

Sustainability in Historical Houses of Tabriz and its Insignificant Role in Contemporary Houses

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ABSTRACT

During recent decades, large cities such as Tabriz where urban development phenomenon is increasingly growing encounter many problems. In transition from historical to contemporary houses of Tabriz, historical houses clearly lost some of their values and factors as well as local knowledge, naturalism and saving energy which played a role in contemporary houses. Moreover, changes made during 'Transform and Restore Iranian Historical Cities Program' including Tabriz, resulted in changes in form and structure of residential buildings which does not consider environmental issues; while a development program is considered a sustainable development so that in long-term it qualitatively improves human health and ecological systems. Sustainable architecture theory is derived from this idea; basics and regulations used in this architecture clearly explain most new concepts in sustainable architecture area. Hence the study attempts to identify and describe sustainability, to identify sustainability concepts on architecture, and to analyze these concepts on residential architecture of Tabriz. The study tries to achieve objective basics for sustainable design of Tabrizian buildings.

KEYWORDS: sustainable development; sustainable architecture theory; environment; climate; contemporary house.

1. INTRODUCTION

In recent years, as population increase on one hand and attitude toward urbanization extend in Iranian large cities on the other hand, house demand and related unsuitable environmental effects also increase. Using sustainable development concept in architecture and simultaneously in urban development and destroying environment raised a discussion called sustainable architecture; the building constructed by sustainable architecture interacts with spatial situation, climate conditions and surrounding nature. The important problem here is how to provide such interaction and considerations for this goal. Therefore, the most important architectural achievements can be considered as decrease in natural resource and energy consumption according to the correlation between building and its environmental context; using renewable energy and maximum environmental protection (Mahmoudi & Nikghadam, 2008). Karami et al. (2013) investigated the Iranian gardens in residential houses and their role in creating sustainable architect. Moosavi (2012) overviewed and examined the socio-spatial obstacles of urban sustainability in historic center of cities in Iran.

Although many years ago, residents of the territories have taken advantage of this technology by special skills considering specific rules about optimal use of energy and natural resources, particularly solar and wind, in harmony with climate, today it has been brought into an abyss of oblivion with negligence. Evaluating common concepts and definitions of sustainable development and architectural basics and its qualities, present study tries to characterize intrinsic similarity between old architecture of Tabriz and this architectural process; then by required investigations on advanced architectural methods through correct scientific analyses, the necessary design would be taken place. Evaluation of residential buildings of Tabriz essentially aims to characterize effects of factors such as culture and climate existing among them which play a role in regional construction; considering these, special conditions should be determined to design contemporary houses.

2. Sustainable Development and its Definitions

The term was first introduced in Universal Conference on Sustainable Development (known as 'Earth Summit'), 1991, by Universal Committee of Environmental Development called as 'Meeting Needs of Current Era without Threatening Future Needs, Considering Environment and Future Generations'. A statement was developed through the conference to provide strategies for sustainable development. Its dimensions were extended so that suitable strategies provided for public.

The term 'sustainable' is extensively used to describe a world in which both human and natural systems can survive in a far future. A sustainable development means providing solutions versus finite physical, social and economical patterns of development which can prevent problems such as destruction of natural resources and environmental sites; global pollution; climate changes; extensive increase in population; injustice; and

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decrease in life quality. Although many definitions have been provided for sustainable development, they totally focus on next generations, environmental future and global environmental protection. Principles of sustainable development include considering culture, local characteristics and past experiences; taking advantage of renewable energies; and avoiding non-renewable energies (Golzari Hatami, 2008).

3. Sustainable Architecture and its Principles

Sustainable architecture dates back to 19th century. Sustainable architecture is based on 'environment-sensitive architecture' as an approach to create a sustainable environment. Currently, the term is used for wide diverse range of environment-sensitive approaches. John Ruskin, William Morris and Richard Letabi are among pioneers of sustainable architecture. Designing sustainable buildings aims to decrease their damages on environment in terms of energy and using natural resources which includes following rules: 1) decreased consumption of non-renewable resources; 2) development of natural environment; 3) elimination or decrease in harmful poisoning materials in construction.

Generally, the following definitions can be provided for sustainable architecture:

- Sustainable architecture is defined as a kind of architecture which is least inconsistent with surrounding natural environment and in a broader sense, with region and the world;
- Sustainable architecture includes a mix of particular aesthetic, environmental, social and moral values (Samuel Mok B, 1989).
- Creation of an artificial environment and committed management based on ecological compatibility and resource efficiency standards which include: minimized consumption of non-renewable resources; decreased ecological damages on environment; and improved environmental conditions (Charles Keybert, 1994).

According to above, the standards upon which a building is classified as a sustainable building can be explained as follows (Ghiasvand, 2006):

1. Energy conservation: the building should be constructed so that it minimizes required fossil fuels.
2. Climate coordination: the building should be designed so that it coordinates with available climate.
3. Decrease in consumption of new resources: the building should be constructed so that it eliminates consumption of new resources and it can be used for constructing new buildings at the end of useful life.
4. Meeting needs of residents: in sustainable architecture meeting mental and physical needs of residents is considerably important.
5. Site coordination: the building should be completely consistent with its surrounding.
6. Holistic: whole sustainable architectural standards should result in a healthy environment.

4. Patterns of Sustainable Architecture

Currently, buildings as a part of environment produce large section of environmental pollutions. This does not mean that constructions should be ended; instead, by a right thought and accurate design and planning, buildings can be constructed which impose least negative effects on environment; sustainable architecture is an idea to plan and design such buildings. In general, sustainable design in a building aims to decrease disadvantages of construction on environment by correct usage of energy and natural resources. A sustainable design follows aesthetic, environmental, social, economic, moral and spiritual values. Therefore, the following patterns can be provided for sustainable architecture:

- Minimized consumption of non-renewable resources; instead, consumption of natural and renewable energies;
- Improved quality of environment and expanded natural environment;
- Eliminated or minimized consumption of polluting materials as well as preventing air and sound pollution;
- Wise usage of land and homogenous forms of buildings and environment;
- Economic construction using efficient substitute technologies.

5. Standards and Characteristics of Architecture in Tabriz

Iran is among few countries which could create diverse architecture by its cultural and geographical characteristics. The diversity can be well observed in geographical classifications of a limited region. Different factors such as topography, climate characteristics, economic capabilities, livelihoods, water resources and etc. In the vast land of Iran resulted in emerging different residential contexts in terms of structural formation. Also, huge developments due to changes and renovation in Iranian historic cities like Tabriz, caused changes in form and structure of residential buildings. Hence, the present study addresses features of traditional architecture in Tabriz and parameters of sustainability in the architecture of the region followed by analyzing insignificant role of these parameters in contemporary houses.

5.1. Morphology and Urban Context of Tabriz

Primary elements influencing on formation of traditional Iranian cities can be presence of water and rivers, ponds etc. Religious elements such as mosques and economic elements such as markets created primary core of a city. Studying simple initial plans of Tabriz and evaluating houses in a certain area of the city, it can be observed that formation of houses was consistent with determining factor of climate and it may mostly depend on culture (Figure 1).

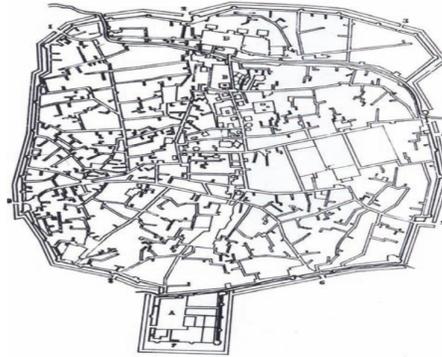


Figure 1: Tabriz formation. Resource: Tabriz map by Pro. Ghiasi, Asar Seasonal journal, 31-32: 19.

Climate is the other influencing factor on urban morphology and traditional Iranian architecture. The formation of Tabriz historical context has also been influenced by prevailing climate and security on the region following culture. Tabriz has dense plans and inter connected buildings by narrow alleys and high walls. This interconnection and integration of context, while securing, can lead shadowing and natural flow of air inside the houses. Most of openings and windows is located against protected areas and central courtyard less affected by the harsh conditions outside the building.

5.2. Introversion and Central Yard

In Tabriz, buildings formed in accordance with tradition around an interior space and are so called introversive. It seems influenced by social and cultural factors more than climate, location, and the area. Lack of direct visual communication between interior spaces and exterior urban spaces as well as available spaces such as central yard or covered parts are among characteristics of introversive houses in Tabriz. It can be observed that openings are opened to these elements (Figure 2).

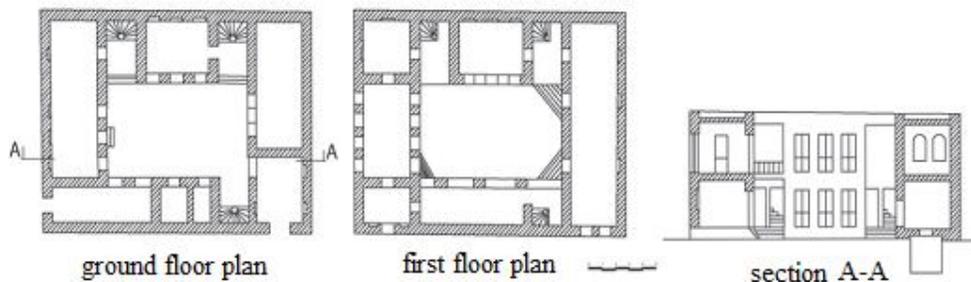


Figure 2: ground floor and first floor plans of a building with introversive traditional structure of Tabriz. Resource: Memarian, 2008.



Figure 3: 'Ghadaki' house. One of the best residential architectures in Tabriz. Resource: Atarzade, 2004.

The yard as the main open space is representative of coexistence with nature and in historic houses, is considered as microclimate and tiny paradise of house. In historical houses of Tabriz, the yard is constructed in the center of the structure and acts as its heart. In these houses, the yard is used as ownership privacy uniting several elements of the house and creating a merry and joyful environment and finally as a secure place for family. Sunken gardens contributed to provide welfare conditions using beauty, shadow and decreased relative humidity of flowers, trees and sometimes ponds or shallow pools in the central yard (Haeri Mazandarani, 2009) (Figure 3). Its size is designed so that it is able to balance temperature of the interior spaces by observing sun lights.

5.3. Vegetation and Landscaping

In relation to plants in traditional buildings, plants play an important role in moisturizing environment due to evaporation (Ghobadian, 2008). In general, available plants and trees in Tabriz not only increase relative humidity but also shadow in summers. For example, a large yard with a wide pool and gardens around it as well as plants (Figure 2) moisturize and decrease temperature of exterior space; they considerably decrease temperature of interior spaces. On the other hand, trees not only prevent wind and decrease dust, transfer voice and clarify the air, but also effectively balance heat fluctuation and provide appropriate environmental conditions in the region.

5.4. Structural Form

Direction is a considerably important problem in construction establishment which automatically interacts with sun rotation and its radiation in different seasons. On the other hand, destroying winds in some areas make direction very important. Hence, the matter is of considerable importance for construction in various climates, especially cold and arid climates (Farokhyar, 2007: 33).

In Tabriz, the building is either constructed one-sided – the yard is on one side – or two-sided – the yard is on sun-light direction for winter and back to sun-light for summer (Figure 4).

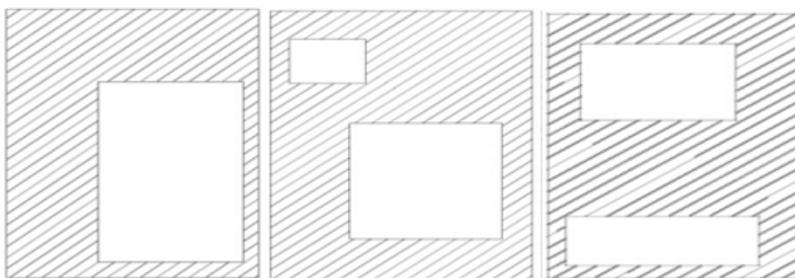


Figure 4: location of yard in relation to building, Tabriz

Spatial structure of houses in Tabriz is toward north and south. To protect rooms against cold weather of winters in traditional houses, windows are constructed double-sided; that is, interior window is opened to room and exterior to outside (Figures 5 & 6). It can be concluded that cold weather of Tabriz resulted in a dense form for buildings and sunlight intensity extends it toward east-west axis. It is worth noting that the best form for buildings of Tabriz is squared plan which possesses both minimum exterior surface and maximum volume; moreover, heat transfer is in minimum level in different seasons (Kasmaii, 2003).

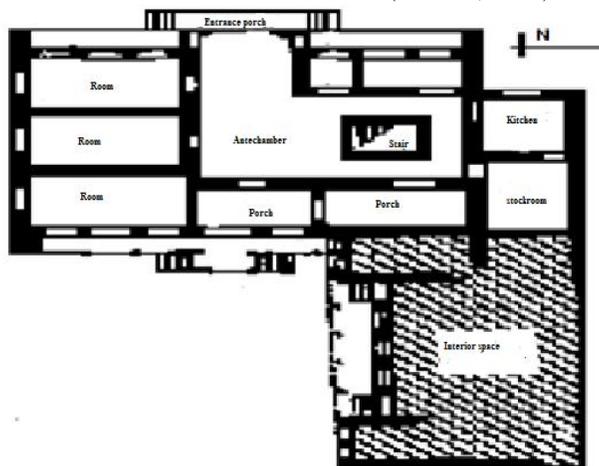


Figure 5: plan of 'Ganjezadeii' house in Tabriz

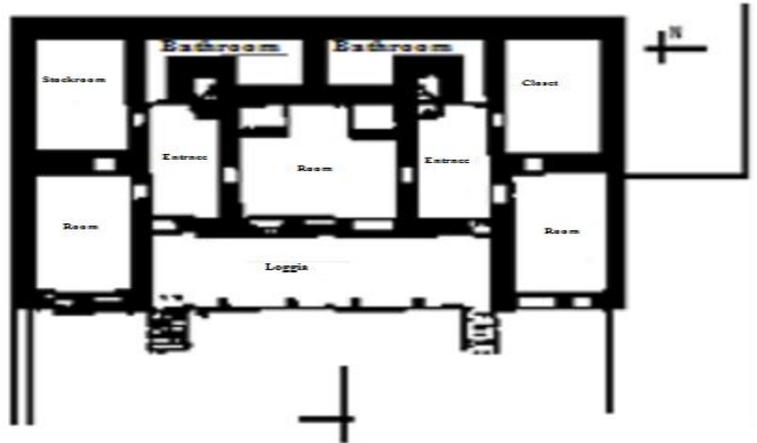


Figure 6: Plan of 'Ghazi Tabatabai' house in Tabriz'

In general, the form of historic buildings in Tabriz possesses following characteristics which are considerably consistent with environmental sustainability conditions: 1) they are completely introversive and bounded; 2) there are a center yard, a porch and a basement; 3) the floor level (especially yard) is lower than passages; 4) height of rooms is relatively short and walls are thick.

6. Description of Formation Characteristics and Qualities of Spatial Pattern in Contemporary Houses of Tabriz

In early 20th century, excessive construction of similar residential buildings and the contrast between design of new buildings and people life style as well as their single-formed characteristic clearly showed their heterogeneity with urban environment, welfare and social demands. Such situation was manifested in architecture of Iranian large cities (Figure 7).

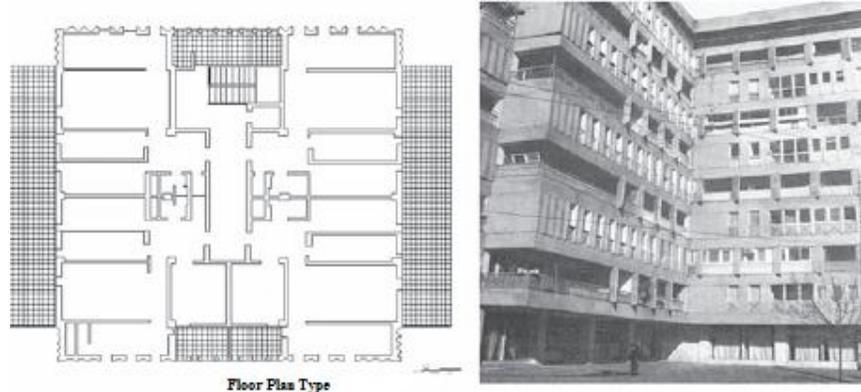


Figure 7: an example of contemporary apartment architecture in Tabriz

Post 1300s, changes in formation due to economic development resulted in related problems in historical cities including Tabriz. Non-academic pre-mature plans broadly formed in residential regions resulted in designs by different techniques without unclear architectural identity. It is worth noting that lack of a comprehensive plan for urban development can be result of this crisis. Post 1320s, due to middle class receiving financial facilities we can observe different houses from condominiums to villas each following a kind of architecture; as a result of irregular usage of architecture, an unidentified architecture was common. Although these components are not unidentified by themselves, they do not follow a system as a whole and belong to a certain period of world architectural history. The city is classified to completely heterogenous areas of assembled parts, each follow a different style. Tabriz modern architecture stems from delivering western enchanting culture to Iranian introversive society. Although Iranian contemporary architecture is individually creditable in terms of art innovations, its individuality could never transformed into collectivity (Atarzade, 2004: 4). The changes were occurred in both spatial organization of house and family life-style so that modern houses can not be called Tabrizian houses compared to houses built in past half a century.

7. Comparative Analysis of Spatial Relationships in Historical and Contemporary Houses of Tabriz

There were a yard or a central yard in total constructed houses by 1300s in Tabriz, from small to large; arrangement of spaces around yard followed a certain spatial system. The oldest, most creditable and sustainable pattern common for locating spaces has been room+ porch + yard (Haeri Mazandarani, 2009, p. 137). According to the pattern, there are three different spatial qualities (opened, closed, and covered) in terms of welfare, climate, elite, private and public domains which are designed inter-extending. These three are applicable and livable and can be both individually and collectively used. The design of these houses involves both most extensively life-style and spatial organization from smallest to largest scale. Spatial organization of historical houses was very flexible to needs and changes in life-scale. Not every available space was blocked; while maintaining independence, they allow combination with surroundings (Haeri Mazandarani, 2009, pp. 91-95).

Now, to characterize residential conditions influenced by culture and climate of historical houses, we analyze how to establish them in our surrounding environment and relations of micro-spaces in these houses.

The followings are main characteristics distinguishing historical houses from contemporary ones:

- Techniques for space empowering in historical houses:
 1. Spatial organization of historical houses is responsible to provide welfare considering usage of opened and closed spaces as well as air movement inside all micro-spaces, shadowing and establishment of pool for surface evaporation and to meet standards of energy saving.
 2. Relaxing factors, such as vent, basement, shady part, pool and garden are incorporated within spatial organization as an architectural manifestation.
- Closed spatial species in historical houses:
 1. Closed spaces have defined scales from small to large which are consistent with requirements of life-style.
 2. It is possible to expand closed spaces to each other, to expand closed spaces to open and covered ones in designing system of spatial organization in historical houses.
- Spatial dynamics of coexisting with nature in historical houses:
 1. In historical houses, the house is not separated from nature and representatives of nature are necessary within spatial organization of house.
 2. Spatial organization of house uses wind direction, sun light, seasonal order and water to provide welfare and incorporates them within bydefining architectural elements.
- Spatial activity dynamics from privacy to sociability in historical houses:
 1. Scale diversity of stop micro-spaces (two-door, three-door and five-door) and their importance for spatial organization allows access to spaces in various domains, from privacy to public.
 2. Covered spaces act as spatial spaces in interface of opened and closed spaces in historical houses.

Residence methods and qualities in Tabriz involved both private and closed spaces; but in modern era, residential is defined as interior space. Spatial formation of an apartment suit (contemporary house) includes a closed and an opened part where opened space (yard) is against closed part. Closed part is resulted by arranging several cubes and does not allow spatial expansion and height diversity in micro-spaces of each apartment unit. The direction remained for interior space of an apartment to expand, is along horizontal side of the cube that now is insignificant within spatial organization due to cubist thought.

The main characteristics of contemporary houses are as follows:

- Techniques for space empowering in contemporary houses:
 1. Spatial organization of historical houses is not responsible to provide welfare and comfort for the house.
 2. In spatial organization of contemporary houses there are no spatial response to consistence with nature and its changes; instead, spatial response was replaced by technology through a divergent path.
- Closed spatial species in contemporary houses:
 1. There are two types of closed spaces in contemporary houses: single and combined; single spaces are only used for privacy and combined spaces are public domain of family.
 2. It is rarely possible to combine closed spaces with each other. Dominant trend in designing contemporary houses is to increase closed spaces in the form of bedrooms of any size.
- Spatial dynamics of coexistence with nature in contemporary houses:
 1. Spatial organization of the house does not consider nature. It does not use its facilities to comfort family and the relationship between construction and nature is reduced to consume and weaken nature.
 2. Nature limitedly and marginally exists in contemporary houses.
- Spatial activity dynamics from privacy to sociability in contemporary houses:

1. Considering micro-spaces individually and impossible combination of spaces and spatial expansion, contemporary houses are divided to two private and public parts; spatial organization is not flexible to sociability.
2. Rooms which are representative of private spaces are re-connected to outside. Crowded spaces, interfered spaces and pollution do not allow privacy.

8. Conclusion

Conducted studies indicate that traditional architecture of Tabriz is sustainable architecture; because meets all sustainability standards and it is able to respond environmental problems. For many years, people tried to meet their needs using available resources, methods, ancient traditions and simple tools. Present study tries to evaluate Iranian traditional architecture in cold climate whereby referred to the relationship of old architecture toward optimal usage of energy and sustainability of the environment. But what happened in modern days whose great losers are supposed to be us, is importing inappropriate standards from other schools and cultures with non-local texture. Byconsistence of modern architecture and new energies used in construction consistent with climate according to traditional architecture criteria energy can be saved and environmental pollution can be reduced whereby a sustainable architecture can be achieved that is consistent with environmental and climate situation, enjoys high quality and resistance, and uses renewable energies. Although proposed strategies are generalized, each one can be the subject of new study.

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