Investigating Sustainable Design According to Sustainability Model to Achieve Less Consumption Mechanism and More Productivity from Nature

Mahdi Aliyari

Department of Architecture, Islamic Azad University, Shabestar Branch, Shabestar, Iran. mehdi_je2000@yahoo.com

Abstract

Sustainable architecture as one of the newest methods of growth and promotion is based on climatic characteristics. In this type of architecture, the building not only adapts itself to the climatic conditions of the area, but also establishes a reciprocal relationship with it. Principles that must be followed in order for a building to be classified as a sustainable building: Energy conservation, harmony with the climate, reduction of the use of non-renewable resources, and meeting the needs of residents, all of which should be implemented in a complete process leading to the construction of a healthy environment, in this regard, in this research, according to the goal of achieving a mechanism of less consumption and more productivity from nature to understand the sustainable design process, it is possible to understand the sustainable design process. The triple model of sustainability was used and the principles and factors that should be considered in sustainable design were investigated in this study. And the results are that in order to achieve a mechanism of less consumption and more productivity from nature, you can use smarter methods to exploit natural resources instead of using them indiscriminately.

.**Keywords**: sustainable architecture, sustainable design, triple model of sustainability, productivity from nature

1. Introduction

Humanity has always been looking for a safe environment for its survival and comfort, and to this day, it has taken every opportunity to achieve this goal. He has realized that technology must be redefined in a different way. Otherwise, they and future generations will be victims of it. It reveals the compulsion of strategies to reduce energy consumption through climate sustainability approaches.

Therefore, if the construction of housing does not have a sustainable trend, no society can achieve sustainable development, which is necessary to deal with such problems, and where architecture in construction and use has played a large role in the emission of carbon dioxide gas, the total emission of which is estimated to be more than 50%. Architecture in general includes cities, buildings and housing, and human activities such as energy consumption and materials, etc Minimizing waste and the activities that link it to the continued protection of natural resources can produce many harmful gases.. In order to understand the sustainable design process, we only use a simple three-loop diagram to represent the dependencies and relationships of different parts of sustainability (Figure 1).

In Figure 1, sustainability includes two parts: the first part is the economy, society, environment, and architecture. Each section has prerequisite factors, which are shown below.

Environment: Orientation, Climate, Infrastructure, Light/Space/Air Conditioning, Energy/Water.

Economy: Value Added, Flexibility, Business Reality, Lifespan.

Society: Culture, Social Interests, People, Health, and Welfare.

Architecture: Form and Function, Identity, Structure, Materials, Innovation.

And in the second part, energy conservation and respect for nature and architecture and the welfare and health of the community in the complex constitute sustainability in architecture [4].

Therefore, architecture is not merely an activity that correctly balances the internal considerations of the building. The building itself enters into a complex unit in which the successful outcome of the project depends on the achievement of a dynamic interaction and harmony between the architecture and the surrounding environment, which is also illustrated by the triple model in Figure 1.

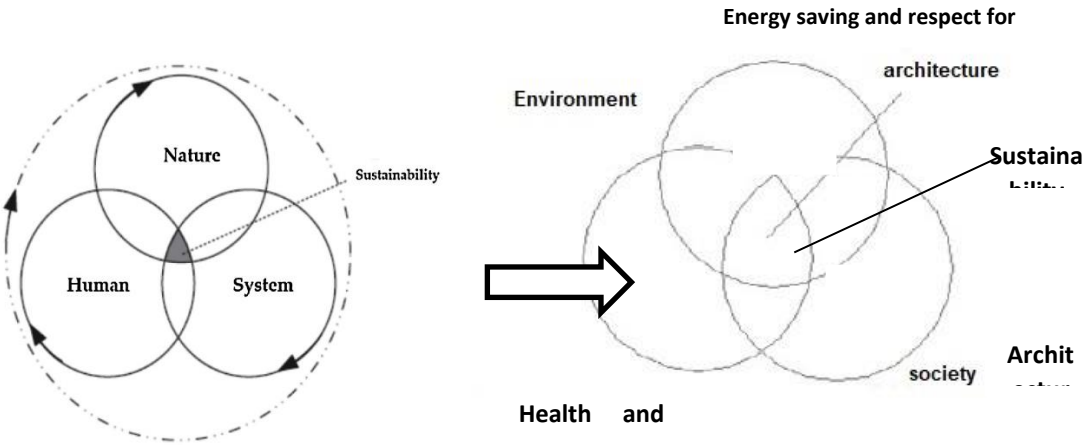

Figure 1. The Triple Model of Sustainability

2. Research Methodology

This research uses a descriptive-analytical method to investigate sustainable design according to the triple model of sustainability in order to achieve a mechanism of less consumption and more productivity from nature.

3. Sustainable Design in Architecture

Sustainability means continuity, progress, and adaptation to renewable resources. Usually, sustainability is seen as a key issue in the economy and society. Now, the challenge of climate change leads us to introduce sustainability in architecture. As we know, architecture is about building a living space for human life and progress, as well as addressing nature and the earth's resources from a sustainable and global perspective.. Sustainable architecture does not have to be exclusively research on reducing carbon dioxide emissions. Rather, it is necessary to look at sustainability from a general perspective that takes into account financial, cultural, and social issues, as well as ecological and environmental ideals.

Since conventional energy sources produce carbon dioxide, the first step is to find ways to reduce the building's energy consumption, which means minimizing the need for anything that requires energy, such as air conditioning, mechanical ventilation, artificial lighting, and so on. The second step should be to exploit renewable energy sources wherever possible in planning future master plans.

Sustainability is a system that is constantly growing and evolving due to sustainable architecture and its surrounding environment. Sustainable design based on the general method can make people's welfare, environmental considerations, technological possibilities and nature itself more connected, which is the basis of a sustainable future.

Sustainable design is the thoughtful collaboration of architecture with structural engineering, and mechanics. In addition to the common design factors such as beauty, proportion, texture and light, and the facilities that must be

considered, the design group should pay attention to many factors such as the environment, the economy, and consider its primary principles, which are as follows:

1) 2) Climate and climate, 3) Covering buildings, 4) Reviving cultural and regional identity, 5) Volume of buildings and placement of interior spaces, 6) Building materials, 7) Estimating human needs, 8) Coordination with the site, 9) Paying attention to all laws at the same time.. In the construction industry, the proposed framework is based on the three principles of sustainable architecture.

The usual practice of architects in sustainable architecture is to minimize the environmental impact of buildings by selecting environmental criteria that are used to influence the design process. The Breim Act[1], the UK Sustainable Building Regulations published in 2006, describes the environmental factors involved in complying with environmental regulations. We believe that this explanation is a better description of environmental considerations in sustainable design Also, it is better to use economic and social factors in the sustainable design process.

Table 1. Factors Affecting Sustainable Design

Categories	Factors
Energy and CO2 emissions	• **Greenhouse gas emissions in apartments** • **Building Texture, Drying Space** • **Indoor and outdoor lighting** • **White goods with energy labels** • **Cyclical storage**
Water	• **Cost of Internal Water** • **External Water Costs**
Materials	• **Environmental Impact of Materials** • **Finding Reliable Sources of Materials – Primary Building Materials**
Waste	• **Storage of non-recyclable waste and recycling of household waste** • **Construction Waste Management** • **Storing organic matter and using it as fertilizer**
Pollution	• **The potential of insulation materials in global warming** • **NOx Emission**
Health and well-being	• **Daylight** • **Sound insulation** • **Private space and living space**
Land use and ecology	• **Ecological value of the site** • **Ecological Enhancement** • **Preserving the ecological features of the land** • **Changes in the ecological value of the site**

- BREEAM(BRE Environmental Assessment Method). [1]

microclimate	• **Vegetation** • **Wind Reduction/Ducting** • **Topography**
Community	• **Social diversity** • **Cultural heritage** • **Low-impact dynamics** • **Law & Regulations, Texture**

3. Sustainable Design Principles

In the modern era, design professions choose the sustainable design method to approach sustainability in architecture. Based on the theory expressed by the three-ring model of sustainability and the holistic method, the basic principles of sustainable design to achieve a mechanism of less consumption and more efficiency from nature are described in Table 2.

to Achieve Less Consumption and More Efficiency from Nature Table ٢: Fundamentals of Sustainable Design

Respect for nature	**1**
Meeting human needs and progress	**2**
Full exploitation of natural resources	**3**
Using local energy as an energy source using local materials and workers	**4**

3.1. Sustainability based on respect for nature

Our understanding of sustainable development has usually been economic and social development that maintains growth within the permissible limits of global resource exploitation and environmental pollution . Nature helps drive where holism is the basis of sustainable building design.

3.2. Meeting Human Needs and Development

Sustainable development should be viewed from the perspective of meeting human needs and progress. In every case, it is not possible to destroy the ecological environment or ignore human needs in the name of protecting the ecological environment.

3.3. Exploitation of natural resources

Emphasis on energy efficiency, full exploitation and recyclable use of resources is important, which achieves rules in the design process.

The Law of Reduction: This law requires a reduction in the need for energy, water, land, and materials used in buildings. It may be as simple as to focus on energy consumption for water heating, summer ventilation, and lighting in design. Active systems, the use of clean and renewable systems, and the selection of sustainable and water materials that can be considered in the design. The production of sustainable materials consumes less energy and is not harmful to the environment.

Recycling Law: In sustainable design, recyclable materials should be selected as building materials wherever possible. Currently, rainwater and wastewater recovery systems are examples of this type of use.

The law of reuse: The permanent usefulness of most building materials should be considered in the design process, which means that at the end of the useful life of the materials, they should be used as after-use resources and given a new life by using them in the form of new materials and by using ready-made parts made of recycled

materials in the form of new materials and ready-made parts or for other uses.. The construction method of any new device should be in order to maximize the efficiency of the building texture in order to conserve resources in future operations. In this context, existing building reserves should be considered as an important resource.

The Law of Renewable Resources: In sustainable design, renewable resources should be used as widely as possible . Renewable energy is a source of renewable resources that cannot be quickly replaced. Many renewable energies such as wind energy, photovoltaic systems, solar thermal systems for heating water, heat pumps with a ground source for heating and cooling, etc. have been increasingly used in recent projects [13-14].

3.4 Using the available energies as a source of energy using local materials and workers

This is the principle of location-based design, which means designing a design based on the principles of sustainability using local energy as an energy source, using local materials and workers in construction, and respecting the region and culture. Adopting a passive design strategy is recommended. Usually, our understanding of the principles of passive design is the creative use of building planning to connect buildings to their environment and climate. [15].

Considerations related to the construction of buildings should be considered in sustainable design. Based on the functional analysis and the main possibilities for the flexibility of buildings and their surroundings at a certain point in time, it is important to give a human spirit to the built environment by designing buildings that are in harmony with their texture and strengthening the sense of locality.

4. Conclusion

Sustainability architecture is defined by the sustainable development of the economy, society, environment, and at the same time architecture itself. Sustainability in architecture originates from sustainable design, which is a dynamic and living process. To understand the mechanism of the sustainable design process , the triple model of sustainability can be used. The principles and factors that should be considered in sustainable design have been investigated in this paper. To achieve a mechanism of less consumption and greater productivity from nature, you can use smarter ways to exploit natural resources instead of using them indiscriminately. And by optimizing processes and using sustainable technologies, you can increase resource efficiency. For example, using solar systems to generate energy such as solar panels. And the conservation and protection of natural resources and the environment plays an important role in achieving sustainability. This includes preserving forests, reducing air and water pollution, and supporting biodiversity. According to these methods and according to the triple sustainability model , you can improve the sustainable design and achieve the mechanism of lower consumption and higher efficiency than nature. Therefore, designing systems and processes in a way that provides flexibility and diversity in the face of environmental and economic changes can contribute to sustainability. For example, the use of flexible production systems that can be adapted to different conditions and the establishment of cooperation with different individuals, organizations, and communities in order to achieve sustainable goals can have a great impact. exchange of knowledge, resources, and experiences.

Due to these methods, you can implement a sustainable design that contributes to the mechanism of lower consumption and higher productivity than nature, achieving economic, social, and environmental sustainability. In this regard, sustainable design, which is very different from traditional design, may be focused design, high-efficiency design, smart design, appropriate design, and interdisciplinary cooperation that has been moving forward.

Countries like China pay a lot of attention to buildings with minimal greenhouse gas emissions. The National Green Building Assessment Standard[2] was published in 2006, and many green buildings were built, among which the China Expo Mansion [3]in Shanghai, China, which was built in 2010, and the twin towers connected to the pool in Singapore[4]in 2015.The texture of this residential complex is reminiscent of the structure of the mountainside and provides good ventilation and lighting due to the fact that it has a suitable and multiple orientations. And the sustainable mixed-use complex was built by Vincent Calbat in Egypt in 2019 These complexes have green roofs and are covered with solar panels to absorb maximum energy from the environment, examples of these buildings are examples.

References

1. Hosseini Mand, Negin .(2013) Design of a 30-unit residential complex with a green architecture approach in Tabriz (M.A., Architecture).
2. Darban, Ali, (2018), Green Architecture: A Step Towards Sustainable Architecture, Journal of Architectural Studies, No. 5.
3. Smith PF.(2010), Building for a changing climate. London:Earthsean.
4. Dawe, N. K., & Ryan, K. L. (2003). The faulty three-legged-stool model of sustainable development. Conservation Biology : the Journal of the Society for Conservation Biology, 2003(17), 1458–1460.
5. Zandieh, Mahdi, Parvard-e-Nejad, SamYara. (1389),Sustainable Development and Its Implications inIran's Residential Architecture, Housing and Village Environment, Vol. 29, No. 130, 1-22.
6. Sami, S., Gholizadeh, M., & Deymi-Dashtebayaz, M. (2024). An applicable multi-generation system for different climates from energy, exergy, exergoeconomic, economic, and environmental (5E) perspectives. Sustainable Cities and Society, 100, 105057.
7. .Mirza Mohammadi, Ahmad, (2018), Designing a Residential Complex with Energy Conservation with Respect to Green Principles, Green Architecture Quarterly, No. 10.
8. Shaykh LuYi Bonab, Shaghaghi, Shahryar. (2023). Principles and Strategiesof New Construction Methods in Architectural Integration with an Emphasis on Buildings Built with Construction Technology. Journal of Islamic Art Studies, 20(50), 411-427.
9. Spinks, M. (2015). Understanding and actioning BRE environmental assessment method: a socio-technical approach. Local Environment, 20(2), 131-148.
10. Yari Boroujeni, S., Bahramian, & Armin. (2020). Achieving Environmental Sustainability in Today's Housing throughPhysical Medicine. Journal of Environmental Science and Technology, 22(5), 377-389.
11. Tom, W., Hugé, J., Verbruggen, A., & Wright, T. (2011). Sustainable development: A bird's eye view. Sustainability, 3, 1637–1661. https://doi.org/10.3390/ su3101637https://www.mdpi.com/2071-1050/3/10/1637.
12. Iclodean, C., Varga, B., Burnete, N., Cimerdean, D., & Jurchiș, B. (2017). Comparison of different Battery types for electric vehicles". IOP Conf. Series: Materials Science and Engineering 252012058.
13. Alizadeh Nazila, Ebrahimi Kimia, Badri Asl Shirin. (2021). Principles Used in Building Design Based on Zero Architecture.
14. Yazdanpanah Mohammad, Joneidi A. (2021). (2020). Sustainable Architecture with a Renewable Energy Approach.
15. Taleghani, A., Kaboodar A. (2020). (2017). Investigating the Role of Recycled Materials in Architecture asa New Method in Environmentally Compatible Design. Elites of Science and Engineering, 8(2), 135-145.

[2] GB/T50328-2006
[3] Expo's China
[4] BISHAN CENTRAL CONDOMINIUM