Najmeh Motalaei

Climate-Friendly Urban Design Process in Old Towns Alongside the Persian Gulf, Case Study: Bushehr

Najmeh Motalaei[1], Ehsan Ranjbar[2]

[1] *University of Applied Science (Center for Building Technologies), Tehran, Iran, n.motalaei@gmail.com*
2 Tarbiat Modares University, Tehran, Iran, e_ranjbar@modares.ac.ir

1. Introduction

The northern side of Persian Gulf with hot and humid climate has a rich treasure of urban development during history. Bushehr is one of big cities in the region that a context for learning traditional urban design according to climate consideration. Especially in Bushehr old town a hierarchy of climatic design can be seen from site selection to building details.

During these two decades, urban design projects have been started in the old town to provide a better context for urban life. In most of these projects, climate consideration of urban development has not been emphasized as a key factor. So, climatic function of urban spaces in the old town has changed and climatic comfort has decreased in urban spaces.

This conflict between new projects and old context design with climate consideration brings up a big question that should be a specific urban design process in sensitive climate?

This research tries to introduce a climate friendly process for urban design projects in Bushehr old town. Thus, as a first step traditional climatic design principals in the old town has been discovered and analyzed base on scientific literature review. Then, main urban design projects have been evaluated based on climatic consideration. Finally, a climatic friendly process has been suggested to enhance the environmental quality of the old town in urban regeneration projects.

2. Learning from traditional design in old Bushehr

The first step of a climate friendly urban design process is analyzing climatic design initiatives through history. Most of time our predecessors have found best solution to provide thermal comfort in residential an urban spaces. Also progressing climatic analysis methods and tools help to recognize these initiatives.

Because of hot humid climate in this region the microclimate of urban spaces has direct relation to shadow area and ventilation. So to create climate comfort the design should enhance the shadow area and excess the velocity of wind.

2.1. Site selection and direction

One of the characteristics of Bushehr location in comparison with other cities alongside Persian Gulf is its peninsula composition. This special situation has led to catch winds in different directions. Because of this position there are a few wind catchers in comparison with other linear cities of Iran alongside the Persian Gulf. One of the consequences of Bushehr position is forming and directing main streets to sea to conduct maximum wind into the city. Despite a lot of buildings have oriented to north and south for minimizing solar heating absorption the special position and different wind direction has let to urban block orientation in different directions.

Fig1-3. Bushehr position

2.2. Streets

Climatic condition has a main effect on form of streets. The H/W of streets produces maximum shadow in more hours of day. Minimum enclosure ratio (w/h) is 1/2. In some streets we can see 1/6 ratio. So most of streets had a lot of shadow area during the day. A lot of junctions with open spaces provide a context for wind distribution and maximum exchange of wind and buildings. Main streets have oriented to the sea for catching the wind of sea. Streets in Bushehr have a special profile. The street width has decreased from down to up. This special profile increases air current. Buildings try to catch maximum wind of streets. So there is a projection in first floor of buildings. There is a little dead end streets in old Bushehr because of creating maximum wind catcher surfaces for buildings. Current air decreases humidity and creates thermal comfort. In addition absorbs humidity of streets walls. We can say humidity of internal spaces conducts out by air current in streets.

2.3. Plazas

These spaces in addition to social function have distributed wind in streets. They are classified in two classes:

-small plaza at the junction of streets

-main plaza as quarter center for social function and programs

One of climatic initiatives in these plazas of old Bushehr is high building located at the edge of these spaces among lover buildings. This location has led to disturb wind and conducted it to ground surface and also shade on other buildings and plaza. This location can also be seen in all texture of old Bushehr. This location of high building has disturbed and conducted regional wind to lower surfaces all over the city. One of important point in these spaces is attention to urban furniture as a part of spaces that attached to building in maximum shadow.

So wind flow in old Bushehr can be seen in three levels:

-First level is regional wind height that high buildings conduct it to the city. First use of this wind occurred on building's roof. Peoples have used roofs in summer nights.

- Second level is courtyard at floors up to ground floor that named internal Tarmeh.

- Third level is urban public spaces or ground floor.

Form of plazas also have affected from wind and sun. These spaces have created with irregular and broken form that a lot of streets opened to them. This form has affected on wind disturbance and distribution and also creating shadow in all times of day.

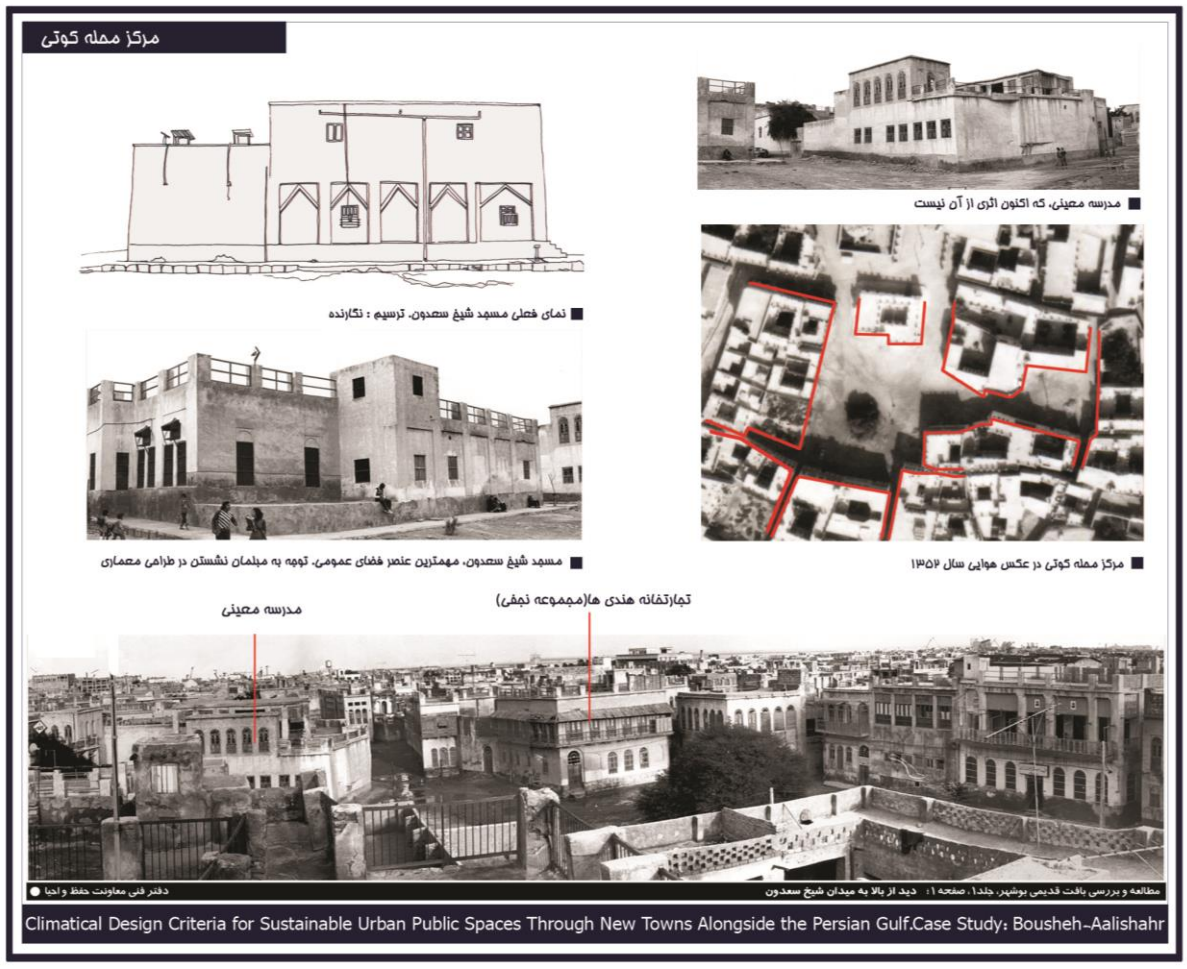

Fig 4. historic form of Kuti Plaza

2.4. Architectural elements

Architectural elements and spaces have a continuous interaction with urban spaces according to wind flow and sun. Opening four sides of building to urban public spaces for catching maximum wind with a small courtyard have formed an introvert and extrovert texture in old Bushehr. We can the continuation of climatic function of urban spaces in architectural elements Tarmeh, Shenashir and Boon.

2.4.1. Tarmeh

Tarmeh is like porch in other cities of Iran. Tarmeh is open from one side, used as living space temporarily in some season and connects several spaces. Tarmeh provide a space with shadow to use wind for ventilation and accessibly to some spaces like living room. Tarmeh has created both in courtyard and external elevation but it is more useful in courtyards. Tarmeh usually has a rectangle form that can be like L.

2.4.2. Shenashir

Shenashir is a unique indicator of old Bushehr that diversity in its construction style has provided diversity in urban escape. shenashir is a multi-function space:

- It's a place for using pleasant wind with shadow that provide a close access from private space of room to public space of city.
- It provides a shadow space for watching urban life.
- It provides a connection between spaces outside.

Shenashirs sometimes is open and sometimes have covered with shutter windows and mobile windows to control solar heating. These netted windows flows wind without view from outside. Shenashirs has been constructed with roof or without it. Shenashir can be imaged as private spaces efforts to use much flow of winds. It has created continuity between private and public spaces to use wind and connected public life to private life.

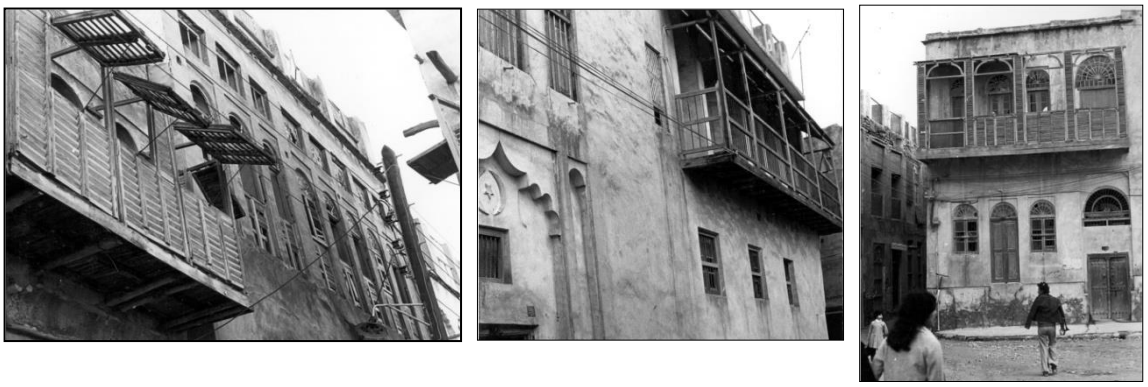

Fig 5-7: Different types of Shenashir

2.4.3. Boon

The form of urban spaces skyline in old Bushehr has a special identity regard to climate comfort. Building's roof has been used for living in summer nights. This roof as a space has named Boon. So parapets have designed with wood details. Boon is a first space that has provided a context for using disturbed regional wind. This use of Boon has created a public space between Boons at night.

2.4.4. Construction materials

Construction materials have been chosen according to climate condition. Walls have been constructed with coral stones that moved from the Gulf. These stones have minimum moisture penetration. Walls have covered with lime mortar that has light color. This leads to minimum absorption of solar heating and maximum resistance to moisture

3. Analyzing new projects in old Bushehr

Three new projects have selected to review using climatic considerations during design process. Without any use of software and scientific method in the design process in old Bushehr, referring to the historical background in climatic design is a logic method to change usual urban design process. Unfortunately there is minimum attention to the climate consideration in these projects. In the first project, Kuti Street that is the main street in Kuti neighborhood and the main entrance of wind flow from the sea, wind flow direction has ignored. Also, new buildings in this street have not built according to climate situation and quite different from historical background. In the second project, Kuti plaza, in addition to changing the form plaza versus historic form, we can see different planting and details in the new form. In the third project that is a street on the edge of historical part and in the CBD, commercial centers has minimum attention to outdoor comfort and the cooling machine heats flow to urban spaces. Also, we can see minimum shadow in the street that could be provided with arcades.

Final evaluation show less attention to climatic design consideration in planning, design and implementation in these projects.

Fig8-9. Kuti plaza. Left: 2015, Right: 1956

4. Climate friendly urban design process in old Bushehr

There are different models for urban design process. Based on these models especially rational urban design process that is mentioned in “Urban Design: A Typology of Products and Procedures” by Jon Lang (2005), this articles tries to introduce a unique model for urban design process in old Bushehr. This new process helps to have more attention to climate consideration and conservation of historical climatic elements. If this process used in all urban design projects providing thermal comfort in urban spaces can be more reachable.

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