

Mazra Calantar

Elham Shams Zade Amiri

MA student, Department of Architecture, Azad University, Iran

elihamet@yahoo.com

Abstract:

Within different kind of existing villages in the world, it is important to study desert's border villages from the ecological and sustainable architecture, urban design exploitation of green energies, point of view. Primarily, at the Middle East region, and its cradle of civilization _Grate Iran_ and the central of Iranian desert, the most huge adobe city of the world, Yazd, diamond of desert, is parading. At Yazd suburb, there are some of the best examples of virgin villages that they have the best adaption between architecture and nature, one of them is Mazra Calantar. This field study essay, at the first step, studies the influence of climate factors on architecture, urban designing and some of the details. In addition, this article has the special attention to analyzing how Ecological Architecture results in the maximum usage of sustainable energies and the minimum usage of fuel and nonreturnable energies. At the next step, it describes the architectural details like building form, construction material and courtyard, urban design details, like village centre, neighbourhoods and neighbourhood canter and details of commercial buildings like Bazaar, Religious building, Cisterns and Water mill.

Keywords:

Ecological Architecture, sustainable energies, village canter, Cisterns, wind captures.

Introduction:

In a vast country, such as Iran, with different climate zones, traditional builders in the past have presented of logical solution for human comfort.

Iran divides into four climates region. One of them, which consist of the most parts of the central Iranian plateau, receives almost no rain for at least six months of year, here is very dry and hot. The best usage of them; otherwise, their buildings would have been very cold in the winter and very hot in the summer. In the other words, since they had no choice, they made the best use of what they had.

Today we try to bring comfort in our buildings only with the use of expensive and polluting mechanical equipment, and if this equipments stops working for any reason, life would be intolerable in these buildings. Of course, in is not right or possible to go back to the ways our ancestor used to live whit, but certainly to study and learn from ways that they had built their buildings and the way they had used the environment to provide human comfort in buildings is necessary and helpful.

It has always been said that “there is some logic in experience” and in many methods and principles that are ancestors had used for constructing buildings in the past thousands years, we can vividly see some logic and reason in them. In order to keep our environment clean and free from smog and noise, and protect the green and natural areas in and around our cities, and reduce oil extraction. We would better understand our natural environment and re-establish the disturbed relation among man and nature, and mechanical equipment only when the climate design of the building is not adequate for human comfort.

This essay is in three part and eight chapters. Part I “site introductions” includes four chapters, which are political, geographical and ecological situation and historical background of Mazra Clantar. In part II: “climatic analysis of the traditional buildings of Mazra Clantar”: four chapters are explained, climatic condition, rural texture, house-building forms, construction material and cityscapes (village canters, neighbourhoods, Ghanat (subterranean canal), cisterns).

Part I

1. Site introductions:

1-1. Political situation:

Mazra Calantar, Meybod, Yazd, Iran, Asia.

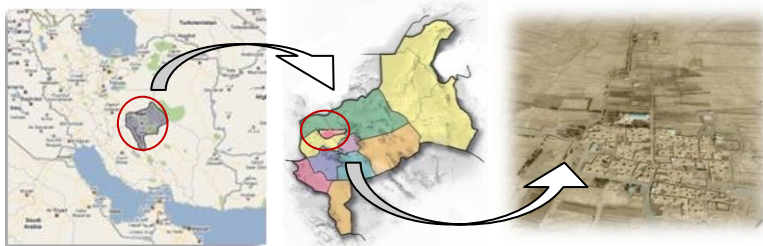


Figure 1 - Iran, Yazd, Mazra Calantar's map

1-2. Geographical situation:

Mazra Clantar is located in $45^{\circ}6'$ of the east and $32^{\circ}11'$ of the north.

1-3. Ecological situation:

Mazra Calantar is located in central plateau regions-Hot and Dry climate.

1-4. Historical background:

Mazra Calantar has established during the Sassanian kingdom. There have remained of historical palace and ruined water mill out of the village that prove this idea.

Part II

2. Climatic analysis of the traditional buildings of Mazra Clantar

2-1. Climate condition

Mazra Clantar has located in the border of the central plateau of Iran, which consist of the most parts of the central Iranian plateau, receives almost no rain for at least six months of year, here is very dry and hot. Climate factors:

- The weather is very hot and dry in summer, and cold and dry in winter
- The rainfall is a bit
- The humidity of wheatear is very low

- Planet covering is so tiny
- Highly difference between day and night temperatures
- Hot and sandy wind

2-2. rural texture

In Mazra Clantar there is a best adeptly between hard climate condition and buildings that prepare a comfort living for people.

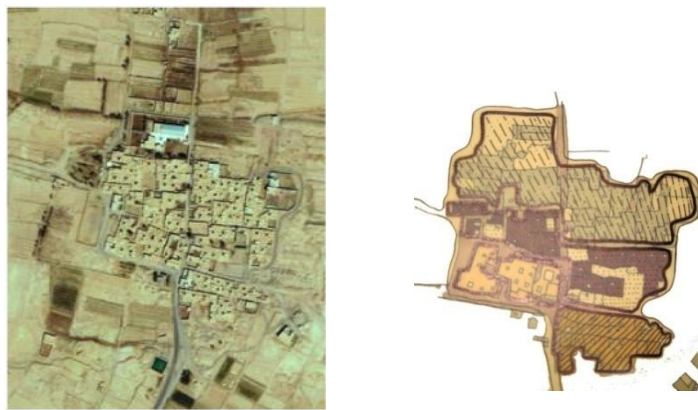


Figure 2 – Map and diagram (Compact rural texture) of Mazra Calantar

2-2-1. Characteristics of the rural texture:

- Very compact texture
- Surrounded rural spaces
- Narrow, disorganized, and covered valley
- Joined buildings

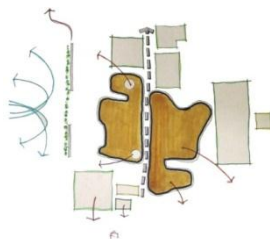


Figure 3 - Schematic plan of village and levee of it

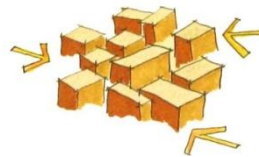


Figure 4 - Schema diagram of compact rural texture

The strategy of buildings settling based on the wind and sunlight direction

In a word, all the village spaces has protected against of climate factors especially displeasing wind and hot sunlight. The rural texture is too compacted and buildings joined. These cause the whole village become like a



Figure 5 - schematic facing of village and levee of it

Castle, which have a very strong surface and protected citadel, there is not no-surrounded space in the village because protect them against bad weather conditions is impossible.

In addition, there is a levee at east site of village to protect it against sandy wind, which is called Esfahan wind. The paths are so narrow that enough just for two persons to cross together in a same time, and intricate in addition walls are so tall, these have ecological results. First tall walls protect paths against warm and sandy winds.

Intricate paths reduce the speed of sandy winds accordingly, the sands of winds quell.

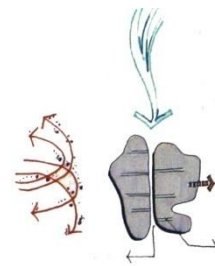


Figure 6 - schematic plan of sandy wind and breeze and paths

Figure 7 - Three photographs of roofed paths

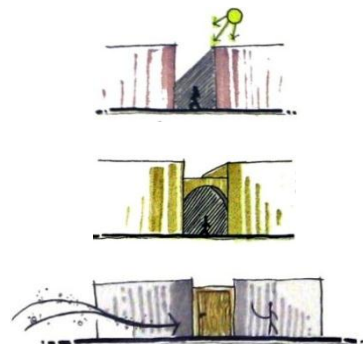


Figure 8 - Three sketches of different kinds of paths



Figure 10 - Schematic sketch of wind capture function

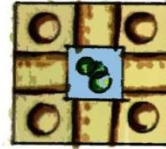


Figure 9 - Schematic site plan of a courtyard house

2-3. House-building forms:

2-3-1. The total characteristics of buildings form:

All the buildings are introverted and surrounded. All the buildings (except bath) have courtyard and frequently of them have nether, wind catcher and loggia. The floor level of buildings especially yards are lower than the paths level. The headroom is usually so high. All The buildings have arched roof or dome. Walls are comparably stout.



Figure 12 - Crib



Figure 11 - Thick wall

The buildings and courtyards surrounded and have controlled ecological environment, as like as the whole city spaces because of hard climate condition.

As it mentioned, here frequently weather temperature is high and the humidity is lower than comfort level. Heating sunlight during the summer is scorching and hot sandstorm cause breakdowns living. So, create a courtyard, improvise a little basin and gardens in the centre of building increase the humidity level.

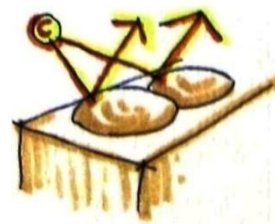


Figure 13 - How dome reflects the sun light

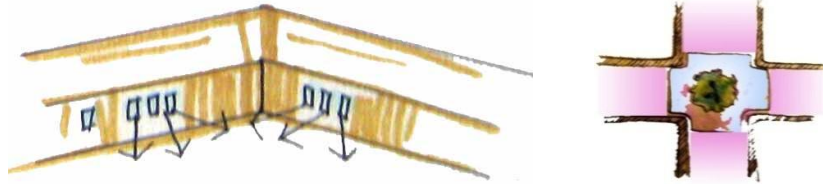


Figure 14 - Schematic sketches of courtyard

In addition, stout adobe walls that stand heavy arches and domes are as heat-condenser therefore decreases day and night temperature oscillations. Finally, locate all openings in rarely humid and mild Environment and close all exterior walls (except internal door) abate the connection between interior and exterior environment as far as possible, accordingly little comfort climate appears during the hottest and driest weather conditions in the world.

2-3-2. Four seasons houses:

The most important characteristics of Mazra Clantar are the adaptability between way of living and climate conditions. One obvious example is introverted house, which called four-season house. Rooms located around the courtyard use in deferent times based on the season weather conditions.

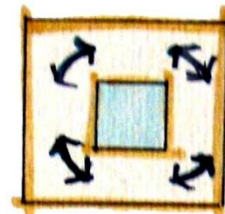


Figure 15 - life cycle of Four-season house

The procedure is it: The north site of yard where sun glows in slant line in winter and gain heat more than other sites is winter-place; most daily activities take place here. Nevertheless, rooms those are located in the south of yard where more is cool and shady use in the summer. This site is named Nesar (place not exposed to the sun, shady), cellar is located here under the ground thus in the hot seasons it has lower temperature than other places of house. The cellar floor level is lower than path level in addition little pools and wind catchers increase the humidity and chilliness of these cellars. Sometime the difference between cellar and path temperature is about fifteen degrees.

Usually, the ceiling of the places in southern site is as high because hot weather elevates and cool weather replace it the room level.

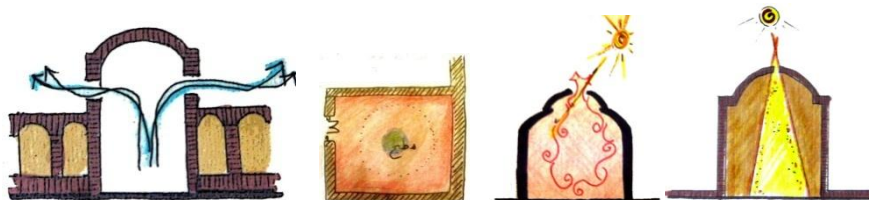


Figure 16 - Diagrams of air ventilation and lighting in rooms

Wind captures and air vents are located here.

Kitchen has placed in the corner of one site that does not have ventilation and light. The ceiling of kitchen is higher than other places and there is a big hole on the ceiling to ventilate this place area. The light comes down from this hole too.

The courtyard has connection joint function. It connects all rooms. Almost, none of windows opens to the out site and all of them open in to courtyard except the internal door, which is the union opening that has connection out site, and it has been connecting to courtyard just by Hashty (an octagon or square room) and corridor.



Figure 18 - Section of courtyard



Figure 17 - Basin and small garden in courtyard

As it mentioned, the courtyard level is lower than the path level this has four benefits: The flowing water of Ghanat (subterranean canal) and river run to the garden naturally. Make mud brick whit soil that gain from digging. The temperature interchange decrease due to main part of building is among the earth. The foundation of building has high resistance against earthquake.

Here are three different plans with the scale of 1/100 that have made by the research group, in Mazra Calantar:

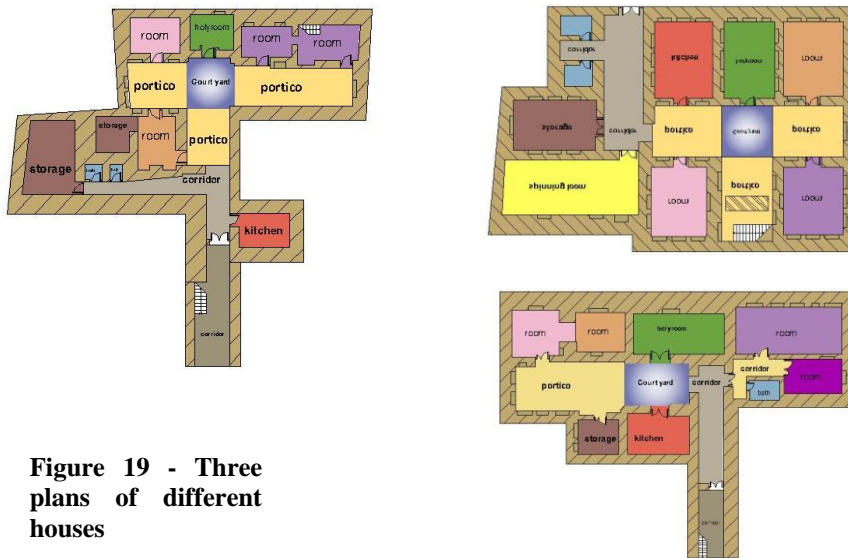


Figure 19 - Three plans of different houses

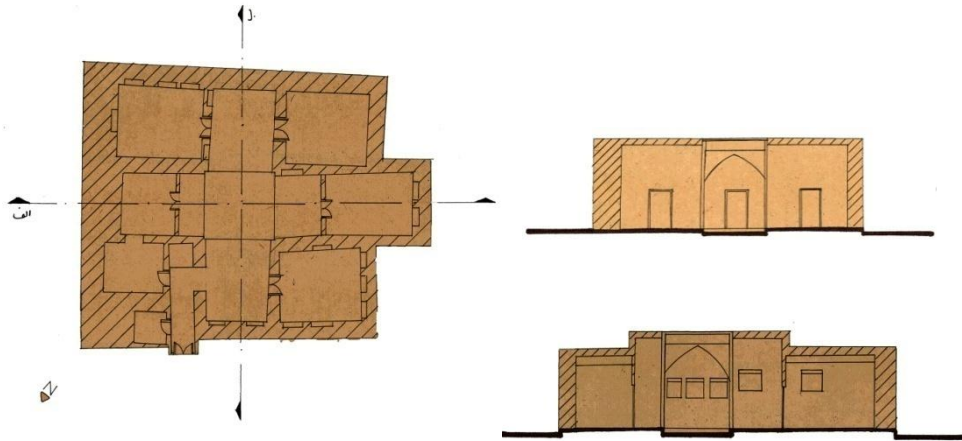


Figure 20 - : Plan and two joined facing and section of house (1)

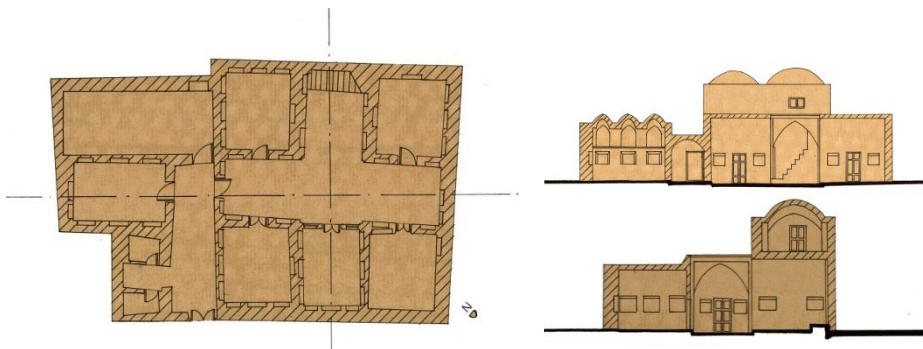


Figure 21 - Plan and two joined facing and section house (2)

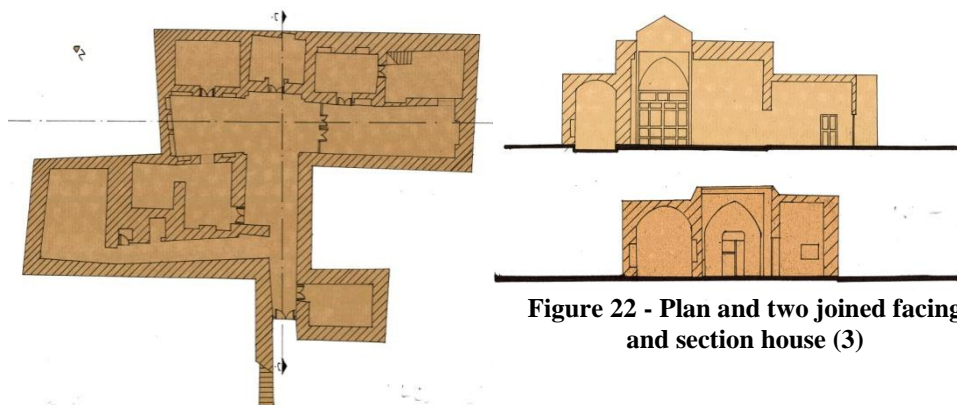


Figure 22 - Plan and two joined facing and section house (3)

2-4. Construction material:

The main materials used in this region are mud, adobe and baked and unbaked brick. These materials are available and cheap in this region. In ecological point of view, these have appropriate function; these become hot slowly during the day and lose it slowly during the night too. So it cause decrease the interchange of

Figure 23 - Adobe construction and form



temperature all day night. Wood has used as door or window and sometimes as column or roof beam in this region. Stone has usually used for foundation.

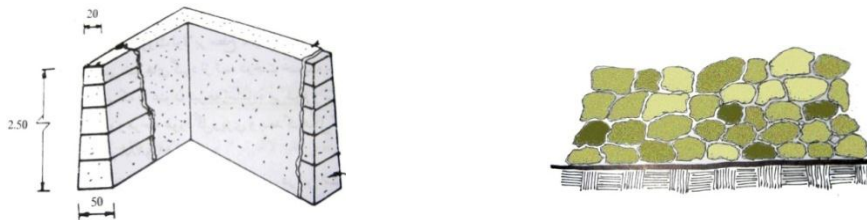


Figure 24 - Adobe wall construction and schematic sketch

2-5. Cityscapes:

2-5-1. Village centre:

All the social gatherings have centre place, where main activities such as social, economical, political, cultural ones take place. In these regions, some special building like Fire temple, Bazaar and cistern because of climate condition that mentioned before surrounds village centre.



Figure 26 - Schematic Sketch of Sabat

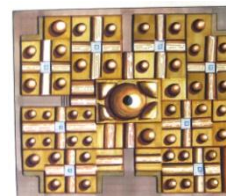


Figure 25 - Schematic site plan of neighborhood

2-5-2. Neighbourhoods (Sabat):

Sabat is roofed valleys that prepare shadow and mild weather for the passer-by. This place has role as a small neighbourhood center in Mazra Calantar, where citizens come and dispute talk together. Sometimes some of them join two or three houses and take role as roofed and lidded valley.

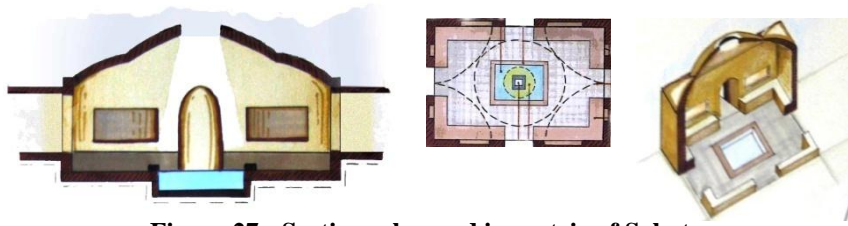


Figure 27 - Section, plan and isometric of Sabat

2-5-3. Ghanat (subterranean canal):

Based on the research group observation the resource of water at Mazra Calantar is Ghanat. Ghanat is one of the intelligent Iranian creations. It is technique to gain water without any kind of energy. It works just by gravity. In the procedure of digging Ghanat, the first level is finding the underground alluvium of mountainside, and then diggers dig a deep wheel which called Mother wheel. The depth of this wheel is about fifteen up to hundred meters. Then they find the manifestation of Ghanat near their village where the water of Ghanat mast exits. Digging the vestibule starts from manifestation to the mother wheel with mild slope. Between computed distances, they dig wheels. These wheels dept is same as the depth of mother wheel. These wheels join to vestibule and have two functions that are bringing the soil of vestibule out and ventilate it.

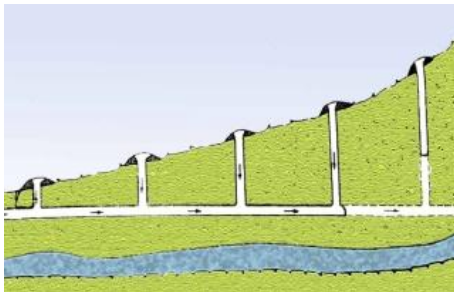


Figure 28 - Section of Ghanat

2-5-4. Cistern:

In hot and dry climate cistern is the most important building to survive water “the main element of human living”. Cistern contains five parts: water reservoir, which called Khazine or Tanoore. A big cube has located under the ground and has roofed by dome. This resister has one staircase at the end of stairs there is a faucet used by citizens to get water. Wind captures is the last and most important part of cistern that use for cooling and ventilation of water.



Figure 30 – Photograph of cistern

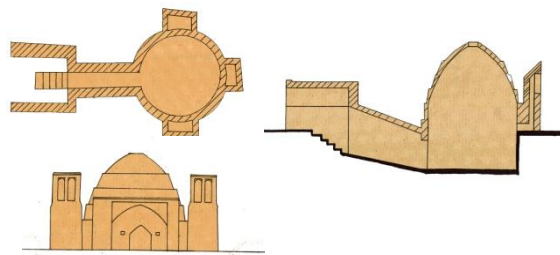


Figure 29 - Schematic plan, facing and section of Mazra Calantar cistern

2-6. the function and diagram of wind capture in Mazra Calantar:

Wind captures use for ventilation and cooling the weather in the house. The plan of these in Mazra Calantar is square or rectangle and these are not so high. In the most primary wind captures, weather come down and lead to the porticos by some portholes, which are open to the courtyard. In fact, a wind capture is an air canals these contracts with mud materials, the internal walls are strained and there are some partitions in it, which increase the heat capacity and clean the air too. The wind captures function based on two principles:

The weather is cool during the night.

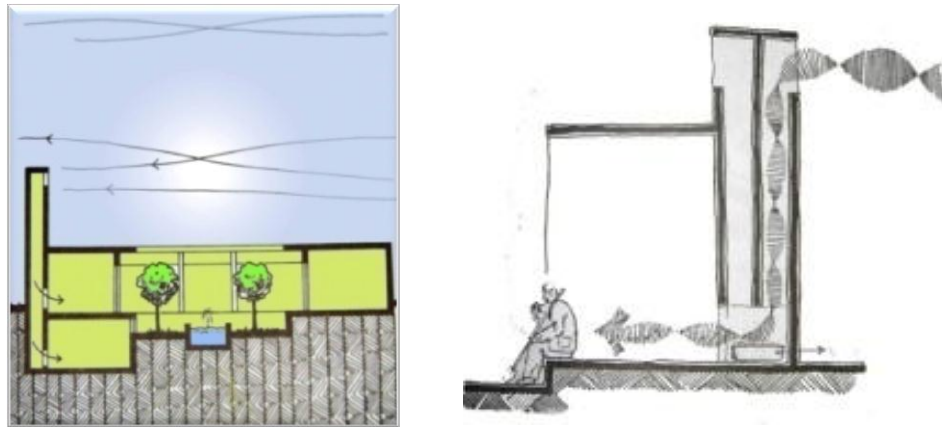


Figure 31- Schematic section and function of wind capture

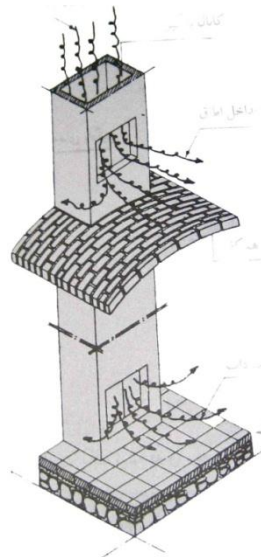


Figure 32 - : Isometric diagram of wind capture

The cool weather comes down because it is heavy.

During the night, cool weather come to the canal and reserve in partitions and walls little by little. This procedure continues until morning, and while a day the weather that is near the walls and partitions get cool and become heavy and come down to the porticos, this vacating cause the warm and lightweight weather go up. This ventilation continues until the reservation of coldness finish. Whit the sun set this procedure happen again. Usually

citizens put a water jug or locate small pool under wind captures portholes so water gets cool and weather become mild, soft and humid.

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