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Mahmoud Tavassoli

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Strategies for Sustainable Development

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To my dear ones
Nayyereh
Babak
Bahman
Sana
Fatemeh and Maryam

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Introduction

The objective of this research was to examine the influence of historical factors on the one hand and climatic factors on the other, to consider urban spatial forms and rural complexes in the hot arid environment of Iran. It reflects extensive journeys in many cities, towns, and villages.

The first Persian edition of this book, *Architecture in the Hot Arid Zone*, was published in 1974. The second expanded edition, *Urban Structure and Architecture in the Hot Arid Zone of Iran*, was published in 1982 and then with some changes in 2003. The 2012 edition continued and expanded the tradition established in the second edition, which was well received outside Iran.

In this revised English edition, new materials have been added, bringing the effort up to date, considering such issues as sustainability. In this work, a considerable attention has been given to the problems of traditional fabrics, urban blocks, and ordinary buildings, an insignificant matter in the academic education and profession.

Today, many courtyard houses, which were once belonging to the extended families, are falling into ruin and replaced by poorly designed multi-story buildings. The compact traditional urban blocks are replaced by massive buildings without public space. This process in the profit-oriented environment is worsening the situation and maximizing the potential effects of natural disasters, such as earthquake. In the historic cities, focus is placed on the restoration of historic heritages, without paying due attention to integration and inseparable surrounding fabric.

Although understanding the past is difficult, especially in our present situation, because of enormous changes in culture and society during the twentieth century, however, through our long journeys, we have been able to recognize the evidences through which the hot arid environment speak to us like an old master. By in-depth analysis of urban form and structure we can understand how past generation's solution to climatic problems had a logical basis. And today in the twenty-first century, that interest is centered on issues of energy conservation, and utilizing natural energy, it is logical to understand the essence of lessons which can be drawn from the past experience for sustainable development.

Fig. 1 Iran and the Middle East

Part I of this book deals with historic, economic, and social context of the old town structure, origin of urban and housing form, mainly during the Middle Ages, Islamic era, up to the twentieth century, modern Iran. It also points out the regional inequality, the problem of accelerated growth of a few large cities, due to the increased sale of urban densities, and widening gap among the regions.

Part II discusses the impact of climatic factors on spatial form of towns and cities and architecture in the hot arid environments. Here, the emphasis is on the manner in which past generations have sheltered themselves under the harsh climatic conditions (Fig. 1).

Part III is devoted to several spatial criteria, considering the lessons from the past, the meaning behind the forms, without replicating them. It also treats in more detail the problem of repeating poorly designed contemporary buildings, and urban block design, considering use of natural energy, and the problem of earthquake.

Appendix 1 includes climatic characteristics and their general distribution in Iran. The information in this section is mainly based on Adl and Ganji, the late professors at the University of Tehran.

Appendix 2 and 3 are structured on the system of research, findings, and methods by Victor Olgay in *Design with Climate*, and a United Nations report on *Climate and House Design*. Here, I have carried out an examination and an analytical and comparative study between the Yazd region, in Iran, and Phoenix, in Arizona, using the methods described by Olgay. Comparison between climatic needs of Phoenix and Yazd shows interesting differences.

As we can see, urban form is determined by three influential factors: climate, belief, and power. Despite of historical difficulties and rigors of his environment,

Fig. 2 Map of Iran

men's inventiveness in the hot arid zone enabled him to resist and be innovative, imaginative, and think about problems in a new way, to produce new works of art. Not only unique architectural solutions, but also hot arid environment mysticism and literature are deeply indebted to difficult historical and climatic circumstances (Fig. 2).

Considering knowledge of utilization of natural energy in shaping urban form, we can study different periods:

(1) Ancient times, (2) Islamic era up to the twentieth century, (3) the twentieth century, and (4) entering the twenty-first century.

1. **Ancient times:** Information about pre-Islamic cities is very limited. During this period, in spite of the role of climate as a determining factor in shaping urban form, the design of some cities often reflects images of power and centrality. The power system-based design was demonstrated in circular pattern, for example, in the Median city of Ekbatana in the cold region of today Hamadan, eighth century BC, or Ardashir-Kurra the Sassanian capital third century CE in the hot arid province of Fars, and later in Islamic period the city of Bagdad, eighth century in today Iraq.

However, Archaeological discoveries depict some unique examples of ancient settlements in conformity with climate and culture. For example, Tepe Zagheh a fifth millennium BC village in central region of Iran shows interesting features, especially favorable orientation, considering winds and sun. Also, archaeological discoveries of a part of housing area in the city of Ur, third millennium BC, show an interesting integrated and mixed use of elements.

2. **Islamic period up to the twentieth century:** This is a long period, more than a thousand years, from the first centuries, especially fourth/tenth century that we have more information about it, up to the first decades of the twentieth century. In this long period, utilization of natural energy is best demonstrated in architecture and urban form. In this period, identity, culture, and urban structure have also remained remarkably constant. These characteristics have been well expressed in the cities that have been studied in the present book.

The fifteenth-century local historian “Ja’fari” has depicted structural pictures of Yazd, from eleventh century, which have a lot in common with nineteenth-century map of Qajar period, and to some extent with 1938 and 1974 maps that have been presented for the first time in this book (Figs. 4.4 and 4.5). The most notable changes, however, have come from the first decades of twentieth century and accelerated in the last forty years.

In Shiraz also, many structural features of the city in the age of Hafez, fourteenth century, have remained constant to some extent. The most notable changes, during centuries, have been the gradual expansion in the number of quarters, which structurally developed in continuation of the previous quarters. Neighborhoods of Shiraz in the age of Hafez had a special cultural and sociopolitical atmosphere. The city’s power was in the hand of people from certain social groups, champions, libertines, neighborhood’s headmen, and people who were able to cause serious disruption.

Prior to the twentieth century, Kashan, another desert city of great architectural value, underwent changes at a slow pace. The first new street’s construction was started at the first decades of twentieth century. But despite of the destructive effects of earthquakes in recent centuries, the city center complex, some of the structural elements, and city quarters were perfectly preserved.

The one unique element, which witnessed and survived the harsh history of the city, is the famous Fin Garden: From Solomonic spring which feeds the garden pertaining to Prophet Solomon, and in local tradition, it is considered as a symbol of purity. In the tenth century CE, the Buyids rulers added Royal buildings and garden. In the sixteenth century, Safavid rulers held ceremonies and banquets there. The Garden survived the destructive earthquake of sixteenth century; later again became a place of pleasure retreat for Fath Ali Shah of Qajar (1772–1834); then became the site of murder of the chief minister Amir Kabir (1807–1852) and changed to a derelict space and place of refuge for thieves; and at the end found a new life and registered as a cultural heritage by the late minister Ali Asghar Hekmat in 1934.

3. **Twentieth century:** Iranian cities after ages of slow change entered the twentieth century. Over the last century, Iran has undergone significant sociocultural and economic changes. These changes, resulting from the historical transformation in culture and economy, have had a considerable effect on Iranian city life and fabric.

After the White Revolution in 1963 and its centerpiece, the land reform, there has been intensive migration from rural areas to urban centers, areas of increased economic activity.

Concentration of industrial production centers, roads, and railway lines close to economic, cultural, educational, and health centers, especially in northern regions and Tehran City Region, has resulted in regional inequality throughout the country.

Tehran changed enormously, with largest rural migration and population growth from 1.5 million in 1953 to 5.5 million in 1979, and approximately 12 million in 2011, 6 % of the total population of the country. During the last two decades, a new determining factor, i.e., increased sale of urban density, especially in large cities, has accelerated regional inequality, urban traffic, and pollution.

Physically also, Iranian cities have changed largely both in size and in population. The development of Tehran since the mid-nineteenth century shows this feature clearly. The historic inner areas of the cities have also changed enormously during the recent decades.

Towns and cities have largely evolved without recognition of urban problems. The compact structure of the city has been divided into pieces by many irrelevant wide streets. A lot of main passageways and bazaars have been widened or ruined to form transport avenues. The principal objective here has been to facilitate the penetration of automobiles into the compact structure of the city, and a lot of available urban traditional open spaces (takyah, maydan), were changed to traffic squares because of their width and size.... Modern city services have been concentrated in the new developments. City landowners,... have had a considerable influence on urban speculation. As a function of these considerations, historical areas of cities in Iran are falling into ruin and have become the shelter of the urban poor. This ruin has been accelerated by the gradual increase in the number of vacant houses in these areas. (Mahmoud Tavassoli, *City Planning in the Hot, Dry Climate of Iran*, in G. Golany, ed., *Design for Arid Regions*, Van Nostrand, 1983).

Altogether in this period, we have ignored the utilization of natural energy.

4. **Entering the twenty-first century:** Extensive research has shown the need for energy conservation and utilization of natural energies. Such an energy is available in the hot arid environment, a matter that should be taken into consideration at university level, both education and research. Other matters that have been discussed in the present book include the problem of regional imbalance, mainly in remote areas. This inequality is the result of uncontrolled compact development of Tehran City Region and several other large cities, and increased sale of urban density, despite environmental problems and natural disasters, especially earthquake. As we will see, also, we need to take firm steps in urban renewal and new urban block design.

Research Method

From the beginning, in the early years of 1970s, I have always had this question in my mind, that, while every urban elements as individual part, such as courtyard house, mosque, or seminary, have always had a cohesive composition and integration of elements, what about the distinctive characteristics of the whole city? Can we say that Iranian cities in Islamic period have had an integrated structure, considering the state power, culture, and climate?

Accordingly, in order to find reliable information, a vast and continuous field studies were conducted in the towns and cities and villages which hardly underwent significant changes. The city of Yazd considered as a center for research. The reason for choosing Yazd was that, in the early stage of this work, the city's old fabric was still to some extent intact. Names and particulars of many places in the old historical document of the city were still recognizable. Local architects and old masters, familiar with the environment of the old fabric, who had the basic role in orienting this research, were still alive.

The method used for this research is both qualitative and quantitative. An exhaustive field research has been conducted during several years, interviewing local architects, elders of neighborhoods, and heads of old families. One distinctive aspect in field studies was a comparison between the information of an old historical document: *Tarikh-i Yazd*, (History of Yazd), from fifteenth century with the existing old fabric, places, and spaces of the historic city of Yazd. The same method and findings were applied in other cities such as Nain, Zaware, and Kashan. As we shall see, it can be concluded that *traditional towns and cities in the hot arid environment of Iran have a common spatial characteristics based on their interconnected parts: neighborhoods and neighborhood centers, and city center, through the main passageways as connected elements.*

The study of spatial structure of neighborhoods, neighborhood center complexes, old urban blocks, and urban and architectural elements such as double domes for the first time, and the complicated form of wind catchers especially in the Friday mosque of Tabas which was destroyed in the 1978 earthquake, expresses creative methods of sustainable design and utilization of natural energy in the hot arid environments.