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Applying the Design Criteria to Redesign Urban Parks (Case Study: Azadi Park, Fars Province, Shiraz)*

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ABSTRACT

Despite the many benefits of modern urban life, it has some disadvantages as well. One of the most important disadvantages is that modern urban life affects the mental and physical health problems due to exposure to urbanize problems such as air and noise pollutions, behavioral disorders including lawbreaking and law violation. Therefore, it seems crucial to allocate a special time to leisure activities in the natural or quasi natural environment to reduce the impacts of urban life. Parks can be one of the most suitable places for spending leisure time. Most parks, particularly urban parks are rarely designed and constructed based on scientific criteria. Thus, redesigning of urban parks based on cultural, educational and environmental criteria should be taken into consideration. Urban parks are one of the most important places that have the highest crime rates due to their inappropriate design. Urban parks are often designed in low quality due to the lack of implementation of standard rules such as massive vegetative areas, low lighting, dark corners and informal investigation. This makes the park less effective and its quantity, quality and sustainability can be affected. Therefore, the only solution for sustainable use of parks, especially the urban parks, which are not designed based on scientific criteria, is to redesign them. The ultimate aim of the present study is to resolve the problems relevant to lack of information discussed above by designing the park with creating priority maps needed for redesigning a park and by a comparative study of the correspondence between the criteria used in designing the Azadi Park in Shiraz and the actual ecological and socio-cultural criteria that are used in designing by a descriptive approach and data analysis using ANP method.

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1. Introduction

Natural, quasi natural green spaces of urban and surrounding suburban areas that are in the ecological zone of cities, are being destroyed over time and have encountered several environmental issues that cannot respond to the current needs of society. Therefore, the environment won't be able to confront more difficult problems and extreme conditions in the future if current trends continue. In general, we cannot be optimistic about the future of the environment without solving the environmental problems and preparation for current conditions to achieve desirable goals in the future. The process of redesigning urban parks will be performed in order to revive, modernize and improve the quality of the environment, which can be helpful to confront future environmental problems related to urbanization and urban life. In this way, landscape and environmental design plays a very important role. The objectives of redesigning urban parks include establishing of ecological balance, arranging, planning, organizing activities, establishment of the spatial orders, preparing appropriate leisure facilities, preserving and sustaining urban parks, which are based on short-term and long-term strategies to improve the current situation and it can be helpful to achieve durable features in the future. This process, the user and the park, will result in a new experience for decision-makers that everyone will be involved in.

Many studies have been conducted on the design of urban parks. However, few studies have so far focused on the redesigning urban parks, and none have studied the application of ecological and socio-cultural criteria to redesign urban parks. Therefore, the present study is divided into two sections: (section one), a comparative study of the criteria used to design the Azadi Park in Shiraz with the criteria that are used to design an eco-park, and (section two), a comparative study on the design criteria of the Azadi park in Shiraz with socio-cultural criteria and also application of ecological and socio-cultural for creating priority maps for redesigning the Azadi Park in Shiraz.

The objective of the present work is to answer following questions: (1) what is the correspondence between the criteria used in designing the Azadi Park in Shiraz and criteria that are used to design an eco-park (ecological criteria)? (2) How is the correspondence between the socio-cultural criteria used in designing the Azadi Park in Shiraz with the socio-cultural needs of citizens? (3) What is the impacts of redesigning a park based on ecological and socio-cultural criteria on urban environmental problems, the level of awareness, and citizen welfare?

2. Literature review

There is not sufficient information about urban parks. In fact, due to the lack of coherent information about

redesigning the parks and also many problems related to the lack of coordination between redesigned places, there are not standard criteria for redesigning the parks. The only work done on redesigning the parks is related to the location of parks. Therefore, few studies have been discussed here about the standard criteria for redesigning of the parks (Chiesura, 2004).

In one study entitled “the role of urban parks in a sustainable city”, the importance of indoor green spaces and lack of related international studies has been investigated. In addition, they indicated the importance of urban parks for the welfare of citizens and urban sustainability. The results of this study confirm that green spaces in urban areas play an important role in enhancing human well-being, and health benefits (Razaghian et al., 2012).

One study was carried out to investigate the criteria required for management and ecological design of urban parks and the possibility of utilizing them to design new parks. This study compared three samples of existing parks in Mashhad city (Khorasan Province) with ecological standards for park design. Differences and similarities of these samples were also investigated. According to assessment of ecological indices related to three main principles such as ecological, environmental and cultural-educational design, the results showed that these three types of parks were inappropriate based on the ecological traits, and therefore

they were indicated as the non-ecological design. The average of the indices of investigated buildings designed in these parks and among the 17 indices were equal to 10.9%, and this index was 37% for the main paths and 45.6% for secondary paths. Children’s playground and parking lots had an average of 58.7 and 11.8 percent respectively. Considering the average rates obtained for each index, and in order to improve the quality of existing parks in Mashhad, some suggestions have been presented for planning, micro and macro levels of management, and designing green spaces of urban areas.

3. Research method

In the present study, the research method was done with the aim of application and a type of assessment based on questionnaire analysis in the actual spaces that could be inferred as a case study. The important parts of this research was determining input and output indices as well as obtaining and extracting variables. The steps were as follows:

- Preparing a questionnaire
- Reliability of the questionnaire
- Data collection
- Determining the validity of questions from the collected questionnaires
- Weighting variables
- Analysis and ranking using the ANP method

Table 1. The criteria for the park design (Lindberg & Schipperijn, 2015).

Main indices	Subdivisions	Requirements and standards
Physical and ecological design	Buildings	The ecological requirements that should be considered in designing buildings in the ecological parks include reducing energy consumption, using natural ventilation, using building spaces economically, providing electricity through solar cells, providing hot water through Solar water heaters, the use of recycled materials, thermal insulation of buildings in the body and floor, the use of double-glazed windows, the treatment of water for non-drinking purposes, the collecting of rainwater from the roofs and other areas and the utility of them for irrigation and swimming pools, designing of dry toilets and fertilizer, complete waste recycling, geometry consistent with the nature, use of organic materials, use of natural sunlight, use of non-renewable woody and fossil resources.
	Passageways and pathways	The relationships between human and nature, and integration of appropriate passageways with natural spaces using the design of spiral passageways in natural spaces, the use of native and natural materials for the design of floors and penetrating floor covering, etc.
	Parking lots	Establishing of parking lots in the spaces, where are far away from the main park area, floor covering with water absorption traits, the design of bicycle parking near the main building in order to encourage cycling and working out, etc.
	Open play spaces for children	Standardization and implementation of safety principles, the use of high quality toys with raw materials, designing the foam floor tiles, the location of playground areas in the vicinity of trees, proper lighting at night, and encouraging the children to respect green spaces, trees and water, using the establishment of their playing equipment in the vicinity of these spaces, etc.
Environmental design	Energy	Providing electricity through solar cells or windy generators, providing non-drinkable water through recycling of water and rainwater, the integration of infrastructures with proper technology
	Plants and animals	Preserving the life cycle, the use of native plants, the maintenance of wildlife, the minimum planting of foreign species, the planting of medicinal herbs and preparation of seeds for birds.
	Environmental pollution	Reducing air pollution, noise pollution, traffic, use of the green wall, utilizing of the wall between the park and the fast pathways to reduce noise pollution, use of massive trees to reduce air pollution and noise pollution.
	Recycling waste and sewage	Recycling of sewage and use of dry toilets and compost, reuse of water in irrigation systems, separation and complete recycling of waste and converting them to compost, encouraging people for recycling by placing colored buckets for the separation of three types of waste (metals, plastics and Paper).
	Fertilizer production	The use of fertilizer systems and systems for producing compost for converting waste to fertilizers that are needed for the parks, the use of vermicomposting techniques and dry toilets for fertilizer production, economic self-sufficiency.
	Drinking water	Collecting rain water using new techniques, collecting water from floor surface in parking spaces and passageways, treatment and reuse of wastewater and use of correct irrigation systems.
Cultural and educational design		Considering the needs and demands of people from the designed spaces.
		Providing environmental education
		Providing the spaces for spending the leisure time
		Making a good relationship between human and environment

In general, the library methods were used for collecting information about the research subject. Also, field method and literature review were applied to confirm or reject the research hypotheses. For this purpose, a standard questionnaire was prepared and distributed to 60 experts of the park design in Shiraz.

4. Theoretical foundations and framework

4.1. The synonyms for the term redesigning, include revitalization, regeneration, modernization, integration or reunification, remodeling, reconstruction, etc. In general, all these terms are a series of plans used to create structure and correct function of the old spaces, and the creation of new spaces with respect to the preservation of standards used for the old spaces and replacing the inappropriate features, which can be done in a long and even short period of time (Park & Evans, 2016).

4.2. Redesigning of urban parks is based on two general principles such as optimizing the ecological function and optimizing the socio-cultural function of the park (Park & Evans, 2016).

Redesigning will be performed based on optimizing the ecological function of the park, including the protection of valuable plant species, optimizing the vegetative areas, the park design in harmony with the environment, flexible design, design with local materials, the use of eco-technique methods, landscaping using native plant species, reducing of water, soil, air, and noise pollutions, and proper location of spaces (Park & Evans, 2016).

Redesigning will be done based on the optimization of the socio-cultural function of the park, including diversity, improving of visual quality, implementation of appropriate accessibilities, enhancing safety and health, well-being, designing based on the educational needs of individuals, the appropriate location for the establishment of tourism facilities and participation of visitors (Park & Evans, 2016).

As mentioned above, in practice, two general steps should be considered for redesigning as follow:

Identifying the actual ecological and socio-cultural criteria (what is) for the park design and a comparative study of these criteria with real ecological and socio-cultural criteria (what should be).

A solution for improving the socio-ecological and socio-cultural criteria used in the park design, which are not in perfect coordination with real ecological and socio-cultural criteria, as well as the presentation of priority locations for redesigning based on the criteria extracted from tables.

Therefore, after prioritizing all the relevant ecological and socio-cultural criteria (Table 1) and calculating the Cronbach's α (0.774), the final ranking was obtained according to the experts' opinions (Table 2).

shown in Table 2, based on expert opinions, the most important criterion for redesigning the parks is considering the needs and demands of people from the designed spaces, after which providing the spaces for spending leisure time is important and finally the least important criterion is drinking water.

4.3. Research spaces

Shiraz city, the capital of Fars Province, is located in an area of 1268 km². The population of city is 1547231. The green spaces in this city are around 28863872 m². The proportion of green spaces is very low in Shiraz, therefore the level of green spaces for each individual is very low. In addition to the lack of green spaces, there is also a lack of efficiency in existing green spaces.

Table 2. Final ranking related to design criteria based on expert opinions.

	Score	Rank
Drinking water	0.01240	14
Environmental pollution	0.05603	7
Environmental education	0.03564	8
Energy	0.107264	6
Making a proper relationship between human and environment	0.14931	3
Recycling waste and sewage	0.08155	5
Providing the spaces for spending the leisure time	0.18080	2
Considering the needs and demands of people from the designed spaces	0.19691	1
Fertilizer production	0.01205	13
Buildings	0.02269	12
Open play spaces for children	0.02383	10
Passageways and pathways	0.10001	4
Parking lots	0.02276	11
Plants and animals	0.03436	9

The Azadi Park is one of the examples of these types of parks that has been redesigned several times. However, it still has some problems (Parks and green spaces of Shiraz, City Council, 2016). Azadi Park with an area of more than 20 hectares is one of the urban parks that is located near commercial centers and residential areas (Figure 1). Considering the diversity of plant species and its location in the city, it has the potential to be changed as an urban eco-park. Therefore, the present research was carried out to redesign the Azadi Park based on scientific criteria



Figure 1. Research spaces (Edalat, 2016).

4.4. Ranking of subdivided criteria

Based on the objectives in this study, paired comparison questionnaires were designed and distributed among the experts. Considering the verbal investigation approach in this study, the numbers and terms in Table 3 have been used.

Table 3. Defined numbers (Likert., 1979).

Relative comparison of indices	Preferred numbers
Absolute importance	9
Very strong importance	7
Strong importance	5
low importance	3
The same importance	1
Intermediate values	2,4,6,8

According to the hierarchical network, paired comparison tables have been prepared, and using the modified method of (Youssoufi & Foltête, 2013), the weight of the components was calculated. The results were calculated using the Super Decision software. For this purpose, the Gogous and Boucher method was used for calculating the compatibility. The rate of incompatibility was 0.04. Since the incompatibility rate was less than 0.1, the weights obtained from this method are reliable. The results of the network analysis are explained in details as follow.

Table 4. Ranking of the main criteria (Edalat, 2016).

No.	Main criteria	Wight	Rank
1	Environmental	0.17344	2
2	Cultural and educational	0.05455	3
3	Physical and ecological design	0.77202	1

Table (4) indicates the ranking of the main criteria is top priority for redesigning criteria. As shown in this table, the physical and ecological design is ranked first (with a weight of 0.77202), the environmental criterion is in the second rank (with a weight of 0.17344) and the cultural and educational criterion is in the third place (with a weight of 0.05455).

Table 5. Ranking of the cultural and educational sub-criteria.

No.	Main criteria	Wight	Rank
1	Providing environmental education	0.1671	2
2	Developing a good connection between human and environment	0.16626	3
3	Providing places for spending leisure time	0.05979	4
4	Considering the needs and demands of people from the designed spaces	0.60685	1

According to Table 5, consideration of the needs and demands of people from the designed spaces is in the first place based on cultural and educational criteria. Moreover, this sub-criterion is considered as the most important design criteria based on expert opinions.

Table 6. ranking of physical and ecological design.

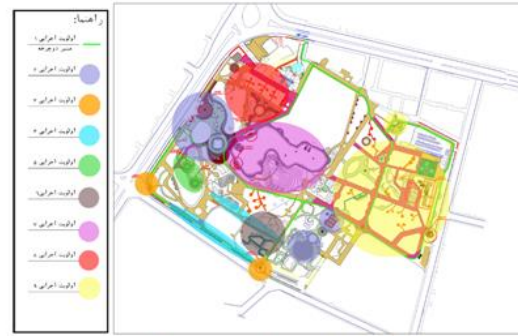
No.	Main criteria	Wight	Rank
1	Buildings	0.18657	2
2	Open play spaces for children	0.05645	4
3	Passageways and pathways	0.64418	1
4	Parking lot	0.01128	3

Table 6. Indicates that passageways and pathways sub-criterion is ranked first based on physical and ecological design.

Table 7. Ranking of environmental sub-criteria.

No.	Main criteria	Wight	Rank
1	Water consumption	0.05359	6
2	Environmental pollution	0.07198	4
3	Energy	0.17413	2
4	Recycling of waste and sewage	0.50249	1
5	Fertilizer production	0.07095	5
6	Plants and Animals	0.12687	3

Table 7 shows the most important environmental sub-criteria, in which waste recycling is ranked first (0.50249). According to the data obtained from this study, the executive priorities are shown in Figure 2, respectively.

**Figure 2. Executive priorities (Edalat, 2016).**

5. Conclusion

Due to some limitations, only a few criteria were investigated in this study. According to the results of the present work, it is recommended to consider other criteria in the future as supplementary studies.

According to this study, it can be concluded that: (1) the most important thing that should be taken into consideration in the urban park design is to address the needs and demands of people. Therefore, before redesigning plans, the needs of users should be considered, (2) since complete implementation of redesigning projects is time consuming and a huge amount of budgets are needed, the application of Analytic Network Process (ANP) is a good way to decide on the priorities for redesigning, (3) the application of ecological and socio-educational criteria simultaneously can be effective for redesigning projects.

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