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## Sustainable Systems in Iranian Traditional Architecture

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### Abstract

Today, sustainable architecture, the way of architectural design which is based on environmental aspects, is a specific style of design which architects and designers try to pay more attention to it and architects in Iran, as a vast country with different climatic zones and regions, had to use this way of design in Iranian traditional architecture from a long time ago to conquest environmental problems in architecture and have a specific system for each region. This paper concentrates on sustainable systems used in Iranian traditional architecture which traditional architects designed and presented to have the solutions of human comfort and save natural energies.

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### 1. Introduction

Sustainable architecture, framed by the larger discussion of sustainability having to do with the pressing economic and political issues of our world, seeks to minimize the negative environmental impact of buildings by enhancing efficiency and moderation in the use of materials, energy, and development space [1]. Due to lack of access to modern heating and cooling equipment in ancient times the architects were obliged to rely on natural energies to render the inside condition of the buildings pleasant [2]. Iran is basically divided into four climatic regions. Region one, is the dry and hot region, which consists of the most parts of the Iranian plateau. Region two, is cold and snowy region in north and west of the country. The third one is the hot and humid region which comprises northern shores of the Persian Gulf and the Sea of Oman and the last region is humid and rainy region which embraces the southern shores of the

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Caspian Sea [3]. In this paper we will focus on various solutions and different sustainable systems which were used in each region of such a multi-climate country, Iran.

## **2. Iran and Energy Sources**

Iran has vast reserves of oil and natural gas and is one the most important centers of these energy sources in the world, but because of its extensively use, at the present rate of use, it will be hard to export any oil in the next few years and not only in Iran, but also in all over the world lack of energy will be the most important problem. So we have to think about the new sources of energy and in order to keep the world clean and also to reduce oil extraction, it is better to think about the natural environment and energies and reestablish the disturbed relation between man and nature, the thing that Iranian traditional architects did many times ago.

Nowadays, we bring comfort in our buildings with the use of expensive energy sources and mechanical & electrical equipments and if they stop working life would be hard in these buildings and as the cost of these equipments and energies is becoming more, the world is becoming more directed toward the use of renewable resources like solar, wind, geothermal and hydro energy. In Iran, the traditional designers had to present environmental elements as their buildings would have been very cold in winter in some regions and very hot or humid in summers in some other regions. So, the way of their design was based on the region they were going to do and according to this we are going to talk more about the regions and their sustainable systems used in each region.

## **3. Region One: Dry and Hot Region, Central Parts of Iranian Plateau**

This region receives almost no rain for at least six months of the year, hence it is very dry and hot. So, cooling is the main purpose of the design in this region. Traditional architects in Iran, tried to use convection and evaporation in their design and certainly wind and water play the main roles in this way of design and by this way, some sustainable systems and equipments such as wind catcher known as "Badgir" and ponds build inside the house known as "Hozkhaneh" were presented to Iranian valuable architecture.

### **3.1 Wind Catcher, A Sustainable System in Dry and Hot Region**

As Iranian sustainable architecture suggests various solutions which are adapted with environmental potentials, natural ventilation, as a certain parameter for cooling and sense of comfort, plays key role in architecture formal design, which is called wind catcher or wind tower [4]. Wind catchers system works by the wind power which comes through the holes designed on it. Air circulation at various points in the building is adjusted by opening or closing the various openers or ducts at the bottom of the wind catcher. The wind catcher operates according to the condition of the wind and sun radiation in the region. The inside and outside walls absorb a lot of temperature during daytime. As a result they cause a balance of temperature at night and bestow the attracted warmth to the cold night air. The thickness of the wind catcher walls and the dimension of the holes inside it is designed in a manner to allow enough heat. The light warm air inside the wind catcher ascends and is sucked by upper elevations. As a result cool air flows from windows and doors into the house and continues all through the night [5].

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