

Environment and Sustainable Architecture

Behzad Pourdehqan¹, Mahdis Rashidi², Mohammad Saeed Firouzbakht³, Nasrin Najafi⁴

¹ MSc student in Islamic Azad University of Mahalat, Arak, Iran; ² MSc student in Islamic Azad University of Hamadan, Hamadan, Iran; ³ MSc student in of Islamic Azad University of Mahalat, Arak, Iran; ⁴ MSc student in Islamic Azad University of Mahalat, Arak, Iran

Abstract

Humans have always tried innately to establish their habitations in a place where the existent natural resources would respond their ecological needs. However, the activities which have been done in the skeleton of the citie, have caused changes such as air pollution, unsystematic and limitless development of cities both vertically and horizontally, unexampled production of the hazardous waste, appearance of the greenhouse effects and heat islands. The common results of these basic changes that have been appeared for more than a century have caused the loss of vital interaction of people with nature. It seems that there is a connection between the existent materials in the living place of the individuals and their preferences for building houses in terms of the kinds of materials. In the present study books and magazines are used to collect information and therefore, the theoretical method is used for researching. Finally, this study aims to provide approaches for reducing the use of energy and improve the standard of living for everyone.

Keywords: sustainable building, indexes, theoretical principals, natural energy

Introduction

Based on the definition presented by the World Commission on Environment and Development, sustainable development meets the needs of existing generation without causing any obstacle for next generations to respond their needs. Besides the mentioned definition, there has been many presented definitions for sustainable development so far, but totally a collection of the existing definitions of the sustainable development can be presented as responding the needs of next generations, paying attention to bearable capacity of the ecosystems, making the human life sustainable, preserving the environment and integrating the preservation and development as a general approach (Aziz, 2005).

Today, the issue of sustainability in different scientific and executive sections is discussed around the world. Sustainable agriculture, sustainable economy, sustainable human resources, sustainable urbanizing and sustainable architecture are the subjects of the day.

Sustainability is also discussed in the field of architecture and today is one of the important topics of these scientific field. Causing the least damage to the environment, regarding the biological diversity, using the pure and renewable resources, utilizing the recyclable regional materials, preserving and revivification of the historic places and paying attention to the economic and cultural issues of each society are some of the matters that are regarded by the sustainable architecture (Qobadian, 2012).

Sustainability literally means stability and durability in Dehkhoda dictionary. In Moein Dictionary, this term means the ability to sustain and resistance (Dehkhoda dictionary; 47). The verb sustain is derived from the Latin origin of Sustinere and is made up of two parts of Sus (from down to top) and Tinere (preserving and maintaining) and it has been used in English language since 1290. This verb is mixed with concepts of “supporting, preserving and continuity” and the adjective sustainable is used to describe a “situation, position or thing” which has been supported or has continued by using help or provision of living needs (Asadpour, 2005; 65).

The design and construction in sustainable architecture are based on environmental considerations and are done by using regional and local materials. It aims to designing sustainable buildings, reducing the damage of the building to the environment, energy resources and nature. The sustainable architecture includes a mixture of aesthetic, environmental, social, political and moral values.

Economizing on using the fossil fuels and sustainable development have turned into very important and common issues internationally, in a way that preserving the resources, reducing the use of fossil fuels and coexistence with the conditions and preventing the environmental and climatic pollution have now turned into the important strategies in architecture and urbanizing and they make architectures observe the specific principles and rules about construction.

Sustainable Architecture

In order to get a better understanding of the concept of sustainable architecture, it is necessary to present a clear definition of the concept of “sustainable development”. A generally accepted definition of the sustainable development is the one that has been included in the Brundtland’s report and based on that, the “sustainable development” is the kind of development which meets the needs of contemporary generation without compromising and inconsideration of the next generation’s abilities to respond their needs (Golkar, 2000). The concept of sustainable development is to present solutions for traditional skeletal, social and economical patterns, so that it manages to prevent the issues such as the decrease of human’s life quality.

The main target of the sustainable building is responding the basic needs, improving and increasing the standard of living for everyone, better preservation and management of the ecosystems and providing a more fortunate and secure future. Finally, it can be expressed that the sustainable development has a comprehensive concept and it is related to all aspects of human life. The use of sustainability concept in architecture has represented a new topic entitled sustainable architecture (Soflaei, 2014).

Improvement of the quality of architecture in sustainable design is meant to achieve a certain goal which is the comfort. An important point which should be thought in this kind of architecture is that all the related elements in providing comfort are considered as a unit system.

The sustainable architecture is an architecture which respects the environmental considerations and climatic adaptation and is designed and built based on the maximum effective exploitation of the natural resources. Sustainable architecture attempts to reduce the negative effects of the architecture on environment (Zahra Ahmadi, 2002).

A sustainable building can be defined as a building which is in the least conflict with its surrounding environment and with the region and the world in a larger scale. In this prospect, the construction techniques are employed in order to provide an integral quality from economical, social and environmental aspects in a large scale (Zahra Ahmadi, 2002)

The Concept of Sustainability

This concept roots in an ecological basis. According to this basis, if the exploitation of all environments is done with respect to their natural capacitance of generation, the principle of the asset (ecological resources) remains stable. Therefore, our utilization of the environment in the limits of that generating capacitance is permanent. The amount of humane utilization of that certain environment which is proper for the capacitance and capabilities of that has the maximum outcome because it fits all of the production (Makhdoum, 2008).

Anyway, if the main concept of sustainability is sustaining the living quality of people, the economical and social goals will be recognized more rapidly. The social goals include achieving the equality and preserving the cultural diversity, increasing the role of family, enhancing the collective

and citizenship sense and obtaining a more qualitative life. The economical goals also include the mentioned ones besides of any change in economical activities which increases the living quality (Razdasht, 2012).

The green architecture provides this opportunity wherever it trends. First designers, only knew the aspect of sustainability of energy and they deposited a primary connection in increasing emission levels of universal carbon oxide. But does the low energy design make actually a great architecture? Few reasons exist for defining the connection between great aestheticism and conservation of energy. In fact, they are most of the times incompatible. This incompatibility only happens when a full image of the economical design addresses the rich, complicated and beautiful appeared architecture (Edward, 2010). Searching for a responding environment has increased the human tendency to aestheticism and it has been directed by the stabled technological needs. Technical, cultural, economical and social sustainability have scales for judging the tomorrow buildings. There has been many tensions which should be raised and they will necessarily lead to a diversity in chosen solutions for solving the forthcoming environmental issues (Edward, 2010).

Sustainable Environment

The idea of sustainable environment means depositing the earth for the next generations efficiently or even better than what it is today. The humane activities help the sustainability of environment, once they could make and preserve it without destroying the natural resources or surrounding environment. Therefore, the use of energy should be low and the used materials should be 100% recyclable or renewable so that, they do not hurt the environment and help save the energy and finally, the used energy could be totally renewable and could not cause any pollution.

Social (economy- education- society- asset- asset of culture)

Technological (technology of energy-
modern educational technology- scientific asset)



Environmental (hygiene- energy-
water- next generation- asset of resources)

Figure 1. Three prospects of sustainable design: social, technological, environmental
(Source: the book “Guides to Sustainable Architecture”)

Adaptation to the environment and sustainability of its surrounding environment

The building should be built with respect to the environment and adaptable to it and should consider following points:

- However its materials should be durable, they should be transubstantiating easily in the environment.
- It should minimize the damage to environment.
- Efficient design of the building in terms of energy saving.
- Efficient use of proper materials for reducing the damages to environment.
- Durable design for environmental sustainability.
- Recycling the wastes for preserving the environment and economical saving.
- Utilizing the principals which prevent the forthcoming dangers caused by construction for the environment.
- Using the green space in construction of the building for keeping the environment cleaner.
- Using the green materials for parallelism with the environment,
- Using durable materials for making the building sustainable.
- Using materials which need less preservation.

- Choosing safe materials from environmental aspect and the health of users (Minooei, Zahra, 2012).

Emersion of the Sustainable Designing

The sustainable designing in architecture and urbanizing is not a new method like modernism or deconstruction, it is an approach and the designing thought which is based on the adaptation to the nature (Fig. 1). This way of thinking has existed since past centuries. For example, Eskimos built their houses by using the regional materials such as ice and snow and they had the best thermal utilization (hemisphere) for dominance on the hard climatic situation of the pole and also Greek, Egyptian and the Inca people and many of the old civilizations considered the navigation of the sun for proper exploitation of the sunlight and its heat. However, with the incursion of the technology these methods have been forgotten (Sayadi and Madahi, 2011).

Environmental Sustainability

Iran has territorial sea in the northern district of the Persian Gulf and Indian Ocean and the northern district of the Caspian Sea but the two ranges of the mountains that one of them is located on the edging of the northern district and Alborz Mountains, and the other one is located on the edging of the Zagros Mountains block the mild, humid weather to get to the interior and median parts of this country. Due to this issue, different parts of Iran have various weather (Memarian, 1993). Fourfold climates of Iran include mild and humid climate (coasts of Caspian Sea), cold climate (western mountains), Warm and dry climate (central plateau), Warm and humid climate (southern coasts of Iran). Historic houses of Iran were designed with respect to the climatic and they are perfectly connected with their surrounding nature thus, they cause the minimum damage to the environment.

The Principals of Sustainable Designing

- Compactness
- Reformed streets for traffic
- Increase of the population in the suburb
- Empowering the applicability of the places which are perfectly supported in terms of transportation (knots and semi-knots)
- Four floor buildings
- Readability

In Neighborhood Scale

- Different applicable patterns of the house
- Safe and intimate passageways
- Preservation of the historic buildings
- Bicycle path
- Bypasses and passageways of the trams
- Utilization of the regional energy resources

In Local Scale

- Designing by consideration of nature (parks, streets, etc.), biological diversity of species
- Using lands with the previous obsolete buildings
- Strong green squares and passages

In the Scale of a Building

- Designing aimed to cause low environmental effects (local, regional and universal)
- Durable design
- Reusable design

- Maximum use of renewable energies
- Independent plans
- Managing the available energy for users
- Designing with respect to the climatic situation
- Healthy designing

Activities to Achieve Energy, Environment and Biome

- | | |
|-------------|---|
| Energy | <ul style="list-style-type: none"> - Moving from fossil fuels to renewable energy resources - Employing a low energy design - Looking at the building as an energy producer - Considering all uses of energy (heating, lightening, ventilation and transportation) - Using the recycled heat - paying attention to the energy and its applicability |
| Biome | <ul style="list-style-type: none"> - Considering the environmental effect on a great scale - Considering the preservation of resources (land, water and materials) - Reviving the land and buildings as a part of the development process - Prevention from the pollution caused by the designing - Stable, flexible, reconstructive, healthy, comfort and secure design |
| Environment | <ul style="list-style-type: none"> - Paying attention to the effect of the selected materials on diversity of biological Species - Connecting the designing systems to ecological systems - Maximum diversity from minimum resources - Using development for expanding or making natural habitations - Using plants as shelter and for restitution of energy |

A proper index for evaluating the restitution of energy in designing level is evaluation of the units based on meter (it is usually shown as kWh). A similar way can be used for evaluating the usability of the installation management system of the building and its modification. However, there has been no prevention of energy reported so far. Therefore, another index such as energy production percentage is produced by the renewable resources. This index can totally change the habiting situation in the building and let the carbon dioxide emission reduction compared to the primary expectations. As a result, this index (energy) can be useful for guiding the designers, those who manage the building based on the applicability enhancement and for the government as an instruction to reduce the carbon dioxide nationally. The health can be an index for both construction workers and inhabitants. The construction materials and technologies carry many hygienic dangers for workers and the health of inhabitants can be threatened due to the deformed design of the area. Local biological diversity is another useful index. Total ecological understanding of the excavation, production, constitution and devolution of the construction materials is difficult to measure (Edward, 2010).

Aims of Sustainability

Four basic aims of sustainability are applicability of resources, applicability of energy, preventing from causing pollution and adaptation to the surrounding area.

Conclusion

Social sustainability represents the ability of the society for preserving and maintaining the necessary tools of generating wealth, welfare and social participation. On the other hand, it attempts

to preserve the stability of the social factors for expanding the union and solidarity. The sustainable development and sustainable architecture consider the preservation of the environment with changing the approach to the nature based on their primary mottos but the presented methods and what is appeared in the constructed area is a kind of discrete and separated approach from the nature and it just considers its preservation in order to be exploited by next generation. In spite of the fact that the principals of the sustainable architecture includes a wide range of utilization of the most simple and complicated modern technologies, the issue is the propriety and adaptation of the method to the social and cultural backgrounds of the people and users of that area. Modifying the point of view to the nature and as a result a change in human attitude toward the nature which would be a great change in consumer culture is a vital step toward sustainable development.

Due to the energy crisis in the world and the exhaustion of the non-renewable resources, and also the increase of the environmental pollution because of the unsystematic use of fossil fuels, the necessity of utilizing the sustainable energies especially in building construction which uses 40% of the energy in country is considered. Based on the growth rate of the technology, representation of the sustainable energies, permanent reduction of the non-renewable energies and also the availability of the proper sustainable energy resources (sun, water, wind, biogas, etc.) in our country, the architects can provide a suitable atmosphere with the favorable thermal condition by using a proper designing which is adaptable to the climate. Besides the Iranian architectural patterns that properly use the sustainable energies in architectural designing and the modern science and technology are also utilized.

References

- Afsharnaderi, K. (2008). Architecture and Environment, Architect magazine, 48. Tehran.
- Ahmadi, Z. (2002). Recalling the lost role of the central courtyard in achieving the sustainable local architecture, City and Architecture Magazine, 2, Tehran.
- Azizi, M. (2006). Sustainable residential region (case studying: Narmak), Fine Arts magazine, 27.
- Edward, B. (2010). Guides to Sustainable Architecture, Second Edition, Trans: Tehrani, Sh. Tehran, Mehrazan.
- Golkar, K. (2000). Urban sustainable designing in desert cities, Fine Arts magazine.
- Kasmaei, M. (1984). Climate and the architecture, First Edition, Iran's house building company publication, Tehran.
- Mahdizadeh, J. (2002). Scales and rules of organizing the urban industries and services. Sazman-e-Shahrdarihayeh Keshvar publication, Tehran.
- Makhdoum, M. (1999). Scientific factors and sustainable development in environment, Environment and Development Association, Tehran University, Tehran.
- Memarian, G. (1993). Residential architecture in Iran, Extroverted Typology, Second Edition, Science and Industry University of Iran. Tehran.
- Minooei, Z. Khavaran Academy with the approach to the regional architecture and sustainable architecture's principals, M.S thesis.
- Qobadian, V. (2012). Climatic and sustainable architecture in Iran, Designer magazine, 5.
- Razdasht, A., Yaghfour, H., Maleki, A. (2012). Comparing the sustainability indexes in the small city of Dehdasht by the medium of urban system of the country considering the urban sustainable development, Amayesh-e-Mohit Magazine, 18.
- Sayadi, E. Madahi, M., Mohammadpour, A. (2011). Sustainable architecture, Tehran, Loutos.
- Soflaei, F. (2004). Investigating the concepts and experiences of the rural sustainable development, Urbanizing and Architecture magazine, 45.