

## Analyses of Shawadoun Sustainable Ventilation in Hot- Humid Climatic Architecture of Shoushtar and Dezful Cities in Iran

Roghaiyeh Mehmani

Department Of Architecture, Bostan Abad Branch, Islamic Azad University, Bostan Abad, Iran

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### ABSTRACT

Natural ventilation is one of the most effective factors is the creation of thermal comfort. This factor leads to comfort conditions in hot and humid climates through the implementation of wind current, a decrease in the relative humidity and an increase in surface evaporation. In order to modifying climate condition concerning buildings, some construction builders have made an effort to build a structure under the ground with a depth of 5 to 12 meters in Dezful which is considered to be one of the hot and semi-humid cities. This sustainable cool underground structure also called Shawadoun - consists of a room or some rooms with an annual average temperature of 25 C° in which an increase in the depth and the volume of Shawadoun causes cooler and more sustainable air – is one of the suitable approaches which is in accordance with the environment and creation of thermal comfort conditions through the stability of the earth's annual temperature and natural ventilation. This structure was used in the summer for daily resting and also storing food stuff and in general to fit cooling requirements. Among the Shawadoun of the adjacent houses whose residents are often a family member or relatives, they used to dig some channels to connect Shawadoun to each other so that air ventilation inside Shawadoun would be performed properly. The cool air was directed into the rooms through the holes which extended from Shawadoun to the rooms of the house.

Shawadouns consisted of vertical channels to provide day light and also the light catching channel was located under the surface of the yard. Some Shawadouns fulfilled the ventilation process by using wind catchers which sometimes functioned as air conditioner. In the summer, the unglazed clay pots were placed on the mouth of these channels, and since the air current was always flowing inside the channels and the surface of the clay pot was wet due to water inside, the evaporation of the water over the pot caused the coolness of the water inside the pot. It must be mentioned that the level of underground waters in this region is very low, and since digging the ground, especially in Dezful, is fairly easy, these two problems have helped establish and expand Shawadoun.

**Keywords:** Shawadoun, natural ventilation, thermal comfort, sustainable architecture

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### 1. INTRODUCTION

The importance and necessity of paying attention to environmental and climatic conditions is one of the determining factors in the architectural designing of the monuments in various parts of Iran. Moreover, using natural energy in the monuments leads to an increased quality of comforting spaces as well as causing safety on the living environment; in addition, adaptation of the monuments with the climate of the region is an influential factor in creating comfort in any place. Therefore, sustainable architecture has been recommended as a set of patterns, which is looking for some standards and criteria in order to achieve the goals mentioned. These principles and criteria have been very outstanding in the former architecture of Iran and they were considered the basic standards and principles from which very beautiful outlines remain in the present time. Water storage, wind catchers, refrigerators and pools have been among the prominent patterns in the architecture of hot and dry areas in Iran. Such a phenomenon existing in hot and semi-humid areas of Dezful and Shoushtar cities, located in an area with exceptional climate, got the architects to learn a lesson from the nature with regard to the provision of their basic requirements. It can be said that living in the three levels of these cities (roof, ground floor and basement) has been the most evident lesson taught by the nature in which other architectural patterns have been achieved from this very factor. In this field, Shawadouns are supposed to be one of the local-architectural patterns with cool underground spaces inside the monuments of the city, which have and effective function in creating optimum comforting conditions inside the spaces where the residents of these old buildings lived [1]. It is through studying some components such as Shawadouns that these architectural spaces can be found in line with the principles and purposes of sustainable architecture and such an issue confirms a necessity for investigating the spaces qualified to be assessed.

The amount of difference and several combinations of climatic factors – which is caused by different geographic locations of various areas – has triggered a different climatic zone in the world and Iran. There, Iranian architects aided by their own perception and skill have made an effort to create some spaces like the central yard, wind catchers, Shawadoun, Sabat and other organic and roofed passer-by [2].