

# The Impact of Environmental Factors on the Formation of Traditional Iranian Cities

Ahmad reza Sahami dehaghani<sup>1\*</sup>

1-Department of management, Islamic Azad University, Tehran, Iran

\*Corresponding Author: email address: [ahmadsahami1375@gmail.com](mailto:ahmadsahami1375@gmail.com)

---

## ABSTRACT

Lack of attention to environmental factors and the use of nature tools have led to an imbalance in the development of the township and has serious consequences, especially for future generations. Sustainable urban development is in fact a solution to ecological balance alongside achieving economic and social growth. In this regard, the development and development of ecosystems is considered as a model for future cities that will lead to mutual economic, social and environmental synergies. As a new concept that has received great attention in international societies in recent decades, Ecushahr illustrates how a sustainable city comes from theory. But one of the problems at first glance at building an ecosystem seems to be the complexity of ecosystem development indicators, especially in developing countries and in some cases not being implemented at all. On the other hand, there are some practical points, particularly in the area of sustainability in Iran's past architecture and urbanization that have not only been unknown in the world, but have been neglected over time by promoting Western architectural and urban style, but today we see even architecture And modern urbanization inspired by historic investments and minor changes to them has reused them, while reviving these principles in Iran is still a lie. Architecture is an art that has always been enriched by the evolution of the people's experiences of the different periods of history, and the historical and traditional contexts have an architectural typology that has responded very well to climatic and cultural issues. The result of human awareness of the socio-economic, environmental, and cultural issues and problems has been the emergence of the concept of sustainability in the 1970s. One of the most important goals of the manifestation of sustainable development in the built environment is called sustainable architecture.

**Keywords:** Sustainable Development, Sustainable Urban Development, Traditional Cities, Environmental Factors

---

## 1. INTRODUCTION

Traditional Iranian architecture has valuable elements in its heart that by exploring these elements can be achieved by sharing aspects of traditional architecture with the principles of sustainable architecture. Many of these elements have been applied to traditional building architecture through traditional architectural principles, following the principles of eco-design. Apply and apply these architectural principles in conjunction with climate design and provide thermal comfort to users of any architecture. Unreasonable and unreasonable use of fossil fuels to provide thermal comfort leading to contamination and destruction.[1]

In today's world, architecture and buildings comprise a significant part of the environment and make up a large part of the natural and environmental pollution.

Of course, construction cannot be stopped, and there are also buildings in modern architecture that incorporate some of the principles of sustainability, and with careful planning and planning thinking can build buildings that have the least negative impact on the environment.

Qajar architecture has urban buildings and elements in which the principles of sustainability have been observed. Using the principles and components that are visible and explored in traditional architecture as well as Qajar architecture, along with new technologies, can enhance the quality of contemporary architecture and examine the principles of sustainability in contemporary architecture can explain the principles of sustainability and present Solutions for contemporary architecture help.[19]

## **2. RESEARCH METHODOLOGY**

Every scientific research requires a proper research method with its own subject matter. Choosing the appropriate research method and its continuity throughout the process and path of research is one of the strategic principles of scientific research. Research is therefore used to obtain the desired results in this paper and to provide a suitable answer to the questions raised by library research such as the book of theses and articles and finally the field survey method. At first, a descriptive-causal hybrid method based on studies and arrangement of frameworks will be researched and then the historical interpretive method will evaluate the suitability of Isfahan architecture based on research findings.

## **3. DEFINE THE OVERALL CONCEPT OF SUSTAINABLE DEVELOPMENT**

Sustainable development is a very broad concept and concept that has many different interpretations and meanings that result from the diversity of the reactions of the experts.

Sustainable development is defined as the balance between development and the environment. This concept was first formally introduced by Brandtland in our joint future report. In this report, the goal of sustainable development to meet the needs of the present generation without undermining the ability of the next generation to meet their needs was introduced and human needs were considered with regard to the ability of the next generation to receive the needs. The result of this new definition was a document from the United Nations Conference on Environment and Sustainable Development as a Sustainable Development Plan for the 5th century. Another definition of sustainable architecture is to inherit and preserve the land in the best possible way for the next generation to responsibly inherit as an important

legacy. The three principles of economic and social environmental sustainability are the principles of sustainable development.

#### **4. INTRODUCING THE CONCEPT OF SUSTAINABLE ARCHITECTURE**

An architectural approach that is based on the performance of sustainable ecological principles and sustainable natural resources, while minimizing the impact of adverse impacts on nature and the natural environment while using users, as well as designing values such as aesthetics, community policy, and environment. Having ethics in mind can be called sustainable architecture. Among the principles of sustainable architecture can be reduced consumption of natural resources and energy design in harmony with the use of natural factors to create comfort and relaxation of use of renewable energy in design in harmony with the site due to changes in land use materials. Recoverable nature conservation and reduced production of poisons are noted therein. Based on the concept of complete ecology or a holistic view of the factors that influence sustainable design, three natural cultural and technological factors can be examined. In this subdivision, the mental image of the natural environment can be understood from the natural study of a natural cycle of living organisms of that place and the balance between these factors. The cultural image of sustainable architecture comes from the study of local cultures, the spirit of place, and the balance between cultural factors. The technology image also emerges from the study of technology on a global scale to the external environmental factors of economic analysis and crisis management. In this case, sustainable architecture, in addition to responding to limited goals such as adapting to the environment, uses renewable energy from forms and materials that are in harmony with the cultural landscape of the environment and the tradition of construction common in each location.[2]

The Vitruvius Principles define another expression of sustainability: the aesthetic and utilitarian strengths that are preferred to each of these principles, but sustainable design is achieved by giving preference and equal attention to all three principles.[8]

Since the goal of sustainable sustainability is according to Vitruvius principles:

1. Strength: Without structural strength and resistance to natural forces such as earthquakes and the design of buildings resistant to disasters and natural disasters - durability and consequently stability is meaningless. Another interpretation of solidity is that the materials used in the building must be such that they can be reused and reused in another building and not become waste.[25]

2. Beauty: A building that is in keeping with users' morals and tastes and will heal the spirits of viewers and users will be endured in a lasting visual memory.

3. Benefit: This is called sustainable design, which can be flexible with different applications over time. Sustainable design is popular and the quality of interiors is of particular importance and the quality and comfort of the environment and the environment with a focus on nature lighting and air conditioning and the use of materials in a way that lasts longer and health And comfort and safety bring the least damage to the next generation of users.[17]

#### **5. INTRODUCTION TO THE MAIN COMPONENTS OF SUSTAINABILITY IN TRADITIONAL ARCHITECTURE OF ISFAHAN**

Various elements can affect the sustainability of a city. Based on historical research, the sustainable elements of the city of Isfahan are divided into eight main categories, among which the four most important functions are: religious, commercial, governmental and communication elements of the city and the other four are educational spaces, cultural spaces, Leisure and service spaces that are less important than the first element. Most of the stable elements of the city of Isfahan are located within or within a short distance of the central texture. In this paper, indigenous houses in the historical Qajar period have been selected to study the components of sustainability in traditional Isfahan architecture.

## **6. SUSTAINABILITY COMPONENTS IN ISFAHAN NATIVE HOMES**

Adapting lifestyles to climatic conditions is an important characteristic of introverted homes in warm and arid climates known as four-season homes (Ghobadian, 1, p.). The reason for this is the placement of the rooms around the central courtyard and their use for a certain season of the year in terms of quantity and quality of radiation required. The use of spaces according to season and time, divides the interior into two parts: cold and warm, and avoids the loss of heat, warmth and cooling of all spaces in comfort.[15]

In Isfahan, the approximate temperature equilibrium has diminished the importance of the residential part of the houses. As a result, the northern front spaces of the courtyard have been in operation for four seasons; Has eliminated (as one of the sustainability considerations) unless it is built on the necessity, dimensions of land, or occupation of the occupants, thus accommodating the four-seasons north side of the courtyard with elements of static heating and cooling systems. Gives. In this article, we review the sustainability features of Isfahan's indigenous homes, and review the sustainability features extracted from previous research in the four houses of Karimi, Friday, Imam Khomeini and the Qajar period. The climatic spaces in these homes include the windshield, the basin, the orange courtyard, the moonlight and the central courtyard.[6]

### **6.1. Heating systems**

In Isfahan indigenous homes, with the use of static heating systems to be introduced and the use of seats and wall heaters, thermal comfort has been established in the past in winter. Of course, the notion of comfort temperature in the past was different from today. Today the heating of all interiors, both primary and secondary, is considered to be a level of comfort, while in the past, partial space heating has been a static approach and the use of seat and wall heaters as a complement to the living area.

#### **6.1-1 Direct absorption**

The use of direct absorption system for static heating in indigenous homes has led to the emergence of a space-dwelling in the north side of the courtyard to benefit from the southern sun. Large sashes and other glass surfaces as radiators, interior walls as absorbers and storages, porches, shades and shades (as fixed outer canopies), canvas (white linen as movable outer canopies) and small leaf trees (Natural Canopies) As a controller, they are components of this system in native homes.

At night, thermal mass is also used as an insulator to prevent heat loss. Because the heat flow between the exterior and interior surfaces of the building depends on the temperature

difference between the interior and exterior, elevated external surface temperatures can help reduce heat dissipation by increasing sunlight absorption, thus making the southern walls at night a thermal mass. By radiating heat into the interior and participating in heat transfer, it is considered an elemental insulation. On the other hand, stretching the canvas and wooden framing with decorative and knot designs will help reduce the heat transfer through the window by reducing the level of the glazed glass in the sash and window.

However, the reduction of the glass surface of the sash due to the implementation of wood-knitting schemes, one of which is the absence of large-scale glass, and the use of colored glass reduces the amount of direct light entering the space. On the other hand, the light-colored wall of the building material as a thermal mass reduces the amount of radiation absorbed by the dark color, considering all the walls (at least 2: 3 sufficient) as a storage and relocation option. The sun's rotating sunlight absorbs and stores heat at different times of the day in the warehouse and eliminates the effect of bright color. On the other hand, the bright color of the interior surfaces with a high reflectance coefficient enables the reflection of other surfaces. The interior enhances the brightness of the space and the daylight factor. Also, the slim layout of the house's spatial layout allows natural light to be used for all spaces. Finally, the stored heat is transmitted to the interior due to the type and properties of the materials and their thickness with appropriate time delay.

#### 6.1.2 Indirect absorption

In historic homes, there is a combination of direct and indirect absorption systems.

The north side walls of the yard exposed to southern light as a thermal mass allow sunlight to be stored during winter days, with optimum delay time, proportional to thickness, capacity and thermal resistance, conductivity, reflection and absorption coefficient. , Color and texture, transfer heat stored to the interior. On the other hand, there is also the use of the inverse summer absorption system as a static cooling system. Clay, as the main material of the sachets, has a high thermal capacity, which means it warms up late in the day and loses heat at night, thereby balancing the thermal fluctuation during the day. On the other hand, the heat transfer is also low in the clay and is a good insulator. The rough texture and the peripheral color of the clay limit its absorption and increase its scattering. Considering the light color of the exterior of the walls, their thickness due to the use of barrier wall structures will increase the minimum indoor air temperature in winter.

#### 6.1.3 Separate adsorption

Regarding the separate absorption system in the native houses of Isfahan it can be considered that the sash chambers, three and five doors which were somehow differentiated from other adjacent spaces with glass surfaces and thermal masses in the walls They can be considered as a separate greenhouse absorption system. The use of controllers such as canvas blinds, head valves and the ability to open sashes to expel hot air from the equipment of the system is considered indigenous.

#### 6.1.4 Earth warming

Plunging into the heart of the ground and lowering the yard floor from the passage floor makes use of high heat capacity of the soil, lowering the level of contact with the outside environment, providing part of the raw material for building materials, earthquake resilience, and atmospheric mounting. Alley planes will naturally be irrigated for the garden and to fill the

water tanks. In all of the houses studied, the yard floor was at least 5 cm lower than the alley floor, reaching 1.5 m in the clean house.

## 6.2 Cooling systems

In this section, static cooling systems in native homes of Isfahan will be introduced and investigated.

### 6.2.1 Direct evaporative cooling

Using static (pond) and dynamic (fountain) water and sweating the plants' surfaces in the backyard will cool the hot air, inject moisture into the dry air, purify and stamp the air contaminated with dust. Turning all the spaces in the yard gives them the benefit of this humid, humid climate as well as the four seasons of the yard. On the other hand, the small yard in the Karimi house, which is designed to provide light for spaces that do not have access to the courtyard, creates the appropriate spaces, especially in our three-door rooms, by creating moisture through the pond and shading through the tall walls to the dimensions of the yard. In Isfahan, it is deeper than other cities such as Yazd, due to the varying temperatures of the water basin because, for example, in a city such as Yazd, it has tried to increase evaporative cooling by decreasing the depth and increasing the surface of the pond. . Approximately 2 percent of the yard on average is dedicated to water ponds and 2 percent to gardens.

In addition to the water pond in the yard, there may be space in the suite of rooms with a fully climatically functioning pool house to create direct evaporative cooling in the summer. This space may be in a variety of ways, such as underground under a summer space with a pond in the middle, or an elevated space on the ground floor with a pond in the middle and the possibility of roof lighting on the corners of the building allowing direct sunlight from the yard. It is not built (like the house of Karimi, Imam Friday and Dibay), or a room on the ground floor on either side of the courtyard with a water pond, like a clean house. If there is a windscreen, it is usually connected to the basin, such as the Karimi House.

The space that is interpreted as a basement in a clean house, a black house, and some other houses in Isfahan, is our hall between two courtyards in the Isfahan Mehrazi vocabulary and idioms. In Karimi's house the basin is connected to an octagonal basin in the middle with three doors and its adjacent hall. The house of Imam Friday is also related to the three adjacent gates, but in the house of Dibi'ah the house has no relation to another room, and the plan of the house is in the houses of Karimi, Friday, and Dibi'ah.

### 6.2.2 Cooling with the ground

Due to contact with the ground due to the effect on the heat exchange with the environment and the use of high heat capacity of the soil, it is possible to cool the interior.

### 6.2.3 Radiation cooling

During the day and night, the body of the yard, which absorbs the sun's energy throughout the day, emits heat in the form of long wavelengths to reach the ambient temperature. Since the heat capacity of the air is very low, the ambient air temperature changes in accordance with the temperature of the yard body. On summer days, the bodies absorb the sun's radiant energy. Clay heat capacity as the main body material makes the material only absorbent and storing at this time and does not aggravate summer conditions by not transferring heat to the environment. On the other hand, in the summer morning, the night before, due to the heavy weather in the courtyard, it still remained, due to the shade on the different sides of the building depending on

the orientation of the conditions. In the evening and at night, the bodies emit the thermal energy they absorb throughout the day in long wavelengths (radiant cooling), and the courtyard air will also cool in harmony with them.[7]

#### 6.2.4 Cooling with air flow

Building cooling by means of overnight ventilation of thermal masses depends on a dual process. First, during the day when the outside temperature is too high for ventilation, the building's membrane is closed and additional heat is stored in the building's mass. Second, during the night, when the outside temperature is low, outside air can pass through the building and eliminate the heat stored in the building's mass. So the building's mass cools so that it can absorb heat again the next morning.

The use of light-colored laminate on the exterior surfaces, appropriate brick capacity and thermal resistance, canopy types such as small leaf trees, porches, faucet element and facade to reduce direct sun exposure indoors, indoor air conditioning effect They reduce the length of the day when hot outside air, on the other hand, the mass of the thermal mass stores the heat of the interior during the day, and in the evening and evening sashes can be opened, and converted into a semi-enclosed space. The porch has the heat stored outside.

To use this method there must be enough mass in the building to absorb the heat generated and the mass to be well distributed so that it has sufficient surface area to absorb heat quickly and keep indoor air low. . The windows should be large enough to allow cool outside air behind the building's mass to remove the heat accumulated during the day. Sufficient thermal mass in the north facade of the yard, near the large sash surfaces and in the windows with large openings, allows this to happen.

On the other hand, the radiation at the three and five doors, like the wing walls such as high pressure and low pressure masses, allows rooms with a surface to be in contact with the outside environment and to allow blindness. The floor of windows is also commensurate with the height of activity in the room (usually sitting or lying down). Another important point about ventilation in the karimi house is the use of a free plan in the design. The hall with the crucifixion plan in the middle is connected to the triple rooms and the basin on its sides. The communication between these spaces is done through three gates that, if opened, can rotate the airflow into these spaces, allowing for the closure and separation of the spaces. This will be very important in preventing heat loss in winter.

#### 6.2.5 Heat Absorption Control

Orientation is one of the effective factors in controlling heat absorption. The best direction to obtain the minimum radiation energy in summer is to stretch along the east-west axis. Of course, a 2 degree eastward orientation makes the northwest side of the courtyard shade for four seasons in the summer afternoon.[12]

The average yard area of the house is 4 m and the yard-to-width ratio of the rectangular geometry is 1.4. The central courtyard, on the other hand, has a static system sufficiently narrow to prevent the sun from shining on hot summer days by shading the surrounding walls.

Apart from the proper orientation to reduce summer radiation exposure, the use of a variety of shadows such as vertical and horizontal shades, trees, shrubs, canvas, wooden frame and colored glass is seen in the studied houses.

Ivanov and Moonlight can also be mentioned among the spaces created in the climatic role of Isfahan native houses. The porch is a small, shallow, and semi-closed space that is limited on three sides and open on one side. This semi-closed space acts as a reflection barrier. Another function of this space, the indirect entrance, is to reduce indoor and outdoor air exchange due to winter commuting to the rooms. Although common in the houses of Isfahan from the middle of Qajar to the porch across the north front,

To benefit from its climatic role, the Four Seasons Homestead, also associated with courtyards, has become courtyard-style with summer gardens and the possibility of using yard air, ponds and gardens. It has provided.

A moonlight or canvas bed is a ceiling-free space that is built adjacent to the courtyard and on the upper floors. Moonlights are used at times where the surrounding walls cast a good shadow, depending on where they are located (usually on the east and west sides of the yard). Moonlight is available in the spring and fall all day and in the summer at night. In the outer and inner courtyards of the house there are also moonlit houses on the eastern and western fronts.

## 7. CONCLUSION

From the above research we can conclude that re-applying the sustainability principles of traditional Iranian architecture and urban planning can lead to the improvement of the quality of contemporary Iranian architecture.

Overall sustainability is an approach in architecture that begins in the process of forming a crisis and aims to mitigate the critical conditions. To this end, reference to architecture at a time when it has been sustained but with little change and interference with the spirit of time by combining indigenous and contemporary architecture is the best version of the complex for this crisis.

Due to the use of static systems in native homes of Isfahan, in Isfahan climate, these systems can be designed to withstand radiation and dry air in summer as well as winter cold. Obviously in designing modern static systems and updating native systems this should always be taken into consideration.[15]

## REFERENCES

1. Bahadori Nejad, Mahdi, Yaghoubi Mahmood. Ventilation and cooling in traditional buildings in Iran. University Publication Center
2. Pyrenees. Karim. Introduction to Islamic Architecture of Iran Science and Technology Publications
3. Qing DK. 1385 Architecture: Form, Space and Order of Translation by Pobierz and P. Quidel. First Edition, Tehran: Arad Book Publishing Collaboration with Creative Thought Page 1
4. Haji Qasemi K. 1377 Ganjnameh Fourth Office, Isfahan Homes. First Edition. Tehran: Shahid Beheshti University Publications and National Heritage Organization. Page 1



5. Dehkhodali Akbar. Dehkhoda dictionary. Dehkhoda Dictionary Institute. Volume 3, p. 1333.132
6. Zandieh. Race God. Samira Sustainable Development and its Concepts in Iranian Residential Architecture. Housing and Rural Environment. Number. 1 pp
7. Sadooki A. 1384 Static Systems and Solar Energy at Home Journal of Architecture and Culture, 23: 30-26
8. Qasemi Sichani M. 1386 A review on how to design traditional Isfahan homes. Journal of Architecture and Culture 23: 28-19
9. Ghobadian.Wahid.Climatic study of traditional Iranian buildings. Second edition. Tehran University Press
10. KibabloClose. 1379 Non-mechanical evaporative cooling. Fine Arts Scientific and Research Journal 8: 1-6
11. Ghayabkoulos: 3 Environmental Conditioning Textbook of University of Tehran Fine Arts Campus
12. Syntax c. 1386 Architecture and New Energy Interaction (Sustainable) Road & Building Magazine. 38: 27-22
13. Syntax c. Architecture, Environment, Sustainable Development of Road and Building Magazine. 45: 56-52
14. Kock Nielsen.Hagler Architecture in harmony with the principles of environmental design in warm areas. Low-key translation. Farzaneh. Study Center

#### Research and Urban Planning

15. Part of the Ahmadinejad Climate and Architecture Editor. Third edition. Isfahan: Soil emission. 1 page
16. Lang.Jan. Creating Architectural Theory The Role of Behavioral Sciences in Environmental Design. Translated by Einfar Alirezaavan University of Tehran Press. Fifth Edition . 1388.
17. Mahmoudi. Reducing pollution caused by housing development with architectural design solutions Journal of Fine Arts. No. 35.2.133318
18. Mahmoudi Mohammad Mehdi. 1388 Housing housing compatible with sustainable development First Edition. Tehran: Tehran University Press. Page 1
19. Mahmoud Mahnaz. School of Architecture, School of Architecture and Civil Engineering, Islamic Azad University, Qazvin Motin Si Branch, Shirley P. 1386 Green Urban Design Dimensions. Translation kindly. second edition. Tehran: Urban Planning and Processing Company. Page 1
20. Mofidi Shemirani Seyyed M in Climatology in Architecture, Ph.D. in Architecture, Faculty of Architecture, Islamic Azad University, Science and Research Branch, Tehran
21. Now Reza. Research in Sustainable Development Process Quarterly Journal. No. 17 pp. 5.1376
22. Fresno Gardens. Timur. Mahmoud.Ashin Bar. Mohammed. Landscape Theory An Approach to Continuity of Interest in Urban Renovation Process

23. Faghih, AK, Bahadori, M, N, Thermal performance evaluation of domed roofs, Energy and Buildings, Vol2011
24. Moradi, AM, Nassbi, F, Bazaar of Tabriz; a sustainable
25. architecture and urban area in .Williamson, Undrestanding Sustainable Architecture, London: Spon Press, ranIran, ENHR, InternatialConfrance, Sustainable Urban Area, Rotterdam, P<sup>r</sup>, 2007