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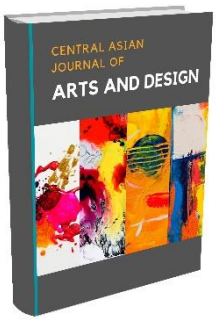

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A REVIEW OF SUSTAINABLE ARCHITECTURE TERMINOLOGY: HOW CAN IT BENEFIT THE USE OF SUSTAINABLE PRACTICES IN UZBEKISTAN

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Abstract: *In recent years, Uzbekistan has made significant progress in embracing sustainable architectural practices. However, the country's experience and practices are still young compared to Western countries. Therefore, it is essential to explore and understand sustainable architecture terminology and practices to achieve long-lived progress. This paper employs a systematic literature review methodology to analyze and synthesize existing sources (books, journals, etc.) on sustainable architecture. The review will pinpoint various labels of sustainability, such as 'green', 'ecological', 'energy-conscious', 'environment-conscious', 'passive' and 'solar'. Further, the paper will discuss the definitions of these labels and their practical applications in building designs. It will also identify and evaluate the benefits and limitations of each label.*

A thorough understanding of these labels can benefit the architects, engineers and designers in Uzbekistan in creating more sustainable buildings that are energy-efficient, cost-effective and environmentally friendly. Moreover, it can address the knowledge gap between Uzbekistan and Western countries and help bridge between those countries regarding sustainable architectural practices. It can also be beneficial in founding a common language and understanding, which can promote effective communication and collaboration among architects, engineers, designers and policymakers. The analysis of sustainable architecture terminology can encourage the development of sustainable building codes as well as the construction practices in Uzbekistan. Finally, it can raise awareness among the public about the significance of embracing a sustainable way of living and its potential future benefits.

Keywords: *Sustainable Architecture, Sustainability, Uzbekistan, Terminology, Benefits.*

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Introduction

Uzbekistan has adopted a sustainable approach in various architectural projects starting from the late 2000s. This search for sustainable architectural solutions takes place predominantly in rural areas of the country, rather than big cities such as Tashkent and Fergana. Rural areas are home to around 16.8 million people or about half of the nation's population. Energy shortage and infrastructure problems negatively affect the living conditions in the rural areas of the country and disrupt the socio-economic balance at a level that causes an intense migration from rural to urban areas in Uzbekistan [1]. From this perspective, the decision to make sustainable investments in rural areas of Uzbekistan is quite logical. However, considering the geographical location of Uzbekistan and the shortage of water resources; the devastating potential effects of the global climate crisis do not only affect the rural areas but also the major cities. Therefore, a holistic sustainable approach should be applied throughout the country. Since the sustainable architectural studies in the country are still new, the sustainability repertoire that Western countries have accumulated for decades can be utilized and sustainable architectural solutions suitable for the geographical, social and cultural characteristics of Uzbekistan can be determined from among a large number of solutions. The first step of this process is to get acquainted with popular labels of sustainable architecture terminology. Therefore, this paper aims to present various labels of sustainability, such as 'green', 'ecological', 'energy-conscious', 'environment-conscious', 'passive 'and 'solar' and discuss their practical applications in building designs. The paper discusses the sustainable architecture terminology by incorporating a literature review methodology to analyze and synthesize existing sources (books, journals, etc.). It identifies the possible benefits or limits of integrating each sustainable architectural method into building practices in Uzbekistan.

1. Sustainable Architecture Terminology

Sustainable architecture or sustainable design has several labels such as 'green', 'passive' and 'solar'. Although, the employment of these labels indicate a discernment of sustainable architectural design as a rule, they differ from each other with their approaches and techniques in architectural applications.
The term green architecture or green design refers to buildings that are less harmful to the environment compared to buildings that are built with traditional construction techniques [2-3]. The green buildings give importance to the aspects of sustainability, such as water conservation and energy efficiency [4]. In terms of energy use, green buildings benefit from renewable energy sources, such as geothermal, wind, sun and ocean and tidal waves [5]. Therefore, the green design approach significantly relies on the conscientious handling of natural resources [6]. How these natural materials will be used is directly related to the conditions of the natural environment in which the architectural design will take place and the natural (sustainable) resources it contains [7].

In addition to minimum negative environmental impact and the use of sustainable resources; another important principle of green design is that it offers health benefits to building occupants by maintaining a high comfort level and indoor climate [8] and can meet the highest aesthetic and architectural standards [9]. Besides the environmentally-conscious path, a green building should take into account social and aesthetic requirements. In other words, the building should be 'meaningful to people' [10]. First, as people

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are social creatures, they also associate themselves with the situations that affect their families and friends [10]. Therefore, when a green building project has a positive affect on its occupants' health and well-being, it can lead to a further demand to transform the non-sustainable built environment of the whole community and extensive appreciation of a green building approach. Second, a green building should meet the aesthetic requirements as well as its technological and physical abilities to be environmentally sustainable. Even though the green design has won support in the political and commercial spheres, it still has a bad reputation in the aesthetic realm, which was associated in the public eye with 'uninspired designs that put environmental concerns far ahead of artistic ones, creating what some critics dubbed the curse of eco-banality' [11]. Therefore, green buildings should pay attention to aesthetic values as well as to use energy-efficient and sustainable technologies. Because in order for a building to be rented or sold, potential buyers should find the overall architectural design aesthetically pleasing [12].

Looking at these definitions of green architecture, it can be argued that the label 'green' is interchangeable with the label 'sustainable' when it comes to architecture. Because green architecture does not simply define green roofs or facades. It rather describes an overall understanding that aims to have a minimum harmful effect on nature. However, the term 'sustainability' also refers to a building's relationship with the local ecosystem. Therefore, the understanding that proposes the use of natural and biodegradable materials to protect the natural ecosystem and reduce the negative impact of the carbon footprint produced by the built environment is explained by the term 'ecological design' or 'ecological architecture'. Similar to the environment-conscious approach, ecological design aims to blend in with the natural landscape. It adopts the principle of making minimum visual impact on the ecosystem by avoiding large-scale and bulky architectural structures.

The focus of energy-efficient or energy-conscious design is to minimize the energy requirement for the operation of mechanical systems such as heating, cooling and ventilation of buildings. This approach utilizes high-tech building materials and systems to reduce the carbon footprint produced by the built environment. It incorporates solar panels to generate on-site energy. Therefore, the solar design is an aspect of energy-efficient design. Solar architecture involves all types of solar technologies to produce energy from the sun and also reduce the reliance of a building on non-renewable materials, such as fuel oil and gas to operate.

Passive architecture is a design strategy that has been used for centuries. Even before the discussions of sustainable architecture started in the 20th century, passive architectural design examples were made with a tradition, knowledge and experience passed down through generations. The main idea of this approach is to design buildings that benefit from the characteristics of the natural environment [13]. Using passive design strategies such as the orientation of the building, dimensions of windows and doors, and selecting natural and readily-available construction materials; buildings get the maximum benefit from natural sources.

There is not much possibility to implement a completely natural approach in urban environments, therefore those principles are rarely realized in their pure forms [13]. Even though there are no technical

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obstacles to realize green projects, the fact that they are not widely implemented and appreciated can be explained by the lack of information in the differences between the concepts of green and pseudo green, which results in the fake display of sustainable architecture [13-14]. The so-called green projects turn out to be 'not green enough', even harmful to the nature and their occupants' wellbeing because of the selection in their materials or their applications.

However, architects and engineers can still benefit from the knowledge and experience gained by already-implemented sustainable projects in other countries. They can extend their knowledge in sustainability by following the successful practices in previous projects, and they may also learn from their mistakes so as not to repeat them in their future projects.

3. Examples of Sustainable Architectural Design

Sustainable architectural approaches have gained popularity and support from the political spheres in several foreign countries. For instance, UAE have applied a significant number of sustainable design projects both in urban and rural areas. Uzbekistan has continental climate but it also has hot and dry summers like UAE. Therefore, concerning the geographical and climatic resemblances with Uzbekistan, four sustainable architecture examples will be presented from UAE in this chapter. Also, one example for ecological architecture will be discussed from Mexico, Mexico City.

UAE has an arid climate and predominantly relies upon natural resources to maintain their building systems. Therefore, the country heavily invests in sustainable solutions in architecture and follows different approaches in each project. For instance, the Lattice-Domed Parliament Building in Abu Dhabi incorporates a passive solar approach [15]. The design of the outside layer is in lattice-form, inspired by the oriental geometric motifs in Islamic architecture. This lattice acts as a shading element and generates a microclimate that makes the project energy-efficient and sustainable.

Abu Dhabi also hosts Siemens Headquarters, which is acknowledged as one of the benchmarks for sustainable architectural projects in the Middle Eastern geography. The project utilizes passive strategies, such as designing the ground floor with semi-open spaces that helps fresh air circulation throughout the area and creates shafts so that hot air can rise and leave the building naturally. The facade is comprised of shading elements which are calculated and mounted according to the angle of incidence of the sun's rays. Siemens Headquarters achieved one of the first LEED platinum ratings of Abu Dhabi by offering a sustainable design at the same price per square meter as a typical Middle Eastern headquarters [15].

There are other examples of sustainable projects in UAE, not only at an individual building scale, but also at the city scale. The Sustainable City project in Dubai covers over 46 hectares of land and hosts a huge mixed-use community by embracing various sustainable design concepts [15]. The city is divided by a 'spine' which consists of 11 bio-dome greenhouses. These structures have a capacity of 3.000 square meters of urban farming by using recycled greywater for irrigation purposes and by making use of the

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solar panels for producing energy on-site. The project brings a green and sustainable way-of-living with its net-zero energy consumption strategy.

The concept of zero-energy consumption also appears in the Masdar City project in Abu Dhabi. The idea for Masdar City was first brought forth by Sheikh Khalifa bin Zayed Al Nahyan, the President of the UAE in 2006. Foster + Partners, the British architectural firm is responsible of the design of the city, while the development is achieved by Masdar, a subsidiary of the Abu Dhabi government-owned enterprise. Masdar City aims to achieve zero-carbon and zero-waste status by incorporating several sustainable features in its design. The project comprises of a huge solar farm to provide electricity for the whole city and green buildings which utilize sustainable construction materials to meet LEED certification standards. The project promotes sustainable transportation by maintaining a pedestrian-friendly approach. It offers narrow streets with shading elements to promote walking. The Masdar City project is still under development and it is planned to be completed in 2025. However it has already become a hub for sustainable technology and research. Masdar Institute of Science and Technology carries out research in renewable and sustainable energy. Masdar City also hosts the World Future Energy Summit every year, and brings together scientists and engineers who research on sustainable energy from all around the world.

While UAE shows great interest in sustainable architectural projects, there are an abundance of green projects all over the world. For instance, Chapultepec Environmental Culture Center in Mexico City carefully integrates the existing vegetation and topography with a pavilion surrounded by set of gardens [16]. The project offers the experience of urban forest with its concentric spiral-shaped pedestrian roads that mimic the topographical features of the site. Those ‘biocultural walks’ are designed to lead to the Center for Environmental Culture: a cultural hub conceived as an open public space where visitors can experience an intimate relationship between nature and new cultural and environmental dynamics. The Center comprises of an open-air circular plaza and an Environmental Pavilion. It promotes environmental culture by hosting exhibitions on that issue. The project aims to reduce its carbon footprint and its impact on the environment by incorporating environmentally friendly materials and construction systems.

2. Final Discussions

Uzbekistan has a high level of irradiation, which makes it an ideal location for solar power generation. Therefore, integrating solar panels into building designs can help reduce the reliance on fossil fuels while operating building systems. Solar design strategies can be used for generating power for building systems such as, heating, cooling and lighting. The excess energy produced by the solar power can be stored in the grid to be used later.

However, the initial costs for solar systems can be expensive. The installation and maintenance of these systems also require expertise which may be difficult to provide in certain regions. Therefore, integrating solar design panels into buildings which are planned using passive design strategies can create a more successful result in achieving sustainability.

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Uzbekistan is a double landlocked country with a continental climate, which is characterized by cold winters and hot summers as well as extreme fluctuations in the heat between day and night, regardless of the season. By adopting a passive design strategy, a stable indoor temperature can be maintained without the need of mechanical heating or cooling systems. This can be accomplished by adjusting the orientation of the building, together with its architectural elements such as doors and windows to provide natural ventilation, cooling, heat storing and shading. Minimizing the reliance on non-renewable energy sources, thus will help reduce the energy costs and greenhouse gas emissions. This is especially important in areas with limited energy resources, which is the case for Uzbekistan.

As discussed before in chapter 2, passive architecture approaches have been used for centuries with the know-how of past civilizations. Uzbekistan has a rich history of architecture so the experts can benefit from the construction knowledge and repertoire of historical buildings in the country. Those buildings, especially civil structures which have survived until today can offer excellent passive design solutions. Studying and analyzing the local architectural typologies, building orientations, wall thicknesses, door and window dimensions, together with traditional construction techniques of historical buildings can help today's architects and engineers better understand the sustainability in architecture as well as combine this knowledge with the green technology of today's world. Making use of the historical experience in building construction can also lead to establishing well-defined sustainable building codes and practices in Uzbekistan and a wide public appreciation of a sustainable way of living.

5. Conclusion

By the year 2023, sustainable architecture practices are still new in Uzbekistan. However, the country can benefit from the wide repertoire of sustainability, mainly established by Western countries. By studying the sustainable architecture terminology and analyzing the already-implemented projects, Uzbekistan can establish a common language and understanding to promote effective communication and collaboration among engineers, architects and policymakers. Finally, it can lead to public awareness of the future benefits of a sustainable lifestyle.

References:

1. UNDP (2015). Project Identification Form (PIF), *Market Transformation for Sustainable Rural Housing in Uzbekistan (Project Title)*, p.5.
2. The David and Lucile Packard Foundation (2002). Building for Sustainability Report, October 2002, p.9.
3. Stang, A. & Hawthorne, C. (2005). The Green House: New Directions in Sustainable Architecture. Princeton Architectural Press, New York, p.12.
4. Bauer, M., Mösle, P. & Schwarz, M. (2010). Green Building - Guidebook for Sustainable Architecture. Springer-Verlag, Berlin Heidelberg, p.7.
5. Clark II., W. W. (2010). Sustainable Communities Design Handbook: Green Engineering, Architecture and Technology. Elsevier, Burlington, MA & Oxford, UK, p.14.

E-mail address: editor@centralasianstudies.org
(ISSN: 2660-6844). Hosting by Central Asian Studies.

6. Bauer, M., Mösle, P. & Schwarz, M. (2010). Green Building - Guidebook for Sustainable Architecture. Springer-Verlag, Berlin Heidelberg, p.20.
7. Ibid, p.100.
8. Henderson, H. (2012). Becoming a Green Building Professional, John Wiley and Sons, Inc., Hoboken, New Jersey, p.35.
9. Bauer, M., Mösle, P. & Schwarz, M. (2010). Green Building - Guidebook for Sustainable Architecture. Springer-Verlag, Berlin Heidelberg, p.8.
10. Clark II., W. W. (2010). Sustainable Communities Design Handbook: Green Engineering, Architecture and Technology. Elsevier, Burlington, MA & Oxford, UK, p.41
11. Stang, A. & Hawthorne, C. (2005). The Green House: New Directions in Sustainable Architecture. Princeton Architectural Press, New York, p.15.
12. Bauer, M., Mösle, P. & Schwarz, M. (2010). Green Building - Guidebook for Sustainable Architecture. Springer-Verlag, Berlin Heidelberg, p.82-83.
13. Lányi, E. (2007) "The basic principles of sustainable architecture", Periodica Polytechnica Architecture, 38(2), p.80. https://doi.org/10.3311/pp.ar.2007-2.06
14. Mahdavinejad, M., Zia, A., Larki, A. N., Ghanavati, S., & Elmi, N. (2014). Dilemma of green and pseudo green architecture based on LEED norms in case of developing countries. International Journal of Sustainable Built Environment, 3(2), 235–246. doi:10.1016/j.ijsbe.2014.06.00
15. <https://www.re-thinkingthefuture.com/2020/10/10/a1834-10-of-uaes-most-sustainable-buildings/> Date of Access: 12/05/2023.
16. <https://www.archdaily.com/998142/chapultepec-environmental-culture-center-erreqerre-arquitectura-y-urbanismo> Date of Access: 12/05/2023.

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