashionable. Transformations of urban societies in Iran, before globalization caused by industrial revolution, was very unnoticeable so the environment of the cities was not changed considerably. From Qajar era and especially from Pahlavi era urban structures a long with economic, social and cultural transformations have changed basically.

Research questions

- How can extract, classify and apply sustainability rules in general and specifically ecological principles in ancient structure of Shahr-e-kord?
- How does Physical Environment effect on urban ecology?
- How can use natural blessings of cold regions to plan new environment?
- Is it possible to present solutions to revitalize the urban structure of Shahr-e-kord through detection

the ecological weaknesses, Strengths, threats and opportunities of the ancient structure of the city?

RESEARCH METHODOLOGY

This research is considered as an applied one and creates a new method; methodologically, it is a combination of field research and documentary analysis. It starts with investigating ecological definitions and principals from the scholars' points of view to achieve indexes related to the issue; in the next step, questionnaires, interviews, observations, field analysis, and SWOT analyses made the indexes accurate and developed the planning of ancient structure of Shahr-e-kord by giving ecological solutions. It is noticeable that the method of analyze was qualitative because the resulted data was not statistical. In fact, city planning intended to develop the urban qualities especially the environmental ones.

Study area

Shahr-e-kord placed in the cold region of the north of Zagors range of mountains. Being 2070m above the sea level, it is the highest city of Iran, known as "Iran's Bam". In recent years, building and renovations inspired by big cities are changing in an unpleasant way, while the structure itself can be a model for other cold cities of Iran.



Outer shell, one of the main streets and vitality

Inner shell. declining: however. it is still alive

Figure1. Geographical situation of the structure and its proximity to natural part in the south of the city

Meaning, prospect, and theoretical principals

Definition of ecology and urban ecology

Ecology is an old word made from two Greek words of *oikos* and *logos*. Ernst Haeckel used it for the first time. It is defined as the science between creatures and their environments and creatures themselves. Ecology studies both animate and inanimate creatures (Shahsavari, 2008, 6). In other words, one of the most significant

activities of ecology is giving priority to climate and earth. Furthermore, autecology, population ecology, and synecology can be at the center of ecological researches. Urban ecology is a part of ecology which studies biotopes, ecosystems and intercity creatures more and pays more attentions to recognize structures, social activities, history and traditions of a city or cities, too (Shahsavari, 2008, 17).

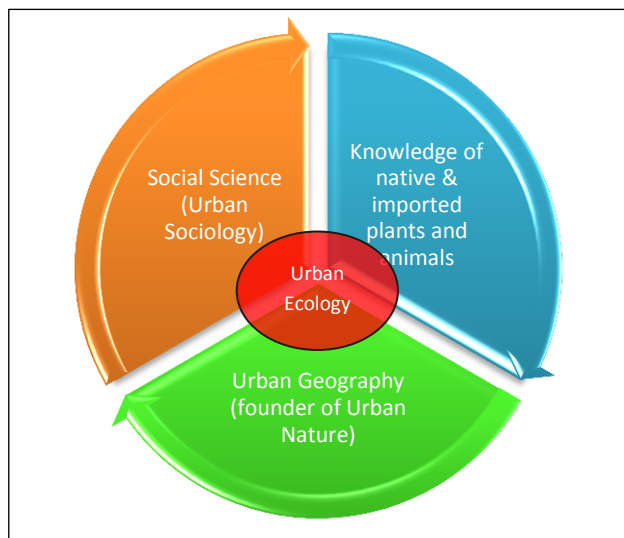


Figure 2. Domain of research activities of urban ecology
Source: The authors

Peter Newman knows urban ecology as a way to define intelligent, safe, and resistant urban areas; “They are intelligent; because they can be compatible with the 21th century’s technology. They are safe; because the buildings are placed where they can be responsible for different events in future. They are stable; they can present suitable answers for important questions about weather conditions, high energy consumption and variety of environments,” he said. Dr. Bahrainy knows the city which depends on its vital sources as an ecologic one, too (Bahrainy, 2006).

Urban ecology and its characteristics from scholars’ points of view:

Jeffrey R. Kenworthy in his article *The Eco City: 10 Key Transport & Planning Dimensions for Sustainable City Development* believes that cities need some changing in the form of the city, transportation, crisis management technology, water, energy and also in their planning system for reflecting principles of resistance. He expresses these 10 tips:

A city with compacted structure and mixed usage which protects natural environments and different varieties of creatures and intercity farms.

1. The influence of natural environment on urban space and the maximum symmetry and productivity in obtaining articles of food.
2. Paying more attention to transport infrastructures like sidewalks, railways, and bicycle lanes and preparation for minimum usage of automobiles.
3. Applying environmental technologies to gain water, energy and crisis management to support closed linear systems in the city.
4. Establishing urban and intercity centers (human centers) having access to different transport systems other than automobiles.
5. Building a city with high quality of public area which shows high public culture, social culture, and good government.
6. Physical structure of the city and city planning, especially with public environments which had high

qualities of penetration, variety and suitable character to satisfy human’s needs.

7. Suitable economic function of city and creating jobs through innovation, creativity, and unity of local environment, culture and history.
8. Programs inspired by debate & decide and predict & provide processes for future of the city (accurate computer programming).
9. Making decisions based on sustainability, via uniting social, economic, ecological and cultural considerations, compacting principals and city planning based on transport in an including democratic decision making procedure (Kenworthy, 2006).

Peter Newman believes that Urban Ecology or the Green City is a way to define intelligent, safe, and sustainable residential areas. He describes and explains the green city with defining seven strategies:

- a. The renewable energy city: using new energy strategy, which shows suitable exploitation of local sources.
- b. The carbon_ neutral city: the strategy of zero carbon with strategy of new energy to unite energy effectiveness.
- c. The distributed city: the strategy of extensive infrastructures, creating small scale energy and water systems for drinking and developments.
- d. The bio-philic city: the strategy of green or bio-philic infrastructures including photosynthetic sources of cities which help providing food and creating variety of environments such as farming areas around the city, roofs and useless walls.
- e. The eco-efficient city: the strategy of ecological proficiency which make relationship with industry to create fundamental changes in metabolism of the city.
- f. The placed base city: the strategy of feeling the place guarantees that human can help establishing green city through developing local economy strategy, encouraging placed_ based point of view in all development procedures, and innovative usage of credits of sustainability.
- g. The sustainable transport city: this strategy is a combination of: 1. High quality and fast in comparison to the traffic caused by cars in main streets. 2. Many possibilities around each station, TOD 3. Walking and cycling strategies in each center and TOD and around the city. 4. Establishing enough infrastructures for electronic cars. 5. Insert cycling and walking infrastructures as a part of designing the structure of streets. 6. Establishing a green belt around the city to prevent invasion to the city’s surroundings (Newman, 2010).

In “Eco-Town Report”, firstly, it is explained the real meaning of urban ecology and later, with the explanation of Standards -Four Cs- introduce its principals in five prototypes: Amersfoort in the Netherlands, Freiburg in Germany, Hammar-by in Sweden, Zaragoza in Spain, and Dangtan in China. In spite of different history and style of living, these cities selected similar ways to find a sustainable society.

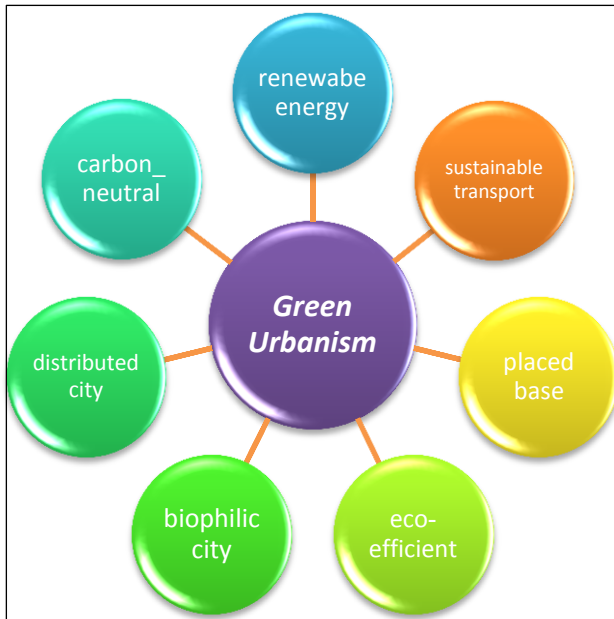


Figure 3: Hypothetical model for the pursuit of green urbanism, Newman's view
Source: The authors

A green or ecologic city is a perfect one that tries to use solar energy, the energy of wind and regaining technologies. Other characteristics of such a city include projects of rebuilding urban environments, urban gardens, and natural farming, using bicycles and public transportations in preference to using personal cars, urban centers without automobiles, and balance in projects of urban development. Four Cs principals expressed in this report include:

Connectivity: Building in correct places:

1. Correct selection of site situation which can access to jobs, educations, and services.
2. Using the energy of serial cities instead of consuming their sources of energy.
3. Building and developing fundamental infrastructures such as railways and bus roads instead of omitting them.
4. Working within the framework of local space strategy and local development strategy.

Community: Working for and with local people:

1. Government permission for local activities in order to develop the city by officials who play the important role in this regard.
2. Using the ability of specialized organizations by local officials whenever it is necessary, supplementary and supporting.
3. Giving permissions to beneficiaries' and stakeholders' programs and giving them social encouragements.
4. Supporting the development of neighbor units through providing accurate programs of social infrastructures like health, education and social atmosphere inside the comprehensive program.
5. Accessing to a balanced form of different types of houses with the ability of moving easily from one to another.

6. Creating long term strategies for social and execution development through encouraging people to change their behaviors.

Climate: Implementing experimented ways to protect natural sources:

1. Considering simple and cautious strategies in building houses with insulations and ventilation to serve energy.
2. Executing local strategies to manage energy consumption, water and crisis like CHP (Combine Heat & Power).
3. Reducing waste of energy and increasing productivity of local sources of energy by using modern models for decreasing the amount of carbon in the air.
4. Establishing public transportation system, cycling and walking choices which have good design and economic motivation.
5. Preparing local solutions and supporting technical results and styles of life.

Characters: Creating comfortable and pleasant places.

1. Designing for all people of the society with special emphasis on family friendly houses and appropriate to humans' scale.
2. High quality development of public places satisfying all characteristics of landscapes of the city.
3. Preparing outdoor spaces for all people in all levels of houses, neighbors, and vast outdoor spaces.
4. Using varieties of good designers for development (Eco-Town report, 2003).

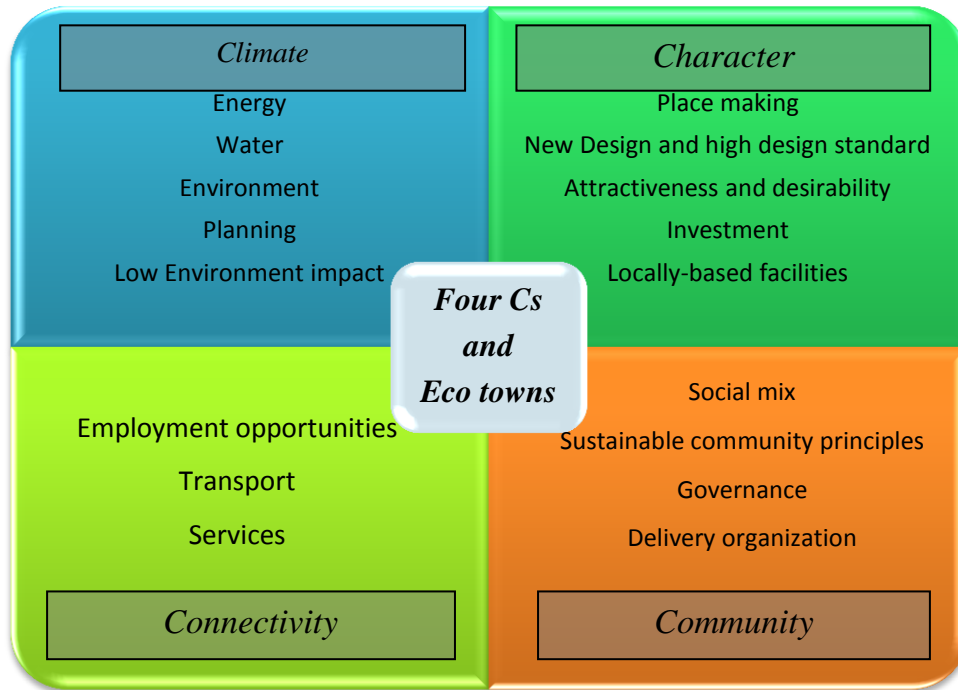
Ruano in "Eco Urbanism" introduces seven principals to prevent environment destruction and explains 60 factors. These factors include:

- Transportation (Mobility): More interference of city planners in traffic and urban transportation in order to create an integrated urban structure.
- Resources: In two parts: a. outlines, building materials, energy, water and unnecessary materials, b. land, investment, building license budget.
- Participation: Creating methods to make sure of the ability of artificial (man-made) environments in satisfying their residents.
- Community (society): Maybe the most valuable asset is human community, but many human habitats do not provide suitable beds for human communications and social life; designing based on automobiles, absence of public places, paying no attention to human standards, lack of places for social communications, low density in cities, insisting on separation and isolation, individualism and protection of peoples veneration, and classifying peoples' actions made human be far away a healthy society.
- Eco resorts: From Ruano's point of view a section of city planning which is summarized in tourism industry is compatible with the environment and %10.7 of general gross income, directly or indirectly is allocated to it.
- Revitalization: In fact, revitalization gives back the equilibrium to the destroyed urban ecosystems and old structures of the city.
- Tele_village: Many experts believe that modern technologies of telecommunications and their

unexpected consequences like new models of working, recreation, and education without movement are the important keys to have a dynamic and active city in future. Today, as mentioned earlier, transportation is one of the most important problems of our non-dynamic civilization. Any program being

able to limit current transportation in the city has a great influence on making the city dynamic. Tele-centers, tele- education, digital phones, computers connected to the World Wide Web, etc. are solutions for this problem (Ruano, 1999).

Figure 4: A Framework for Analysis: Conclusions arising from the “Four Cs”



Source: Eco-Town report, 2003

Finally, from Ashton’s point of view, such a city has at least the four characteristics below:

1. The minimum interference in natural environment.
2. The maximum variety (activities and usages).
3. as a closed system if possible.
4. Optimal balance between population and sources (Ashton, 1992).

RESEARCH FINDINGS

Subjects and topics of urban ecology are considered basically in new city and village planning and newly built towns. However the question is that whether the available cities have fundamental potentials and infrastructure or not. One of these old and ancient structures is the old structure of Shahr-e- kord in the southern part of this city. In first sight, it can be concluded that this structure is located in the vicinity of the plain of Shahr-e-kord _ farming zone_ in the southern part of the city. It shows the first sign of an ecological city which is vicinity to the nature around and having suitable relationship with it. Proper buildings and consuming energy can be seen too.

Old structure of Shahr-e- kord, as figure 1 shows, is economic and social center of the city and faces with two different approaches in rebuilding:

- A. Main streets of the structure with commercial functions which need some renovations.
- B. Inner structure or in the other words secondary structure of the city with residential functions

destroying because of neglecting and over emigration which its revitalization is important.

This part of the studies starts a new way by identifying ecological and local infrastructures of the city to preserve the suitable structure and omit incorrect solutions. In theoretical principals, some features and characteristic of urban ecology is explained from different peoples’ point of view. Investigating mentioned definitions, rules and characteristics can lead to a series of principals to achieve to an urban ecology. These principals mostly extracted from “Eco-city Report”, considering renovation and reconstruction approaches mentioned earlier, introduce another case in addition to climates, connectivity, Characters and community for easily presentation of ecological principals. This additional case is Textures. In the next part of this article, the ancient structure of Shahr-e-kord is studied followed by introduction and definition of these principals. Considering these principals, designing will be discussed.

Textures:

1. Using modern technologies like photovoltaic cell and water recycling system in building and renovation to decrease energy consumption in houses.
2. Creating green infrastructures like photosynthetic resources in the structure (creating farming zones, green spaces on roofs, and unused walls).
3. Building different types of houses appropriate to ecological area.
4. Working within spatial and local texture.
5. Using present infrastructures for new buildings and paying attention to infill design city building.

6. Creating squeezed structure with mixed-used.
7. Having physical structure and penetrable, various and suitable public places to satisfy human needs.
8. Penetrating natural environments in the city.
9. Paying attention to the direction and situation and morphology of the structure considering weather of the region.
10. Creating urban and inter-urban centers, As centers of human

Climate:

1. Selecting the suitable place for city building to benefit natural sources of the region.
2. Paying special attention to environment-based designing to decrease bad effects of the weather of the region.
3. Applying guidelines and techniques to create a carbon-zero regions.
4. Managing water and energy consumption in the environment.
5. Introducing strategies to use ecological sources and local technologies.
6. Reusing unnecessary materials and increasing ecological effectiveness.
7. Applying modern and renewable energies (local sources, solar energy, wind and water).
8. Identifying the lands inter and around the structure to use correctly.

Connectivity:

1. Decreasing using personal automobiles in the structure.
2. Giving the best choices for public transformation and creating the most attractive spaces for cycling and walking.
3. Building and expanding fundamental infrastructures such as bus lines and railways.
4. Considering sustainable transportation especially by establishing TOD principals.
5. Strengthening the relation of old structure with other parts of the city to access services and job opportunities.

6. Strengthening role and function of the structure, especially by considering local features to high the quality of life.
7. Providing communicational infrastructures based on recent scientific developments to decrease unnecessary traffic in the city.

Character:

1. Creating the sense of the place.
2. Developing public area with high quality and preparing outside spaces in various sizes usable for all.
3. Good economic function (especially local economy) and situation of employment.
4. Designing for all layers of the society.

Community:

1. Involving local officials in creating urban ecology and letting them to play role in local activities.
2. Using the ability of specialized organizations in urgent occasions and attracting local firms and cooperation of universities.
3. Introducing social encouragements for landlords.
4. Creating different types of residence with the ability of easily movement from one to another.
5. Supporting development of neighboring units through careful social infrastructures like health, education and social places.
6. Programming for the future of the structure through negotiations and decisions.
7. Decision making based on substantiality and compacting principals, decision making process based on democracy and inclusions.

These principals are both rules and guidelines for ecological designing and norms for testing how much the city is ecologic.

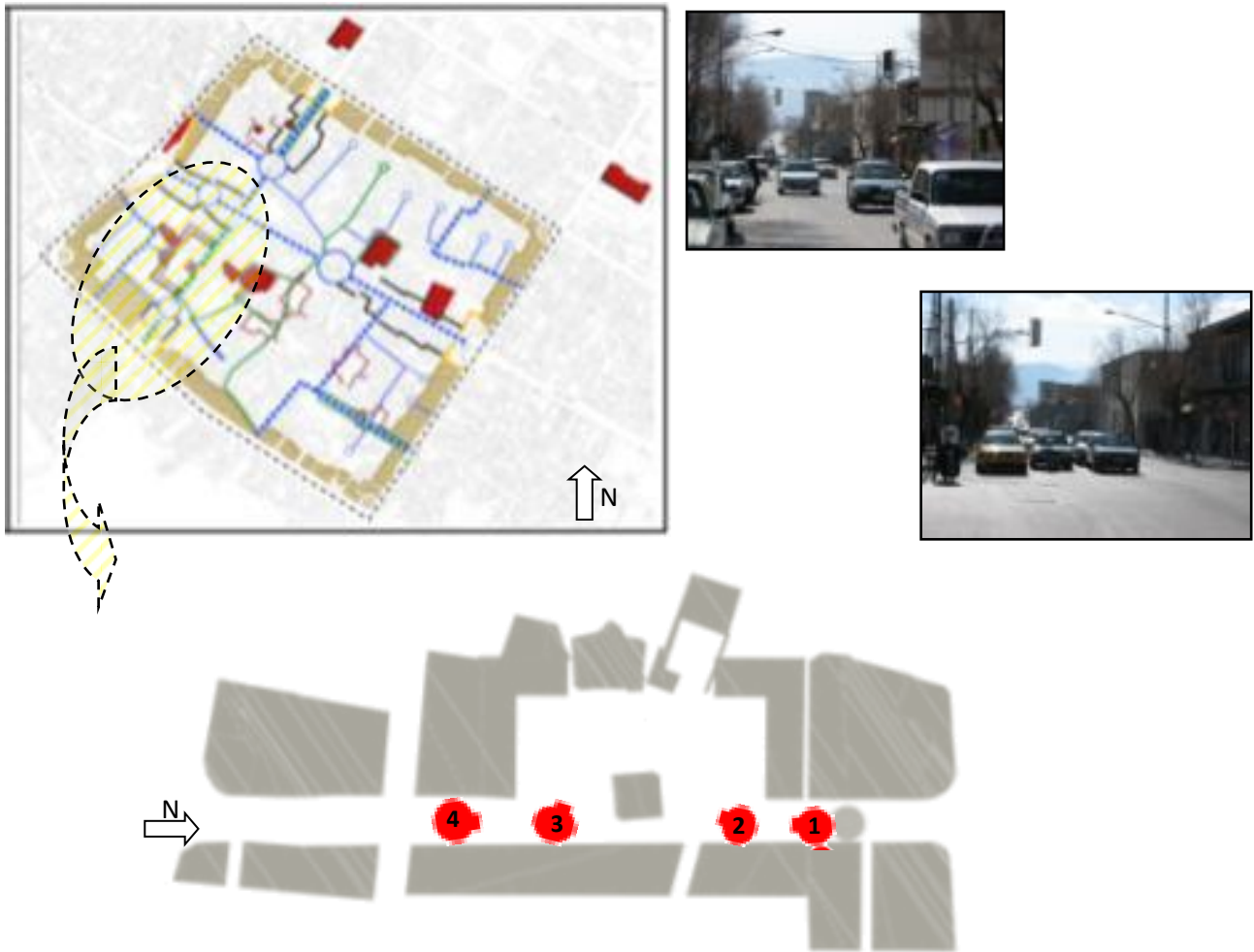
To interfere in ancient structure of Shahr-e kord, in appraisal phase for ecological principals, mentioned in five groups, we discuss this structure first. Because of the great extension of these contents, they are not explained here. The results of the analysis of this structure are summarized in table 1. (SWOT table)

Table 1: Ecological SWOT Analysis

	Threat	Weakness	Opportunity	Strength
Feature	<ul style="list-style-type: none"> ● Absolute consideration of traffic problems 	<ul style="list-style-type: none"> ● Low connection with nature ● Low attention to local urban spaces ● Absence of service spaces in neighbors 	<ul style="list-style-type: none"> ● Several numbers of travels to the structure ● High space feeling 	<ul style="list-style-type: none"> ● Being local ● Multiple functions
Body	<ul style="list-style-type: none"> ● Directionality of developments I surrounding texture crossing the old structure 	<ul style="list-style-type: none"> ● Static problems of the buildings 	<ul style="list-style-type: none"> ● farming lands in the South ● Low slope of the region 	<ul style="list-style-type: none"> ● Correct directionality of houses ● Symmetry between transparent surfaces and buildings
Climate	<ul style="list-style-type: none"> ● Low raining 	<ul style="list-style-type: none"> ● Plant covering in texture ● Pollution of water sources 	<ul style="list-style-type: none"> ● Vicinity to natural sources 	<ul style="list-style-type: none"> ● Water-land sources ● Long hours of sun shining
Society	<ul style="list-style-type: none"> ● Emigration ● Presence of impenetrable layers in main streets 	<ul style="list-style-type: none"> ● Absence of local centers and councils 	<ul style="list-style-type: none"> ● High potential in neighbor connections 	<ul style="list-style-type: none"> ● Presence of important urban usages ● Presence of potential open spaces in texture
Connections	<ul style="list-style-type: none"> ● Faded role of North to South streets in traffic 	-----	<ul style="list-style-type: none"> ● Not considering special spaces for pedestrians and bikers ● Absence of suitable transportation system ● Relocating incompatible usages making traffic 	<ul style="list-style-type: none"> ● Traffic problems because of conflict between checkered network around the texture and organic network of old texture ● Absence of green infrastructure for telecommunication

Source: The authors

Figure 5: General idea in ecological design of old texture of Shahr-e-kord. Vali-e-asr Street locate in primitive core of the city is a developing motivation to create a sustainable ecological structure.



Source: The authors

After identification of weaknesses and Strengths, major and minor purposes and strategies which are the principals of designing are given and finally the design will be established in some parts of the structure. Based on the mentioned principals, some notes are given before designing. In other words, these notes are the guidelines of designing to interfere in the structure. These guidelines are:

Connectivity:

1. Dominance of walking especially in Vali-e-asr North- South Street as the structure and core of the city; ecological passage.
2. Allocating safe spaces for cycling.
3. Suitable surrounding of passages.
4. Decreasing unnecessary traffic, allocating some spaces as parking in Mellat Street near Val-e-asr Street.
5. Creating 3 social_ ecologic axes (2 local ones and 1 ultra-local).
6. Strengthening public transportation with suitable infrastructures.
7. Correct width of passages based on weather conditions of the region.

Character:

8. High attraction of employment and recreation (ultra-local one beside the main street and local one in the structure).

9. Cohesive and various populations.

11. Establishing different walking-based usages.

12. Creating a field in primitive center of the city (center of Vali_e_asr Street).

13. Creating spaces for reviving local and ecological traditions of Shahr-e-kord. (Open spaces of the city).

14. Distribution of 24-hour usages in all parts of the region.

Community:

14. Creating open spaces in neighborhoods to form regional councils (one in the north of the structure and the other in the south part).
15. Creating safe spaces for people.

16. Drawing natural spaces into the structure or encouraging people to enjoy the beauties of nature.

Climate:

17. Suitable plant covering of the region.

18. Using roofed places to be protected against weather conditions.

19. Using modern clean energies.

Textures:

20. Suitable positioning of buildings to achieve natural energy more.
21. Using some types of houses for all people which have partial relation with each other.
22. Identifying and using native material of the region.
23. Appropriate building façade.

Social_ ecologic designing of pavement of Vali-e-asr Street:

Here because of absence of delivering and explaining of all interferences, some parts of the designs established based on ecological principals in historical texture will be delivered. In fact, this design is transformation of Vali-e-asr Street to a social- ecological pavement based on mentioned principals. Vali-e-asr Street as the oldest street in the center of old structure of the city does not play an important role in traffic, because the city extends from the east to the west. Atabakan mosque and *Holy Shrine of Do-Masoom* are located in the center of this street. As tourist part of the region, native and attractive usages locate in the vicinity of traditional activities and usages of the city. Moreover, the north to the south streets of the city having natural views from both sides and making connections between nature and human can be considered as a potential for creating a social ecological direction. Therefore, this passage and its rich urban space can be considered as potentials for

achieving suitable motivation in establishing ecological renovation designs of the old structure of the city and all principals should be regarded.

As shown in below figures, Vali-e-asr Street from Bazaar crossroad to the beginning of Khajeh-e-Nasir Boulevard is called safe pavement, where one line allocated for buses (public transportation). The whole of this passage has been designed for safe walking. Several porticos have been designed at the margins of this passage to protect people against bad weather conditions. There is also a subterranean canal in north part of the structure. Some of its water is directed toward the passage to increase humidity, create good weather conditions and water plants. Special species of plants agreeable to weather condition of the region are used to strengthen the appearance of the street and the view of the city does not limit to inside and outside of the structure. Shahr-e-kord has especial plant covering and located in Iranian-Turanian region. Plants suggested for this region include elm, different species of box tree, magnolia, Lotus, ash, cotoneaster, barberry, maple, Lace. Here, figures of plans carried out in Vali-e-asr Street show how the ecological principals of city planning are used.

Figures 6. The idea of Social-Ecological passage which is the first and the most important point in development of the texture and finally the entire city

1. Strengthening public transportation with suitable infrastructures to surround passage correctly.



2. Creating spaces to renovate local and native traditions and safe spaces for people



3. Building views suiting texture and climate; using roofed places to protect people against bad weather conditions.



4. Appropriate native vegetation for Chahar-Mahal va Bakhtiari region; importing a natural environment inside the texture to satisfy sightseeing needs.



Source: The authors

CONCLUSION

What ways lead to a substantial and ecological city in future? This is the question we will face so many times in future. So experiences, science and inspirations of before and after examples can be the basis for city planning guidelines and strategies. Cities and their inside structures are very dynamic and change rapidly. After consuming low-priced, abundant natural resources, cities now face some crises which they are prepare to deal with or they continue their ineffective life. It is obvious that the second solution will be defeated so some strategies should be taken. The first and most important strategy is cleverly dealing with problems like energy production, regaining residues, protection of environment etc.; to be able to have an exact program of negative and positive points of the city. The second strategy is creating the city for humans not for machines and remove mechanization of the city. The third strategy is localizing production, consumption and reproduction to save energy and expense. The fourth strategy is observing justice and fairness, something that has not been observed in any part of the world since cities emerged.

These are not diminutive but problem solving issues which play significant roles in planning an ecological and sustainable city. Small and alive city of Shahr-e-kord and its old texture, which is a source of inspiration for native designs, is not an exception. The mentioned strategies classifying rules and principals of ecological planning can play a role to do so.

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