



THE SUSTAINABLE ARCHITECTURE OF EARLY AND MIDDLE QAJAR DYNASTY: A COMPARATIVE INVESTIGATION OF THE TRADITIONAL HOUSES IN TABRIZ

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ABSTRACT

Sustainability is considered to be a designing method. Quality-orientedness, attention to and awareness of the surroundings and consideration of the future constitute the underlying foundation and rationale of sustainable architecture. An examination of the former and old architectural buildings reveal that the designed spaces and buildings in the traditional architecture of Iran conform to the suitability principle and are regarded as sustainable since all the indexes of sustainability have been included in them. That is, compatibility and matching of the buildings with the nature and the environment, the least amount of harm to the nature and saving energy, reflecting the influence of cultural, environmental and geographical circumstances and appropriate response and function with regard to the needs are considered as the indexes of sustainable architecture. The traditional architecture of Iran with respect to residential buildings are characterized with unique features which not only take aesthetic issues into consideration and protect the environment but also meet all the geographical and local needs of the people. Most of the techniques and principles which have been used in the traditional architecture of Iran represent the modern concepts of the sustainable architecture. Beauty, comfort, sustainability, high quality and invocations for efficient use of energy in the traditional architecture indicate the knowledge and awareness. In this study, the researcher will first review the origins of the sustainability concept in the architecture. Then, the residential and local housing will be introduced and discussed as the most significant entity and unit of inner designing. Next, the traditional houses of Tabriz relating to Qajar dynasty will be investigated and evaluated with respect to structural and geographical elements. It should be pointed out that the data used and discussed in the present study has been collected through both the review of previous studies and the original observations of the researcher.

KEY WORDS: Cold and dry climate, Sustainable architecture, Sustainability, Traditional house, Local materials

INTRODUCTION

A sustainable environment refers to the one whose existence is characterized by the application of natural resources and materials in a way that it is in a reasonable harmony with its surroundings. In case a space and environment is structurally available and existent, it should be sustainable (Mofidi, 2003 cited in Shaghagi, 2010). Architectural and urban science should give particular attention to the protection of natural resources and the continuity for the prosperity. Protection of natural resources is joint and generic feature of all the definitions for the future (Leghaieh, 1999 cited in Shaghagi, 2010). Various methods for efficient use of energy were used in traditional architecture of Iran and an attempt was made to use energy ecologically. That is, consistent energies such as sunlight, wind force, the movement of air and hence the creation of airflow and breeze are regarded as some of the methods which were used to utilize and exploit natural energies efficiently and resourcefully.

The typical type of building materials, the weight-loading elements and the techniques which were traditionally used in the past to support and sustain the building were so thick and heavy that they had remarkably high capacity in saving energy and making a balance in the heat and thermal conditions of the spaces of the buildings.

The impetus beyond the present study is to compare the traditional houses of the Qajar dynasty with respect to the principles of sustainable architecture. The study is intended to answer the following research questions:

Are the traditional houses of Qajar dynasty compatible and consistent with the climatic and local conditions the surrounding environment?

Do the traditional houses of Qajar dynasty conform to the principles of sustainable architecture?



The present study has relied upon an analytical investigation and comparison of the traditional houses and has drawn upon the data which has been collected in the related reliable literature.

MATERIALS AND METHODS

The Research Problem

How to deal with, manipulate and create an architectural design in the surrounding environment is an issue which has to be considered in different areas of the world. Indeed, valuable works of architecture which have remained from the past eras are evidence that human beings have been able to overcome the climatic and geographical problems (Mofidi, 2003). According to the concept of sustainable and consistent development and consequently sustainable architecture, the fact that a building should have reasonable interaction with its natural surroundings is obvious. However, the central issue in establishing such an interaction is the manner and methodology and the measures which are done to fulfill the desired interaction and compatibility.

The existence of spaces such as Summer-stay room, cellar and basement reveal the consideration of different seasons and climatic conditions in the architecture so that different rooms and spaces are consistent with different weather types. In fact, the traditional architecture of Iran has made optimal use of wind energy, sunlight and the thermal capacities of the soil which can be considered as outstanding features (Zandiyeh and Parvardinezhad, 2010, p. 3). It should be argued that sustainable architecture can be defined as one specific type of architecture in which all the capabilities and advantages of the environment are used for maintaining comfort and convenience for the residents and users of the house.

This architecture uses intelligent and techniques, instruments and strategies to minimize the undesirable and negative impacts of the construction. Accordingly, the buildings should design and planned in such a way that they should function and remain optimally under the different conditions and interact desirably with the environment. In other words, sustainable architecture aims to minimize the negative impact and confrontation of the natural environment. The sustainability and orientation and viewpoint of the traditional architecture of Iran towards human being and environment can be considered as a hot issue for research and investigation. The fundamental principles of Iranian traditional architecture have been derived from and originate from nature and its features and capabilities such as light, water and soil. It can be argued that the architecture of Iran is context-based, nature-oriented and goes hand in hand with the natural attributes (Ahmadi, 2003).

Concepts and Definitions

The Lexical Definition of Sustainability

According to the definition which was given by the Dekhoda Dictionary for *sustainability* in the Persian language, it means durable and lasting. Another Persian dictionary, namely Moin Dictionary, has defined the term as maintenance and resilience. With regard to the meaning of the term in English language, it should be mentioned that the verb *sustain* originates from the Latin root *sustinere* and consists of *sus* and *tinere*. The word has been used in English language since 1290 (Zandiyeh and Parvardinezhad, 2010).

Conceptual Definition of Sustainability

The first book which was devoted particularly to the concept of *sustainability* is *Sustainable Society, Ethics and Economic Growth* which were written by the Christian religionist Robert Louis Stevenson. In the 1980s, as a result of the world strategy of protection, the international union of protecting the nature and the report of the council of the natural environment quality and more importantly the report of the world natural environment commissionaire in 1987 with the presidency of the prime minister of Norway led to the development and expansion of the realm and significance of this concept (Mofidi and Azerbaijani, 2003). The term *sustainability* was first addressed by the world committee of developing the natural environment in 1986. Since then, the different facets and features of this concept is expanded and new strategies are introduced for the societies (Nasr, 2010).

Sustainable Development and Architecture

The application of the concept of *sustainability* in architecture has resulted in the introduction of a new perspective in architecture which is referred to as *ecological architecture*, *green architecture* or *biological architecture*. All these titles connote the same concept and trend in architecture and are based on a type of architecture which is compatible with the natural environment (Mahmoudi, 2004).

Defining the Sustainable Architecture

The following definitions and statements underscore and grasp the different aspects of sustainable architecture:

A building which has the least amount of incompatibility with its surroundings and more generally with the related zone and world can be regarded as a sustainable construction.

The creation of a human-made environment on the basis of local principles of compatibility, consistency and efficiency. These principles include: minimizing the consumption of non-restorable and non-reproducible resources, improving and optimizing the natural and environmental conditions and features and minimizing the harm and destruction imposed on the environment (Bert, 1994).

Explanation and expression of a more balanced and symbiotic relationship between an architectural work and the environment which is based on an awareness of the relation between surroundings and architecture (Hogan, 2001).

According to OECD, sustainable buildings are those buildings which leave the least destructive impacts on both manufactured and natural surroundings and the background area. Sustainable buildings take all parts of the life-cycle of the building into account and pay attention to factors such as high-quality in environment, efficient function and future.

Sustainable and homogeneous designing refers to a kind of architecture in which any component and part coherently makes up one section of a bigger whole (Rocky Mountain Institution).

Sustainable architecture consists of a mixture of aesthetic, environmental, social, political and ethical values (Samuel Moby).

Sustainable architecture brings about a deep and fundamental realization and conceptualization of the location; a process which leads more to restoration and revival than to undermining and destruction. Indeed, sustainable is the science and art of maintaining a sound relationship between humanistic milieus and the natural architecture world.

The Result of Definitions

The above-mentioned definitions focus on the following outcomes:

Improving the quality of life and humans' health

Meeting the needs of people

Preserving and protecting ecological systems (see figure 1)

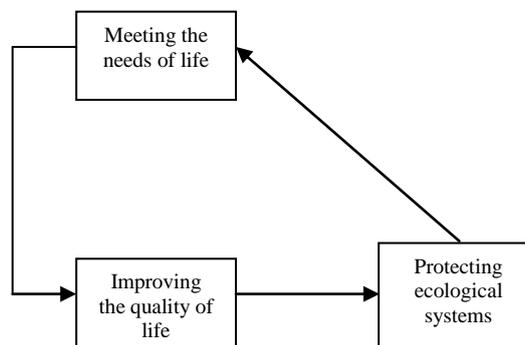


Figure 1. A sustainable biological cycle (Shaghagi, 2010)

Theoretical Background

Geographical and climatic-based Designing

Throughout the entire history of architecture and civil construction, designers always intended to take right measures with regard to different climatic conditions. Traditional architectural designing which was based on climatic and geographical conditions was elaborately expressive, deft and artful. Hence, it can be argued that, as a result of such masterly designing, buildings in mountainous areas were protected against wind and houses with central yards were designed in such a way to protect from cold weather at night in dry and desert geography. In such local buildings which



have a local architectural style, climate and geographic features are considered as a basis and foundation for the life and activities of the native people of those areas. Indeed, the form and style of those buildings stem from the climatic and geographical-based designing. This architectural style which is also called *biological- geographical style* consists of a series of applied and scientific principles; Conforming to and applying these principles by the architects can result in the designing of optimal spaces with respect to convince and energy economy (See table 1).

In the geographical and climatic approach to designing and architecture of buildings, an attempt is made to reduce the energy consumption inside the buildings and hence the building is designed based on the assumption that the building is the first defending line and structure against the geographical and climatic conditions and factors (Gobadian and Mahdavi, 1993).

Table 1. The principles of sustainable architecture

Principle 1	Energy preservation	The designing of the building should minimize the need of the building to the fossil fuels
Principle 2	Compatibility with climate	The designing of the building should be compatible and consistent with geography
Principle 3	Reducing new material use	The design and architecture of the building should minimize the need for using new material types and they should be reused for making new buildings in the future.
Principle 4	Meeting the needs of residents	In sustainable architecture, realizing the residents' physical and spiritual needs is important
Principle 5	Consistency with site	The building should be established smoothly and mildly on the ground of the site and location and it should match the site.
Principle 6	Integrity and entirety	All the principles of sustainable architecture should be operationalized and fulfilled in such a way that a healthy location and environment is created.

Architecture of cold and mountainous regions

In cold regions, the external surfaces should be set up against the direction of prevailing wind; the double-glazing windows should be used and the walls should have the proper and appropriate thickness so that the heat and thermal exchange is minimized. Also, moisture and humidity is another factor which should be considered in choosing the construction method and the choice of building materials. Therefore, it should be mentioned that the environmental factors have a significant effect on the building forms, direction and orientation of the buildings, streets and alleys and also the choice of materials (Gobadian and Mahdavi, 1993).

The form of the building is designed and built according to the regional climate and geography so that the extreme cold weather can be controlled and harnessed. The general features of the form of a building should be as follows:

The buildings have central yard inward

The proportion of the outer shell of the building should be less than the inner space of the building.

The heights of the rooms should be low.

The roofs should be mainly flat.

The openings should be small and the number of openings should low.

Balconies and yards should be small.

The walls should be relatively thick (Gobadian, 2005).

Methods of controlling and handling the climate in cold regions

In order to handle and manage weather conditions properly, one should control and manipulate the exchange and flow of heat from outside to inside and from inside to the outside of the building. As it is clear, heat can be exchanged and transferred in three ways: light and radiation, convection and conductivity. With regard to climate and maintaining the required conditions for the residents' convenience and comfort, surface evaporation can also be considered as a significant factor in reducing the temperature. Table 2 illustrates the natural factors should be considered for decrees or increase of temperature.



Table 2. The theoretical and practical methods of controlling the weather (Watson and Lebz, 2004)

	Conductivity	Convection	Light	Evaporation
Increase in heat absorption			Using the sun heat	
Preventing heat waste	Reducing the flow of heat conduction (Insulating)	Reducing the air flow from out of the building Reducing the penetration of air		
Preventing the absorption of heat	Reducing the flow of heat conduction (Insulating)	Reducing the penetration of air	Reducing heat absorption from sun	
Increasing heat waste	Using the coolness of ground	Using air ventilation	Using the radiative coolness	Using the evaporative coolness

Iranian Houses

Old Iranian houses which are available in Iran not only have direct and close relationship with the cultural, religious and traditional origins and heritage of the setting and location but also respond appropriately to and are matched with the climatic and geographical conditions of the region. The principles of aesthetics are interwoven and hidden in these old houses and one should rely on principles of symmetry and analogy to fully appreciate and discover the aesthetic values of them. The form of the buildings are to a greater extent a function of climatic conditions, the availability of building materials, local methods of construction and the residents' beliefs; in a similar vein, the internal organization and designing of the old residential buildings have been inspired by certain aspects such as social and religious relations, common conventions and traditions and public attitudes.

In a traditional Iranian community, Family was considered to be one of the fundamental units of society and the house was regarded as the significant means for unifying and integrating the family members. As a result, the house was designed in such a way that it would be separate from the outer world and the crucial values of family within the realm and area of the house were of high significance. In a society which is highly dependent on family, the concept of house will be a much more extended and rich concept which goes far beyond the notion of a house as merely a private location. Indeed, house is a holy and sacred privacy and hence the residents of the house should be safe from the aliens and strangers' eyes and looks. Thus, because of the aforementioned belief, the central house in a traditional and old house is inward and is located at the heart of the house (Kateb, 2006).

The houses of Qajar dynasty

In general, the houses in Qajar dynasty can be divided into two general periods:

Early Qajar: from the beginning of the reign and sultanate of Agha Mohammad Khan until the end of the reign of Mohammad Shah: in this period, the dominant view and outlook towards the architecture was inward and inbound. It was based on the style of Isfahan and it was perfect-oriented architecture. Cases such as the Shrine of Hazrat Masumeh in Qom and Sultani mosque can be considered as examples of this type of architecture.

Middle Qajar: from the beginning of Naser al-din shah until the end of the Qajar dynasty: in this period, since Naser al-din shah and his caliphs traveled a lot and many students were sent to Europe for study and education, an architectural style was created which was a combination and integration of local and western architecture. If we define architectural evolution as the widening, transparency and the lightness of the spaces, hence, it can be argued that the architecture of this period should be recognized as the complementation, enlargement and expansion of the old architecture of Iran (See tables 3 and 4) (Iran Newspaper; Interview with H. Mirmiran).

Table 3. Macro-features of the architecture of Qajar era

<p>Macro Architecture in Qajar era</p>	<p>Using vertical reticular colored windows called Sush windows Using red or purple color in seven-colored brick tiles Using knurls along the side of the roofs in palaces Creation of big and high porches at the entrances High buildings which inspire magnificence and power Establishment of staircases in the central axis Observing the sequence Conversion of three-doors to two-doors</p>	<p>Using patterns and motifs of Takht-e Jamshid Using decorative elements and façade inspired by western elements Centrality of the building with columns and capitals Materials such as stone, cement, iron Inward and inbounding Internal decorations Card postal architecture Gable roof Creation of Plazas</p>
<p>Decorations in Qajar era</p>	<p>Seven-color tiling and colorful glazes Stucco and tiling in internal façade Using wooden arrays in decorations Colored glasses Using decorative cast bricks and the special exfoliation of Qajar era Mirror decorations Patterned tiles with ancient pictures Brick carving in decoration of religious sites Karbandi & rasim bandi Using the pattern of London flower in tiling</p>	

Table 4. Characteristics of residential houses in Qajar era

<p>Residential buildings of Qajar era</p>	<p>It includes central room: balcony with two columns in front of it. Small rooms around the central room located simply Plans designed along the building Creation of great views through the windows Basements with beautiful patterns and percussion brick coverings Spring houses Wind catcher for cooling the house Columns and column capitals at the entrances High porches Two-way staircases on the central axis of the building Conversion of three-doors to two-doors and the direct penetration of light into the building More variety, lightness and extension of the spaces Steep roofs and gables Combining of Iranian and western architecture Old mirrors and rich and fine stuccos</p>
<p>Decorations used in buildings</p>	<p>Old mirrors with rich and fine stuccos Marble columns and column capitals Wall paintings with different themes English and French areas with extended grass surfaces Square and rectangular ponds and docks Decorations of internal and external spaces</p>

Table 5. The Physical characteristics and sequence and hierarchy of traditional houses in Qajar era in Tabriz (Early Qajar era)(Adapted from Keynezhad and Shirazi, 2010, p. 24-26)

The orientation and direction of the building		
Built fronts and facades	Location of main spaces on the north front due to climatic conditions (sun light on the north front)	
Orientation of the building	The building is oriented towards the south to use sun light for the main spaces (parlor, Kalleh, pool house and living room)	
Neighbors	Most houses have neighbors from three sides and face the pass-over from only one side and the entrance of the house is from that side (Salmasi & Ganjeih zadeh houses)	
Physical elements		
Entrances	Houses have entrance portal with decorations and brick works. In some houses, the entrance portal is the intermediate space between the entrance and vestibule	
Vestibule	In Qajar houses, vestibule is the major space and has an octagon shape Vestibule is is the intermediate space between the entrance portal and internal space (yard or inside of the house)	
Parlor	As the main space of the house, parlor is located along the major axis of the house on the ground floor at the north front. Parlors often have an overall balcony in the south (north Ganjeizadeh house) and sash windows are used in the south side of the parlor. The shape of the parlor is sometimes in the form of ripped abs (Mojtehedieh house) and often in the form rectangle (Mashruteh house) Elongation and the stretching of the parlor is in the vertical direction on the main axis to have more light	

Table 5. Continued....

<p>Kaleih</p>	<p>It is located on both sides of the parlor and on the upstairs of the parlor and along the major axis Its overall shape is rectangle with a sinking or lump on its walls and it has the height of one floor.</p>	
<p>Pond houses</p>	<p>In Qajar era, ponds had particular importance. They were located along the main axis and were perpendicular to it in the north front (using the south light)</p> <p>This space was usually in the basement under the parlor where there is a pond at the center of the building The pond house is in the shape of a cruciform or recess at the sides (Salmasi house). It is the same height of a floor and it has some windows at the south side facing the yard for ventilation and light. They have various coverings and the covering the central space of the pond house is front from those of the half sides.</p>	
<p>Outer yard</p>	<p>In the houses which have two yards (internal and external) the outer yard is located at the south of the house (Behnam house). However, those houses which have one yard, the yard is in the form of outer yard (Salmasi house).</p>	
<p>Balcony</p>	<p>It is one of the main spaces in Qajar era and is located along the central axis on the south side of the building (to respond to climatic issues). It is in the form of a rectangle which is stretched along the length of it and is perpendicular to the main axis. The balconies of this era are of the overall type on the ground floor. For setting up the balcony, plaster columns and capitals were made and decorated. Access to these balconies is through the yard. Balcony foreheads are limited and blocked from three sides and are only open from one side. They also have plaster decorations.</p>	
<p>Staircases</p>	<p>In Qajar era, stairs were of little importance and were only used to connect the floors to each other. They were usually hidden and the height and floor of the stairs were so that using them was not easy.</p>	

Table 6. Physical features and sequence and hierarchy of traditional houses in Tabriz in Qajar era (Middle Qajar era) (Adapted from Keynezhad and Shirazi, 2010)

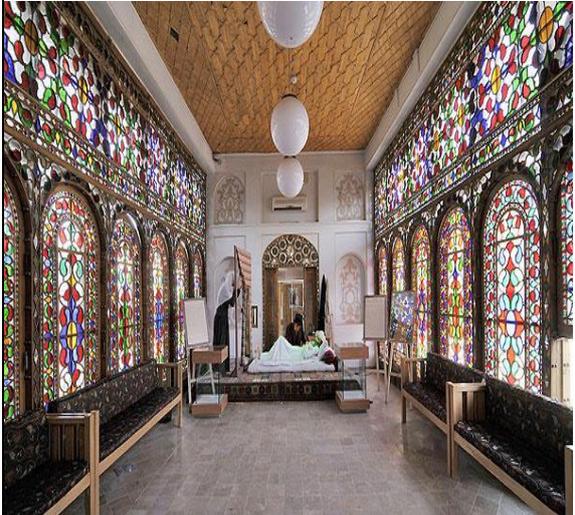
The orientation and direction of the building		
Built fronts and facades	<p>The main spaces are located on the northern front due to climatic conditions (sun light on the north front)</p> <p>The southern and western fronts are of the next priority (in houses which have two fronts)</p>	
Neighbors	<p>Most houses have neighbors from three sides and face the pass-over from only one side and the entrance of the house is from that side</p>	
Orientation of the building	<p>The building is oriented towards the south to use the most sun light for the main spaces.</p>	
Physical elements		
Entrances	<p>Houses with decorated entrance portal can be found only in some houses (Mashruteh house). Manly, the portal has a geometrical shape and it is symmetrical.</p>	
Vestibule	<p>Again like early Qajar houses, vestibule in the middle Qajar houses have an octagon or tetrahedral shape. It is located at the center of the house (Mashruteh house)</p>	
Parlor	<p>As the main space and room of the house, parlor is located along the major axis of the house on the ground floor at the north front.</p> <p>Parlors often have an overall balcony in the south and sash windows are used in the south side of the parlor. The shape of the parlor is sometimes in the form of ripped abs (Mojtehedieh house) and often in the form rectangle (Mashruteh house)</p> <p>In middle Qajar era, the decorations of the parlor such as wall paintings decreased</p>	

Table 6. Continued...

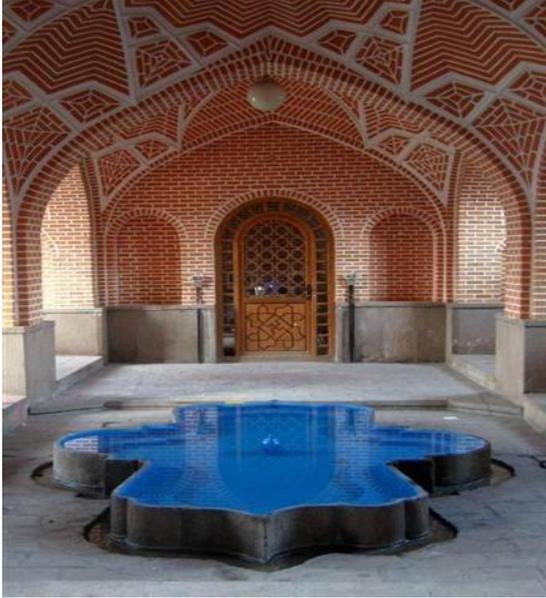
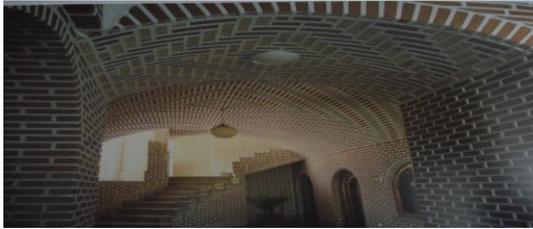
<p>Kaleih</p>	<p>It is located on both sides of the parlor, on the upstairs above the parlor and along the major axis. Its overall shape is rectangle and its height is almost one meter.</p>	
<p>Pond houses</p>	<p>In middle Qajar era, pond houses were particularly important. They were located along the main axis and were perpendicular to it in the north front (to use the south light)</p> <p>This space was usually in the basement under the parlor where there was a pond at the center of the building.</p> <p>The pond house is in the shape of a complete cruciform (Mojtahedi house) or in the shape of partial cruciform with recess at the sides (Alavi house).</p> <p>It has the height of one floor and it has openings from one side.</p> <p>It has various decorations and arch coverings</p>	
<p>Outer yard</p>	<p>In the houses which have two yards (internal and external) the internal yard is located at the north of the house (Mojtahedi house).</p> <p>The general shape of the external yard is quad lateral.</p> <p>The floor of the external yard is lower than the floor of the entrance.</p> <p>Access to the external yard is possible either through interface spaces such as "entrance-vestibule" or through "entrance-vestibule-hall"</p>	

Table 6. Continued...

<p>Internal Yard</p>	<p>In the houses which have two yards (internal and external) the internal yard is located at the north of the house (Mojtahedieh house). The general shape of the internal yard is quad-lateral and is not stretched in any direction. The floor of the internal yard is lower than the floor of the entrance. Access to the external yard is possible either without any interface space or through interface spaces such as external yard or through the internal spaces of the house.</p>	
<p>Balcony</p>	<p>It is one of the main spaces in Qajar era and is located along the central axis on the south side of the building (to respond to climatic issues). It is in the form of a rectangle which is stretched along its length and is perpendicular to the main axis. The balconies of this era are of the overall type on the ground floor. For setting up the balcony, plaster columns and capitals were made and decorated. Access to these balconies is through the yard. Balcony foreheads are limited and blocked from three sides and are only open from one side. They also have plaster decorations.</p>	
<p>Staircases</p>	<p>In Qajar era, stairs were of little importance and were only used to connect the floors to each other. They were usually hidden and the height and floor of the stairs were so that using them was not easy.</p>	



Environmental, Geographical and Climatic Features Tabriz

Tabriz is the capital city of E. Azerbaijan province. This province has an area of 2167.2 Square Km from which Tabriz makes up 4.76 % of the area of the province.

The city of Tabriz consists of two mountainous sections and a plain section. Tabriz has cold and dry climate and a wind blows constantly throughout the year which is a local wind rather than a continental wind. However, sometimes, Siberian drifts and flows pass the coasts of Caspian sea and reach Tabriz which result in extreme cold, storms and road blockade. In this city, winter starts early and finishes late. It is in the GS

(B) Klima row and Kvin ranking. That is to say, it is included among the regions with Mediterranean type of weather or cool-summer type. The average annual rainfall in the city of Tabriz is 305 Millimeter and there is little rainfall in the summer season than the other seasons. The average maximum temperature in July is equal to 32 degrees of Celsius and the average minimum degree in January is equal to 7.2 degrees of Celsius. The registered absolute maximum temperature is 42 degrees and the registered minimum temperature is 25 degrees of Celsius. The number of glacial days is at most 155 days and at least 52 days and on average 107 days (adopted from Governor Website of Tabriz).

Sunlight and Shadow

The use of maximum sunlight in extremely cold climate is of high significance and this is only possible if one can store the energy of sunlight and use it later on cold days. Creating comfort and convenience is important not only inside the building but also outside of it. In cold regions, there is some distance between the buildings so that they do not cast shadow on one another. The streets are oriented in a way that they benefit from sunlight throughout the most sunny hours of the day and they are not in shadow.

Wind and ventilation

Wind is one of the most important climatic elements which can cause a lot of trouble for the residents of cold regions. It also causes the temperature to decrease in cold seasons of the year.

Architecture of traditional houses of Tabriz

As a result of a catastrophic earthquake in Tabriz in 1192 Hegira, the whole city was completely demolished and destroyed and except for a few famous buildings such as Alishah Citadel (Arg) and Blue Mosque, nothing remained. Hence, the antiquity of the buildings of Tabriz date back to early Qajar era (Shirazi, 2005). The houses of early Qajar era which conform to the ancient pattern of Iranian houses have internal and external features. As the time goes by and we approach the Pahlavi era, this pattern wanes so that it disappears in the early Pahlavi era; as a result, the houses adopted an outward and extrinsic orientation Sirazi, 2005, p.33).

The ancient houses of Tabriz have extraordinary conformity and consistence with the climatic and geographical features which is not comparable with the buildings of other regions. Presence in the architecture of Iran is important and hierarchy and sequence is the temptation. On the other hand, hierarchy guarantees the difference and distinction between the inside and outside of the house (see table 5).

The distance between the inside and outside is not a line, neither distance; rather, it is the distance within distance which distinguishes the inside from the outside of the house. In Qajar houses, the hierarchy and sequence for entering the house was defined as follows: doorway, door, vestibule (entrance hall or Hashti), atrium and parlor. As we move towards the Pahlavi era, the internal pattern and features of the house wane; hence, the house become more and more extrinsic and outward (Shirazi, 2005) (see table 6).

The Position of the Case Study

Nobar neighborhood is located in the southern part of the city of Tabriz. This neighborhood is connected to Rasteh-Kucheh and Miarmiar neighborhoods from the northern part and is connected to Yanig hills from the southern part. From the eastern part, nobar neighborhood is connected to Maralan neighborhood and from the western part, it is connected to Charandab and Miarmiar. Bagh Shomal, Maghsudieh and Sarbazkhaneh are regarded as the areas included within Nobar neighborhood. Maghsudieh square is considered to be the central spot of this neighborhood. This neighborhood has 26 mosques; the most famous of which are the Ganni and Meidan mosques. Maghsudieh building which dates back and has been built by Maghsud Beigh, the son of Hasan. He was one the kings of Agh goyunlular Dynasty. The name of Maghsudieh neighborhood originally dates back to this king and is one part of Nobar neighborhood (see figure 1).



Figure 1. The old context and structure of the city of Tabriz and Magsudieh neighborhood (Adapted from Google Earth application)

The case study chosen from a house of Qajar era

Gadaki house (Maghsudieh neighborhood, Moshir Daftar alley): This house was built 160 years ago and it dates back to middle Qajar era. The aristocratic area of the house is 863 square meter and its field area is 1340 square meter. This building includes both interior and exterior parts. The interior yard is small and the openings of the interior parts of the house face the interior yard. The entrance portal leads to vestibule and it leads to the exterior yard. The eastern and western parts of the building have been constructed in two floors. The rooms of the eastern and western basement have arch-shaped ceilings. They include rooms for storing water, kitchen, storehouse and the upper rooms of the basement were used as bed rooms and living rooms.

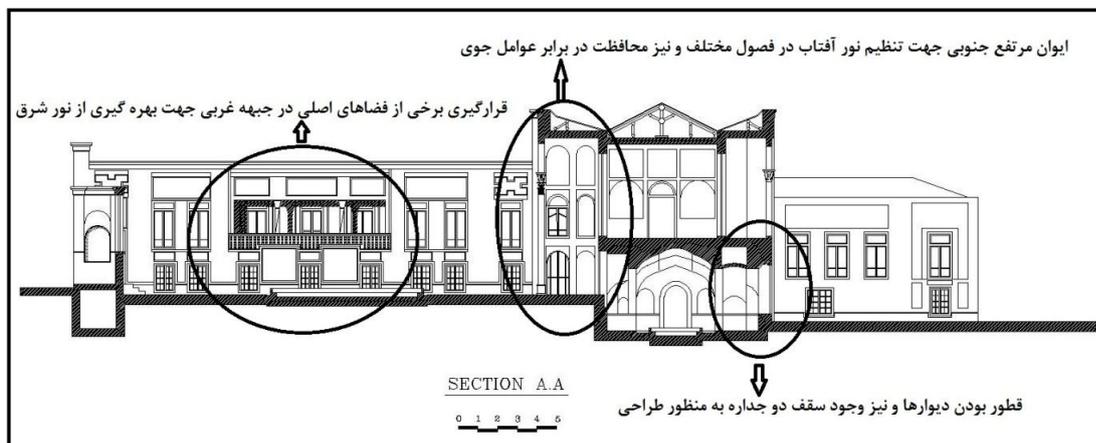


Figure 4. Considerations and measures done in the building for climatic conditions

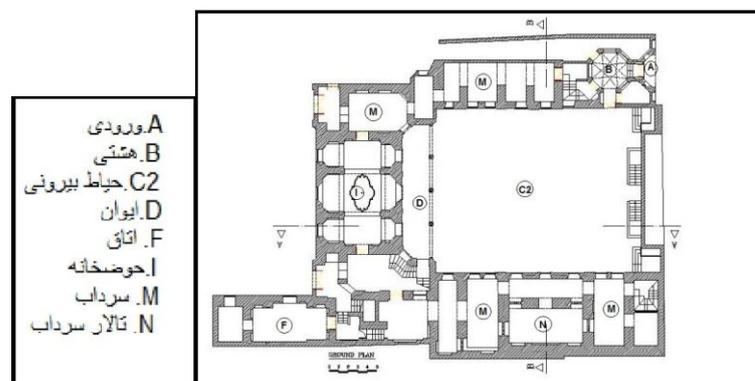


Figure 5. Floor plan of the building (cultural heritage and tourism)



Figure 6.The northern façade of Ghadaki house

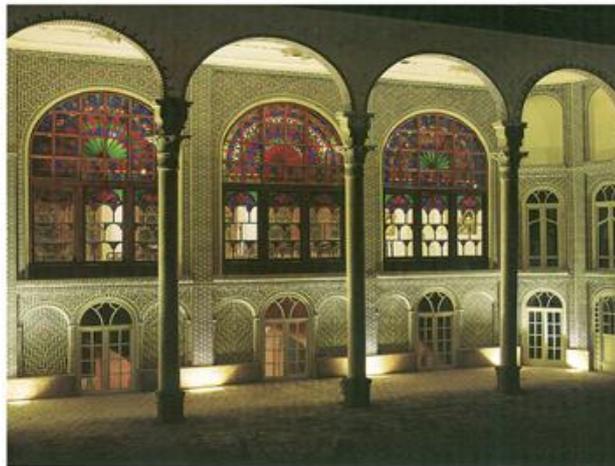


Figure 7. The high balcony of the northern front of the house (Keynezhad & Shirazi, 2010)

The west side of the building has a beautiful balcony which is supported by columns. The northern part of the building has a big parlor which has sash windows and its colored glasses face north and south. At the south of the parlor, there is a big balcony supported by a column; these columns have been decorated with stucco (see figure 2). Ear-shaped rooms are located at both sides of the parlor. In the underground of the parlor, there is a very beautiful pond house with decorated arch-shaped ceilings with side platforms and a stone pond (see Figure 3). On the façade of the building, various decorations on bricks have been used (see Figures 5 and 6). This building has been established and built by Etemad al-Doleh's command who was the governor of Tabriz and at a time it was used as an armory and temporary committee. It has been also mentioned that the well-known martyr Segatoleslam once lived in that house. This building is now used as one part of the architecture Faculty of the University of Islamic Arts (keynezhad and Shirazi, 2010).

RESULTS AND DISCUSSION

Analyzing the traditional and local architecture of the city of Tabriz reveals that it is consistent with sustainable architecture. The results of the analyzing and investigation the traditional architecture of Tabriz is mentioned below:

Principle one: energy conservation: The strategy used in the traditional architecture of Tabriz was to use thick brick walls which attracted heat during the day and stored it for the night. The rooms had little height. There were double glazing ceilings and windows in some buildings

Principle two: consistency with the climatic conditions: Balcony was used in the southern part of the building to make use of sunlight and protection against climatic conditions. Cubic spaces were used in the building to reduce the degree of contact with the external cold weather.

Principle three: reducing the use of new housing materials: local materials were used. Stones were used to cover the walls and the ceilings of the floors were covered with woods and thatch.



Principle: meeting the needs of residents: privacy was considered to be significant and hence interior yards and pond houses were built. Service providing (kitchen) and comfort and convenience rooms (parlor) were separated from each other.

Principle five: compatibility with site and location: most houses had neighbors from three sides of the building and they had access to the external alley and street only from one side; the entrance to the house was through this side.

Principle six: holism: the traditional house of Tabriz was based on the principles of sustainable architecture and it can be characterized by features such as using local materials, compatibility with climate, proper direction and orientation with respect to the movement of the sun, the efficient use of sun heat in different seasons, using the thickness of the pillars of walls, using the thermal capacity and potentials of the soil in the winter, using basement in summer, the arrangements and consistency between local culture, beliefs and the construction which resulted in the creation of sustainable architecture.

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