

Isfahan's Urban Design Sustainability with Climate During Safavid Period.

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1. Introduction

The name of Iran is the Modern Persian derivative from the Proto Iranian term Aryānā, meaning "Land of the Aryans", first attested in Zoroastrianism's Avesta tradition. The term Ērān is found to refer to Iran in a 3rd-century Sassanid inscription, and the Parthian inscription that accompanies it uses the Parthian term "aryān" in reference to Iranians.

In Iran, there are several unique climatic regions, each having special characteristics. As a result, Iran is like a little continent. All of Koppen's climate zones and their deviations can be found in Iran.

2. Abstract:

In general, Iran has an arid climate which characterized by long, hot, dry summers and short, cool winters. The climate is influenced by Iran's location between the subtropical aridity of the Arabian Desert areas and the subtropical humidity of the eastern Mediterranean area. Therefore, sunlight and its heating effects were important factors of Iranian architecture and gardens structural design. Textures and shapes were selected by architects to harness the light and supply a shadow in the summer (Fig.1 & Fig. 2).

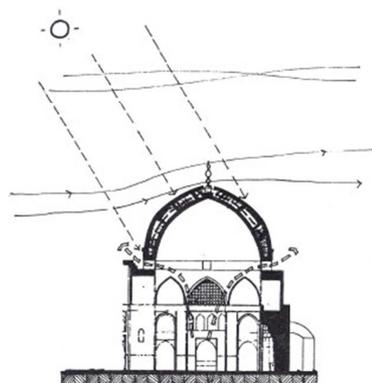


Figure 1 : Climate of curved arches and domes in hot and dry climate.

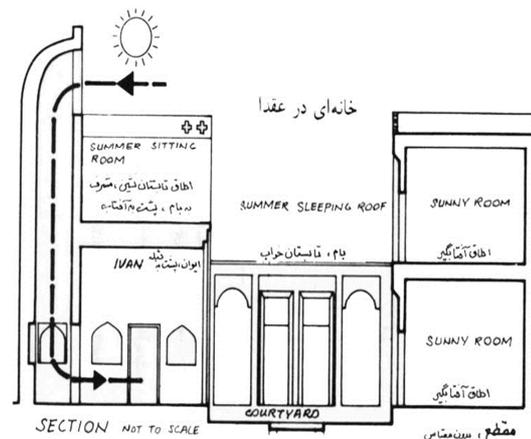


Figure 2 : To be adopted to the climate conditions, they have been used courtyards, Badgir (wind catcher) towers and the dome shape for building's roof.

Trees and trellises broadly used as biotic shade component. Pavilions and walls, building arrangement, orientation and configuration are also structurally prominent in blocking the sun (Table1).

	Characteristics	Result
Urban Texture	Dense and very compact	Thermal loss is lowered
Urban Environment	Enclosed	<ul style="list-style-type: none"> Prevent high velocity wind and sand storm Prevent the invasion of enemies from all side. Inside air is more static than the outside air.
Alleys	Narrow and irregular	Prevent receive sunshine for long hours of day.
Buildings Arrangement	Compressed to each other and merged wall	<ul style="list-style-type: none"> Less thermal exchange between inside and outside. Cool environment in summer and warm environment in winter.
Orientation & Configuration	Near to the orientation of north to south	Absorb the maximum of heating in winter as well as shadow in the summers.

Table1: Urban texture and architecture's Characteristics in Iran arid climate

Water is very important in this climate, both in the architectural design and longevity of gardens. This problem has been explained in the first section of this paper with emphasizing on Persian garden's types (Table 2) as well as garden city.

Persian garden types according form and function	Garden City	Garden city is the Islamic concept of the Ideal City, formed according to the Garden of Eden, was taken into consideration in the Safavid period. Gardens as parables of Heaven were often used as composing elements in urban design. This idea resulted in the formation of a strength procedure of city planning.
	Bagh Kooshk(Pavilion Garden)	
	Bagh Hayat(Court Garden)	
	Bagh Maghbereh(Tomb Garden)	
	Bagh dar Bagh(Garden inside Garden)	
	Bagh Chador(Tent Garden)	
	Bagh Ghaleh(Castle Garden)	
	Bagh Tajir(Garden with Semitransparent wall)	
	Bagh Takht(terrace garden)	
	Bagh-e Vahsh(Zoological Garden- Such as Tavoos khaneh va Shir Khaneh in Isfahan)	
	Bagh-e Shekar(Hunting Garden)	
	Bagh-e Aab(Water Garden)	
	Bagh-e Melli(National Garden)	
	Bagh Bisheh(Forest Garden)	
Bagh-e Giah shenasi(Botanic Garden)		

Table 2 : Persian garden types.

Then this paper will explain the Isfahan Garden City designing process as Capital of Safavid Dynasty. The city has been designed and planning for enhancing citizens' health and wellbeing. Climate adaptation and water supply problems have been solved in Isfahan's urban design (Fig. 3). The image of the town altered by water channels that ran all around the city and expansion of gardens as major physical composer elements along Charbagh Street and other new city regions. The subjective image of new city depicts an ideal figure of Heaven and integrated it with the beauty of gardens and nature. This research discuss the methods which Safavid's had applied for attaining sustainable water supply and proper shade space to produce urban vitality in hot and dry climate of Isfahan.

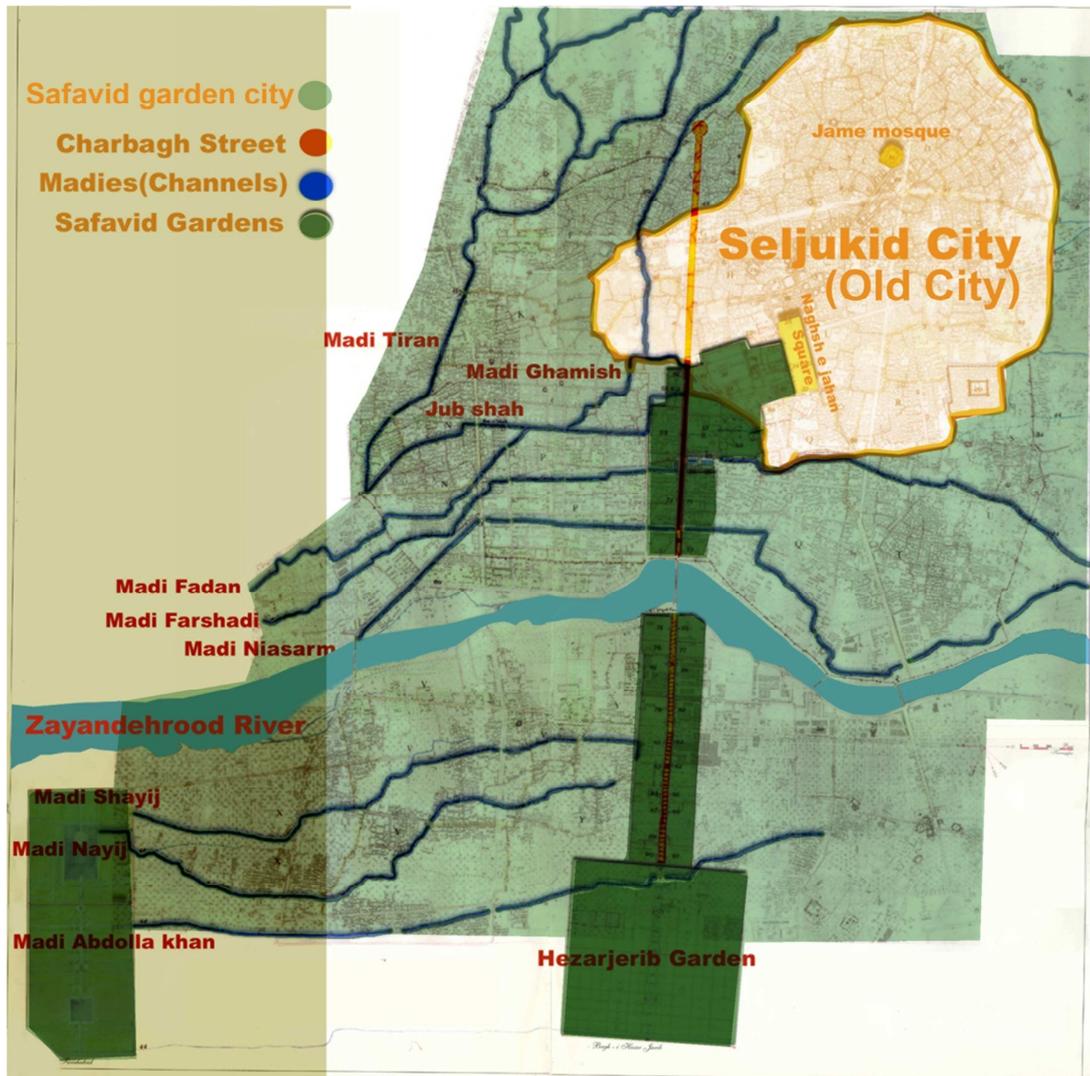


Figure3: Isfahan Seljukid(old) city and its development as garden city during Safavid period. In order to create long-lasting green cityscapes in garden city, the Safavids developed and used dug canals (madi) which branched off the river.

Finally, this paper introduces the foundations of urban design and the city axis features to indicate the inventions and adaptation to climate (Fig 4). The result of the study shows that Isfahan's urban design principles has been used in accordance with climate conditions during Safavid period, created a state of longevity in the design of the city and its environment. During Safavid period most of new buildings have been constructed inside gardens as pavilion and changed to extrovert model (Fig. 5). Some buildings formed according introvert model with big courtyard as garden. Therefore, the gardens provide thermal comfort as the new technique. This innovation was the new solution to be adapted to the climate.



Figure 4: Isfahan city axis (Charbagh Street) as main garden city axis.



Figure 5: Isfahan new building built inside gardens as pavilion and changed to extrovert model.

Key Words: Garden City- Sustainability- Isfahan- Climate – Safavid Dynasty

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