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CASE STUDY RESEARCH PAPER

The use of architectural decorations in the principles of sustainable architecture of traditional houses and its compatibility with modern houses in Mashhad city

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ABSTRACT

traditional houses have served as symbols of cultural identity, regional climate adaptation, and craftsmanship. Decorative and architectural elements within these houses such as intricate carvings, geometric, floral, and religious motifs were an integral part of regional cultural and artistic expression, endowing the structures with aesthetic significance and symbolic meaning. The present study aimed to examine the application of architecture-dependent decorations in the principles of sustainable architecture of traditional houses and their compatibility with modern houses in Mashhad city. Sustainable architecture is a design and construction process that emphasizes efficiency, economic sustainability, environmental friendliness, and other environmental benefits. The term sustainability refers to three pillars: ecology, economy and community. The present study was descriptive-survey in terms of method type and applied in terms of purpose. Every scientific research needs its own appropriate methods. Choosing an appropriate research method and continuing it throughout the entire research process is one of the strategic principles of a scientific research. The way of facing the problem and research is closely and mutually related to the structure and nature of the research in some case studies in Mashhad city. The findings shows that in traditional architecture, principles such as respect for the environment and ecosystem, energy efficiency, and the use of spaces to provide a comfortable living experience are observed. Finally, understanding the key elements of traditional Mashhad architecture and interior decoration, and applying them in a way compatible with sustainability principles, can serve as a practical model for designing new buildings and restoring historical structures.

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INTRODUCTION

Historically, traditional houses served as symbols of cultural identity, regional climate adaptation, and craftsmanship. These dwellings were primarily constructed using indigenous natural materials such as bricks, plaster, and wood, which offered both economic efficiency and high environmental compatibility. The architecture of these houses was based on organic principles and geometric harmony, tailored to respond to regional climatic factors such as the intense heat and aridity of summer and the cold temperatures of winter. Decorative and architectural elements within these houses such as intricate carvings, geometric, floral, and religious motifs were an integral part of regional cultural and artistic expression, endowing the structures with aesthetic significance and symbolic meaning (Reed and Lowry, 2022). These decorative elements were not solely for beautification; they also played a vital role in reducing energy consumption, facilitating natural ventilation, and maintaining indoor thermal comfort, thus supporting sustainable living practices. Over recent decades, with the advent of industrialization and modern construction technologies, traditional architectural paradigms gradually gave way to new, often minimalist, industrial forms that primarily employed modern materials and simplified design principles. However, a critical review and re-evaluation of historical principles and elements reveal that many traditional features continue to hold valuable lessons for contemporary sustainable architecture. For example, utilizing natural architectural elements such as wind catchers, central courtyards, small windows, and local building materials can significantly decrease reliance on mechanical heating and cooling systems, thereby reducing energy consumption and enhancing indoor environmental quality (Kadir, 2020). These elements embody a profound connection between humans and nature and exemplify a harmonious integration of artistry and technology rooted in vernacular architecture, which can serve as a guiding model

for modern eco-friendly and environmentally conscious design approaches. Furthermore, in examining Mashhad's architecture, the role of ornamentation and cultural artistic elements must be appreciated within the framework of sustainability and aesthetic harmony. Decorative arts such as glazed tiles, bas-reliefs, plasterwork, and ornamental plant and symbolic motifs serve not only aesthetic purposes but also contribute to energy efficiency and environmental performance. These historically developed decorative elements, primarily based on local materials and traditional craftsmanship, can be repurposed and integrated into modern design as natural, cultural, and energy-efficient alternatives to complex technological solutions (Palang et al., 2021). The return to and adaptation of these ornamental features in contemporary architecture can preserve cultural identity, reduce construction costs, and minimize environmental impacts. On the other hand, modern architecture in Mashhad, characterized by the use of innovative construction technologies, industrial materials, and minimal adornment, aims to meet urban and economic demands. Nonetheless, this approach often faces challenges such as cultural dissonance, lack of contextual adaptation, and increased energy consumption. Therefore, the fundamental question of this research is whether modern buildings in Mashhad can incorporate principles of sustainable architecture and ornamental dependence to harmonize technological advancements with cultural identity and environmental sustainability? Addressing this question requires a comprehensive analysis and integration of traditional and modern architectural elements, fostering a resilient and culturally rooted sustainable urban development. The rapid urbanization and modernization of Mashhad have led to significant changes in its architectural landscape, often at the expense of traditional building practices and cultural heritage. While contemporary architecture emphasizes technological advancements and industrial materials, it frequently overlooks

the sustainable principles embedded in the region's vernacular architecture, such as natural ventilation, climate-responsive design, and cultural ornamentation. This disconnect poses a challenge for developing urban spaces that are both environmentally sustainable and culturally authentic. The primary issue is whether modern architectural practices in Mashhad can leverage the historical insights and techniques found in traditional homes particularly the use of decorative elements and natural materials to create environmentally friendly, culturally meaningful, and functional structures that address contemporary needs.

The aim of this research is to analyze and compare the sustainable principles inherent in traditional houses of Mashhad focusing on their decorative elements and regional architectural features and explore how these can be integrated into modern architectural designs. The study seeks to identify the potential for traditional ornamentation and related elements to serve as natural and energy-efficient solutions in contemporary buildings. The key research question is: Can modern architecture in Mashhad incorporate principles from traditional construction especially ornamentation dependent on local

materials and sustainable design to develop buildings that are environmentally responsible while preserving cultural identity? The goal is to provide practical insights and innovative strategies to foster sustainable urban growth that respects both the environment and the city's cultural heritage.

MATERIALS AND METHODS

Background Research

The table below summarizes some of the articles and texts related to the research topic. (Tab. 1)

The analysis of the existing literature reveals that most studies have focused on various aspects of sustainable architecture in traditional and modern houses across different Iranian cities. However, significant gaps remain in this field. On one hand, many of these studies have primarily addressed the identification of sustainable architectural elements, comparative analyses of historic houses across different periods, and regional case studies. On the other hand, there is a notable lack of practical and applied research on how to effectively implement these principles in contemporary building design and construction. Additionally, only a few studies have explicitly examined the

Table 1: Background research

Title	Authors	Keywords	Objectives
Comparative study of sustainable architecture in traditional and modern houses of Tabriz from the perspective of social interactions	Parvaneh Mohammadi, Jalal Nakhai, Mehrdad Javidnezhad	Traditional houses, modern houses, comparative study, sustainable architecture	Study of sustainable architecture in modern and traditional houses of Tabriz from the perspective of social interactions
Comparative study of sustainable architecture and its compatibility with indigenous traditional houses in Iranian-Islamic city; analysis of energy indicators, materials, and openings in the studied samples and comparison	Esmail Zarghami, Ali Khaki, Saeed Sarrafi	Sustainable architecture, Iranian house, traditional architecture, indigenous architecture	Principles of indigenous architecture that align with sustainable architecture components and methods for their revival and reutilization
Comparative analysis of exterior shells of residential buildings in traditional and modern fabric of Tabriz with a sustainable architecture approach	Maryam Sangari, Sarvanaz Abdoli	Traditional and modern houses, Tabriz climate, sustainable architecture, comparative analysis	Comparative analysis of the outer shells of residential buildings in traditional and modern urban fabrics of Tabriz with a sustainability approach

Title	Authors	Keywords	Objectives
Evaluation of architectural component features in traditional and modern houses with a sustainable architecture approach (case study of Tabriz)	Tarlan Zarneshani Asl, Nima Valizadeh, Hassan Sattari	Sustainable architecture, indigenous houses, traditional houses	Examining the gap between contemporary architecture and traditional architecture with sustainability components
Formulation of a model for sustainable principles of Iranian modern architecture, in comparison between traditional Iranian architecture and five modern cities worldwide; case studies of Vancouver, Copenhagen, Oslo, Curitiba, and São Paulo	Shima Karimi, Mahdi Zende Yad, Yusef Gorgi	Sustainable development, traditional architecture, sustainable architecture, sustainable city, Iranian architecture	Introducing patterns derived from historical traditional architecture along with sustainability points in modern cities and providing strategies to operationalize them
Examination of sustainability patterns in traditional house architecture of Mehriz	Mahboubeh Pourahmadi	Sustainable architecture, recurring values, environmental design, cultural design, economic design	Understanding the recurring principles and values governing the architecture of houses in Mehriz as a sustainable architecture and deriving repeatable features to achieve sustainable objectives
Assessing the concept of sustainability in residential architecture of the Khorasan region: a case study of traditional houses in Boshrouyeh	Behzad Vossagh, Mojtaba Badorfshan	Sustainable architecture, traditional houses, Greater Khorasan	Understanding sustainable architectural elements in historically valuable houses
Analyzing Masuleh city's climate design framework for human comfort towards sustainable development	Bahman Ramezani	Urban climate design, sustainable development, sustainable design, Masuleh	Climate design
Extracting repeatable features to achieve sustainable architecture goals, as related to climate-aware design	Zahra Kazemnajad	Case study: Masuleh town	Relationship between sustainable environmental architecture and climate design
The value of Iranian indigenous architecture in relation to sustainable architecture principles	Maryam Armaghan, Yusef Gorgi	Sustainable architecture, design process, local architecture	Indigenous architecture
Designing earthen shelters based on sustainable architecture principles to reduce energy consumption in hot and dry climates: case study of Shahrud city	Maryam Arab, Mohammad Farrokhzad	Architecture, building energy, sustainable development, design	Principles of sustainable architecture to reduce consumption and develop sustainable building models
Comparative study of traditional houses in Kermanshah and Sanandaj during Qajar and Pahlavi periods, aiming to identify effective spatial organization parameters and prioritize these in the structural design of traditional houses	Behnoosh Maleki Zadeh, Mohammad Mahi Soroush, Soleyman Molanayi	Traditional houses, comparative study, Qajar and Pahlavi periods	Emphasizing the importance of respecting and preserving traditional architectural heritage, not merely nostalgic imitation
Identifying and prioritizing influential factors in the design and spatial arrangement process of traditional houses	Mahya Ghoochani, Mohammad Arabi	Architectural design, traditional houses, spatial arrangement	Spatial design factors

relationship between indigenous architectural elements and sustainable architecture, and how these features can be reused or integrated into modern designs. Most research is limited to specific regions such as Khorasan, Kermanshah, or Masuleh, and there is a need for more comprehensive, cross-regional analyses that can provide broader insights. The main challenges in this area include preserving and reviving traditional architectural elements amid rapid urban development, the lack of standardized guidelines for incorporating sustainable principles into new projects, and the necessity for practical solutions that enable architects and designers to harmonize sustainability with cultural identity. Contrarily, the current research aims, through a detailed understanding of the valuable elements in historic houses, to propose practical strategies based on traditional and indigenous principles that can address these gaps. By emphasizing the repeatability and transferability of these features into modern design processes, this study seeks to create a bridge between traditional architecture and sustainable modern construction in urban environments. Ultimately, the goal is to fill existing research gaps, promote indigenous and sustainable architectural practices, and support the development of resilient, culturally rooted, and environmentally sustainable urban spaces in Iran.

Sustainable Architecture

The field of sustainable design can be traced back to the early 1900s, when the first buildings with sustainable features such as natural ventilation, passive heating and cooling systems, and solar heating were created. Since then, sustainability has become an increasing concern for architects around the world. As technology advances, there are more options for designing future buildings that take these sustainability concerns into account. (Nicol and Roaf, 2007) Sustainable design is a design and construction process that emphasizes efficiency, economic and environmental sustainability, and other environmental benefits. The term sustainable refers to the three

pillars of sustainability: ecology (the environment), economy (the entire community), and society (people). This means that energy-efficient buildings should be designed with the long term in mind, taking into account not only the carbon footprint but also the use of natural resources. (Roaf, 1982, Ghobadian, 1998) The term sustainable design is currently used in many contexts. It is used to describe sustainable architecture or sustainable fashion. It can also be used in fields such as information technology, where they emphasize the importance of environmentally friendly products and practices, such as recycling old computers instead of throwing them away after a few years. Sustainable architecture is architecture that seeks to minimize the negative environmental impact of buildings through improved efficiency and moderation in the use of materials, energy, development space, and the ecosystem as a whole. Sustainable architecture uses a conscious approach to energy and environmental conservation in the design of the built environment. The idea of sustainability or eco-design is to ensure that our use of currently available resources does not have detrimental effects on our collective health. The term sustainability in relation to architecture has so far been considered mostly through the lens of building technology and its transformations. Beyond the technical realm of “green design”, invention, and expertise, some scholars are beginning to place architecture within a much broader cultural framework of human interactions with nature. Adopting this framework makes it possible to trace a rich history of cultural debates about our relationship with nature and the environment from the perspectives of different historical and geographical contexts. (Bahadori, 1985)

Principles of Sustainable Architecture

By definition, sustainable architecture is based on the principles of sustainability and promotes them through well-known projects distributed around the world. It is based on a very broad cultural approach, which includes all aspects of design, from the choice of materials to construction

techniques, from aesthetics to energy efficiency. Sun, wind and shade are free natural resources that can be used to light, heat and cool spaces. Passive design uses these resources by working with the specific conditions and climate of a site. Houses are purposefully designed for the movement of sun and wind, and the building envelope (walls, floor, roof and windows) is carefully designed to control where and when sun, breeze and shade enter the house throughout the day and the seasons. Depending on its location and location, a house with a good passive design can be thermally comfortable all year round without the need for additional heating and cooling. Buildings designed with sustainable architecture are distinguished by two goals: ([Kazakova and Stefanova, 2019](#), [Mitrović and Selam, 2019](#))

- Have a minimal environmental impact;
- Improving the lives of the people who live there.

In recent years, the increasing attention to people's needs and the intense concern for psychological balance have given new impetus to these principles, the real cornerstone of current sustainable architecture. Sustainable architecture is based on four fundamental principle: ([Kosanović et al., 2018](#), [Correia et al., 2014](#))

- Respect for the environment and the ecosystem;
- Energy efficiency;
- Use of spaces;
- Living experience

By pursuing these objectives, we want to obtain efficient buildings that fulfill their intended use and are harmonized in the environmental context without negative impacts. Everything revolves around the concept of sustainability, developed in 1991 by the (UNEP United Nations Environment Programme) with the aim of "improving the quality of life, without harming the environment". Sustainable development is a process of change in such a way that the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are in line with

future needs. Respect for fundamental principles is the basis of sustainable architecture. Traditional Sustainable Architecture in Iran. Today, sustainable architecture, a style of architectural design that is based on environmental aspects, is a specific style of design that architects and designers are trying to pay more attention to, and architects in Iran, as a vast country with different climatic regions and zones, are trying to pay more attention to it. In order to overcome environmental problems in architecture and have a specific system for each region, this design style should have been used in traditional Iranian architecture since ancient times.

Sustainable architecture, which is related to the larger sustainability debate that is related to the pressing economic and political issues of our world, seeks to reduce the negative environmental impacts of buildings by increasing efficiency and moderation in the use of materials, energy, and development space. (18) Due to the lack of access to modern heating and cooling equipment in ancient times, architects were obliged to rely on natural energies to make the interior spaces of buildings pleasant ([Radivojević et al., 2014](#), [Tomovska et al., 2017](#)). Iran is basically divided into four climatic zones. Zone one is the dry and hot zone that makes up most of the Iranian plateau. The second zone is a cold and snowy region in the north and west of the country. The third zone is a warm and humid one that covers the northern coasts of the Persian Gulf and the Sea of Oman, and the last zone is a humid and rainy one that covers the southern coasts of the Caspian Sea.

The dry and hot region, the central parts of the Iranian plateau, this region has almost no rainfall for at least six months of the year, hence it is very dry and hot. Therefore, cooling is the main design objective in this region. Traditional architects in Iran tried to use convection and evaporation in their design, and wind and water certainly play a major role in this design style, and in this way some sustainable systems and equipment are built, such as the windcatcher

known as the windcatcher and the ponds. Inside the house known as the “Hoozkhaneh” was presented to the valuable Iranian architecture. Windbreaker, a sustainable system in dry and hot regions Since Iranian sustainable architecture proposes various solutions that are compatible with environmental potentials, natural ventilation plays a fundamental role in the formal design of architecture as a specific parameter for cooling and feeling of comfort. (Vuksanović, 2015) The windbreaker system works with the force of the wind that comes from the holes designed on it. The air circulation in different parts of the building is regulated by opening or closing the various openers or channels at the bottom of the windcatcher. The windbreaker operates according to the wind conditions and solar radiation in the area. The interior and exterior walls absorb a lot of heat during the day. As a result, they balance the temperature at night and give the absorbed heat to the cold night air. The thickness of the windbreaker walls and the dimensions of the holes inside it are designed to have enough heat. The light warm air inside the windbreak rises and is sucked in by the high altitudes. As a result, cool air flows into the house through the windows and doors and continues throughout the night (Ghrishman, 2018). Using this system, the building uses natural energy and is cooled like modern air conditioners without using expensive resources. Figure 1 shows

an example of this system. (Fig. 1) In the hot and dry region, there is an area inside the buildings called “Huzkhaneh”. In this space, there is a pond full of water and the wind coming from the holes in the wind catchers is directed to this area by special channels and evaporation occurs. In fact, the wind uses water and evaporation to cool the atmosphere. This place is also called “Tabastan-e-Neshin”, meaning a cool place to live in the hot and dry summers (Fig. 2).

Refrigerators, ice shops for storing ice Since in this cold and snowy region where we have snow most of the time, traditional designers have designed a special place called “Yakhchal” which is a place to store ice and store and preserve it for the summer. The architecture of these shops is very interesting. They usually have arched domes. Such a dome helps the refrigerator to have a cool internal temperature and through this people can use cold water in the summer (Fig. 3 and 4).

Methodology

The present study was descriptive-survey in terms of method type and applied in terms of purpose. Every scientific research needs its own appropriate methods. Choosing an appropriate research method and continuing it throughout the entire research process is one of the strategic principles of a scientific research. The way of facing the problem and research is closely and



Figure 1 (Left): Sticky windbreaker in Sirjan city, Kerman
Figure 2(Right): Summer residence of the Borujerdiha house, Kashan



Figure 3(Left): Traditional Twin refrigerator in Sirjan, Kerman **Figure 4(Right):** Traditional refrigerator in Abarkooh, Yazd

mutually related to the structure and nature of the research. Therefore, to create a foundation of integrity in this research, a qualitative method has been used throughout the research process. In order to achieve the desired results in this article and provide appropriate answers to the above questions, a library research method including books, theses, and articles has been used. And finally, an attempt has been made to analyze the data obtained through field observation and present conclusions.

DISCUSSION AND FINDINGS

Traditional architecture of Mashhad

In many Iranian cities, including Mashhad, the capital of Khorasan Razavi Province, typical examples of small-scale domestic architecture are not considered heritage. While the principles of house-building are valuable in all traditional Iranian houses. In the past decade, Mashhad has lost its identity and become a modern city. Its recognition as the Capital of Islamic Culture in 2017 by ISESCO and the resulting search for new developments and developments led to the demolition of a large number of traditional medium-sized dwellings. Like almost every traditional Iranian house, almost all settlements in Mashhad follow Iranian-Islamic principles in design. A large number of traditional houses in Mashhad consisted of a central courtyard, and only a few of them had two courtyards. Houses belonging to the wealthy were usually divided

into two living quarters and a service area. However, ordinary people only had two living quarters facing each other. They were in two directions: northeast/southwest or northwest/southeast. Considering the local builders, this type of positioning was based on the geographical and climatic characteristics of Mashhad, which provided for the seasonal migration of residents throughout the year. In fact, in summer or winter, the building masses settled based on direct exposure to the sun and wind. In traditional houses, there were different rooms that could be distinguished by their function or the number and type of openings. In fact, all types of houses, whether wealthy or ordinary, have similar architectural and decorative elements. But economic conditions, combined with the land dimension, always required residents to use these elements more or less.

Traditional Architecture and Energy Conservation

One of the traditional and historical houses in Mashhad, where sustainable architecture components are clearly visible, is the Darogha House of Mashhad. Darogha is the Iranian word for police chief. And as its name suggests, this house belonged to Yousef Khan Herati, the police chief of Mashhad. He began construction of the house in the last year of the Qajar dynasty. Yousef Khan Herati was the last police chief of Mashhad and then the first head of the Nazmiyeh, the new force in law enforcement, after the Constitutional Revolution of Iran. Since then, it has been

a private house until about 30 years ago. Then it was used as a place for religious gatherings. After that, it underwent renovations and was registered as a national heritage of Iran. The historical Darogha House occupies an area of six hundred and ten square meters on a plot of land of one thousand one hundred square meters. As expected, the police house should be unique in its kind with special features such as having the first private bathroom, bakery and cellar. At that time, there were only public bathrooms. The cellar is an underground structure with a water tank or well to save water, food and cool down in the summer. In addition, there were two other traditional houses from the same time. All were connected. And together they created a complex. (Fig. 5 and 6)

In this traditional semi-Iranian house, brick-shaped walls, seven-colored tiles, wooden carvings under the ceilings and detailed plasterwork in the courtyard are souvenirs of Russian architecture. The balcony structure with a staircase on both sides of the “Orosi” and its decorations are from traditional Iranian designs. The walls of the courtyards are made of bricks in different shapes with stucco sculptures such as human heads, lion heads and angles with wings. The entrance is on the south side. Like most traditional Iranian houses, the door of the house opens to the courtyard. The courtyard has a pool and a small green space. The first floor is 75 cm

below the level of the courtyard. The historical Daroghe house has a triangular structure. That is, the house is like a U and the courtyard is in the middle. This building is not a straight building from north to south, but for ease of description. One side faces north, one side faces south and the other side faces east. They are all connected from the inside. The house has two floors on each side. In this traditional house, various parts have been designed to conserve energy and be sustainable architecture, as follows: The seasonal parts of the house were one of the components of traditional sustainable architecture in the past, especially in Iran. In traditional Iranian architecture, we usually have a building with a winter side and a summer side. The winter side is where it receives the most sunlight during the cold months of the year. And the summer side is where it receives the least sunlight during the warm months. The interesting thing about this house is that each side has a summer side and a winter side (Fig. 7 and 8).

Another sustainable traditional element in Mashhad is the presence of a tabastana in its traditional houses. In the hot and dry region, there was an area called “Hoozkhaneh” inside the buildings. One of these examples is the Ardakani house in Mashhad, which was divided into two parts: a tabastana and a winter house. Figure 8 shows a view of the entrance to the Ardakani house. In this house, most of the main

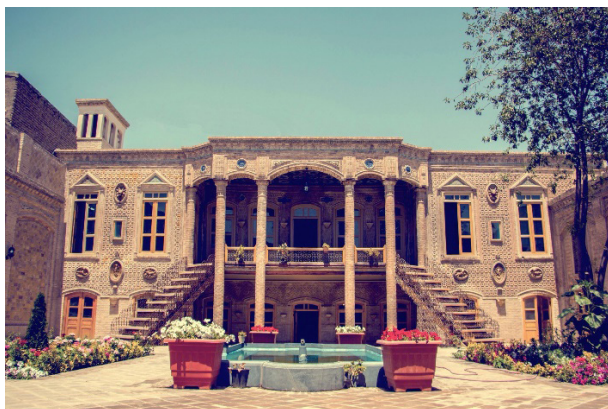


Figure 5(Left): Traditional house of Daroghe, Mashhad,
Figure 6(Right): Elevations of Traditional house of Daroghe

elements of traditional houses with sustainable architecture are visible, including the central courtyard, the tandoor, the summer house, the winter house, the pond, and the water tank. Another component of Mashhad's sustainable cement architecture is the icehouses. Traditional designers have designed a special place called "icehouse" which is a place to store ice and store it for the summer. The Karimabad Icehouse in Mashhad is one of these icehouses, which is a century old (Fig. 9 and 10).

Architectural decorations in sustainable architecture
In sustainable architecture, architectural decorations are selected and designed to be environmentally friendly and help reduce the negative impacts of construction. These decorations can include recycled materials, native plants, rain-

water harvesting systems, and other design features that increase sustainability and reduce energy consumption. In the Sirjan Badgirchapghi, the outer body of its pipes is designed with small pieces of hexagonal geometric bricks that resemble the head of a chapgh or pipe. The use of brick decorations has been a smart use, considering the climate of this region, for strength and durability. The interior decorations of the Boroujerdi House also include delicate stucco, mogharnas, murals, and elaborate mirror work, which were carried out under the supervision of Sani-ol-Molk and Kamal-ol-Molk. The stucco designs of the Boroujerdi House display symbols of the trade and life of its owner, which add to the charm of this building. The Sirjan Twin refrigerator also includes geometric brick dec-



Figure 7(Left): Hoozkhaneh in Ttraditional house of Darooghe,
Figure 8(Right): Inside decoration of traditional house of Darooghe



Figure 9: Icehouse of Karimabad, Mashhad
Figure 10: Inside of Icehouse of Karimabad

orations on the west of the shade wall. They are executed in a raised and recessed manner. These decorations are also appropriate for the climate of this region. Also, the architecture of the Darooghe House is inspired by Russian architecture and includes some of its features. The terrace design and stairs on both sides of the building are examples of this inspiration. Also, inside the house there are decorations such as colorful tiling, wooden ceiling decorations, and statues of lions, angels, and plaster that refer to Russian taste. The unique architecture of the Ardakani House is a room that regulates heat and cold. The Shah Neshin area, the tandoor, the water tank, the pond, the porch, and the beautiful colored tiling in the Pahlavi style distinguish this historical house from other historical houses in Mashhad.

RESULTS AND CONCLUSION

As mentioned, sustainable architecture is a design and construction process that emphasizes efficiency, economic and environmental sustainability, and other environmental benefits. The term sustainable refers to the three pillars of sustainability: ecology (environment), economy (society as a whole), and society (people). This means that energy-efficient buildings should be designed with the long-term in mind, and not only the carbon footprint but also the use of natural resources should be considered. The findings of this article showed that in the city of Mashhad, traditional architecture has well considered the components of sustainable architecture, and traditionally designed houses have the distinctive features of minimal environmental impact and have led to the improvement of the lives of the people who live there. Among these architectures, one can see in the traditional houses of Darooghe, Ardakani. The decorations in these buildings pay attention to sustainable architecture. The findings of this study showed that in the traditional architecture of Mashhad, the principles of respect for the environment and ecosystem; energy efficiency; use of spaces,

decorations, and a comfortable living experience have been observed. Overall, the decoration and interior design of traditional houses in Mashhad naturally align with the principles of sustainable architecture. These principles include utilizing natural materials, reducing energy consumption, creating resilient and multifunctional spaces, and fostering harmony with both internal and external environments. At the same time, preserving cultural elements and traditional decorations embedded within these houses demonstrates a balance between safeguarding cultural identity and adhering to environmental standards. For instance, the use of traditional tiles and handcrafted ornaments in interior decoration, which are both aesthetically pleasing and environmentally friendly due to their materials and construction techniques, exemplifies this approach. In Mashhad's traditional homes, extensive use of natural light, ventilation, and precise spatial engineering reduce reliance on electrical lighting and mechanical cooling systems. These practices, well-reflected in interior and decorative design, showcase how sustainable architecture is inherently embedded in traditional construction. For example, the incorporation of lattice windows and central courtyards allows for natural air circulation and shading, keeping the indoor environment cool during summer while reducing energy consumption for air conditioning. In this context, interior decoration plays an indirect yet effective role in sustainability, as elements such as locally sourced rugs, textiles, and artifacts contribute to minimizing environmental impact. Furthermore, interior design in Mashhad's traditional houses focuses on creating tranquil, balanced spaces that support the mental and physical well-being of residents. These spaces leverage natural colors, plant-based materials, and indigenous elements to promote a sense of peace and harmony. Such spaces also reflect cultural and religious customs while being conscious of conservation and resource efficiency. This demonstrates how interior decor can align

with sustainable architecture objectives without sacrificing cultural and aesthetic values.

Finally, understanding the key elements of traditional Mashhad architecture and interior decoration, and applying them in a way compatible with sustainability principles, can serve as a practical model for designing new buildings and restoring historical structures. This approach not only reduces costs and environmental impacts but also strengthens cultural and social ties within communities. Moreover, integrating

indigenous architectural features and interior elements with modern technologies ensures that future architecture will be not only sustainable but also adaptable to local needs. Thus, renovation and conservation of Mashhad's traditional houses provide a platform to bridge cultural heritage with contemporary green architecture, ensuring that both cultural values and environmental preservation are simultaneously achieved. (Tab. 2)

Table 2: Table of findings of sustainable architecture principles and its relationship with architectural decoration in traditional houses in Mashhad city

Sustainability Outcome	Cultural and Decorative Elements	Natural Ventilation and Lighting	Space Design	Materials and Resources	Sustainable Architecture Principle/ Method
Reduces energy consumption, eco-friendly	Handwoven carpets, traditional tiles	Natural ventilation through windows and courtyard	Central courtyard, lattice windows	Mud, clay, thick bricks	Utilizing local and natural materials
Reduces reliance on mechanical equipment	Traditional decorations and indigenous arts	Protects against heat and cold	Multi-use spaces	Durable materials, multi-purpose structures	Using resilient and multifunctional design
Preserves cultural identity, promotes health of residents	Cultural and religious symbols	Natural light and heat exchange control	Eco-friendly paint, local decorations	Handcrafted artifacts, traditional arts	Incorporating cultural elements in interior decor
Reduces need for electric cooling systems	Traditional elements and artisan crafts	Natural cooling and ventilation during hot seasons	Improved building placement	Indigenous trees, natural shades	Balancing shade and sun shading
Conserves resources, reduces costs, ensures cultural and environmental sustainability	Cultural decorations and local symbols	Natural ventilation and light management	Spaces that can be changed according to needs	Varied materials, adaptable space layouts	Applying indigenous technologies and flexible architecture

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