

# RECOGNITION OF SUSTAINABILITY CONCEPTS; A REQUIREMENT FOR INTEGRATING TRADITIONAL IRANIAN ARCHITECTURE WITH APPLICATION OF MODERN ARCHITECTURAL TECHNIQUES

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## ABSTRACT:

In order to create a balance in the environment and reduction of deleterious effects of fossil energy consumption of the Earth, modern strategies for continuity and sustainability of the environment and energy saving that is the primary prophecy of sustainable development, has been presented. Strategies used in the traditional Iranian architecture are the origins of the environmental sustainability principles in different climates. This strategy has been changed during the time and has the disadvantages of using local material construction. In this article, we try to use modern and technological techniques by integrating natural energies and design according to the climate of the area, which they are the nature of the traditional architecture with the contemporary sustainable architecture of the west. After that, we can lead the contemporary architecture of Iran to the sustainability. This study is descriptive and analytical. It uses publications, articles, books, and electronic resources information to gather. Finally, by integrating these methods used in the contemporary sustainable architecture in the West (especially United States of America) with traditional Iranian architecture we can provide a list for architecture and urban design to advance humanity toward the sustainability.

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## KEYWORDS:

Efficient Energy Consuming, Renewable Energy, Sustainable Architecture, Traditional Architecture.

## INTRODUCTION

Due to uncontrolled population growing, today's man needs to have indiscriminate use of energy and natural resources, while the nature of the service will not going be uninterrupted. The largest amount of energy wasted due to the lack of structural coordination of spaces with continental conditions, which leads to environmental pollution. The most important goal of sustainable architecture is to protect the environment and therefore paying attention to the energy consumption and continental elements should be at the top of human activities.

In this paper, we first describe the concepts and principles of sustainable architecture and traditional Iranian architecture, which had all indicators of the sustainable architecture in the past. Then some examples of sustainable architecture in the West will be introduced. These samples minimize the utilizations of natural energies by maximum utilization of continental conditions and existent elements. Nowadays we can mention the

sustainability strategies in traditional architecture by returning to the application techniques, efficient usage of energy and coordinating to the continental conditions. We can design these patterns for our country, so we can use the sustainability elements (building form, continental conditions of environment, etc.) to protect the natural energy. The overall objectives of this study outlined as follows:

- Identify indicators of sustainability in traditional Iranian architecture
- Identify indicators of sustainability in West contemporary architecture with an analysis of the sample
- Integrating traditional Iranian architecture patterns with contemporary sustainable architecture and using the modern technologies.
- At last, provide an application diagram for designers, architects, and urban planners.



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## Historical background

When human race came out of the cave, he needed a safe shelter that protects him from heat, cold, so it is natural that the house is the oldest building. The remains of old settlements and traditional buildings show that materials used in these building can be found in the nature, so the type of architecture has inevitably complied with it. Fire discovery and making tools were two important phenomena that dramatically changed the face of human life because these tools had an effect on carving and forming the stone, changing the shape of the surrounding and constructing the settlements and fire made the place warm and brought some developments. With the beginning of Iron Age and the acquisition of a human to the variety of fossil energy with the widespread application of them, the relationship between human race and the nature have changed. In many fields human, will conquest the nature. As a result, Industry Age let human extends the destruction more and more. The nature cannot retrieve it. AS it is clear, this age has two main crises, one of them is biological environmental problem, and the other one is energy, while it should inevitably extend [1].

To respond to this crisis and continue the process of development, many viewpoints and theories have been found. The most important of these viewpoints are sustainable development. Brantland gave a definition for it: "A way of developing that provides the requirements of the society and simultaneously do not reduce the capability of the future generations [2].

This concept during the 1980s and from the time of a global strategy to protect natural resources or the overall goal of achieving sustainable development through critical resources by International Union for Conservation of Natural Resources (IUCN) was seriously considered as the first sustainable development report of "Brant land" that was introduced in 1987. The report as our common future includes a set of proposed legal principles for achieving sustainable development in developing countries. The agenda 21 published in 1992. According to the document, planning system and urban design introduced as one of the important mechanisms for the pursuit of sustainable development. Therefore, architecture and urban designers have set their agendum into the sustainable architecture in the city [3].

## DEFINITION OF SUSTAINABILITY

### Sustainability in dictionary

In Dehkhoda dictionary, it defines as durable and lasting [4]. In Persian Dictionary (M. Moin, no.20) it means resilience. The definition for an adjective "Sustainability" is Stable, lasting and resistance [5].

The Latin root of the verb Sustain is Sustainer. It consists of two parts. One of them is "sub" and it means "from the bottom to top" and Tenure which means keeping or maintaining. It has been used in

English from 1920 [6]. This verb combined with some meanings such as "supporting, lasting". An adjective "sustainable" describes "a situation or state of something" that is supported.

Therefore, the word "sustainability" means stable and maintenance. It means something that can be continued in future [7].

### Definition for Sustainability Development

Sustainability development includes management and correct utilization of natural, financial and human resources to achieve to the appropriate patterns of consumption by using technical equipment to eliminate the requirements in order to be satisfied. The word sustainability itself means eliminating the requirements [8].

A most usual definition is the one that WCED introduced. This organization described it as a development that provides the individual requirements of this generation, without any injury to the future one. According to this definition, before each society can achieve the sustainability, it should provide justice between generations [9].

Another definition: Sustainability development means development. It is the product of a comprehensive stable process, which coordinates all the social and cultural aspects of each society [10].

Global Bank gives another definition for sustainability development: "A development which is lasting" [11].

### Sustainable Architecture

This architecture related to 19 century. John Ruskin, William Morris, and Richard Letha by are the pioneer of this method of architecture. Ruskin mentioned in his book "Seven Torch of Architecture", that for achieving the development and growth, we could use the discipline harmonic pattern of a nature. Morris suggested that we could use the areas of the suburbia and reusing local industries. The goal of designing the sustainable building is reducing their environmental damage. They can effect on the utilization of the natural resources and energy. It includes these rules:

- Reducing the consumption of non-renewable resources
- Developing a natural areas
- Reducing or eliminating the consumption of poisons or the materials, which damage the building industry [12].

### Principles of Sustainable Architecture

Some principle needs to be followed in order to have sustainable buildings. These principles are [13]:

- Maintaining energy
- Coordinating with the continent
- Reducing the consumption of new resources
- Providing the requirements of the settlements
- Coordinating with the site
- Holism.



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## Patterns of Sustainable Architecture

We have three main pillars in the definition of sustainability:

- Increasing the level of life and health quality (This generation and a future)
- Providing the routine requirements of human
- Maintaining the ecological systems and energy resources

A general goal of the sustainable design of the buildings is reducing the effects of building on the environment by correct utilizing of energy and natural resources. A sustainable design can also achieve the aesthetic, biological environment, social, economic, ethical, and moral values. Therefore, we can present the following patterns in the sustainable architecture:

- Minimizing the utilization from non-renewable resources and using natural and renewable energies.
- Rising the quality of biological environment and extending natural one
- Eliminating or minimizing the consumption of poisoned and unclean materials.
- Maintaining a cultural and ethnic Identity
- Promotion of a healthy life
- Advised usage of the land and coordinating the form of the buildings with the biological environment
- Economic construction by using alternative efficient technologies

- Preventing from noise and air pollution

Therefore, a sustainable architecture can help to have a healthy environment based on utilization of the resources, maintenance of non-renewable resources, reducing the renewable energy consumption and raising the quality of life [14].

## Traditional Iranian Architecture

Traditional Iranian architecture especially traditional houses in the warm and dry areas or cold zones of Iran get their rhyme from natural blessing. These areas try to utilize all the natural resources without damaging the calmness of the life. [15]. Having standard architecture with continental factors can be seen in all parts of our country, such as urban spun, type of materials or in general in architecture and urbanity of Iran.

In the center parts of Iran, especially deserts, such as Yazd, Isfahan, Kashan, etc. are the best samples of original architecture and urbanity. They have the most homogeneity with the cultural, religious, social, and natural floors.

We can review and recognize the most of the concepts and characteristics of the sustainable development and architecture, which discussed, nowadays in our ancient history of architecture and urbanity.

In this section, sustainable elements and their use in traditional Iranian architecture briefly summarized in a Table 1.

Table 1: Environmental Elements in Traditional Architecture

SUSTAINABLE ELEMENTS OF IRANIAN ARCHITECTURE	DEFINITION	APPLICATION	CONTINENT
Windward	A cooling to a system that provides air conditioning by using renewable energy wind Using wind to bring a well air to the building. Using suction to push the warm air and pollutants.	Use of cooling system Air Conditioning	Warm and dry climates. Warm and humid climates.
Ditch garden	Space in the central courtyard	Use thermal capacity of the soil Proper use of water and plants	Warm and dry climates.
Seraglio	Basement or cellar - Sometimes fills the whole area under the floor. Sometimes its roof is one meter above the surface of the yard. In wet areas, it provides a cool atmosphere.	Using the thermal capacity of the soil in different seasons Use the thickness of the pier of the wall	Warm and humid climates.
Veranda	It is eaves that the wall exists on both sides of it. Semi-open spaces in the form of columns that are next to the rooms.	Control the depth and amount of solar radiation	Warm and humid climate mild and humid climate
cathedra	These rooms are built in the winter part. At the corners of these rooms you cannot see a lot of doors and windows in order to keep the rooms warm in winters.	Use the thickness of the pier of the wall Efficient use of solar thermal energy in different seasons	Cold and mountainous terrain climate
Roof	In traditional architecture, in addition of complex and beautiful volumes, is sometimes used as a yard.	Prevention of direct sunlight directing rainwater (Roof)	Roof in mild and humid climate Dome Roof in warm and dry climate



**Western Contemporary Architecture Based on the Principles of Sustainability**

In this section, in order to achieve a desirable sustainability outcome, efficient solutions introduced, such as reviewing some of the reliable models of sustainable architecture projects in the United States which following the principles of sustainability in their works. These projects selected because of their similar characteristics to the Iran's vernacular, and sustainable architecture.

**CDC Division of Laboratory Sciences**

Architect (s): Perkins + Will Architects  
 Building Location: Atlanta, Georgia  
 Completion Date: June 2007  
 Building Type (s): Laboratory



**Fig 1:** CDC Division of Laboratory Sciences: Courtesy of Perkins + Will.

Sustainability strategies employed in this building:

- Equipped with Water conservation systems. (Collecting water in cistern and seep into the ground to irrigate the landscape.)

- Used renewable materials, like bamboo.
- Recycled more than half of construction wastes.
- Using solar energy.
- Sixteen foot (4.80 meter) high ceiling allows sunlight to extend deeper into the lab rooms.
- Equipped with brise-soleil (sun shading device) to prevent excessive sunlight in summer time.

Each year, this building saves about \$ 175 thousand in energy costs (USGBC Guide). For more information, please go to the Table 2.

**Z6 House**

Architect(S): Ray Kappe Architects  
 Building Location: Santa Monica, California  
 Completion Date: August 2006  
 Building Type(S): Residential (figure 2)



**Fig 2:** Z6 House Source: Courtesy of Ray Kappe Architect.

Table 2: Survey of Sustainable Building Design

SYSTEM CLASSIFICATIONS	EXPLANATIONS	CHECK STATUS
Sustainable sites	Strategies used to reduce the effects of construction on ecosystems and natural sources	Met: Not Met
Water Efficiency	Promoting right methods of using water to reduce drinking water consumption	Met: Not Met
Energy Conservation	Promoting the use of renewable energies instead of fossil fuels	Met: Not Met
Energy and Atmosphere	Raising the energy performance of the buildings through innovative strategies	Met: Not Met
Materials and Resources	Encourage the use of environmentally friendly building materials and reduce wastes	Met: Not Met
Indoor Environmental Quality	Improve indoor air quality and natural light entering the building	Met: Not Met
Recycle	To encourage recycling of construction waste and use of recycle materials in construction	Met: Not Met

Sustainability strategies employed in this building:

- Using solar hot water heater. This heater also contributes to warming the house by powering the radiant floor heating systems

- Special glazing system used on the building's facade to allow winter sun to warm the house effectively [16].

- Window orientation; ventilation in the building structure allow breezes to cool the house.

- Using balconies to provide significant shading for hot days in summer.
- Green roof (a specification of a green roof is to absorb rainwater, providing insulation, and helping to lower the air temperature).
- Gray water (collecting and reusing wastewater generated from the showers and baths for landscape irrigation).
- Selecting materials made from recycled products, such as tiles and counter tops.
- Used cork for the floors instead of wood for protection of trees [17].

### Factor 10 House

Architects: Esherick Homsey Dodge and Davis  
 Building Location: Chicago, Illinois  
 Completion Date: August 2003  
 Building Type: Single family house  
 For more information, please see figure 3.



**Fig 3:** Factor 10 House Source: Courtesy of Dodge and Davis.

Sustainability strategies employed in this building:

- To improve the building's ventilation, this house is equipped with "Solar Chimney", this system composed of a vertical shaft utilizing solar energy to enhance the natural ventilation throughout the building.
- Solar chimney has been in use by Persian's in Middle East and Near East and by Roman's in Europe within centuries.
- The house insulation mostly made from recycled material
- Incorporated "fly ash concrete" in this building's foundation. (Fly ash is a byproduct of coal combustion. Fly ash produced by coal combustion, generally captured by electrostatic precipitator equipment to produce Portland cement.)
- Carpet flooring consists of recycled materials such as recycled plastic bottles.
- The Architect of this building claims, the structure consume only one-tenth of the environmental resources that the average building uses. (The reason why this building named "Factor 10 House") [18].

### Adam Joseph Lewis Center for Environmental Studies

Architects: McDonough and Partners

Building Location: Oberlin, Ohio  
 Completion Date: January 2001  
 Building Type: Educational  
 For more information, please see figure 4.



**Fig 4:** Adam Joseph Lewis Center for Environmental Studies Source: Courtesy of McDonough and Partners

Sustainability strategies employed in this building:

- Minimized water consumption with a system called "The Living Machine". (This machine treats and purifies the water so it can be reused for the toilets).
- This building equipped with Photo Voltaic (PV) system located on the roof. This system utilizes solar energy and reduces the building's reliance on fossil fuels or coal fired power plants. (In this case, the energy produced by the sun is greatly more than building needs.)
- Geothermal Wells used to heat and cool the building [19].

### Solar Umbrella House

Architects: Brooks and Scarpa Architects  
 Building Location: Venice, California  
 Completion Date: 2005  
 Building Type: Residential  
 For more information, please see figure 5.

Sustainability strategies employed in this building:

- Solar panels contribute to heat water for the hot water supply
- The structure allows significant use of daylight, so artificial lights are not necessary during sunny days.
- Used recycled materials for building renovation, such as 50 percent fly ash concrete, and recycled mild steel.
- 80 percent of the water that does not enter the ground it will enter into the water retention system to collect the water in the basin to reuse for irrigation purposes.
- Umbrella like PV panels covered the entire exterior facade of the building. The PV panels will prevent direct sunlight and therefore less energy is required to cool the building [20].



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**Fig 5:** Solar Umbrella House Source: Courtesy of Brooks and Scarpa Architects

### Lake View Terrace Library

Architect (s): Fields Devereaux Architects and Engineers

Building Location: Lake View Terrace, California

Completion Date: June 2003

Building Type(S): Library. For more information, please see figure 6.

Sustainability strategies employed in this building:

- This building uses wind energy rather than fossil fuel energy
- Windows designed for this building lies along an east-west axis, which takes full advantage of daylights, and minimizes the need for artificial lights during the daytimes.
- Suitable structure to allow ventilation to keep the building cool [21].



Fig 6.

### Colorado Court Affordable Housing

Architect(S): Lawrence Scarpa Brooks and Scarpa Architects

Building Location: Santa Monica, California

Completion Date: 2002 Building Type(S): Residential

In this district of Santa Monica, California, where the cost of living is very high, city officials have been seeking ways to help low income people live in this area. This building equipped with two different energy generator systems. (Energy needed for these generators, supplied with PV panels). For more information, please see figure 7.



**Fig 7:** Colorado Court Affordable Housing Source: Courtesy of Brooks and Scarpa Architects

Sustainability strategies employed in this building:

- Fuel of natural-gas turbine cogeneration system, is supplied with recycled materials
- Heat obtained from the combustion of fuel, is converted to electric or mechanical energy, while the exhaust heat utilized as an energy source to produce steam. Produced steam used to operate air conditioners and, since the system's CO<sub>2</sub> discharge is lower, it contributes to reduce environmental burden.
- Building window placements keeps the building cool in summer with natural ventilations.
- Lights turn off in an unoccupied room by the use of motion sensors (for energy conservation purposes.)
- Equipped with water collection systems for efficient use of rainwater.
- Used recycled concrete (Concrete used in this building, partially consists of fly ash.)
- Recycled newspaper used for building insulations (USGBC Guide).

### CONCLUSION

With an overview of Iran's vernacular and traditional architecture, we realized that the predecessors also followed the principles of sustainability by utilizing natural airflow, solar energies, used endemic materials compatible with the local environment, proper orientation of buildings, proper use of water and vegetation, using the heat capacity of the soil, etc. In addition, they have achieved to create elements, consistent with the climate for energy conservation, least impact to the environment. To generate new patterns of sustainability inspired by past techniques and



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environmental elements simply we can follow the world's modern and up-to-date technologies and recognize the traditional architecture concept used in Iran. Evaluating some of specific buildings, built in the United States, introduces new strategies to deal with environmental and energy crisis and insists to use clean and natural energies, such as ecological design and prefer to use natural energies instead of fossil fuel. For Example, use of recycled materials, insulation, pay attention to the window orientations, taking advantage of rainwater and reusing it for other purposes, using solar panels, covering building exterior facade with vegetation (living facades), etc. It is noticeable that, these principles were directly corresponding to the Iranian indigenous and traditional architecture. To conclude, following a sustainability checklist would help us achieve a green, echo-friendly building construction with zero emission, no footprints.

#### Notes:

- The Shorter Oxford English (1996).
- John Ruskin (1819-1900) M. Poet, Philosopher, English Writer, and Critic.
- William Morris, 19th Century Writer
- RICHARD LETHABY, Leading developer of sustainable architecture
- Center for Disease Control & Prevention (CDC) Environmental Health Laboratory Building
- Perkins + will (design firm)
- Atlanta, Georgia
- Z6 House, Santa Monica, California
- Ray Kappe
- Factor 10 house, Chicago, IL
- Esherick Homsey Dodge & Davis
- Chicago
- Adam Joseph Lewis center for Environmental studies Oberlin Ohio
- William McDonough and Partners
- Oberlin, Ohio
- Lake view Terrace Library = lake view terrace California (Platinum LEED rating)
- Field Deveraux Architects
- Colorado court affordable housing project (Santa Monica California)

#### REFERENCES

1. Kharrazi San'at Shotorban M (2001) Architectural Building Design and Development of Environmentally Sustainable, Third National Energy Conference of Iran.
2. Asadpour A (2006) Sustainable Patterns of Desert Architecture, Iran's Regional Conference of Desert Architecture, Islamic Azad University of Ardestan.
3. Golkar K (2000) Urban Design at Desert Cities, Fine Arts, Architecture and Urbanism Journal.
4. DEHKHODA Lexicon
5. MOEIN Persian Culture Dictionary
6. Proffitt M (1996) the Oxford English Dictionary, Oxford, United Kingdom, Oxford University Press.
7. Soflaei F (2005) Environmental Impact, Sustainable Residential Architecture in Hot and Dry Areas of Iran's Central Courtyard, Doctoral Thesis in Architecture, Islamic Azad University Science and Research branch of Tehran.
8. Bahreyni S H (1999) Modernity beyond Novelty, and Then in the Urban, Tehran, Publisher: Tehran University.
9. Abdoli M T (1997) Ecosystem Effects on Energy Technology Development, Tehran; Center for energy studies of Iran.
10. Amini A (1994) Sustainable Development, Understanding and Identifying Concepts, House Publication and Research.
11. Azizi M M (2001) Safah Journal.
12. Zandiyeh M (2010) Sustainable Development and its Implications for Residential Architecture in Iran, Rural Housing and Environmental Journal.
13. Ghiyasvand J (2006) Interaction of Architecture and Renewable Energy (Sustainable), Construction Journal.
14. Hatami Golzari E (2008) Traditional Iranian Architecture and Sustainability, Rural Housing and Environmental Journal.
15. Ghezelbash M (1985) Structure Alphabets of Traditional House in Yazd.
16. Henn R L, Hoffman A J (2013) Consulting Green: The Social Structures of Sustainability, Cambridge, Massachusetts, the MIT Press.
17. Kennedy J (2011) Revealing of California Architects, Santa Barbara, California, The Kennedy Pix.
18. Sorensen G L (2000) A Better Environment through the Market, Copenhagen, Sweden, Danish Environmental Protection Agency, Nordic Council of Minister Copenhagen.
19. AIA, American Institute of Architecture.
20. Watch (2008) Building Type Basics for Research Laboratories, Hoboken, New Jersey, John Wiley and Sons.
21. Henderson H (2012) Becoming a Green Building Professional, Hoboken, New Jersey, John Wiley and Sons.



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