Iranian valuable architectural patterns towards sustainable development

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Abstract:
Architecture is an art that always leads in harmony with features and thoughts if his time. In recent years, wide progress in science and changes in lifestyle has made a new word called sustainable development. Sustainable development is looking for a roadmap to sustainable the global development trends and prevent from deterioration of earth's natural resources. In architecture field this term is known as sustainable architecture. Despite of wide changes in different historical periods, Iranian architecture has preserved its own identity as a climatic and nature oriented architecture. This study by analyzing valuable patterns of Iranian architecture aims to survey possibility if using them to improve sustainable architecture of contemporary era. The findings of this study shows that Iranian traditional architecture includes effective ways that is result of understanding and mastering of residents of every region toward environmental issues. In the process of preparing this research, the content analysis method is used to achieve the best result and data collection has been done by library documents including books, articles, thesis and internet. Also descriptive analysis method is selected to analyze the collected data to suggest solutions for using Iranian sustainable patterns.

Key words: Sustainable development, Iranian architecture. Sustainable patterns

Introduction:

Sustainability is an important issue that recently experts have paid special attention to it. The danger of pollution on earth and disorganization in balance of nature has revealed the necessity of finding a solution to solve these problems. The architects along with other scientific sectors are trying to participate in this trend and make effective changes in their own field. Saving fossil energy used in buildings, preventing from environmental pollution and coexistence with natural conditions are included the solutions which are considered by architects and urban planners, those who commit themselves to follow the related rules.

Analysis of the traditional architecture in different areas of Iran and their wise solution to climatic factors shows their special consideration to climatic and nature issues. To extract values that must be studied in the formation of Iranian architecture, considering repeating values of traditional architecture is very important. And also knowing the vernacular ways that were used in past seems necessary to balance the environmental condition of present time. Analyzing Iranian valuable patterns of traditional architecture can help to find an answer to this question that whether well-known architecture patterns can be effective in order to achieve sustainable development in contemporary era?

Sustainable development:

The word sustain in derived from the word sustence that means keep in existence or able to keep in a special condition. Because of environmental history, this word is usually used in environmental issues. But over time, universality of the term sustainable development made its entry to various other fields such as technology, industry, architecture, urban planning, etc. (Asghari, 2010) A large increase in the negative impacts of human activity on Earth caused to adopt a resolution in the united nation general assembly to establish a commission in 1983 headed by Mrs. Brundtland, Prime Minister of Norway. The purpose of this commission was to study environmental issues and global development. After extensive research, the final report of the commission was published in mid-1987, entitled Our Common Future. since then the term sustainable development was generally accepted. In The Commission's definition of sustainable development: the only kind of developments are acceptable as sustainable that provide the present needs without making any risk for the future generations and their needs. (Tropper, 2000)

Natural resources and how to use them is emphasized by sustainable development experts but it is not only natural resources that is at risk but also the qualitative characteristics such as past Heritage, landscape, health and enjoyable life are in risk, so in the sustainable development goals, both quantitative and qualitative characteristics of environment must be considered. (Barton et al, 2000) sustainability is a pervasive and interconnected issue and it will be impossible to improve the environmental situation without people's participation. Teaching the issue of sustainability and its acceptance by society is not easy and requires the participation of various associations with an efficient plan to introduce sustainability principles. (Munier, 2005) Sustainable development requires changes in foundations and structures so that all social, cultural, environmental and the needs of future generations should be considered. Consumption of natural resources, and the progress of science and technology must be achieved in harmony

with the cultural principles of a society. That's why all cultural dimension of development should be recognized and encouraged by all the institutions. (Moradhasel et al, 2007)

Sustainable architecture:

Following the issue of sustainable development, sustainable architecture demands buildings with the least amount of inconvenience and conflict with surroundings. This act doesn't happen without improving the quality of attitude to nature in architecture and using long term materials especially vernacular materials. (Wills, 2000) one of the most important principles of sustainable architecture is considering native features for creating new buildings. Advances in technology and industry in recent years has made changes to vernacular architecture which has caused negative effects on the environment. (Abdel Aziz et al, 2011) Buildings compared with other man-made products have usually longer life and at all stages, including design, construction, equipping and re-using are linked with sustainable development. Buildings are made from a combination of materials that mutually affect each other and also they have potential impact on human health. (WGSC, 2004)

Sustainable Design:

A building with sustainable design is makes Healthy atmosphere and durable construction which focuses on native features. From the perspective of Richard Rodgers sustainable design aims to be faced with future needs, and in this way tries to protect the natural resources of future generations. In designing sustainable buildings, buildings must have resource efficiency, Minimal energy, flexibility and long life. (Gorgy Mahbelani, 2010) overall, Features that can include a building as a sustainable building are:

1- Energy conservation: a building should be constructed and maintained the way that has the minimum need to non-renewable energy consumption.

2-Harmony with the climate: the building should be built according to environmental condition of its surrounding

3- Reduce the use of new sources of materials: Design and construction of buildings should be to reduce the use of new resources and at the end of its life to be used as a new source.

4- Meet the needs of residents: Spiritual and physical needs of residents must be considered in sustainable architecture

5- Coordination with the site: the building must be made in coordination and interaction with the environment

6- Holism: the principles of sustainable architecture should eventually lead to the formation of healthy environment. (Ghiasvand, 2006)

Sustainable patterns in Iranian architecture:

Central courtyard:
Central courtyard refers to a yard that at least in one side and maximum in four side of it, a built space exists. This central space supplies light, ventilation and also other internal communication functions of building. The reason for naming this space as the central courtyard is because it is usually located in the central part of the building among other spaces. (Soltanzadeh, 2011)

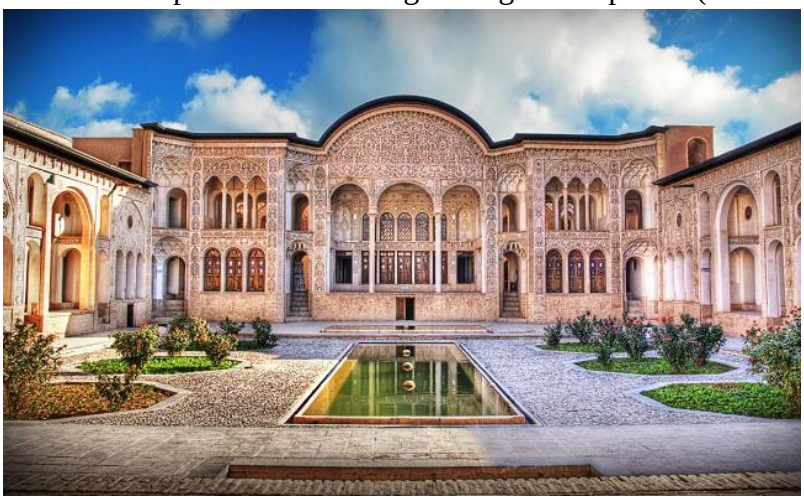

Fig 1: The central courtyard of Tabatabai house, Kashan

Climatic Considerations:
Constructing buildings with central courtyard in different climates with their unique features, especially in tropical regions of Central Iran admits the special attention to climatic aspects of the area in which the building is formed. The central courtyard makes it possible to provide light for indoors when there is no possibility to put windows on external walls. It also allows the fresh airflow into the building. In many cases by putting a canopy of plants, light and wind meet the plants on their way and it makes a good and modified atmosphere. Planting is a good way to restrict the entry of light into the building. The central courtyard makes the light and breeze to flow inside always, even without considering the prevailing wind direction. Windflaw inside the building reduces the air pressure and thus reduction of the pressure causes displacement of indoor and outdoor air and finally ventilation happens. (Rastegar, 2011)

Cultural Considerations:
The factors affecting the traditional formation is current culture of people. The central courtyard was used in a many areas that family privacy matters. The central courtyard space is shaped for coordination and communication between the artificial shape of the building and the nature. It is an efficient model that utilizes natural elements and characteristics for making urban environments tailored to individual humans. Given the importance of the separation of family

privacy from public space the central courtyard is widely used In the Middle East, especially Iran. (Zareh et al, 2011)

Materials:
The use of materials with regard to natural resources is the most important characteristic of vernacular architecture. Because of the abundance of clay in vast areas of country and the possibility of turning it into mud and adobe, this material was widely used. This material features include long life, natural cycle of climate adaptation and the least damage to the environment. Because central courtyard is made with evacuating central part of the building from clay, the clay itself can provide material without need to cost and energy consumption. Especially since in the past materials were hardly carried out by humans and animals. This allows to increase the speed of constructing and reducing the remaining materials. (Ahmadi, 2011)

Wind Catcher:
Wind catchers are well known patterns of Iranian architecture for using renewable wind energy in tropical areas.

Wind Catcher history:
Wind catcher as an element that plays the role of ventilation in buildings, has been used across the Middle East from many years ago. But we can say that the most beautiful and the most resistant of wind catchers belongs to tropical region of Iran. The remarkable thing is that despite the diversity in the structure and appearance of wind catchers, they all have the same usage; allowing windflaw to inside the building.
The oldest known wind catchers can be traced to map of two triangular tower on papyrus in 1500 BC of Egyptian civilization. Also in 600 BC, a wind catcher with two recipients at the Royal Hall of Babylon has been used to get favorable winds. (Roaf, 1988)

Wind catcher structure:
Wind catchers consist of two main parts that include aspects of aesthetic and functional elements. The components include racks, stem, primary and secondary blades and pores. The space between two walls is the blade. If the pores is open and allows air to flow, it is called opening pore otherwise it is a closed pore. The upper part of wind catchers are shaped according to the prevailing wind direction. Inside the column is also divided to multiple parts by brick walls to be coordinated with the wind direction and input channel. (Bahadori Nejad et al, 2008)

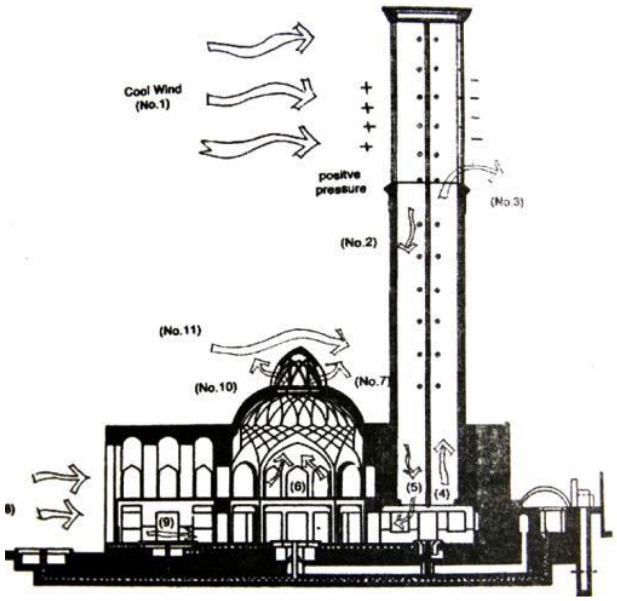

Fig 2: The wind catcher of Dowlat Abad Garden, Yazd

Wind catcher performance:

Wind catchers allow the chill wind to enter and create natural air conditioning into the yard and other areas by making air circulation. The front opening is located toward the favorable wind which has positive pressure and the rear opening has negative pressure. Wind catcher middle blade has the task of separating the positive and negative pressure zone. The pond below the wind catcher channel causes the cooler air flow and the air-conditioning inside the room, and finally the negative pressure air is removed from the rear opening. Wind catchers are shaped in many spaces due to usage such as housing, water storage or cellar in variety type and size according to wind direction. (Kiani, 2004)

Physical characteristics of cities:

Iran has vast areas of geographic and climatic diversity, so the inhabitants of every region tried to coordinate their cities with environmental characteristics to benefit from relative comfort with minimal manipulation in nature. Urban pattern in warm and dry regions and also cold regions are almost identical. In the tropics, to avoid the sun, urban texture is dense and enclosed and attempts the building to deal the Sun with the lowest levels. In cold regions in a similar way, to escape the cold, streets and passageways are narrow and buildings are interconnected to reduce the contact with outdoor and avoid from wind penetration. (Ghobadian,1998) but in wet areas such as the southern shores of the Caspian Sea and northern shore of the Persian Gulf, to use the favorable wind and air, urban texture is discrete and open to allow airflow in the city. (Kasmaei, 2005)

Materials:

The most important feature in the choice of materials is the use of vernacular materials. Same as General quality of urban textures, materials in tropical and cold regions are identical and they are chosen based on high thermal capacity to store heat during the day and transfer it inside when it is cold at nights. Simplicity of turning clay to mud and its derivatives and also the high thermal capacity of this material has led to use it in many areas of Iran. (Tavasoli, 1981) But in more humid areas where the temperature is not important and the most important problem is dealing with moisture, Local materials like wood and carpet were used. In the foothills where the density of trees is reduced due to the height, the stone was a good choice for the flooring and construction. The extensive use of wood as a structural and aesthetic for houses is a sign of interest in local materials to build houses. (Faraholahi Rad, 2008)

Enjoying sustainable patterns:

What has existed in Iranian architecture for long time is a fundamental attitude to the preservation of nature and sustainable priorities. These are clearly visible in Iranian traditional architecture as we see the least manipulation in nature. This is precisely based on the beliefs of the ancient Iranians that believed in nature as trust in their hands, so using nature is only permitted when it would not be destroyed and is delivered to next generations intact. This attitude is exactly what today is known in the world as sustainability.

Suggestions for improving the process of sustainable development:

1-To benefit from traditional sustainable patterns the factors that affected them should be studied and deeply understand and not just imitate them blindly.

2- Policies and programs for sustainable development should be such as to introduce the importance of sustainability and encourage investors to enter this sector.

3- The importance of long-term plans benefits compared with short-term solutions must be considered.

4- Goals should be developed in coordination and interaction with native communities and in accordance with their values of past and present.

Conclusion:

Perhaps it could be said that the climate is the most influential reason to create unique form in each region and diversity in the structure of architecture. Achieving comfort in any climate requires local factors that lack of attention to them weakens or destroys comfort. Across the country sustainable patterns can be found that fit with the region’s strength and limitations. Unfortunately, the current trend in construction is less due to the observed pattern. Despite the fact that over time our needs change with each period of time and changes in architectural styles, but always there is the possibility of coordinating these changes with characteristic of sustainable architecture.

References:

[1]Abdel Aziz, Tamer. Shawket, Indjy M. (2011). New strategy of upgrading slum areas in developing countries using vernacular trends to achieve a sustainable housing development. Energy procedia. 6(2011). 228-230
[2]Ahmadi, Zahra. (2011). Reading missing role of central courtyard in achieving sustainable architecture. City and vernacular architecture. 2(2011). 25-40
[3]Asghari, Reihaneh. (2011). Comparative study of the origins and components of sustainable architecture and ecological architecture. The Second National Conference on sustainable architecture. Hamadan, Sama vocational school of Hamadan.
[4]Bahadorinejad, Mahdi. Dehghani, Alireza. (2007). Wind Catcher engineering feat of Iran. Tehran, Yazda Press.
[5]Barton, Elizabeth. Williams, Katy. James, mike. (2010). Compact city and urban sustainability. (Farideh Baroghi, Trans.). Urban Management, Vol 1. No.4. 14-25
[6]Farajolahi, Amir. (2008). Review and structural analysis of the vernacular architecture of Gilan east plain. Art and Architecture, 8(2008). 112-115
[7]Ghiasvand, Javad. (2006). Interaction of new architecture and new energy (sustainable). Journal of Civil Engineering, 38(2006). 22-27
[8]Ghobadian, Vahid. (1998). Climate study of traditional buildings. Tehran, Tehran University Press.
[9]Gorgi Mahbelani, Yousef. (2009). Sustainable architecture and its critique of the environment. Iranian Society of Architecture and Urban Planning Magazine, 1(2009). 91-100
[10]Kasmaei, Morteza. (2005). Climate and architecture. Soil Publications. Tehran.
[11]Kiani, Mohammad Yousef. (2003). History of Iranian architecture in the Islamic period. Organization of Study and Compilation of Humanities Books of Universities, Tehran
[12]Morad Hasl, Niloufar. Pajouyan, Jamshid. (2007). The effect of economic growth on air pollution. Economic Research, Vol 7. No.4. 141-160
[13]Munier,Nolberto.(2005). Introduction to sustainibility: Road to a better future. Netherland: Springer.
[14]Rastegar, Nooshin. (2010). The Role of traditional courtyard home in environmental sustainability of desert climate. National Conference on canvas of desert tourism and environmental arts, Najaf Abad, Islamic Azad University, Najaf Abad branch.
[15]Roaf, S. (1988). The wind catcher of Yazd, Ph.D Thesis, Department of architecture, Oxford polytechnic.
[16]Soltanzadeh, Hosein. (2010). Geography role in the formation of traditional courtyard houses. Human Geography Research, 75(2010). 69-86
[17]Tavasoli, masoud. (1981). Creating city and architecture in hot and dry climates of Iran. Message Publications, Tehran.
[18]Troper,k.(2000). The triple bottom line economic. Social natural capital, UN chronicle. Vol. 36. No.2. 39-40
[19]WGSC. (2004). Working group for sustainable construction (WGSC), Working group for counstruction method and techniques final report.
[20]Wills, Anne Marie. (2000). The limits of sustainable architecture. Paper delivered at the shaping at the shaping the sustainable millennium, Brisbane, Queensland university of technology.
[21]Zareh, Leila. Naghizadeh, Mohammad. Hariri, Sharareh. The relationship between nature and the central courtyard (Looking at residential architecture in Iran). Journal of city identity, Vol 6. No.12. 49-60