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# Larestan $\bar{A}$b-Anb$\bar{a}$rs: A Fine Congruity between Sustainable Architecture and Sustainable Tourism

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# آب انبارهای لارستان؛ همسویی معماری‌پایدار و گردشگری‌پایدار

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**Abstract:**

The predecessors were very careful in dealing with the environment when trying to meet their needs. Without inflicting any harm on the environment, they utilized best out of the least possible in the environment. In the past, the architecture practiced in Iran made use of all that the surrounding environment and climate capacities. In doing so, architecture never weak or wreck the structure and the nature of environment, but its purpose was to consolidate the surrounding environment. Being acquainted with the natural, economic, social, and other capacities of a region enables the tourism planner to come up with a sustainable tourism development for the region based on its current status and potential. This paper was an attempt to study Larestan"s $\bar{A}$b-Anb$\bar{a}$rs and examine their potential impact on the development of tourism in Larestan County by drawing a connection between the principles and elements of sustainability with the architecture of these $\bar{A}$b-Anb$\bar{a}$rs. Accordingly, the present research, using a comparative research method, aimed at comparing the principles of sustainable and compatible, with the environment, architecture with the structure of $\bar{A}$b-Anb$\bar{a}$rs .

The results indicated that the climate of Larestan County had an underlying influence through a historical process on the quality and construction of $\bar{A}$b-Anb$\bar{a}$rs. Both in the construction and use of $\bar{A}$b-Anb$\bar{a}$rs, special attention must have been paid to the principles of sustainable architecture such as energy conservation, climate compatibility, reducing the use of new resources and materials, meeting the needs of the locals, being in harmony with the environment and the site of construction, holism, and the protection of residential areas against the atmospheric agents. Using accessible and native methods, optimal use had been made of the atmospheric agents. In this regard, Larestan $\bar{A}b - Anb\bar{a}rs$ are the real examples of adaptation to the climatic conditions and factors. Far from causing any damage to the environment, the architecture of these water reservoirs is compatible with the environment and is actually devised in a fashion to protect it.

Larestan, despite its enormous potential and capabilities as regards tourism, it has not yet found its true place in Iran"s promising tourism industry. With respect to this dormant source of tourism, both the central government and people in the region should pay more attention to restoring and using these water storage facilities.

**Keywords:** Sustainable architecture, sustainable tourism, $\bar{A}b$ $\bar{a}rs$, Larestan

**چکیده:**

پیشینیان برای رفع نیازهای خود در برخورد با محیط زیست بسیار آگاهانه عمل کرده‌اند و بدون لطمه به محیط زیست از کمترین امکانات بهترین استفاده را نمودند و در پاسخگویی به نیازهای خود دست به کارهای خلاقانه زده‌اند. در گذشته معماری ایران از تمامی امکانات محیط و اقلیم پیرامون بهره می‌برد. در این بهره‌وری نه تنها طبیعت محیط را تضعیف و تخریب نمی‌کرد، بلکه هدفش تحکیم طبیعت پیرامون بود. همچنین شناخت توان-های طبیعی، اقتصادی، اجتماعی و غیره در هر منطقه به برنامه‌ریز گردشگری این امکان را می‌دهد تا براساس وضع موجود و توان‌های منطقه، توسعه پایدار گردشگری آن را شناسایی کند. این مقاله با مطابقت عوامل و اصول پایداری با معماری آب انبارهای لارستان سعی دارد، به شناخت و مطالعه دقیق و تاثیر آن در توسعه گردشگری لارستان برسد. لذا تحقیق پیش‌رو با روش تطبیقی، اصول معماری پایدار و همساز با محیط زیست و آب انبارها را مورد مقایسه قرار می‌دهد.

نتایج به دست آمده این است، که آب‌وهوای لارستان در یک فرایند تاریخی بر کیفیت و ساخت آب‌انبارها تاثیر زیربنایی داشته است. در ساخت و استفاده از آب‌انبارهای به اصول معماری پایدار از قبیل حفظ انرژی، هماهنگی با اقلیم، کاهش استفاده از منابع و مصالح جدید، برآوردن نیازهای ساکنان، هماهنگی با محیط و مکان خود، کل‌گرایی و حفاظت فضاهای سکونت در مقابل عوامل جوی توجه بسیار زیادی شده است و با استفاده از روش‌های آسان و بومی سعی شده است، از پتانسیل‌های عوامل جوی استفاده بهینه شود. دراین‌راستا آب‌انبارهای لارستان نمونه‌های واقعی سازگاری با شرایط اقلیمی هستند. همچنین معماری آب‌انبارها نه تنها تخریبی را به محیط تحمیل نمی‌کند، بلکه با محیط زیست سازگاری دارد و در جهت حفاظت از آن می‌باشند. علاوه‌بر این لارستان با وجود دارا بودن پتانسیل‌ها و توانمندی‌های بالا در بخش توریسم نتوانسته است به جایگاه واقعی خود دست یابد. در این زمینه مردم منطقه و دولت باید حمایت خود را برای مرمت و استفاده بهینه از آب‌انبارها صورت دهند تا بتوانند از این بنای منحصر به فرد بهره کافی ببرند.

**واژه‌های کلیدی:** معماری پایدار، گردشگری پایدار، آب‌انبار، لارستان.

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## 1. STATEMENT OF THE PROBLEM

Today, sustainable architecture is recognized as the most important solution in preserving energy resources, preventing environmental pollution, and co-existence with the natural and climatic conditions. The physical design model of the architecture of hot and cold climate is a clear example of sustainable architecture. One of the most tangible reflections of the impact of climate on the formation and construction of buildings and the prevention of the pollution and ruination of environment could be seen in the artistic designs of this vast region. Working within the parameters of sustainable architecture, each building should interact with its context and surrounding environment. The point of overriding significance is the nature of the strategies planned for such interaction between the two. Our ancestors, many years ago, found that formula via their special skill in using energy and natural resources efficiently and in harmony with the climate. Nowadays, with the increasing population and the lack of non-renewable energies, a combination which threatens the human life, sustainable development has been proposed and accepted internationally as an apt blueprint to combat these perils. In compliance with such plan, protecting the environment and preventing pollution, adaptation to the climatic and natural conditions, and the use of renewable energy should be considered in designing new buildings and structures. It is, however, interesting to note that the principles of sustainability seemed to be addressed more in our traditional architecture, shaped according to the exigencies of its surrounding environment and climate, than what is practiced today. The traditional Iranian architecture had unique features, including a proper understanding of materials and elements used in construction and the utilization of that knowledge with respect to the climate issues, which enabled it to achieve sustainable designs.

In the present climate, tourism has attracted the attention of a great number of countries across the world. Its fascination is partly due to its being a clean industry and the third most dynamic, flourishing and developing economic phenomenon after the oil and automotive industry. Tourism can have different impacts on the tourist hubs; the impacts could be social, cultural, economic, and environmental. Development planners and policymakers also regard the tourism industry as the main pillar of sustainable development. Given the widespread use of the term sustainable development, the term has been described differently. Basically, it refers to the transformation of the relations between systems, on one hand, and social, economic and natural processes and institutions, on the other hand.

The objective of the present research was to examine $\bar{A}b - Anb\bar{a}rs$ located in Larestan County and evaluate their designing with regard to the established criterion and principles of sustainable architecture.

Taking into account the above concerns, this paper sought to reach a general understanding of the principles of sustainable design that governed the architecture of $\bar{A}b - Anb\bar{a}rs$ in the hot and cold climate of Larestan. In obtaining such understanding, the following research question had to be addressed:

1) To what extent do the functioning and architecture of Larestan $\bar{A}b - Anb\bar{a}rs$ correspond with the six principles of sustainable development and architecture?
2) What could have been the impact of Larestan County climate on the formation of $\bar{A}b - Anb\bar{a}rs$ ?
3) How much significance could be attributed to the sustainable architecture of Larestan $\bar{A}b - Anb\bar{a}rs$ in the development of tourism in this region?

## 2. LITERATURE REVIEW

Our review of the existing literature informed us that there had been no independent study conducted to address the architecture of Larestan $\bar{A}b - Anb\bar{a}rs$ and its relation to the principles of sustainable development. There were, however, some researchers who had focused on the architecture of the Larestan reservoirs without trying to establish a

connection, if there would be any, between their architecture and the established criterion of sustainable development. One of the studies carried out on the architecture of Larestan $\bar{A}b - Anb\bar{a}rs$ is reflected in an article entitles, „The architecture of $\bar{A}$ $Anb\bar{a}rs$ in the natural environment of Larestan", dealing exclusively with the features of the architecture of these sources of water storages. Another article, „A comparative study of the role of $\bar{A}b$ $Anb\bar{a}rs$ in the spatial organization of historical cities of Iran (cases of Yazd and Lar), compares the $\bar{A}b - Anb\bar{a}rs$ present in Yazd with those in Lar. This research was undertaken to find the possible traces of the principles of sustainable and compatible, with the environment, architecture in Larestan $\bar{A}b$ $Anb\bar{a}rs$.

## 3. METHOD

Given the nature of the study, the researcher opted for a descriptive-comparative method of research. First, library research was used to gather information. Then, and based on the original plan, the data were organized, classified, and matched with the six principles of sustainable development. The population of this research was the $\bar{A}b - Anb\bar{a}rs$ in the Larestan region.

## 4. THEORETICAL FRAMEWORK

### 4.1. Sustainable Development and Sustainable Architecture

Sustainable development is an endogenous, systematic, and balanced development which infuses a systemic insight into all disciplines. The first field of science using this concept was the environmental science. Sustainable development is intended to encourage concerted actions among the nations of the world and a peaceful co-existence; it highlights peace and a better exploitation of renewable energies. Sustainable development is the evolutionary version of developmental programs, which attempts to follow a balanced course of action through holism and a systemic approach. Today, several factors are subsumed under sustainable development and, in particular, sustainable urban development. These factors include the reduction of pollutants and emphasis on renewable energies (World Conservation Union, 1994: 1).

The term „sustainability" is defined as stability and durability, something that has been seen constant and enduring. The sustainability of the sustainable phenomena results from the durability of a pattern, method, or a system over a long period of time. Sustainability, when used to describe a system, reflects the fundamental continuity of that system through time, leading to the survival of that system. The term describes how biological systems could keep being varied and productive over time. Sustainability is a dynamic concept and is focused on the exploitation of resources in a steady fashion. These days, sustainable development is referred to as one of the most important and widely-discussed issues on an international scale. Sustainable development was conceived at around 1980, in response to the alarming reality that our planet and many of its resources, including water, have been severely damaged since the industrial age due to the excessive use of them by humans. This, unsurprisingly, has had adverse effects on the lives of future generations to come since then and the resources they may have needed. If development is a desirable process and if it is to be sustainable, we must make sure it happens for everybody and in harmony with nature (Zandiyeh & Parvardi, 2010). According to the World Commission on Environment and Development (WCED), sustainable development is "the kind of development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). The application of the concept of sustainability and sustainable development in architecture created fresh topics in architecture such as sustainable architecture, ecological architecture, and environmental architecture. They all share the same concept and objective, i.e. architecture congruent with the environment. Architecture is sustainable when it attains high efficiency, by means of a coordinated and harmonious

system of management, in handling renewable energy sources and avoidance of pollution. Architecture must be in line with the exigencies of nature and designed to strengthen it. Generally speaking, sustainable architecture refers to "what can continue to endure" (Saflaie, 2003: 134). In other words, the goal of sustainable architecture is to live on Earth and use its resources while not leaving the future generations resourceless (Alpago Novello, Mehryar, Roboubi, Flamaki, & Dadkhah, 2008: 29). In general, it can be stated that sustainable architecture is intrinsically and basically dependent on place/location; a process which is expected to end in recovery than ruination, a conflation of science and art as to strike a balance between the humans and the nature they live within. The result of such effort would be, speaking in micro-levels, a building that has the slightest inconsistency with its surrounding environment. Principles of sustainable development could be encapsulated as follows: Minimizing the use of non-renewable resources, improving the natural environment, and minimizing the ecological damage to the environment (Zandiyeh & Parvardi, 2010: 20; Jodat, 2006: 68). Some buildings and structures enjoy features that make them suitable candidates to be characterized as sustainable buildings.

A sustainable architecture approach requires an appropriate local arrangement. Considering local context is noticeable in two respects: 1) Establishing a fitting platform for the development of sustainable architecture, and 2) Cashing in on the replicable values embedded in the local architecture in the process of sustainable architecture. Obviously, the exploitation of the environment while respecting it is vital to the architecture practiced locally (Falamaki, 1992: 56; Pirnia, 2013: 37).

In preparing the setting for the establishment of sustainable architecture, we must take heed of environmental impacts and issues. That could be translated in any attention paid to the characteristics and capacities of the region and people that will be affected by our initiative. Therefore, by designing the climatic architecture and considering the appropriate urban design in macro-planning, it is possible to achieve the ultimate goal of sustainable architecture, which is the same as environmental sustainability. Taking account of the climatic conditions in the architecture of building construction plays a pivotal role in keeping the comfort of the citizens and preserving natural resources. The climatic status of each region directly affects its architecture (Zargar, 2005: 35).

Sustainable architecture signifies a kind of architecture that can, as far as possible, create an acceptable natural environment for its users while being in harmony with the natural environment surrounding it and utilizing optimally from the natural potential of the setting it interacts with. From this statement, it can be inferred that the climate conditions of the place should be considered in terms of human comfort and the design of the structure (Zomorshidi, 2012: 20).

There are six principles that should be met before a structure or building could be characterized as one erected based on sustainable architecture: 1- Energy conservation 2- Climate compatibility 3- Reducing the use of new resources 4- Meeting the needs of the residents 5- Congruity with the site 6- Holism (Watson, 1993; Ghiasvand, 2009: 6).

As a result, to reach a sustainable urban development, in addition to the conformity with the six principles cited above, the physical model of sustainable development, i.e. changes made to the levels of population density intended to meet the needs of the residents, has to be given priority so as to leave the city environmentally habitable (Mukomo, 1996: 226). The assessment of urban development resulting from such developmental planning, therefore, should reflect the principles of sustainable development in all regions and districts.

### 4.2. Sustainable Development and Sustainable Architecture

In the present era, the concept of sustainability has gained such credence that any new discussion about environment and

development is deemed incomplete without including it on the agenda. That said, it should not be assumed that this term is always part of our everyday conversations. The concept is often dealt with as presupposed. For instance, it is used to illustrate philosophical points about all societies or to compare and contrast them without basing those claims on observations made at a particular time. Such sweeping statements and comparisons, with no regard for historical assumptions, have contributed little to the development of the concept of sustainability. That people from different cultures may understand and interpret the concept differently and that the concept probably does not mean the same as what it might have meant to the people of the past generation or century have been neglected to a large extent (Redcliff, 2000: 45). Put another way, the concept of sustainability varies in meaning according to the time, place, and societies it happens within; thus, there is no possibility of generalizing a particular interpretation of it and promoting it (Heeney, 1995: 12; Bossel, 1999: 23).

Due to the technological, cultural, political, and socio-economic infrastructure created in the 21st century, tourism, as a phenomenon, appears to be an inevitable reality, which is reflected in human‟s behavior and action and intended to satisfy the curiosity of its soul. Exploring the effects of tourism industry substantiates the point that tourism has the power to lead to a series of economic, social, cultural, and even environmental changes in any country it enters (Perece, 1989: 10).

In the era of postmodernism, everything in our planet, from the depths of the oceans to the all human, cultural, natural, and features, and artworks, forms the spectrum where tourism can move on. Human beings have transformed culture and nature into valuable assets, so much that not only using them but also hearing, touching, tasting, and smelling them have turned into a lucrative business for some. Man has even turned clean air for breathing into a commodity that attracts tourism (Mohseni, 2010: 151).

Sustainable tourism applies to a kind of tourism in which a balance in keeping the values, morality, and economic principles, as well as the economic benefits for all, is taken into account. It endeavors to replace a balanced and all-out development with a purely economic development. In this perspective, the development of tourism is planned to be dependent on the existing resources and in a fashion that meets the economic, social, cultural, and legal requirements of a society and the expectations of tourists and promotes the unity, integrity, cultural identity, environmental health, economic equilibrium, and the well-being of the local people (Alvani, 1993: 10). Sustainable tourism is aimed at regulating the relations between the host society, the tourist destination, and the tourists, for these relations could be dynamic and constructive. Setting the right balance between these players can minimize the environmental damages and cultural harms, satisfy the tourists, and enhance the economic development of that region (Mohseni, 2010: 152).

Arid and semi-arid regions face a whole host of problems due to the climate and ecological limitations imposed on them. These areas, however, can be of great importance because of their high potential in attracting various types of tourism such as ecotourism, geotourism, health tourism, and so on. Channeling our attention towards such areas can contribute to a country's economic development.

## 5. RESEARCH FINDINGS

### 5.1. Larestan County and the Issue of Water in it

Traditionally, Larestan region covers an area in the south of Fars Province. Geographically, It is now limited to smaller areas. This region with an approximate area of 26,964 square kilometers is bounded northwards to Darab, Zarrin Dasht, Jahrom, Qir and Karzin and Farashband, from west and southwest to Mehr-Lamerd, and from the south and south-east to Bandar Abbas (Vosoghi, 2001: 1, 11). The Larestan County and the city of Lar have long been suffering from the shortage of

drinking water; a long-running problem intensified by the texture of the land and presence of unfavorable climatic elements such as low rainfall, high temperature, and high evaporation rate. These elements together increase the solute concentration and decrease water quality. Larestan County is also one of the most deprived areas in Iran in terms of having freshwater aquifers. What has compounded the already dire situation is the passing of water from salt pans and salt domes, causes water salinity (Kardavani, 1992: 29; 1985: 15). One of the climatic limitations troubling Larestan region is low and irregular rainfall, which begins forcefully but lasts for a short period of time. The average annual rainfall in Larestan is 15.217 mm, most of which happens during Azar, Dey, and Bahman. In dry months, due to the lack, or absence, of raining the temperature rises sharply. Drought and intense sunlight are inextricably linked, i.e. extreme sunlight is both a result and causes of low rainfall and relative humidity (Kardavani, 1999, 1st volume: 6). Larestan is among the areas that have some especially appealing features in terms of local and climatic architecture. Residents of the region, via their experiences over time, have come up with practical measures to reduce the adverse effects of the climate on their environment and habitation.

That explains why the people of Larestan built $\bar{A}b - Anb\bar{a}rs$, locally known as Berke[1]. They did so intending to save their drinking water from winter rainfall and use it for the whole year or even during droughts for several years. There are still a large number of underground cisterns in the old city, yet they are not of much use these days (Fars Housing and Urban Development Organization, 1991: 14). Although it is not possible to talk of the exact number of $\bar{A}b - Anb\bar{a}rs$ constructed in Larestan, late Seyyed al-Aldin, a historian, estimated that the number of them should reach 24,000; and his estimate is not far from reality (Vosoghi, 1992: 44).

$\bar{A}b - Anb\bar{a}rs$ are valuable sites and a reminder of how well the cultural and biological aspects of a need for water were allied with the structural, climatic, and artistic considerations. That being the case, $\bar{A}b - Anb\bar{a}rs$ represent a fusion of art and expertise; art since the architects did not feel pleased with constructing simple tanks holding water but aspired to imbue them with a sense of beauty and artistry, expertise since they created a repository that could hold a precious gem, i.e. water, and prevent the loss of it even if that is a drop (Memarian, 2008).

The common feature of all cisterns is the presence of a reservoir in under the ground and at a lower level than the waterways, qanats, springs, river paths and where the rainwater streams. Three essential factors were taken into account for the construction of each $\bar{A}b - Anb\bar{a}rs$: First, their location in the neighborhood and the city and its spatial association with other public buildings and habitations; second, the land and the soil and their relationship with water supply sources; and third, economic considerations (Maserat, 2010: 53).

### 5.2. The coordination between the elements of sustainability in the architecture of Larestan $\bar{A}b - Anb\bar{a}rs$

Principles to be observed so that a building could be considered as an example of a sustainable architecture are: 1- Energy conservation 2- Climate compatibility 3- Reducing the use of new resources 4- Meeting the needs of the residents 5- Congruity with the site 6- Holism (Memarian, 1993: 17).

In what follows, the architecture of $\bar{A}b - Anb\bar{a}rs$ will be evaluated with regard to each of these six principles. To conduct such evaluation, some general architectural characteristics of Larestan $\bar{A}b - Anb\bar{a}rs$, cited below, need to be borne in mind: 1- Variation in the shape of the tank and its cover. 2- Simplicity in the design. 3- Materials made up of rocks and a type of motor, called Saruj[2], all covered with cob[3] 4- Built alone or along a series. 5- Mostly

1. A Pond

2. Or Sarooj

3. a mixture of compressed clay and straw used, especially in former times, for building walls (Cambridge Dictionary)

without a wind catcher[1].

**5.2.1. Energy Conservation**

Conserving more energy is one of the most influential concerns in sustainable architecture; in a way, this is the ultimate goal of sustainable architecture. As already been pointed up, in a sustainable architecture, reducing the consumption of non-renewable resources, improving the natural environment, and tackling or reducing pollution are major priorities.

Architectural design, environmental issues germane to $\bar{A}b - Anb\bar{a}rs$, as storage facilities which provided clean water and kept it cool, and their availability to all users have been of special interest to the researchers.

The architecture of these underground cisterns demonstrates the accuracy and precision of the local architects of these structures, who must have been conversant with some vital issues such as the pressure imposed by water on the floor and the surface of the $\bar{A}$ $Anb\bar{a}rs$, application of sealant to the inside sections of the cistern, ventilation, refinement, and the prevention of water contamination (Malazem Hosseini, 2009: 35).

Each building has to be designed and constructed in a fashion that the need for fossil fuels be minimized. In $\bar{A}b - Anb\bar{a}rs$, the principles of energy conservation are followed inasmuch as ventilation techniques had been utilized for cooling and keeping the water healthy. Water cooling in these cisterns is done by tapping into some unending energies and factors. The type of ventilation in $\bar{A}b$ $Anb\bar{a}rs$ is carried out via two means: 1- Some holes in the structure and 2- Wind catchers.

In Larestan $\bar{A}b - Anb\bar{a}rs$, which are mostly without wind catchers, the holes in the body of the dome or on the storage tank and the water withdrawal valves allow for proper ventilation (Pirnia, 2013: 37). Nevertheless, this must be borne in mind that in the hot and dry weather of Larestan, due to the low humidity in the air, there is a significant difference in temperature between the spaces under the shade and those exposed to the direct sunlight. For that reason, wind catchers are given less attention in the construction of the cisterns in this region. The valves designed for withdrawing water and the small holes made on the dome and the tank, as mentioned above, keep the smooth circulation of air possible within the cisterns. The only $\bar{A}b$ $nb\bar{a}rs$ that has a wind catcher is the one belonging to Hajj Gholam Reza Motamed. The architect of this exceptional case must have been from Isfahan and familiar with the central areas of Iran at the time (Kazemi, Boustani, & Taleb Bidokhti, 2011: 107-123).

Tapping into the geothermal energy is another point worthy of attending when discussing $\bar{A}b$ $Anb\bar{a}rs$. It is important to note that deep inside the Earth is a good place for the storage of energy. Erecting a building below the surface of the ground could address so many of the issues and problems associated with the climate. That informs us why the storage tanks of $\bar{A}b - Anb\bar{a}rs$, built under the ground, creates minimum energy fluctuations due to the energy stored deep down under the ground.

Earth is a huge reservoir of energy, and this energy can be harnessed for the benefit of humans. Atmospheric agents and temperature fluctuations could have a limited effect on the structures built underground since the Earth's crust, like a buffer, protects these structures against unfavorable effects. Hurricanes and winds cannot penetrate into the Earth inner space, for the Earth's crust acts as a huge thermal insulation preventing heat from transferring into its inner side. The deeper a structure is built under the ground, the less would be the temperature fluctuations because of the thickness of the soil. From a depth of 1.6 meters and below, the temperature is almost constant and equals the annual temperature in the outer space of that site (Ghobadian, 1993: 87). With this explication, it now seems obvious why the storage tanks of $\bar{A}b$ $Anb\bar{a}rs$ were built under the ground: Energy conservation.

1. Badgir

**5.2.2. Climate compatibility**

For buildings to be compatible with climate specific to them, they must be designed in such a way that they can efficiently use the potentials afforded by that climate and the local energy sources available within that climatic pattern. In that respect, 1) the type of coating used in $\bar{A}b - Anb\bar{a}rs$ and 2) the materials used to build them have the necessary compatibility with the climate of the Larestan region. Some conditions must have been met to ensure us that this principle of sustainability was addressed in the construction of cisterns.

The canopy used in $\bar{A}b - Anb\bar{a}rs$ was congruent with the climate of Larestan. In the process of the evolution of cisterns, ponds were coated, as the combination of a pond with a cover began to be referred to as $\bar{A}b - Anb\bar{a}rs$. The coating on the tank was a clever idea to prevent evaporation, contamination, and warming of the water while keeping the water cool. The intense sunlight, starting from mid-spring to late October (Mehr) in Larestan, leads to the evaporation and dissipation of part of the water that had been stored with difficulty. That makes covering an indispensable consideration in the construction of $\bar{A}b - Anb\bar{a}rs$.

The forms of the canopies used in Larestan $\bar{A}b - Anb\bar{a}rs$ are themselves indications of harmony with the climatic conditions[1]. The domes and cones are the most common styles in Larestan. In summer, domes made of bricks and clay store the heat during the day and emit it to the environment throughout the night. That is due to the point that materials formed with bricks and clay have a high thermal capacity and can accumulate heat. That being so, the heat is kept away from the surface of the water at a distance due to the dome's structure, hence the water is kept cool in the heat of dry seasons and months.

Dome is the predominant cover for the existing $\bar{A}b - Anb\bar{a}rs$ in the Larestan region. One possible explanation could be that the large diameter of the opening of the tank makes it fit for a cover that is in the shape of a dome. Said in another way, constructing a dome on a circle-like surface is both simple and feasible. Among the large cisterns in the city of Lar, which has a dome covering, is Seyyed Jafar's $\bar{A}b - Anb\bar{a}rs$, with a base diameter of 18 meters (Kazemi et al., 2011: 107-123). This water storage is of great value both for the very low slope in its dome cover and its large size.

Another prevalent roof shape seen in Larestan $\bar{A}b - Anb\bar{a}rs$ is cone. This type of cover is also constructed on circular plans and does not differ much from domes; rather they are an indication of the taste of their designers. Newly-built water cisterns are mostly cone-shaped. There would be a dramatic impact on the coolness of the $\bar{A}b - Anb\bar{a}rs$ as the cone cover runs higher. $\bar{A}b - Anb\bar{a}rs$ Bam-e Boland in the old city of Lar has a conical roof with an approximate height of 10 meters.

The design of $\bar{A}b - Anb\bar{a}rs$ and the use of materials in tune with the environment are just two manifestations of compatibility with the climate. Our construction should be proportionate and influenced by not only the climate of different regions we dwell in but also the traditional architectural experiences of those regions. Our ancestors in each region strived to create a residential space with materials that were consistent with the climate of that area (Mahmoudi & Niku Ghadam, 2008: 44).

In the native architecture of Iran, architects were adamant to get their materials from the closest places. As a result, the buildings were made more quickly, they were more adapted to the nature of its surroundings, and when they needed to be refurbished, the required materials were always available (Pirnia, 2005: 168). The same considerations must have been in the mind of those who built $\bar{A}b - Anb\bar{a}rs$.

The materials used in the construction of water cisterns have unique features due to their specific functions. Storing a large amount of water inside the underground reservoirs requires a building that can withstand pressure from the volume of water

1. These include domes, cones, barrel, and flat, each in a way in harmony with the climate.

and its moisture. Equally important, the materials to build such a structure have to be available. Rubble and rough stone are the most common materials used in the construction of Larestan water reservoirs and can be seen in all parts of the structure as in its floor, body, and dome.

Stones used in the water storages should be clamped together properly as to prevent leakage and enhance the endurance of the body of the structure as well as its dome. Failure to comply with the precautionary measures in insulating or sealing of the storage tank will lead to the leaking of the gem it holds, i.e. water, and can cause problems for the tank and its users. Mortar plays a key role in this respect and is employed in the construction of a tank, dome, and in other building processes such as brickwork, lime concreting, flooring, and coating of the inner side. Saruj, a mixture of compressed clay, ash, sand, and lime, is the principal mortar in the construction of $\bar{A}b\ \ Anb\bar{a}rs$ in the Larestan region. Also, cob is used for coating the outside surface of the dome and plaster for the interior coating. This combination is essential for creating a smooth surface in the body of the structure and ensuring water hygiene (Farshad, 1997: 38).

Using materials available locally, such as adobe, clay, and brick, in building domes for the cisterns is noteworthy. The employment of abode and mortar was an environmentally friendly initiative and a sensible approach, given the abundance of soil and lack of water. This is consistent with the fact that only a limited amount of water is needed to create molecular chains in clay. That is, native technologies, and not sophisticated techniques of construction or transportation of heavy materials, were employed in the construction of $\bar{A}b - Anb\bar{a}rs$ (Ahmadi, 2005: 90).

Materials used in these underground cisterns were easily recyclable and did not give rise to any kind of contamination or damage. Abode, which is produced with the least changes in the environment and with maximum synchronization with it, is the most economical type of materials. The use of soil available at the bed of a structure, without leaving residues at the site of extraction, and low consumption of water, usually flowing at a depth of about one floor under the ground in qanats, in making materials made minimum energy consumption possible and attainable. This efficient use of energy is one of the key issues in sustainable architecture. The extraction of materials from nature, leading to undesired changes in the environment, changing the nature of materials in the factory, and transporting them to the site of construction usually consumes the largest energy and generates the highest pollution in the environment. This process that drains a sizeable amount of energy is eliminated in the construction of $\bar{A}b - Anb\bar{a}rs$ (Ahmadi, 2005: 90). The shape of the storage tanks of these water reservoirs, cylindrical, cubic, eight-fold or composite, represents a point where artistic and indigenous knowledge of locals unites with the principles of sustainable development; the nature of such union is dependent on the type of land and amount of rainfall specific to each region and area (Kazemi et al., 2011: 107-123).

**5.2.3. Congruity with the Site**

Each building should be gently grounded on the land hosting it and be in harmony with its surroundings. In accordance with this statement, 1) the location of $\bar{A}b - Anb\bar{a}rs$ and 2) the water supply method to them are compatible with their corresponding environment and site.

The design of $\bar{A}b - Anb\bar{a}rs$ is congruent with the site, neighborhood, and the ground in which they are founded as well as with the climate of the region. At the same time, they have evolved in form and design to fit the changing conditions outside. These cisterns provide the energy they need from the site they are located in. As stated, using natural vents and wind catchers, $\bar{A}b - Anb\bar{a}rs$ make use of the natural energy and the wind to ventilate and circulate air within their tanks. With the tanks being placed in the bottom of the ground, the heat exchange is set to minimum.

Urban and rural cisterns have each their own

way of their association with their locations and sites. In cities, $\bar{A}b - Anb\bar{a}rs$ are located next to other urban public spaces such as mosques, markets, and arcades. The larger the neighborhood, the greater would be the number of cisterns; and as the neighborhood and the city expand, new water reservoirs are added to the already existed. Urban $\bar{A}b - Anb\bar{a}rs$ have more storage capacity than their counterparts as to meet the demands of the populated neighborhoods of urban areas for months. The total water supply in the city of Gerash is 7800 cubic meter which testifies to the proposition just made. Few may disagree that the design of urban $\bar{A}b - Anb\bar{a}rs$ captures the most glamorous of all architecture (Vosoghi, 1992: 218). Similar to Mo"tamed $\bar{A}b - Anb\bar{a}rs$ in Lar, the cisterns in villages do not differ fundamentally with their urban counterparts. The only difference is in the simplicity of the shape, the form, and the construction of the former group, rural cisterns.

**Fig 1.** Kal $\bar{A}b - Anb\bar{a}rs$ in Larestan

The creators of $\bar{A}b - Anb\bar{a}rs$ in villages, as those in urban areas, did their utmost to keep these buildings near the mosques, hosseiniyehs, and the market so that more people could benefit from them (Memarian, 1993: 17). These water reservoirs were mainly built in the center of the villages or alongside the watercourses, and water was often taken from them for use manually. To give an instance, we can mention Haj Hossein's $\bar{A}b - Anb\bar{a}rs$ in baen, a village in Lar.

Sahraei[1] $\bar{A}b - Anb\bar{a}rs$ are built in the heart of deserts, at the margin of roads, and in the barren lands. They are usually small in size and simple in design, built to serve pedestrians, livestock, and sometimes farmers (Abedini, Saeidi, & Alem-Zadeh, 33: 1995; Memarian, 1993: 16).

With regard to the water supply to $\bar{A}b - Anb\bar{a}rs$, it should be noted that water was transmitted directly and indirectly. For water reservoirs that are located around or outside the villages, the locals do not have direct involvement in conducting water into them and there are not continuously monitored if they are working properly. Therefore, the flood generated from rainwater enters the cistern through some small holes and exit from some other holes once the cistern is filled. What happens here is a spontaneous storage. Thanks to the frequent withdrawal of water from $\bar{A}b - Anb\bar{a}rs$ located in the desert, most of them are filled directly. In these water cisterns, before entering the storage tanks, the water passes through a pond or some small pits so that it carries less dirt and mud (Sa"din, 1992: 4). As stated, the water supply to the cisterns built in the desert is done without human involvement. This confirms further the idea that these $\bar{A}b - Anb\bar{a}rs$ are in congruity with their environment and sites.

On the other hand, in the indirect transmission of water to cisterns, water is directed to the storage tanks through some special channels and streams, known as Mamar in Larestan, only after has it been refined and carefully checked for pollutants present in it. These channels referred to, if they pass through residential areas, they will have roofs and built underground and the opening designed for allowing water to enter them will be closed until next year once the transmission of water is finished. This is done to prevent

1. Built in or related to desert

pollutants from entering into the channels and, predictably from, the $\bar{A}b - Anb\bar{a}rs$ (Hushmand, 2004: 76). If conductive channels were to be made without any roof, various contaminating substances would proliferate around the bed of these channels during the dry seasons. Heeding the same point, it is advised not to use the first stream of water reaching the channels, and just allow the water enter the channels once the water has been flowing in them for a while.

**5.2.4. Reduction in the Use of New Resources**

Each building should be designed in such a way that keeps the use of new resources at a minimum. Since there is no need to tap into new resources in reusing $\bar{A}b - Anb\bar{a}rs$ in the Larestan region and it is possible to activate them with the same old materials, we can conclude that the design of these $\bar{A}b$ $Anb\bar{a}rs$ is in tune with the principle of sustainability. In Larestan County, the severe shortage of drinking water sources and the poor quality of them have made the hard-working people of the area continue building cisterns and use them as an effort to combat water scarcity. Cisterns that currently receive water directly or indirectly and are in use in the hot and dry months of the year are categorized as active $\bar{A}b - Anb\bar{a}rs$.

**5.2.5. Meeting the Needs of the Residents**

Meeting the physical and emotional needs of residents is of great importance in the principles set for achieving sustainability. 1) The type of productivity $\bar{A}b - Anb\bar{a}rs$ afford and 2) easy access to them supports the idea that the architecture of these water reservoirs devised in accordance with the principles of sustainability.

Finding a solution to the perennial problems and needs of the residents of a region, dealing with special circumstances, at all levels and stages, from finding the right materials to preparing them for use and designing and constructing buildings, reflect the high level of creativity of our ancestors. In order to meet the people's needs, ease of access to water is one of a number of main concerns. $\bar{A}$ $Anb\bar{a}rs$ have been built in line with the gradual growth of the cities and next to other urban places such as markets, mosques, hosseiniyehs, and passages. Of the most interesting examples of cities with $\bar{A}b$ $Anb\bar{a}rs$ located within them is the old city of Lar. The city abounds with cisterns such as Dahan-e Shir $\bar{A}b - Anb\bar{a}rs$ and Ard-Foroushan, next to Lar Qaisarie Market, Mohammad Ali Beyg $\bar{A}b - Anb\bar{a}rs$, next to the Lar Central Mosque, and Haj Gholam Reza (Abolfazl) $\bar{A}b - Anb\bar{a}rs$, on the opposite side of Hosseiniyeh Abolfazl Al-Abbas.

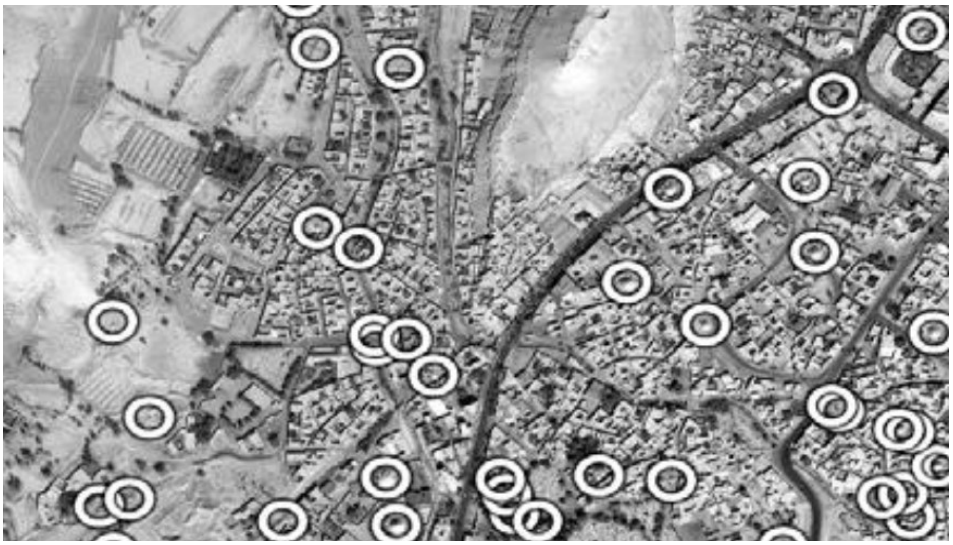

**Fig 2.** Aerial view of the dispersal of $\bar{A}b$ $Anb\bar{a}rs$ in the old city of Lar

Water reservoirs are divided into private and public, in terms of their use by the local residents. Private cisterns are located in different places such as in the middle of the yard, underneath the courtyard, or in the basement of the houses (Maserat, 2010: 53). The source of water for domestic $\bar{A}b - Anb\bar{a}rs$, as for other cisterns in Larestan, is rainwater, usually saved through small channels and gutters connected to the roof. All Larestan water cisterns, other than domestic ones, can be considered public. Public $\bar{A}b - Anb\bar{a}rs$ are, by and large, constructed for public good or utility. They were built by philanthropists, rulers, kings, and statesmen, to propitiate God and please people, and often were impressive and large in size (Maserat, 2010: 53). Public $\bar{A}b - Anb\bar{a}rs$ can be classified as urban, rural, built-in-desert, and built-in-roadside.

**Fig 3.** Mohammad Ali Beyg $\bar{A}b - Anb\bar{a}rs$, Lar

Thanks to the location of water reservoirs in the center of Lar and the urgent need felt by the bulk of the city inhabitants to water (due to the lack of a qanat network), access to the water reservoirs takes place directly and through the embedding of at least one opening for direct access to the storage tank(s) (Arasteh & Taghvaee, 2012: 97-106). In order to facilitate people"s access to the water stored in the $\bar{A}b - Anb\bar{a}rs$, either some internal stairs, leading to the water tanks, or a rope and some buckets are available. Each of these two access methods has boosted the degree to which the design of $\bar{A}b - Anb\bar{a}rs$ could be associated with sustainable architecture. The stairs built inside the cisterns is one of the fastest and simple ways to get access to the water stored in them (Memarian, 2008). Almost all the $\bar{A}b - Anb\bar{a}rs$ in Larestan have these stairs, locally known as Pakaneh, which allow quick access to the water and use of it without any particular means. The stairs are also used to provide access to the floor of the $\bar{A}b - Anb\bar{a}rs$ as to dredge up silt and mud whenever necessary.

The usual method of taking water from the cisterns in Larestan is the use of a rope and some buckets. In this region, there are a number of openings or holes built in the lower part of the dome and covers intended to ease access to water. From these apertures, one can enter the $\bar{A}b - Anb\bar{a}rs$ and draw water by means of a rope tied to a bucket.

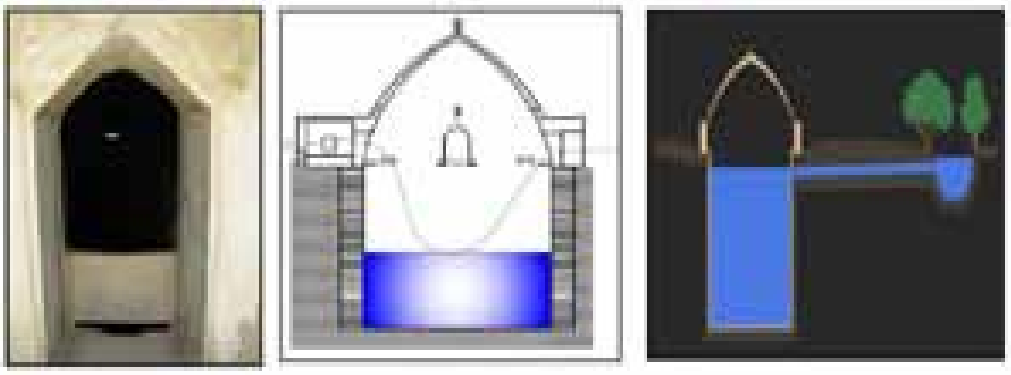

**Fig 4.** From left to right: The flow of seasonal flood from watercourses to $\bar{A}b - Anb\bar{a}rs$; the contact of the air stream with and the blowing of wind to the surface of the water in $\bar{A}b - Anb\bar{a}rs$; direct access to the storage tank of $\bar{A}b - Anb\bar{a}rs$ in Lar (taken from Arasteh & Taghvaee, 2012)

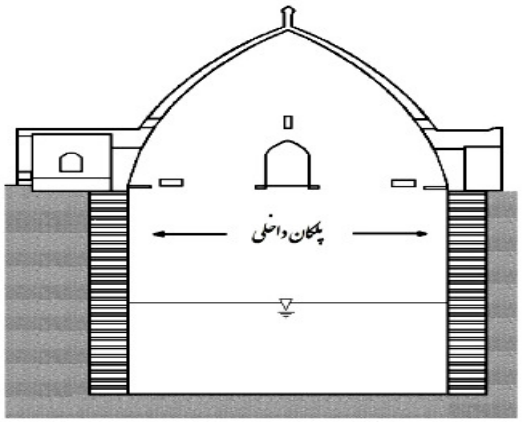


**Fig 5.** Internal stairs leading to the storage tank within the $\bar{A}b - Anb\bar{a}rs$ (Kazemi et al., 2011)

Ways planned to ease people access to water, the network of roads, and local access to $\bar{A}b \quad Anb\bar{a}rs$ are all worthy of note in urban context. Looking at the aerial photos taken from the historic city of Lar, the spatial connection between the $\bar{A}b - Anb\bar{a}rs$ in the main network of roads and the distinctive public spaces of the city is impressive. In fact, located in the center of the various neighborhoods in the city, the water cisterns are the points where the key roads lead to and exit from. As a result, it could be concluded that $\bar{A}b - Anb\bar{a}rs$ play an integral role in the main structure of the city of Lar. In addition to being located in the center of each neighborhood, they have an important role in shaping the network of roads and access to the city (Arasteh & Taghvaee, 2012: 97-106).

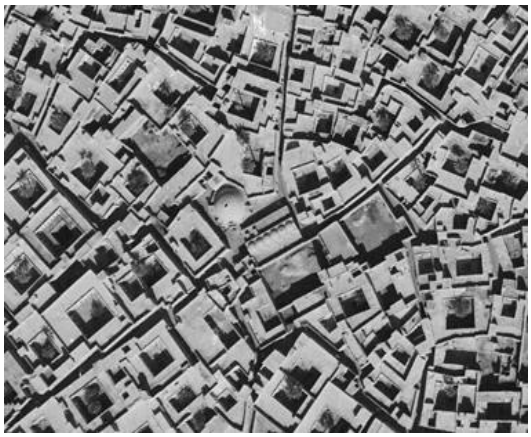

**Fig 6.** The old city of Lar, the role of $\bar{A}nb\bar{a}r$ in the formation of inner-city passages and passageways (National Cartographic Center)

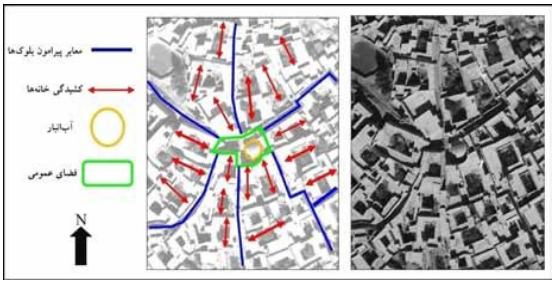


**Fig 7.** The radiant city design, the centrality of $\bar{A}b \quad Anb\bar{a}rs$ and the orientation of the houses on the routes leading to $\bar{A}b - Anb\bar{a}rs$ in the historical city of Lar, reference: Arial photos taken from Lar, 1976


**Fig 8.** The Spatial link between the $\bar{A}b - Anb\bar{a}rs$, watercourse, and the main network of roads and public spaces in the city of Lar

The historical context of Lar must have been greatly influenced by the location of the water reservoirs. In fact, owing to the point that water cisterns were located in the center of each neighborhood, all major passages and pathways led to them, resulting in a radio-centric design around $\bar{A}b - Anb\bar{a}rs$. What draws attention in the context of this city is that the orientation of the houses built around cisterns follows a radio-centric scheme. In other words, having $\bar{A}b - Anb\bar{a}rs$ at the center of each neighborhood led to a situation where most homes were constructed and arranged around the $\bar{A}b - Anb\bar{a}rs$ or near the pathways leading to them, regardless of the

environmental conditions.

This itself speaks of the importance of supplying and having access to water in the city of Lar. This environmental concern must have directed and influenced the orientation and arrangement of houses situated around the $\bar{A}b - Anb\bar{a}rs$ without anybody having planned for it in advance. To sum up, due to the lack of a permanent qanat network in the city, the urgent need for more water, and the heavy reliance of residents on $\bar{A}b - Anb\bar{a}rs$, they had to be placed in the center of each neighborhood.

This radial access to $\bar{A}b - Anb\bar{a}rs$ was actually the best efficient way to facilitate the access of all residents to water. Combining all these factors put the body of the cistern in coordination with the space surrounding the central square, leading us to this conclusion that the architecture of the $\bar{A}b - Anb\bar{a}rs$ was devised in such a way that met people"s needs. To this end, not only the spatial organization of the neighborhood but also the body of the $\bar{A}b - Anb\bar{a}rs$ had to be adapted to these needs (Arasteh & Taghvaee, 2012: 97-106).

**5.2.6. Holism**

All principles of sustainable architecture must be embodied in a comprehensive process that leads to the creation of a healthy environment (Watson, 1993). In the previous five principles explicated and discussed above, the significance of $\bar{A}b - Anb\bar{a}rs$ was assessed in relation to their intrinsic and internal aspects, but in the sixth and final principle, i.e. holism, the focus is on the outer elements of these water cisterns and their impact on the configuration and structure of the city.

It is believed that the most impressive $\bar{A}b - Anb\bar{a}rs$ in Iran are urban $\bar{A}b - Anb\bar{a}rs$, with their skillfully-devised architecture. Urban water cisterns were typically built in the center of neighborhoods and near residential areas. They gradually turned into vibrant centers for those neighborhoods (Alam-al-Hoda & Attarha, 2003: 84-91). In determining the position of an $\bar{A}b - Anb\bar{a}rs$, priority was given to the places that had the highest population density. One of the most common and favored positions identified by the designers was public places, known for their religious, educational, or commercial significance, with a high level of activity and full of bustle. These popular positions included mosques, hosseiniyehs, shrines, tombs, markets, caravanserais, main squares, main pathways, and public baths, forming a unified whole. The existence of $\bar{A}b - Anb\bar{a}rs$ in a neighborhood could have highly influenced the layout of the streets and passageways, inasmuch as that access to these cisterns was the deciding factor in designing alleys and pathways. In fact, this system of water supply in neighborhoods or cities reveals the presence of an urban social life as well as the fulfillment of a common need (access to water) (Ayatollah Zadeh Shirazi, 1970: 31). Therefore, it can be safely stated that $\bar{A}b - Anb\bar{a}rs$, in addition to their physical presence and significance in the layout of cities, had a significant role in the spatial organization of these cities.

Put differently, in the city of Lar, water storage facilities, by having been located in the center of many urban neighborhoods, played a significant role in the formation of the city's layout and its spatial organization. The position of $\bar{A}b - Anb\bar{a}rs$ in the whole context of a city was an important factor in the overall composition of the context of that city. For instance, in the old city of Lar, which is densely populated texture, the distribution of water reservoirs follows this density. That there are about 100 cisterns in an area of about 2.5 square kilometers in this city corroborates the above statement. Due to its geographical location, the city of Lar is very much affected by monsoon rains throughout the year, and this has led, over the years, to the formation of neighborhoods directly impacted by the watercourses flowing from the rain. By the same token, the location of $\bar{A}b - Anb\bar{a}rs$ was determined based on the flowing route of watercourses and proximity to natural elements. The study of the development of the city of Lar indicates that the water cisterns existed before the development of the city, and whenever that

development reached the location of an $\bar{A}b \quad Anb\bar{a}rs$, it had to comply with the body and overall composition of that $\bar{A}b - Anb\bar{a}rs$ (Arasteh & Taghvaee, 2012: 97-106).

In the design of the layout of hot and cold cities, urban development was entirely based on environmental elements. This was done to improve the comfort and welfare of the residents. The direct observation of the hot and cold regions shows how compact the urban layout is (Ghobadian, 1993: 87). This latest observation invites us to believe that the defining role of $\bar{A}b - Anb\bar{a}rs$ in the development of Lar made the city compact and dense in its layout. This kind of development was congruent with both hot and cold cities.

## 6. DISCUSSION AND CONCLUSION

The degree of attention paid to the environmental issues, as to protect and preserve it, in Iranian native architecture is the legacy of centuries of both experience and art left to us from our ancestors. This kind of architecture does not impose destruction but actually adapts itself to the environment. It is the result of a long peaceful coexistence between humans and nature and could be seen as an attempt to set environment, climatic conditions, and the surrounding nature work in tandem with architecture.

Water cisterns are a clear indication of the presence of sustainability patterns in our native architecture. Thus, in order to achieve an environmentally sustainable architecture, coordinated action must be taken to protect and preserve our natural environment. Architecture can get close to this goal and fulfill it when it seeks to recognize and utilize the native architecture and to take measured steps to use renewable energy sources, avoid contamination, and seek compatibility with the environment on a regular and planned basis.

Throughout this study, an attempt was made to explicate the six principles of sustainable development and discuss them in relation to the architecture of $\bar{A}b - Anb\bar{a}rs$ and their function in the Larestan region. Energy conservation, as one of the principles of sustainable architecture, was realized in the architecture of $\bar{A}b - Anb\bar{a}rs$ by means of small holes and wind catchers created on the body and cover of them. In this regard, tapping into the energy trapped in the depth of ground was quite noteworthy. Because the depth of the earth is cooler than the surface of it, the earth's crust acts as a thermal insulation. The construction of a water reservoir in the heart of the earth, accordingly, is an example of energy conservation.

Climate compatibility was another principle of sustainability which was explored in this article. Dome and cone roofs and the use of materials accessible locally in the architecture of Larestan $\bar{A}b - Anb\bar{a}rs$ were compatible with the climate of that region. The places where water cisterns were built and the mode of supplying water to them were in harmony with the environment and the site. The need of residents to water was met through the construction of private and public $\bar{A}b \quad Anb\bar{a}rs$ and their access to these water storages were facilitated through the internal staircases and the establishment of a network of urban roads.

Water cisterns are vitally important in the spatial organization of Lar. They were often located in the center of the neighborhood so that it could be part of the main public space of that neighborhood. The impact of this centrality of $\bar{A}b - Anb\bar{a}rs$ was reflected in the layout of the city of Lar, creating a radial access to the cisterns and, thus, the formation of a radio-centric model for the city. This particular structure, i.e. radio-centric, also affected the orientation of the houses located in the vicinity of $\bar{A}b - Anb\bar{a}rs$, in a way that the orientation of each building or house was changed and rotated depending on its location relative to the $\bar{A}b - Anb\bar{a}r$(s) at each neighborhood. Due to the indispensable role of cisterns in the layout of Lar, their design, architecture, and details of their construction were mutually affected by the environmental factors and limitations particular to Lar.

The patterns of sustainability explored and revealed in this article in relation to the $\bar{A}b \quad Anb\bar{a}rs$ in the Larestan region cast light

on the conformity and compatibility of these underground water reservoirs with the surrounding environment have, leading to the sustainable urban development of Lar. $\bar{A}b - Anb\bar{a}rs$, as an essential element in the whole city of Lar, are not only environmentally friendly structures but also have been influential in the development of urban and social fabric of Lar. That explains the density of population and the close-packed houses of the city. Inferring from such understanding, it is warranted to state that such compact and dense city layouts are most suitable for places with hot and dry climate. It should be added that $\bar{A}b - Anb\bar{a}rs$ in Larestan, as shown in this article, have both internal and external features that make them compatible with the environment. Internally, the architecture of the $\bar{A}b - Anb\bar{a}rs$, even when examined in detail, was in line with the principles of sustainability. Externally, the construction of these water cisterns had a profound effect on the urban layout and development of the city.

As elaborated earlier, in the past the cycle of water used to move in a regular direction, and our forefathers tried hard to build structures which were most suitable to this cycle. In the contemporary era, nevertheless, this cycle and the harmonious system it functioned within it have lost its balance due to the changes happened to the humans‟ life over the course of time. With the establishment of the modern water supply networks via a system of pumps and pipes, the need to store water was no more felt; and after a while, the $\bar{A}b - Anb\bar{a}rs$ were abandoned and went into rack and ruin. However, in the Larestan region, the severe shortage of water resources, the positive attitude of the people in the region towards $\bar{A}b - Anb\bar{a}rs$, and the lack of a complete modernized system of water supply and the dissatisfaction of the citizens from its present state have led to the survival of these essentially crucial structures which reflect delicate aspect of water engineering.

The people of Larestan still do their best to repair, refurbish, and build underground cisterns as to store water, usually captured from the winter rainfall. This is a philanthropic and purely spontaneous initiative taken by the public. Despite the controversial issues associated with $\bar{A}b - Anb\bar{a}rs$, such as the claim that the water stored in them is left unused, they are still deemed by some to be the most economical solution to the perennial problem of water shortage, especially in the Larestan region where there is a great number of water cisterns. Some have also argued for a change in the use of them. This idea has also been discredited since no convincing plan has yet been proposed to change the use of $\bar{A}b - Anb\bar{a}rs$. To recapitulate, it is worth protecting $\bar{A}b - Anb\bar{a}rs$ because not only are they compatible with their surrounding environment, but also they can encourage a sustainable tourism thanks to the principles of sustainability materialized in their architecture.

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