

Climate and Passive Defense Role in Shaping Sustainable Architecture

Reviewsamples (NoshAbad, Kashan, Iranand Derinkuyu, Turkey Handcarving Architecture)

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Abstract - Iran is a country with particular geographical situation and diverse climate in the region. Besides these features, the differences in religious beliefs and political beliefs and also conflict over the use of natural resources and geographical land acquisition as well as violence of nature in the past become the other factor for architect that new days is well known as a defense architecture. Today, the context of these effort can be seen as a passive defense. All these conditions together cause the human thinking on how to shape their living space with priority of space security. The overall results is to achieve a form of sustainable architecture. Meanwhile, underground architecture or hand carving, are the sample properties that all the sustainable principle including climatic condition and passive defense is well respected. Good location finding, being multipurpose, and easy access are the features of this architecture. Architect that the materials are renewable and using appropriately from nature and supply a utopia for residents. A notable example is the Ooyi in Kashan that are consistent with nature and human needs of that time and capacity of utilization and reuse of it is still exists. In this article, with an overview of the definitions of climate and passive defense and with showing their characteristic in sample architecture, we have tried to understand correctly about sustainable architecture by comparing our samples with similar ones in Turkey. Our purpose is modeling and appropriate using of these architecture and utilizing right programs to attract tourists in these areas.

Keywords - sustainable architecture, climate, Nosh Abad, City of Derinkuyu.

1. INTRODUCTION

As mentioned, Iran with a vast area and ancient history, has experienced many ups and downs during history. Iran's diverse climate makes a variety of different types of architecture that with over time and in combination with different cultures and traditions getting their characteristics. The architecture that was based on welfare and tranquility for humans. While some Iran's

area has been on the attention and encroaching other people because of its particular geographical situation and its natural resources, thus we are witnessing the creation of conservative thinking in architecture that with regard to environmental and areas climate condition and also the customs of their ancestors emerged. Optimal use of nature, being in the service of the people, natural and human hazards excretion are noteworthy in this architecture. The principles that that are remember and well known as passive defense. In the simple definition, passive defense is set of acts that apply for ward off potential hazards and keeping security. These opinion has been prevalent among Iranians since ancient Iran. Perhaps the most beautiful and best of its kindis hand carved or underground architecture. Creative vision to choose the location, its advanced engineering, its consistent with nature, all was for welfare and tranquility of residents of this region. This architect whether or not, is not defined for a generation. This architecture is renewable and have the features of change its use over time. Therefore in this article we are going to mention and describe two particular case of them. Underground city of Ooyi in Nosh Abad are two pure architecture of hand carved which in turn represents a part of defensive architecture and are consistent with Iran's climate. On the other hand, we are witness of the birth of similar architecture in Cappadocia, Turkey. A series of underground cities that have advanced architectures and in them almost all needs of a town resolved. In first part we'll have a precise definition of passive architecture. Then we will review the impact of climate in formation of this architecture. In the following, we will have a brief description of the architecture of underground city of (Derinkuyu) to compare it with the Iranian sample. And with obtained data, we will reach the roles of passive defense in the formation of this architecture that are the sustainable architecture. And also we will work on how we canuse this experiences in this time, and does this architecture is utilizable in this time or not.

2. PASSIVE DEFENSE

In a simple definition it is a defense that are not based on military equipment and weapons. But it is a set of plans and actions that decrease damages against enemy threats.

This concept is also mentioned as a deterrent. The main policy of defense is based on survival and security. Some of passive defense are include hidden, camouflage, deception and so on. We can see all these point in hand carved architecture that to be discussed.

3. CLIMATE AND ITS IMPACT ON SUSTAINABLE ARCHITECTURE

Climate is a science in search of describing and explaining the nature and how it change from one place to another and also how it is related to human activity. In short: long term average of atmospheric condition of one region is climate. Climate itself is an important factor influencing the formation of passive defense. Or we can say that the basis of physical architecture based on passive defense is climate. Architect element and their function have been already influenced by climatic factors. On of these element is location finding. In the regard temperature and wind have the key role. Next element is orientation and regularity of building. Despite seasonal and local changes of sunlight angle and therefore the length of time and sunlight intensity, taking into account of this parameter and compute it in architect and urbanization is necessary. Materials and their resistant are one of the other elements. Environment and nature often give the needed and consistent materials to the human. Overall a architect set should be design for resistance against the natural forces includes fluctuations of temperature, humidity, rain, heavy snow and ice and wind and pressure forces. Another issue can be make proper heating and air conditioning in the interior architecture. Underground shelters are considered and use in passive defense. Building are very robust and reliable except for deep explosions bomb. A complete underground construction system that is connected to the communication tunnel can be a strong defense base. Deep tunnels are suitable for executive operation and also storage of necessary materials. Also the cave shelters generally built with tunneling in the hillside and into cuts or drilling in the highland. Since the top cover of cave shelter does not disturbance and the entrance is covered with a very low risk of detection that other shelters.



Fig 1. We can see the earliest evidence of human interference in his life space in caves and mountains.

We will describe all the point and their impact on the case that we mentioned. At first we introduce the case briefly.

4. THE UNDERGROUND CITY OF OOIYI (NOSH ABAD)

Ooyi is the hand carving tunnel that are used as military and defense application in different historical period. This work was discovered in 1383 accidentally. Nosh Abad is located in 7.5 km from historical town of Kashan. Ooyi is a word form Kashani dialect that use for raise awareness and call. People said that because the underground city was being nested in ancient, for finding each other, people call them with word Ooyi.



Fig 2. Halls and space division in their

What archeologists earned during two seasons of excavation in underground city of Nosh Abad is include winding and branching canals, rooms or living space with different plans in multi-floor, steps, wells and even subterranean path in this city with dense and complex structure. Different floors of the city connected by vertical and horizontal canals. The depth of this city is about 20 meters and consist of three floor.

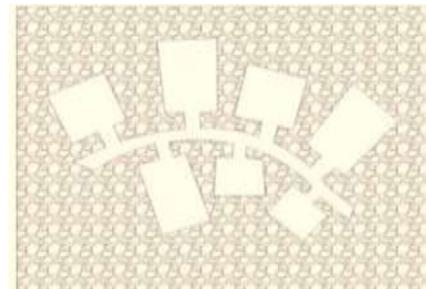


Fig 3. Schematic plan of the location of rooms in Nosh Abad

5. UNDERGROUND CITY OF DERINKUYU

Cappadocia is a historical and unique region in Turkey that besides of the beautiful architecture of its stone, have hidden treasure in its heart. In this region a series of underground city created a social colony. Derinkuyu is one of these underground city that possibly built by Hittites, 2,000 years ago and in latter periods extended and by passage of time life developed in it. This city consist of 11 floors and is located in depth of about 85 meters. This city was discovered in the 7th century and was extended during Byzantine period (figure 4).



Fig 4. View of the historical region of Cappadocia



Fig 5, 6. Truncation of the underground city Drynkuyu

About the city of Ooyi, we must say that defense thought and factor plays the greatest role in shaping it. A living/defending space that encompasses the relative condition of living in crisis time. A series of large and small spaces that are connected with curved halls. The city covers an area of about 6 km which only 600 meters is excavated. Type of the soil in this region is clay with very high strength. This caused pitman spend much time for digging the city. Sizes in the city of Ooye is interesting. Except entries, almost height of all points is as high as a human height about (170 cm to 2 m). Entrance dimension in Ooyi is about 1×1.5 m. Most of the main entrance are coastal of subterranean and usually are hidden. (Fig 7)(Fig 8).



Fig 7 Fig 8

Rooms' dimensions are about (2×2.5 , 2.5×6 , 2×3 m). Halls are winding and connecting the room with another. This city have been drilled in three floors with depth of (4.5-5, 10-14, 18-21). Sewer systems have been built next to the entrance with a well in dimensions of about (1×0.7 m with depth of 70 cm). Lower floors are in access through a tunnel with 1 m or less diameter with winding shape. What it is important about the city of Ooyi is that the city has been used as a temporary residence and as a tent.



Fig 9. Access through the tunnel to enter the floor, diversions and it is from bottom to top

Harsh weather in Cappadocia region and existence of wild animals and dispute over natural resources are the main factors for shaping this city. Land in this area is made of volcanic rock. This led to provide large spaces for ceremonies and workshops. What it is clear is that the development of the city was periodically over time. Because we have spaces such as (bath, stables, victuals storehouse, kitchen, workshop, school, or even church) we can say that we observe a complete city with a separate life.

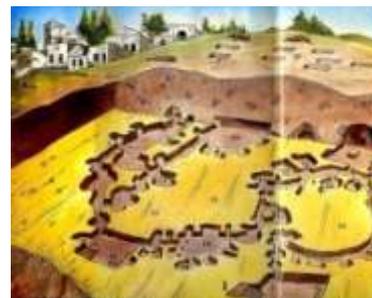


Fig 10. Underground city of Derinkuyu plan

There are 40 underground cities in Cappadocia region. The city entrance was liked a well. Some of main entrance such as the city of Ooyi has the dimension of 1.2×1 m. Almost every house has a separate entrance. Interior space's height is nearly identical with Ooyi. Except for public space and underground workshop that has a height about 2 - 2.2 meters. About 20 to 50 thousand people were lived in this city. Now, just three floors of this city had been explored and is open to the public. (Fig 11, 12)



Fig. 11



Fig. 12

6. CLIMATE AND SPACE COMMONALITIES

With one glance to these two examples, and compare them we will reach some common point. Perhaps most notably of all is temperature differences between the surface and underground space. The temperature of sample in tests was about 25 C. of course the temperature varies according to the size and depth. As an example, the temperature range in summer is shown in Fig 13.



Figure 13

This temperature is very close to the body comfort temperature and this shows a steady state. In all samples, air conditioning occurs naturally in a way that during the day hot and light air leading up through air conditioner canals and in night cool and heavy air is transported into space. This represents excellent coexistence of architecture with the environment. Another point is the effect of temperature and inside air of samples on foods such that the food durability is much higher than in surface. Thus we consider particular space for storehouse and storage. Storehouse dimensions of Derinkuyu is larger than Ooyi. In the city of Ooyi, sewer disposal system worked in two ways of small wells and sewer transferring but in Derinkuyu because of land type, they built wells that can easily emptying. Another common point is water supply system. As mentioned, the entrance of Ooyi had been built in coastal of subterranean. Also in spaces they built some wells that ended in subterranean water. We have subterranean and underground aquifers in lower floors on Derinkuyu.



Fig 14. Well for air conditioning in Ooyi



Fig 15. There is a well with a depth of about 80 min Derinkuyu.

Width of these wells are about 80 cm. interesting point is that, in addition to air conditioning task, these wells led to subterranean water and in both floors you could use water.

7. EVALUATION OF USING PASSIVE DEFENSE METHODS IN SAMPLES

As noted above, defense issues are the main factors of sustainable architecture shaping. Sources are limit but human needs and ask are unlimited. Competition over the use of these resource always caused the conflict between humans. Hence, the need for a safe and secure place, results in profound creativity among human. Turning to underground architecture – a space that solve the needs of human on land. Here we suggest some of important methods in this architecture as a passive defense. From important cases, in this architecture, entrance, kitchen, and interior of coastal subterranean are hidden from public view. In the city of Ooyi, entrance was camouflaged with oven. In public spaces they built an entrance for gardens, markets, and public places. In the city of Ooyi, a guard sat in the entrance and controlled the coming and going. Nested space, winding hall, and asymmetric accessible are the point that they used. They use natural light only on the first floor and it has been limited. Hence, they were used oil lamp for lighting and interestingly, they had a particular workshop for producing lamps' oil. In the city of Ooyi's architecture, and Derinkuyu, diversion wells were built that enemy became confuse and got in trouble. In Nosh Abad, a path for accessing the different floors are from low to high. In this manner, enemies had severe limitation to access these spaces. Next to the every entrance we saw a big stone door that was vertical and wheel shape that caused the doors become closed. This method in Nosh Abad are in horizontal shape.(Fig 16).



Fig 16.

Different using and reusability are the steady factor of this architecture. As in Derinkuyu, at the time of Roman Empire, Islam, and Ottoman wars were used. Shoadans also as a strong place for refuge at the time of war, during the bombing of Iraqi army were used as a protection in Dezful.

8. SUSTAINABLE DEVELOPMENT AND ROLES OF ARCHITECTURE IN IT

Now days, one of the mankind concerns is reaching the general welfare and a perfect life. A perfect or an ideal life in which economic, social, and life development occurs in harmony with nature and human interaction. A set of these properties will lead to sustainable development. In the definition of sustainable development we have – it is a shape of combining the economic, social, and life purpose that for maximizing human welfare in this time, without damaging to future generation welfare and ability to reach their needs. (Dr. Mehrdad Tavanbakhsh, 1388, p.23).

Humans must create a cooperation with environment and with concentrating to next generation needs, try to reach their goals. This factor is due to sustainable rules of nature and accompanying with nature rule to reach their goals. This factor is duo to restrictions in the flow of human life. And this factor that the land and nature resources are limit and human needs and goals are unlimited. To achieve this goal without considering the principle of social justice in the present generation we cannot expect justice in the future generations. Here, sustainable architecture can be appropriate choose for reaching sustainable development goals. Humans naturally love beauty and perfection and this factor effect on human life space. It will also turn to create architecture by the human. An architecture that are base of nature and emphasize on welfare and human safety.

9. CONCLUSION

Old architecture are popular art that develop over time. With a depth look at the architecture and the mentioned cases we will find that human in the past with all

restrictions, looking for welfare and safety. Human with reaching nature strength and by appropriate using of it create the architecture that are steady to this time. This architecture observing the principles of sustainable architecture that are solving and reaching human needs and the connection between environment and development. Reversible principle in their architecture are non-repudiation. Human are form soil and they will calm in soil. Human, using harsh climatic condition by helping from nature as an opportunity and as a tool. And they considered all the security principle. Usability of this architecture is a principle that we are seeing. And such that they create sustainable architecture. We must use the benefit and maximum capacity of this architecture with planning principles. Hence Iran is a historical country and have beautiful and historical places, we must use this factor to attract tourist and to develop our tourism industry. We must keep this heritage that the results of it, is the effort to reach sustainable development. Today, the main purpose of Iran tourism is visiting the historical place and works. So we must take this building and historical place and region in our consideration and especially pay attention to them. Derinkuyu in Turkey have different conditions. In this city occurs regular exploration, accurate information, extensive advertising to attract tourists caused countless annual sustainable tourism travel to this city and region. We must use this experience duo to the our culture, facility, and etc to bring tourist into our country. Here we suggested some offers due to the mentioned issues.

- Considering the facilities for the reception of tourists and design and implementation of infrastructure.
- Using experience and action plans that are made in same sample.
- Specify the bounds of historical city
- Ongoing excavations by the archaeological elite masters
- Appropriate and extensive national advertising
- Documentation on how to build and run the region in the past
- Designing a suitable use for keep it alive and dynamic
- Establishing the specialized ngo such hotel owners or restaurant owners association.
- Providing the perfect platform for attracting private sector participation.
- Appropriate actions to plan for promoting economic vision in revenues through tourism.
- Social and mental preparation and training of host population to recognize their identity and values and using their contributions.

Our need is that to utilize this kind of architecture as a today's architectural framework. Given the current situation and political and security issues as well as our specific climate and topography condition of Iran, passive defense and climate is two-fold importance in our architecture. With the hope that we observe the formation of popular architecture that it's only purpose be safety and welfare.

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