Ecological Analysis of Urban Parks (Case Study: Mashhad Metropolitan)

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Abstract

The symbol of ecological urban sustainable development is the construction of urban ecological parks or Eco-parks. This paper's aim is to provide standards and criteria for ecological planning in urban parks and use them in the design of parks. Finally the comparison of three existing parks in Mashhad with the principles of ecological parks is the last purpose. The statistical society is all parks of Mashhad metropolitan and the case study are three parks of Mellat, Vahdat and Koohsangi. Evaluation of ecological indicators is in the three main axes of Physical and Ecological Design, Environmental Principles, and Educational and Cultural principles. The current status of these parks is inappropriate that are being non-ecological. In order to improve the quality of existing parks we offer suggestions in micro and macro levels of management, planning and design of urban green spaces. Finally the ecological landscape thinking will be clear at the end.

Key words: Eco-park, Ecological indicators, Mashhad, Sustainable development, Urban parks

1. Introduction

City is an alive and dynamic system which parks and green spaces are part of it. They are valuable because of the effective role of them to reduce the urban density, completing and improving the functioning of educational facilities, cultural, residential and reserve land for future expansion of the city. **(Karim Zadegan, 2003)**

The distinguishing characteristic in the third millennium is planning based on principles of sustainable development in line with nature and all activities related to urban issues. Ecological concepts and consequently ecological parks refer to a comprehensive and integrated set of measures which create coordination and balance between the constituent elements of the park in order to establish sustainable development. It means that environmentally friendly plants are not the only matter, so at the same time recycling and saving energy is also considered. We can say that it includes such a wide scale of ecological indicators of environmental variables energy and material usage. **(Rahnama, 2009)**

As an example we can mention to different developed countries like Singapore, China, America, Germany, Britain and South Korea where ecological planning is in the top of government policies. First they experess the slogan of sustainable development and then by organizing the Green and Ecological Movements they try to reach the sustainable development. Singapore government consider policies like "The Second Master Plan of Green Buildings" as a progressive plan in sustainable development , the main purpose of this plan is to reach at least 80 percent of buildings become green by 2030. **(Wong, et al., 2011)**

In addition in developed countries like Germany, government has fundamental role in promoting sustainable development in ecological parts. Furthermore, in a common program, German and China governments perform the project of Eco-City in Shenzhen city of China in line with Planning and management, so we can say that local organizations have essential role in Development of ecological thinking. **(Abbas Zadeh, Hosseini, 2011)**

Evidence in planning and designing urban green spaces indicates the fact that the idea of ecological design is very poor. The idea of using ecological parks needs theoretical foundations, principles, criteria, standards from one side and comparison of existing parks and identifies the similarities and differences with these criteria from the other side, which are consider in this paper.

2. Research Methods

According to Having 24900 thousand square meters of green spaces and 10.2 square meters per capita in more than 324 local, regional and urban parks, three Mellat, Koohsangi and Vahdat Park of Mashhad, which pass at least five years of construction and have considerable area to modify the ecological disparities, is selected and have been seen in figure 2.1. Information has been collected on their ecological characteristics using questionnaires (open and closed questions), along with interviews. This information is collected in two documents and field ways. The research hypothesis is a qualitative hypothesis concerning the possibility of applying the principles, criteria and standards for urban ecological parks. So in order to determine and define the parameters of ecological design of urban parks we use scientific internal and external resources (books, articles, and websites).

3. Explanation and Theoretical Foundations

The World Commission on Environment and Development (WCED) (1987) defines sustainable development as "development that meets the needs of the present without compromising the ability of the future generations to meet their own." It requires meeting the basic needs of all and extending to all the opportunity to satisfy their aspirations for a better life. Moffat (1994) acknowledges the holistic nature of sustainable development as well as its focus on the parts and Dahl (1997) emphasizes the definition's accountability of time and responsibility towards future generations. **(Abbas Poor, 2007)**

The United Nations Conference on Environment and Development (UNCED) in 1992 took place and the question of how to relieve the global environmental system through the introduction to the paradigm of sustainable development. It emphasizes that economic and social progress depends critically on the preservation of the natural resource base with effective measures to prevent environmental degradation. The UN summit focused on three broad concepts: An "Earth Charter" covering a number of principles aiming at development and the protection of the environment, was the first focus for discussion. Secondly, "Agenda 21" was intended to be a global action plan for sustainable development; thirdly, developing countries demanded a substantial increase in new funding from developed countries to contribute to sustainable development in the South.
(http://www.worldsummit2002.org/index.htm)
Thus, the sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

3.1. Eco-Park

Ecological park or Eco-park is an oriented environment which creates an advanced system to have a sustainable environment. Eco-park is a park which 75% of its metabolism is compatible with nature, economically self-sufficient, adaptable and flexible in terms of climatic and environmental conditions and social identity of this park is distinctive characteristics of the local subculture and relaxing environment. In this parks 100% of waste is recycled, about 50% of the required energy is supply with sun's energy, 100% of wastewater is recycled, About 75% of materials used in construction are local and is compatible with the environment and the energy saving is up to 75% in comparison with normal conditions. (**Mikaily, Kiazadeh, 2008)**

In this park 50% of plant and animal species are native, up to 75% of car trips are reduced in parks and the use of bicycles, walking and public transportation within the park increases, artificial and incompatible materials are used only in emergency situations and administrative organizations, museums, laboratories and buildings will be constructed in accordance with ecological standards. **(Mikaily, 2004).** In addition the process of designing includes doing and preserving system which is organized a set of activities and cycling of the system **(Rahnama, et al, 2012)**

The Ecological Park could be anywhere of any shape, any size. (**Zarabi, Azani, 2001)** Organizing geometries may be rectilinear, curvilinear or naturalistic since it is not its look that matters so much as its biological functioning. At its best, each park connects fragments of open space into a comprehensive network, both to increase human well-being and benefit natural system. The Ecological Park strives to realize an older vision of the city as a garden, blurring the distinction between the two. Yet it also employs the most up- to date methods to minimize such impacts of city life as urban runoff, air pollution, and traffic noise. Through the design of healthier open spaces, it echoes the nineteenth- century notion of parks as the "lungs of the city**". (Cranz, 1982)**

One of the positive effects of developing the parks and green spaces is to increase the bioclimatic efficiency and reduce the air pollution. (**Baharam Soltani, 2008)**

4. Discussion

4.1. Assessment indicators of ecological parks

Considering parameters in this study for the design of ecological parks are divided into three different groups: 1- Physical and Ecological design 2- Environmental 3- Cultural and Educational. Each of the following sections has specific requirements, standards and indicators that should be considered with designers, planners and builders of ecological parks.

The main axis of Physical and Ecological design have four subdivision of Buildings, Crossings and Pathways, Children's play spaces and Parking spaces each of which has ecological indicators. For example the indicators of Buildings are as follows:

1-Electrical energy from solar cells (photovoltaic), 2-Supply hot water by the solar water heating system,**(Piri, Rezaei Rad, 2006)** 3-Using mesh sunshade on the windows, 4-Thermal insulated building in shell and roof, 5-Double openings, 6-Sealing vents, 7-Intelligent control systems of comfort quality, 8-Using recycled materials, 9-Using native materials, 10-Roof and other surfaces rainwater collection system, **(Amirifard, 1992)** 11-Water filtration systems used in buildings, 12-Using large and compact trees in the vicinity of the buildings, 13-Using natural light during the day, 14-composting toilets or fertilizer maker, 15-Waste separation system in the building, 16-Access to bicycle paths, 17-Bicycle parking space near the buildings.

Standards and design requirements in subdivision of Crossing and Pathways are as follows: 1-The human relationship with nature and natural spaces combined with appropriate pathways through spiral pathways designed amidst the natural spaces, **(Bozorgi, 2004)** 2-The use of indigenous and natural materials for flooring, etc.
In subdivision of Parking spaces, they should be: 1-Far from the main area of the park, 2-Water and moisture absorbent flooring construction should be observed, 3-The bicycle parking space should be near the main buildings and encouraging the culture of cycling and sports.

In addition for the Children's play spaces we should pay attention to: 1-Standards and safety principles, 2-The use of toys with high quality raw materials, 3-Use children proportions in toys, 4-Fender flooring, 5-Plan play spaces in the vicinity of trees, 6-Proper lighting at night and 7-Linking children with green space, which are the main principles**.**

The main axis of Environment has been divided into six different subdivision such as Energy, Plants and Animals, Environmental pollution, Waste recycling and Wastewater ,Production of fertilizer and Water consumption which the most important indicators for them are: 1-Maintaining the life cycle, 2-Using of native plants, **(Khalil Nejad, 2005)** 3-Maintenance of wildlife, 4-Minimum planting of foreign species, 5-Cultivation medicinal plants, 6-Providing seeds for birds, 7-Reduce air pollution and noise pollution, 8-Use of devices for converting waste to compost and required fertilizer and using wormy compost techniques to produce fertilizer.

In the Cultural and Educational axis the main indicators are: 1-Paying attention to audiences' requirement for designing space, **(Ahmadieh, 2006)** 2-Provide environmental education, 3-Provide leisure and 4-make appropriate linkage between human and nature.

4.2. Survey the ecological indicators in case study parks

This research indicates that the basic concept of case study parks isn't ecological and they have been built just for urban function. The numbers and averages have been achieved through specific questionnaires and detailed interviews with managers and technical experts of the parks.

In this paper the ecological thinking and viewpoints will be introduced. Three Mellat Park, Koohsangi and Vahdat Parks of Mashhad (figure 4.2.1, 4.2.2 & 4.2.3) have been chosen through all parks of the city. Their ecological indicators are as follows:

- The Physical and Ecological design axis has four different subdivision of Buildings, Crossing and Pathways, Parking and Children's play spaces with total 41 indicators which just 19 indicators have been observed. So the buildings of Koohsangi Park have the average of 11.4% which it is 10.4% in Mellat and 11% in Vahdat Park. In addition the second subdivision of pathways which is divided in two main and subsidiary parts has the averages of 36.2%, 42.5% and 32.5% respectively for the main pathways in Koohsangi, Mellat and Vahdat parks and 33.7%, 54.3% and 42.7% for subsidiary crossing for the above parks respectively. The children's play spaces and the parking spaces of Koohsangi Park have the average of 75.5% and 14.2% which are 61.1 % and 14.2% in Mellat and 40% and 7.1% in Vahdat Park.
- In these parks the waste and garbage have not been recycled and there is no system for rain water collection, no equipment to produce and convert solar energy into electrical energy within the parks and they are directly connected to AC power supply network. In addition there is no local storage and composting of waste.
- Incidental learning is the most important part of educational and cultural axis which has not organized program in these parks. Special educational training has been done in some occasions but the environmental education isn't existing. It seems that the citizenship education is ignored.

Table 4.2.1. Shows the main Physical and Ecological design in three parks.

5. Conclusion and recommendations

The results of the research reveal that urban parks of Mashhad city are weak in different ecological dimensions. So the indicators such as supplying energy from recyclable resources, waste recycling, environmental education, etc has been ignored and the limited ecological indicators have not targeted programs and usually be temporary. Finally it illustrates that the case study parks not only economically self-sufficient, but also have high cost of energy. Finally we can conclude that they don't pay enough attention to 5R process (recycle, reduce, reuse, re engineer, reclaim).According to the studies the parameters needed for ecological design of urban parks or enhance existing urban parks are as follows:

- Preparing a comprehensive plan to construct and develop the eco-parks.
- Study the characteristics of eco-parks in other countries especially which have similar climate, economic and social conditions with Iran and Mashhad.
- Observance of ecological indicators as legal principles and promoting efficiency in the management of executive agencies.
- Charge the agencies with applying the ecological principles in construction of new buildings and parks.
- Definition of standards, instructions and special provisions for the legalization of ecological criteria, in construction of new buildings and open spaces and public places.
- Provide environmental and ecological education by private investment to develop the training.
- Provide leisure and cultural services through exhibitions, workshops and scientific – cultural festivals.

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(http://www.worldsummit2002.org/index.htm?http://www.worldsummit2002.org/guide/unced.htm, 18-jul-03)

Figure2.1. Location of the selected parks in Mashhad City (Source: writers)

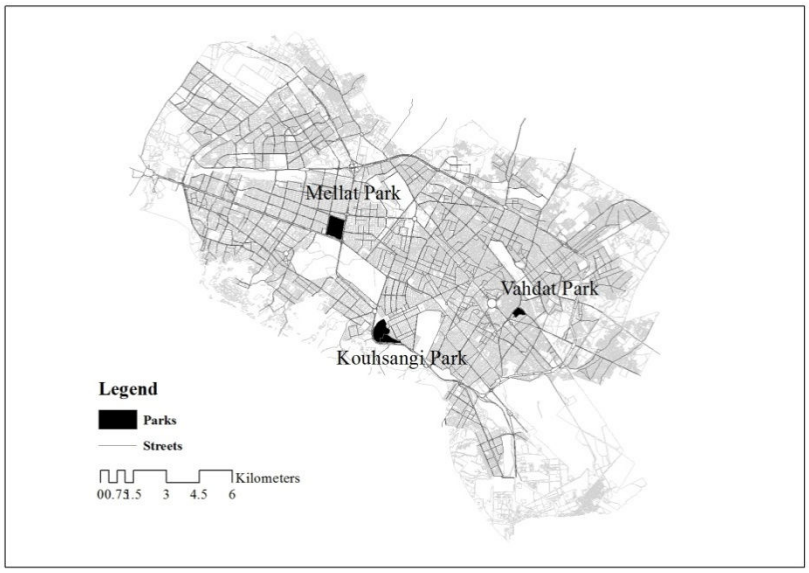

Table 4.2.1. Assessment of Koohsangi, Mellat and Vahdat Parks of Mashhad to reveal the rate of Physical and Ecological indicators (Source: writers)

Buildings	Koohsangi 22 buildings		Mellat 36 buildings		Vahdat 6 buildings		Average	
Average	**11.4**%		**10.4**%		**11**%		**10.9**%	
Crossing & Pathways	Koohsangi		Mellat		Vahdat		Average	
	Subsidiary	Main	Subsidiary	Main	Subsidiary	Main	Subsidiary	Main
Average	**33.7**%	**36.2**%	**54.3**%	**42.5**%	**48.7**%	**32.5**%	**45.6**%	**37**%
Children's play spaces	Koohsangi		Mellat		Vahdat		Average	
Average	**75.5**%		**61.1**%		**40**%		**58.7**%	
Parking spaces	Koohsangi		Mellat		Vahdat		Average	
Average	**14.2**%		**4.2**%		**7.1**%		**11.8**%	

Figure 4.2.1. Koohsangi park (Source: writers)

Figure4.2.2. Mellat park (Source: writers)

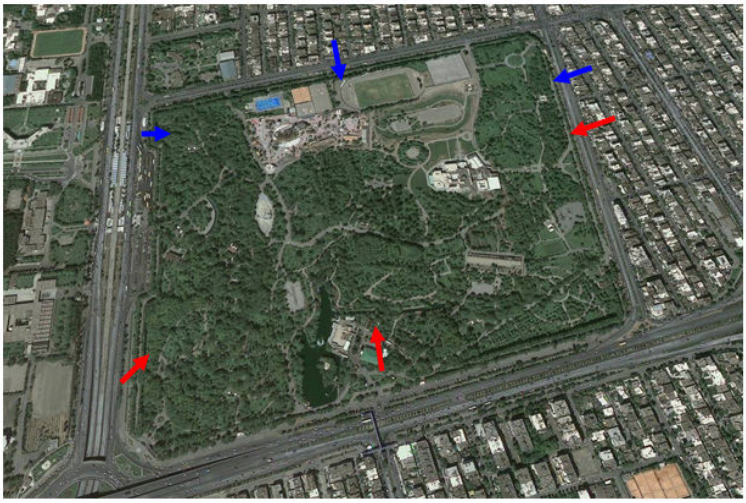

Figure4.2.3. Vahdat park (Source: writers)