

Masouleh: A City; A History

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Abstract—Human always tried to create a suitable situation for their life according to environmental conditions. In fact, geography has an important role in the shape of our living area. Iran also as a four-season country has different climate type: hot and humid, hot and dry, mid and humid, and cold; therefore, we can find different architecture styles in Iran. Gilan's traditional architecture is a suitable sample of sustainable construction in Iran. Because the main factors of every dwelling are the climatic, social, economic and cultural effects which demonstrate the interaction between environment and people settlement.

This paper was determined the interaction between environmental factors and the rural dwellings in the Gilan province. Also, traditional village (city) of Masouleh as a rare sample of rural and sustainable architecture was introduced.

Keywords—Masouleh, Traditional architecture, vernacular materials, sustainable architecture.

I. INTRODUCTION

THE remained monuments are witnesses a contradiction between the residents and climatic problems. Because of this, there are different native architectures in various climate and culture throughout the world. In Iran, as a result of the different geographical parts and culture, there are several vernacular architectures. Furthermore, Gilan's rural architecture mirrors its settlements' interaction with the environment, social and economic status, and also worldview, artistic talents and technical building skills [1]. Thus Gilan is a suitable case study for traditional architecture investigation.

Different studies were done about arid and mountainous traditional architecture of Iran [2], but limited experts pay attention to Gilan with the specific climate and architecture. The most common subject of Gilan studies have been the environmental, social, anthropology and cultural investigations [3], [4]. However, few researchers have been studied about traditional architecture in some part of Gilan [5] and the sustainability reasons of this structure pattern [6], [7].

Based on this, Masouleh as a unique style of Gilan's architecture was selected.

All in all, the purpose of this paper is investigation of green

architecture in Masouleh. Also, involved factors in successful design of Masouleh traditional architecture pattern are estimated; these factors are included the resourceful use of indigenous materials, to careful consideration of function, climate and location, also with less waste of energy.

II. STUDY AREA

Gilan is a Northern Province of Iran which is located in the Southern west of the Caspian Sea; Gilan is divided into three parts based on the nature: The eastern is plain, Central is forest and Western is mountainous [8], [9], [10]. The existence of rain-bearing winds of north and western north, Alborz mountain ranges in the south and the Caspian Sea in the north have amounted to particular climate in the north of Iran with heavy rains, high humidity, hot summer and cold winter.

A. Climatic Effects on Gilan Architecture

Gilan residences life style is totally different from other parts of Iran, because of the specific climate condition [5], [11]. Therefore, traditional architecture of this region has reached some solution to this climate situation to provide peace and comfortable for dwellers along with living, social and cultural factors. As a result of climatic condition, there are several architectural characteristics such as air condition, spatial characteristics and materials.

One of the most suitable climate solutions of traditional houses in Gilan for using the ventilation is appropriate orientation and the height of building. With the linear expansion of the building in east-west direction, the inhabitants enjoyed enough sunlight and local airflow. Thus, balcony (Fakoon) was built in one or several faces of the building in order to prevent rain from hitting the building body [4], [7].

Because of continuity and severity of rain, the roofs of traditional houses were built with two or four slopes. In some places there are strong winds which those parts are completely closed by a long roof. The space between sloped roof and upper floor roof caused the air to flow and the humidity to decrease in warm season. Also, since this space is usually filled with hay in cold season, it functions as insulation against cold [12], [5].

As a result of high humidity, wet soil and overwhelming rivers, houses have been built in two storeys to avoid the penetration of land moisture into the houses. The foundation area was built with wood in plain area and was used stones. However, there are some differences between the height of foundation in different parts of Gilan; for example, because of the surface of groundwater and sticking soil, the houses are

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made in 100-150 cm above the grand land; while this height is lower in forest part about 80-120 cm [5], [13] (Fig. 1).

On the other hand, as a result of different climate condition in mountainous areas, architecture typology is completely different from the plain areas; for instance, the houses are located in the hearts of mountains, including Roodbar, Masouleh and Deylaman which have staircase structure. In addition, the wooden roofs of these houses are flat and customary are used adobe, stone and mud to build the houses. Consequently, the livelihood and dwelling style of rural families has adapted to climatic strategies after many years leading to harmony in the architecture of rural houses and sustainability of this structure.

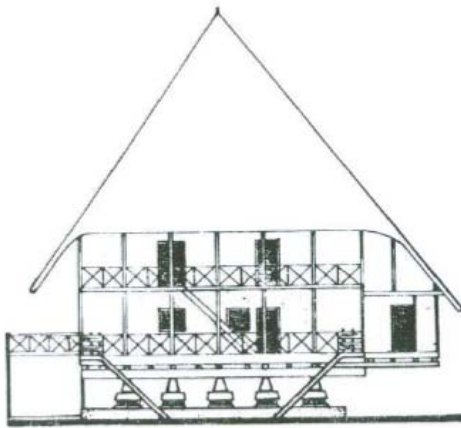


Fig. 1 The sample of height expansion houses in Gilan

III. DESCRIPTION OF MASOULEH AND ENVIRONMENTAL CONDITION

For years, Masouleh has been an obvious type in fantastic harmony between nature and human. This historic town as a national relic is an obvious type of the historic habituate of mankind. The influence of culture from one side and the nature from other side are the creature of specific architecture and urban development in Masouleh. By this order, in a continuous and constant cooperation, it has created wonderful dynamism in historic lifetime of Masouleh.

A. Geographic Condition

Masouleh is a Beautiful village near the Alborz mountain range with peculiar architecture of its own. Spread over 100 hectares, Masouleh is located at the southern end of the humid Caspian Sea in a river valley. This city is 1050 meters above sea-level. Because of the beauty of nature and unique traditional architecture of Masouleh, the village was registered as a national monument in 1975 with the number of 1090 (Fig. 2) [14].



Fig. 2 Aerial photograph of Masouleh

B. Climatic Condition of Masouleh

Being close to sea, Masouleh is located in a mountainous and high altitude region. Hence, its climate is a blend of mild mountainous weather (winter) and humid coastal climate (summer). Because of the heavy rain, the relatively humid is 87% in this village. Rainfall is generally around 700 millimeters and snow is 800 millimeters per year [15]. Forests and mountain have created a beautiful landscape for whole seasons of Masouleh.

C. Historical Background

Masouleh in local language was named Khoortab Khani (Xortāb Xāni), Bishatol Baghar (Biša-tol-baqar) and Masalar (Māsālār). Based on the traditional anecdote, this village had located in near Masalar Mountain, thus village `s name change to Masouleh during the years. The date of Old Masouleh back to 8th century (After Hegira) as excavation on ancient site. In addition, new Masouleh was made in near ruined city after outbreak of plague (1565) in Old Masouleh [16].

D. Characterization of Masouleh Houses

1. Architecture Characteristic

Since Masouleh is built on a steep hill, a unique architecture is used for its construction. The houses form rows of huge steps and each house roof is the yard for the house in the upper row. Courtyards and roofs both serve as pedestrian areas similar to streets. In the other words, when we cross a road, we are actually walking on the rooftops of the other houses. This way it is the most unique village in Iran with such prohibition, actually the narrow streets and many stairs

also would not make it possible for vehicle to enter (Fig. 3).



Fig. 3 Access routes and allays in Masouleh

At the moment, there are more than 350 residential units. The 70% of houses are two-floor high, such that one- storey, and three- storey houses are rare.

Bazar of Masouleh is seven- storey and there are 120 shops in there (Fig. 4).



Fig. 4 The main financial part of Masouleh, Bazar

○ Anatomy of Masouleh City

Masouleh generally is divided to six parts, five districts and one market. The districts of Masouleh are known as Khaneh Bar, Kashteh Sar, Asad Mahalleh, Masjed Bar and Reyhaneh Bar. Also, its market which is hub of trade has independently to each district (Fig.5).

2. Orientation of Masouleh Houses

Masouleh is located in the hearts of mountain and mountainous cities should not located in down of valley; because village not only face to flood, but also is suffered from the cold weather at night. On the other hand, as a result of cold and heavy wind, the village could not make on the top of mountain. Therefore, the middle and south of foothill is the

most suitable part for village construction.

With the expansion of Masouleh houses in south or south west, the dwellers enjoyed enough sunlight in winter and local airflow in summer.



Fig. 5 The location of Bazar in Masouleh

3. Functional Spaces in Masouleh Architecture

The formation of traditional houses is normally made by room, entrance, corridor, staircase, Chghm, Soumeh (Svmh) and storage. Dimension of smallest house in Masouleh is 60 m² and the greatest one is 300 m².

In multi- storey houses, the upper floors which are free from the moisture are suitable places for the habitation of the dwellers. These floors are included rooms and balcony.

Corridor (Daalan) is a functional factor in traditional houses of Masouleh. In one- storey houses, Daalan has a conjunctive space function which called Chghm. In two and three- storeys, the spaces near the corridor were allocated to livestock spaces such as stable, yarn, foodstuff storage places, also bathroom, toilet and staircase. Staircase is also generally made by wood and is connected to Chghm.

In this architecture, the upper floor consists of some rooms allocated to dwellers living space. Rooms, according to the dimensions, location and the number of windows have different name; the great one called Pilla Ke, the small one called Rooke, the upper one called Jera Ke, the down one called Kafi Ke and the middle one called Mena Ke. In addition, rooms have one, two and three windows called Ie Baria Ke, Du Baria Ke and Se Baria Ke respectively. In the other words, the houses with window called Baria Ke (Fig.6) and those have Talar and balcony called Talare Ke (Fig.7).

Rooms, generally did not have any special function and were used differently based on season and family's requirement. The great room which commonly seen in the rich people's house called Talar and allocated to guests. Talar is located behind the balcony.

Balcony was located in one or more sun-facing sides of building which was the place of daily activities such as cooking, eating, doing house chores, living and even sleeping during some suitable months of year; while in the cold seasons of the year these activities were transferred into the house.

Also The hall where located behind the rooms or Talar in local language is called Soumeh, which is also the family winter quarter [7].



Fig. 6 The sample of Baria Ke house



Fig. 7 The sample of Talar Ke house

4. Structural Elements of Masouleh Houses

The existence of rainforest because of humid and mild climate, has led to utmost using of Local materials in vernacular architecture. Hence, wood, stones, wild ferns and adobe were used as the main sources of building in Masouleh. The foundation and basement were consist of thick lumbers and stones. The stones of foundation and basement were avoided the penetration of land moisture into the houses and absorb the warmth of sunlight during the day [8], [10], [17] (Fig.8).



Fig. 8 Basement was made by stone

Oak, Aspic, Zelkova Carpinifolia, Elm, Maple, Linden, Alder and Walnut are commonly in use for foundation, doors

and windows; because, they have enough resistance against humidity and termite invasions.

After making the foundation, wooden column were erected and installed on the beams of the foundation. Columns with the upper beam were made a frame for the rooms. In first storey, the space between the columns was covered with stone. Then adobe (30×30×8) (in diagonal directions) and stone were provided walls of other storeys (Figs. 9, 10).

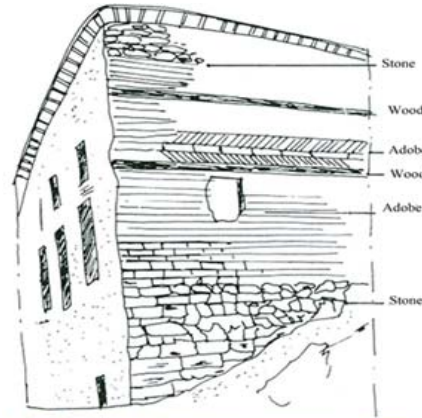


Fig. 9 Ingredients of wall in Masouleh houses



Fig. 10 Adobe and stones were provided walls

Horizontal beams (Oak wood) were installed on the cradles of the walls, also some other beams which called Kalile put in as parallel as the horizontal beams to make roof; Kalile was distribute the stress. As a next step, timbers (Beech wood) were connected to the beams in each 20 or 30 centimeters. Then the crevices among the timber of floor were covered with cob, wild fern and Fal-gel with 8%-10% slope; wild ferns grow abundantly in Masouleh and acting as an insulator

against water. Also Fal- gel is a common plaster which is mixture of clay, shattered rice stalk and water; shattered rice stalk should not be longer than 10 centimeters (Fig. 11).



Fig. 11 The structure of roof at first until the end

5. Façade

Beautification and ornamentation in Masouleh houses are wooden and muddy whether are used in balconies or doors and windows. Depending on the residences' economic condition, parapets are simple or complex.

Based on the Masouleh weather, yellow clay coats the exterior of most buildings in Masouleh, which provide the chance for better visibility in the fog.

Often tree trunks are used as elements not only for the structural use, but also for decorative components as doors and windows [10]. Doors in Masouleh houses are made in different way; the most common variety of doors in Masouleh are single-leaf doors and double-leaf doors. Standard door size in residential houses is 70 centimeter wide and 160-170 high, but the door of some houses has 170 width and 200 centimeter height for transportation of domestic animals (Fig. 12).



Fig. 12 The sample of door in Masouleh houses

Windows were made in single (Ie Baria), double (Doo Baria) and triplex (Se Baria) types. Windows also have an

aesthetic role and craftsmen use the geometric and especially circle motif for establishment [18] (Fig. 13).



Fig. 13 The sample of Window in Masouleh houses

E. Destruction of Historical Construction

The depreciation of essence and spirit of Masouleh during these 50 years is noticeable. After Manjil earthquake in 1990, 400 units of Masouleh houses were reduced to 100 residential building which 90% of these 100 houses suffered from serious destructions. Also, after 1990, 15% of traditional doors and windows were remained. In reconstruction done by the government, 250 new houses with modern technology and building materials were made during the last 10 years. In fact, the main reason of devaluation of Masouleh historical value is the use of modern technology and changing the staircase style of Masouleh structure in new construction (Fig. 14).



Fig. 14 New construction in staircase structure of Masouleh

On the other hand, Villagers' dwelling pattern is changing with time due to penetration of urban culture through mass media. Therefore, during last 60 years, Masouleh population

has decreased from 3500 to 900. This shows descending history progress of this ancient town (Fig. 15).

One of the important problems caused a lot of concern among cultural heritage experts is the construction of villas and residential settlements by non-domestic people in this historical village, which has intruded the cultural landscape and historical texture of this national heritage site. Furthermore, the road construction project for widening the road of Fouman to Masouleh is another problem, because it is located in cultural landscape.

Historic village of Masouleh is the first Iranian city which has been completely registered in list of Iran's National Heritage sites. Despite all the problems, cultural heritage experts are making huge effort to prepare the suitable ground for its world registration.



Fig. 15 Old Masouleh and new Masouleh

IV. CONCLUSION

Human, throughout the years, has lived compatible with nature, creating an extraordinary habitat and architecture. In fact, indigenous material and traditional dwelling pattern of Masouleh is made it a unique model of outward oriented architecture.

In this type of architecture, vernacular materials such as wood, clay, stone and plants have been the most popular ingredients and are in harmony with the environment. Also, Masouleh's architecture has had an appropriate orientation of structure in relation to wind and sunlight, which has led to create the balcony and Soumeh for summer and winter, respectively; balcony provides ventilation in summer and spring, also Soumeh was disconnected inside house from utter side of the building reducing the waste of energy. This concept is an important concern for the modern architecture.

Restoring the principle of region architecture based on climatic conditions and the relationship of dwelling spaces is the most important part of preserving. Therefore, attention of

experts to basic principles of this traditional architecture in later development is necessary. Reconstruction by use of indigenous technology and building materials encourage the local people to pay attention to conservation of their own houses. In addition, this policy will increase the construction of sustainable houses and will lead to appropriate developments in future.

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