Safavid Period Urban Spaces that is Shaped by Water

Niloofar Dehghan Hosseinabadi

Submitted to the
Institute of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in
Architecture

Eastern Mediterranean University
August 2019
Gazimağusa, North Cyprus

Approval of the Institute of Graduate Studies and Research

Prof. Dr. Ali Hakan Ulusoy
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Architecture.

Prof. Dr. Resmiye Alpar Atun
Chair, Department of Architecture

We certify that we have read this thesis and that in our opinion, it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Architecture.

Assoc. Prof. Dr. Netice Yıldız
Supervisor

Examining Committee

1. Prof. Dr. Mukaddes Polay

2. Assoc. Prof. Dr. Payam Mahasti Shotorbani

3. Assoc. Prof. Dr. Netice Yıldız

ABSTRACT

Water as an essential element in the formation and perfection of Iranian urban space, has played a valuable role since the ancient times and some excellent examples survived from different periods, one of which is the Safavid period (1501-1736), that this thesis will focus. Water is inherent in the concepts, associated with all its properties and fluidity as one of the most important elements, and induces the ability to create a coherent combination in the dominant sense in the formation of well-designed urban settlement sites. If urban space and water are combined carefully and creatively, the impacted aesthetic quality of this mixture will be indescribable and unlimited. Landscapes and interiors are designed with such architectural elements so as to provide the natural needs of the occupants as well as to create beautiful environments that could psychologically arouse a relaxed atmosphere or in another word, sense a feeling of a paradise, which was also a common topic of Iranian literature. Water as a source of life has a tremendous importance in ideology, cultures, and mythologies and its role has gone beyond functional role, as a symbol of purity, birth and beauty. In ancient Persia, water was a messenger of brightness and purity, and was worth much. Due to its logical and indigenous nature, Iranian urban space almost in all periods of its history, has always sought to use the facilities of environment and water in the best possible way, and also apart from the performance and physical needs, has always sought to introduce beauty and integrity of water for construction. Water has shown its spiritual role in Iranian urban space, so that the water flow is an abstract water representation in nature. Water in the gardens and the palaces brings streams, waterfronts, rivulets, pools and fountains, and each of these, represents the domination of human to nature. Water as a spiritual and holy element, as well as

its role as a source of life, in the beliefs of the Persians before and after Islam, and always was the main factor in the displacement and shaping of the spaces, and especially the Iranian Safavid gardens. This aesthetic approach was also seen in contemporary architecture of Iran's neighbor countries, mainly Ottoman Empire and Indian Mughal Empire. However, it goes back to Babylons in Mesopotamia and another far away country set up by the Ummayads in Spain, mainly the Cordoba palaces. In Iranian-Islamic urban spaces, the use of water in all important monumental buildings is seen indicatively and clearly. Therefore, theories related to the relationship of urban spaces and water, which is well expressed also in literature, will be explained from different sources in the case study selected from the well-known heritage of the Safavid era. The findings of the focused area will also be compared with other geographies, mainly Umayyed era, Spain and Mongol India, to understand the possible cultural exchanges. It is well known tact that ancient settlements started near water sources, and some of those had the chance to grow up into large cities that left their traces in world history. The areas that lacked enough water sources somehow found solutions to supply water to their settlements. Islamic regions gave more importance to water, particularly for its hygienic storage purposes and in time, water became an important concept in the urban planning. Within these context, this thesis will introduce the historical development of water related architecture of urban spaces, in Islamic countries and in particular Iran. However, this research will be limited to the Safavid era (1736-1501), and in particular to the Safavid capital city, Isfahan.

Keywords: Water Architecture, Islamic Architecture, Iranian Urban Spaces, Architectural Theories, Aesthetics, Palaces, Gardens

ÖZ

İran mimarisinin ve kentsel mekanların oluşumunda ve mükemmelleşmesinde temel bir unsur olan su, antik çağlardan bu yana oldukça önemli bir rol oynamıştır. Iran'da egemen olan devletler içinde, özellikle İslam mimarisi ve sanatının anıtsal boyutlarda meyve verdiği ve bu tezin odaklanacağı Safevi dönemi (1501-1736)'nde yapılıp farklı dönemlerde kısmen korunup, kısmen de değişikliklere uğrayarak günümüze kadar su unsurunun önemli bir görsellik kattığı kent meydanları ve saray bahçeleri dünya kültür mirasına önemli bir katkı olarak devam etmiştir. Su, tüm özellikleri ve en önemli unsurlardan biri olan akışkanlığı nedeniyle doğal bir görsellik oluşturur. İyi tasarlanmış kentsel yerleşim yerlerinin oluşumunda baskın anlamda tutarlı bir kombinasyon oluşturma yeteneğini teşvik eder. Eğer mimari ve su dikkatlice ve yaratıcı bir şekilde birleştirilirse, bu karışımın ortaya çıkardığı estetik kalitesi tarif edilemez bir güzellikte ve sınırsız olur. Peyzaj ve iç mekanlar, kullanıcıların yaşam alanları ile ilgili doğal ihtiyaçlarını karşılamanın yanı sıra, üzerindeki olarak rahat bir atmosferi uyandırabilecek güzel ortamlar veya başka bir anlamda bir ortak cennet hissi uyandıracak güzel ortamlar yaratacak şekilde tasarlanmıştır. İran edebiyatı da zaten bu cennet bahçelerini anlatan eserlerle doludur. Bir yaşam kaynağı olarak su, ideolojide, kültürlerde ve mitolojilerde büyük bir öneme sahiptir ve saflık, doğum ve güzelliğin sembolü olarak işlevsel rolün ötesine geçmiştir. Eski İran'da, su ayrıca bir parlaklık ve saflığın da belirtisi olup, çok değerliydi. Mantıksal ve olağanüstü doğası gereği, İran mimarisi, tarihinin hemen hemen her döneminde, çevre ve su olanaklarını mümkün olan en iyi şekilde kullanmaya çalışmış, ayrıca performans ve fiziksel ihtiyaçların dışında her zaman yapıların görselliğini ve bütünlüğünü de artırıcı mimari elemanlar yaratmıştır. Su, İran mimarisinde manevi bir rol üstlenmiş. böylece su doğada

akışkanlığı ile soyut bir öğer haline gelmiştir. Bahçeler ve saraylardaki sular; akarsular, sahiller, su kanalları, havuzlar ve fıskiyeler ihtiyaçların giderilmesi yanında görsel bir zenginlik getirmekte ve bunların her biri insanın doğaya egemenliğini de temsil etmektedir. İslâm öncesi ve sonrası Perslerin inançlarında su, bir ruhsal ve kutsal unsur olduğu gibi, yaşam kaynağı olarak da rol oynamış ve bahçeler.de her zaman mekanların evriminde ve şekillenmesinde ve özellikle İran Safevileri'nde ana faktör olmuştur. Bu estetik yaklaşım, İran'ın komşu ülkelerinin, özellikle Osmanlı İmparatorluğu ve Hint Babür İmparatorluğu'nun çağdaş mimarisinde de görülür. Ancak, su mimarisinin tarihçesi Mezopotamya'daki Babillere ve İspanya'daki Emeviler tarafından, özellikle de Cordoba sarayları tarafından kurulan Iran'dan kilometreceler uzaktaki bir ülkeye kadar uzanmaktadır. İran-İslam mimarisinde, tüm önemli anıtsal yapılarda suyun kullanımı açıkça ve açıklıkla görülmektedir. Bu nedenle, edebiyatta da ifade edilen mimarlık ve su ilişkisi ile ilgili teoriler, Safevi döneminin bilinen mirasından seçilen örnek vakalar farklı kaynaklardan bilgiler aktarılarak irdelenecektir. Odaklanılan bulgular, olası kültürel değişimleri de anlamak için başta Osmanlı İmparatorluğu ve Moğol Hindistanı olmak üzere diğer coğrafyalarla da karşılaştırılacak. Antik yerleşim yerlerinin su kaynaklarının yakınında başladığı bunların bazılarının dünya tarihinde izlerini bırakan büyük kentlere dönüşme şansını yakaladığı bilinen bir gerçektir. Yeterli su kaynağına sahip olmayan yerleşim alanlarında, bir şekilde yaşamlarını sürdürebilmeleri için su sağlamak için çözümler üretmek zorundadır. İslâmî ülkelerinde, özellikle temiz su depolama amacıyla suya daha fazla önem verilir ve zamanla su, şehir planlamasında da önemli bir kavram haline gelir. Bu bağlamda, bu tez, genel olarak suyla ilgili mimarinin İslam ülkelerinde ve de özellikle İran'da tarihsel gelişimini tanıtacak, özelde ise Safevi dönemi (1501-

1736) ve vaka takdimlerinde ele alınacak örnekler ise Safevi başkenti İsfahan yapıları ile sınırlı olacaktır.

Anahtar Kelimeler: Su Mimarisi, İslam Mimarisi, İran Mimarisi, Mimari Kuramlar, Estetik, Saraylar, Bahçeler

Dedicated To My Dear Parents

and Most Affectionate Brother and the Love of My life.

To Monir, Abbas, Maziar, …

با احترام و عشق تقدیم می شود

به مادر و پدر و برادر عزیزتر از جانم.

منیر، عباس، مازیار

ACKNOWLEDGMENT

Thank Allah and thanks to the support of my family, Abbas, Monir and Maziar, who were by my side at all stages of my life.

I would like to acknowledge the guidance and supervision Asst. Prof. Dr.Netice Yıldız for the achievement of this study. Many thanks to my thesis jury members, Prof. Dr. Mukaddes Polay and Assoc. Prof. Dr. Payam Mahasti Shotorbani for their kindness and magnanimity.

Very speciall thanks to EMU registrars, Mr. Hüseyin Ünsal Yetiner, and also Prof. Dr. Özgür Dinçyürek and Prof. Dr. Resmiye Alpar Atun for their fairness and help.

Words are not enough to say thanks to my cousin Mr. Mohammad Ghavipanjeh, who supported me financially and psychologically during the period of my studies and this thesis.

TABLE OF CONTENTS

ABSTRACT.....iii

ÖZ.....v

DEDICATION.....ix

ACKNOWLEDGMENT.....x

LIST OF TABLES.....xiv

LIST OF FIGURES.....xv

LIST OF ABBREVIATIONS.....xviii

1 INTRODUCTION.....1

1.1 Research Problem.....3

1.2 Aim of the Research.....4

1.3 Objectives.....4

1.4 Limitations of the Research.....5

1.5 Research Methodology.....5

2 A BRIEF INFORMATION ABOUT IRAN AND ITS HISTORICAL HERITAGE..6

2.1 Geographical Characteristics of Iran.....6

2.2 Brief History of Iran.....9

2.3 Iranian Architectural Styles in Pre-Islamic and Islamic Eras.....14

2.3.1 The Origin and Characteristics of Isfahani Style (School of Isfahan).....17

2.3.2 Effects of Water Resources on Urban Planning.....19

2.3.3 Architecture of Urban Spaces in Iran.....19

2.3.4 Transformation of Urban Spaces from Closed to Open Space Plan.....20

2.3.5 Varieties of City Shapes in Islamic Iranian style.....20

2.4 Safavid Period.....21

2.5 Safavid Architecture.....23
2.6 Summary.....25
3 WATER AND URBAN SPACE.....27
3.1 Water as the Basic Thing for Living.....27
3.2 Types of Water Sources.....28
3.3 Importance of Water in Islamic Iranian Urban Space.....29
3.3.1 Relationship of Water Architecture in Urban Plan and Landscape.....32
3.4 Water Supply System to Settlement Sites.....37
3.4.1 Aqueduct System: Qanats and Wells.....37
3.4.2 Water Canals.....39
3.4.3 Water Reservoirs and Waterways.....40
3.4.4 Hammams.....43
3.4.5 Water Related Architecture in the Mosques: Fountains and Pools.....45
3.4.6 Bridges.....47
3.4.7 Gardens and Courtyards as Spaces to Contain Water.....48
3.4.7.1 Physical Components of Iranian Gardens.....54
3.5 Summary.....57
4 WATER RELATED URBAN SPACES THAT SHAPED THE URBAN PLANNING OF ISFAHAN DURING THE SAFAVID ERA, AND SOME SELECTED CASES.....59
4.1 A Brief History of Isfahan.....65
4.1.1 Use of Water Sources in Isfahan Before Safavid.....65
4.1.2 The Origin of the Urban Planning of Isfahan.....66
4.1.3 Space Organization of Isfahan in the Safavid Era.....67

4.1.3.1 The Role of Water in the Formation of the Urban Planning of Safavid Isfahan.....73
4.1.4 School of Isfahan Monuments.....77
4.1.4.1 Case study.....78
4.1.4.2 Chaharbagh Boulevard as an Indicator of the Axis of Isfahan Garden City.....84
4.1.4.3 Chaharbagh Boulevard, Isfahan, that Shows all Common Structural Features of the Iranian Gardens.....85
4.2 Summary.....91
5 CONCLUSION.....92
REFERENCES.....97

LIST OF TABLES

Table 2.1: Some Selected Examples of the Iranian Monuments and their styles.....15

LIST OF FIGURES

Figure 2.1: Location of Iran.....7

Figure 2.2: Iran Border with Neighbors.....7

Figure 2.3: Ethnoreligious Distribution of Iran.....8

Figure 2.4: Iran Political Map.....13

Figure 2.5: Safavid Persian Empire.....22

Figure 2.6: Naqsh-e Jahan Square – Created Cir. 1632.....24

Figure 2.7: Chehel Sotoun Palace and Garden – Mid of Seventeenth Century.....24

Figure 2.8: AliQapu Palace - Early Seventeenth Century.....25

Figure 3.1: Iran's Major Water Basins.....31

Figure 3.2: Jahan Nama Garden-Shiraz – Eighteenth Century, Iranian Garden- Four Sections by Waterways.....34

Figure 3.3: Shahzadeh Mahan Garden - 1850 A.D.....35

Figure 3.4: Haft Awrang (Seven Thrones) by Jami (d.1492), A Father Advises His Son About Love. Qazvin. 973AH=1556-1565 A.D. Safavid Period Watercolor, Ink and Gold.....36

Figure 3.5: Jaame Mosque of Zanjan – About 1863 A.D.....36

Figure 3.6: Qanat section, sketch by Massoud Shamaeezade.....38

Figure 3.7: A Qanat (Aqueduct) Tunnel near Isfahan.....38

Figure 3.8: Historical Hydraulic System of Shushtar - Sassanian Era / Khuzestan Province / Iran - Gargar Dam and the Areas of Mills.....42

Figure 3.9: Shushtar/Khuzestan Province/Iran - Fisheries and Ponds along the Gargar River.....42

Figure 3.10: Zayanderud River/Isfahan.....43

Figure 3.11: Bathing Hall in Hammam-e Ganjali Khan-Kerman – 1611 A.D.....44
Figure 3.12: Sultan Amir Ahmad Bathhouse-Kashan /16th century, Safavid era.....44
Figure 3.13: Shah Mosque of Isfahan – Safavid era 1641 A.D. – Its Reflection on Water and Sense of Purity and Monumentality.....46
Figure 3.14: Pool in Jaame Mosque of Isfahan Courtyard – Umayyed era 777 A.D.46
Figure 3.15: Sangab, in the Courtyard of Seyyed Mosque of Isfahan – Qajar era 1801 A.D.....47
Figure 3.16: Allah Verdi Khan or Si-o-Se-Pol Bridge one of Most Important Water Related Urban Space of Safavid era – 1629 A.D.....48
Figure 3.17: Alhambra Palace – Morocco - 1232-1492 A.D.....49
Figure 3.18: Agdal Garden - Twelfth Century – Morocco.....50
Figure 3.19: Persian Garden Complex, Unity, Hierarchy, Composition and Accomplished Incorporation in Open and Closed Spaces.....51
Figure 3.20: Persian Garden (Inspired by Timurid Miniatures -1,500 A.D.), by Monir & Mehdi Ghanbeigi.....53
Figure 3.21: Fin Garden in Kashan.....57
Figure 4.1: Development of Isfahan During Safavid Period into a Garden City.....64
Figure 4.2: The Process of Formation and Development of the City of Isfahan.....70
Figure 4.3: Isfahan Urban Development According to current Streets position.....71
Figure 4.4: Perspective of the City of Isfahan and Historical Center of the City During the Safavid Period.....72
Figure 4.5: The Structure of the City of Isfahan and the Cultural and Historical Axis of the City During the Safavid Period.....72
Figure 4.6: (a) Chaharbagh Boulevard at Seventeenth Century (b) Chaharbagh by J. Chardin, 1965 (c) Plan of Chaharbagh-Four Hundred Years Ago.....74

Figure 4.7: Zayanderud Basin and Hydrological Sub Catchments.....76

Figure 4.8: Main irrigation networks along the Zayanderud.....76

Figure 4.9: Sketch of Old Naghsh-e Jahan Maidan (Square).....80

Figure 4.10: Iranian Garden Plan of Naghsh-e Jahan Maidan (Square).....80

Figure 4.11: Chehel Sotoun Palace and Garden - Isfahan.....83

Figure 4.12: Chaharbagh Depicted by Chardin – Seventeenth Cent.....85

Figure 4.13: Safavid Isfahan Structure Located on Two Main Axes/ 1.Chaharbagh Boulevard 2. Zayanderud Riverer.....86

Figure 4.14: The Main Axis of Iranian Garden.....87

Figure 4.15: Safavid Isfahan – Chaharbagh Boulevard by Pascal Coste in 1839-1841.....87

Figure 4.16: Iranian Garden Division.....88

Figure 4.17: Safavid Isfahan – Division of Chaharbagh Boulevard Gardens.....88

Figure 4.18: Iranian Garden Pools and Creeks (Streams) Positions.....89

Figure 4.19: Safavid Isfahan – Water Positions in Chaharbagh Boulevard.....89

Figure 4.20: Hezar Jerib, One of Several Chaharbagh's Gardens in Iran.....90

Figure 4.21: Current Isfahan – Chaharbagh Area and its Greenary.....90

LIST OF ABBREVIATIONS

A.D.	Anno Domini (Before Christ)
A.H.	Anno Hegirae / After Hegira
B.C.	Before Christ
Cent.	Century
Cir.	Circa
ICHHTO	Cultural Heritage, Handicrafts and Tourism Organization of Iran
ICOMOS	International Council on Monuments and Sites

Chapter 1

INTRODUCTION

وَأُدْخِلَ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ جَنَّاتٍ تَجْرِي مِنْ تَحْتِهَا الْأَنْهَارُ خَالِدِينَ فِيهَا بِإِذْنِ رَبِّهِمْ ۖ تَحِيَّتُهُمْ فِيهَا سَلَامٌ.

And those who believed and did righteous deeds will be admitted to gardens beneath which rivers flow, abiding eternally therein by permission of their Lord; and their greeting therein will be, "Peace!" (Quran, Surah Ibrahim: 23).

Water, as an essential element in the formation and perfection of Iranian urban space, has played a valuable role in the lives of living beings since the ancient times. Water is inherent in the concepts, associated with all its properties and fluidity as one of the most important elements, and induces the ability to create a coherent combination in the dominant sense in the formation of well-designed urban settlement sites. If urban space and water are combined carefully and creatively, the impacted aesthetic quality of this mixture will be indescribable and unlimited (Seyyed Sattari & Balilan, 2012). Landscapes and interiors are designed with such architectural elements so as to provide the natural needs of the occupants as well as to create beautiful environments that could psychologically arouse a relaxed atmosphere or in another sense a feeling of a paradise, which was also a common topic of Iranian literature. This kind of design is also expected to bring a centrality to a complex of architectural project and unification to a complex of architectural form. Some excellent examples of water urban space survived from different periods, the most significant of which is the Safavid period (1501-1736), that this thesis will focus.

Water and its role on psychological and physical refinement, and its recognition as a symbol of birth and purification, have placed a grand place in the minds of people from the past. Water is a foundation of existence, and belief, concept and doctrine which is believed to come from a large part of the religious and ritual traditions. Water as a source of life has a tremendous importance in ideology, cultures, and mythologies and its role has gone beyond functional role, as a symbol of purity, birth and beauty. In ancient Persia, water was a messenger of brightness and purity, and was worth much. Due to its logical and indigenous nature, Iranian urban space almost in all periods of its history, has always sought to use the facilities of environment and water in the best possible way, and also apart from the performance and physical needs, has always sought to introduce beauty and integrity of water for construction (Hasani Miyanroudi, 2016).

Water has shown its spiritual role in Iranian urban space, so that the water flows is an abstract water representation in nature. Water in the gardens and the palaces brings streams, waterfronts, rivulets, pools and fountains, and each of these, represents the domination of man over nature (Sheykhi & Kolaei, 2016). Water as a spiritual and holy element, as well as its role as a source of life, in the beliefs of the Persians before and after Islam, and always was the main factor in the displacement and shaping of the spaces, and especially the Iranian Safavid gardens. This aesthetic approach was also seen in early Islamic era Islamic Spain and also contemporary architecture of Iran's neighbor countries, mainly Ottoman Empire and Indian Mughal Empire.

The role of water in the Iranian gardens and palaces, on the one hand in creating a similar sense of paradise and the image of man before he descends from paradise, on the other hand, in the creation of the principle of repetition visually, in the form of

illusory fountain, finally in creating simile and permissible in mirroring the reality, by the element of the ponds or pools and the reflection of the image of the building, garden and sky, is the most significant symbol in the Iranian gardens (Saffari & Abbasian, 2015).

In Iranian-Islamic architecture, the use of water in all important monumental buildings is seen indicatively and clearly. Therefore, theories related to the relationship of urban space and water, which is well expressed also in literature, will be explained from different sources in the case study selected from the well-known heritage of the Safavid era.

1.1 Research Problem

During the research process, it has been realized that water has played a significant role in the architecture and urban planning of various buildings in history, on the other hand, in some religions, cultures and architectural styles, more importance has been given to the role of water in the formation of settlements and buildings.

Considering that the most prominent water-based urban space can be found in the Islamic era and in Iran during the reign of the Safavids, the question now comes to mind, about the effect of water on Iranian Islamic urban space and also the meaning and the role of water in identity of Safavid architecture and urban spaces.

But unfortunately, based on the published literature, the results show that there is still a great deal of gap and flaw to show the significant impact of water element on Islamic urban planning, especially in Iran.

1.2 Aim of the Research

According to the use of water in urban planning, urban spaces could be divided in two categories: one group is the type of spaces that the water has directly affected their design process, another group is the places that the water designed after their construction.

This research seeks to explore the contribution of water to the aesthetic of built forms in Iranian urban spaces during the Safavid period through existing published sources (literature review), survey and case study.

As a result, because of the gap in other researches to show the significant effect of water element on Islamic-Iranian urban planning, in this research by selecting prominent examples of buildings and urban spaces related to water in the Safavid era, particulary in Isfahan, such as Naghsh-e Jahan square, Chehel Sotoun palace and garden and Chaharbagh boulevard, tried to attempted to show the impact of the water element on urban spaces more clearly and practically. During this research, Identifying various buildings and urban spaces related to water supply and providing, will be investigated.

1.3 Objectives

The objective of this study is to bring out theoretical aspects of the role of water for the shaping of the monuments and urban sites in a chronological and comparative method as well as to emphasise the importance of historical heritage of the Safavid era so as to enable the protection of these valuable monuments.

1.4 Limitations of the Research

It is well known tact that ancient settlements started near water sources, and some of those had the chance to grow up into large cities that left their traces in world history. The area that lacked this facility somehow found solutions to supply water to their settlements.

Islamic regions gave more importance to water, particularly for its careful storage purposes and in time, water became an important concept in the urban planning. Within these context, this thesis will introduce the historical development of water related urban space in Islamic countries and in particular Iran. However, this research will be limited to the Safavid era (1736-1501), and in particular to a more specificated, to the Safavid capital city, Isfahan.

1.5 Research Methodology

This research has been done by qualitative - descriptive method, which after a brief review of the theories related to the sanctity and holiness of the water element in Iranian beliefs and culture, the role of water in shaping the urban/landscape planning of Iranian gardens and palaces during the Safavid period in Isfahan will be analyzed through some examples.

Chapter 2

A BRIEF INFORMATION ABOUT IRAN AND ITS HISTORICAL HERITAGE

2.1 Geographical Characteristics of Iran

"Islamic Republic of Iran is the country in west Asia with its capital at Tehran." Iran is the land of the Aryans, which is one of the oldest long-living civilization and survived emergence in the modern sense as first state of the world, for at least five thousands years. In the middle of the second millennium B.C. one tribes of white Indo-European people from Gihon and the Caucasus Mountains, left their lands and peoples, and moved to central Asia (Iran). These were part of a large group called Sikh *[ˈsɪkːʰiː]* who migrated from their native lands, and then divided into two large groups. The name of the main tribe was Ari, that means "noble" and "honorable". The first residence of those people is Iran Vich, which gradually changed its name to Iran. The historians usually consider them as an Indo-Iranian race (Bloom & Blair, 2009).

Iran is situated in Middle East - southwest of Asia. Somehow this country has largest number of neighbors, around fifteen autonomous regions and countries. Its area has 1,648,195 square kilometers land. In history most of these neighbors have been part of the Persian Empire, which disintegrated in late 18th cent. and 20th cent. After the World Wars I and II. Iran is bounded by Russia, Armenia, Azerbaijan, Kazakhstan, Turkmenistan and Caspian Sea to the north, by the Persian Gulf, Oman Gulf and Strait

of Hormuz to the south, by Iraq - Kurdestan and Turkey to the west, and by Pakistan and Afghanistan to the east (see figure 2.1 and 2.2).

Figure 2.1. Location of Iran (https://www.ontheworldmap.com.com)

Figure 2.2. Iran Border with Neighbors
(http://en.farsnews.com/newstext.aspx?nn=13931027000233)

Figure 2.3. Ethnoreligious Distribution of Iran (http://anthropology.ir/article/611.html, 18.03.2019)[1]

Iran is a diverse and vast country with deserts and mountains, that just a tenth percent of its area is settled under economic use. Its current population is estimated to 82.88 million of inhabitants from different ethnic groups, that share a mixture of social cultures, with several different linguistic dialets of Persian language, under a federal-style government system. Except of central province, Caucasian Azerbaijani natives comprise the the largest population group, where they speak Azeri which is the Perso-Turkic languages. Other regional consciousness related area include the Turkmen steppes in northeast, Baluch in southeast, Kurdistan area in the west and in the southwest there is Khuzistan lowlands and its Arab zone. The phrase Iran,

[1] This map provides a general picture of the ethnic structure of Iran. In the map, we can observe the position of the Azeri, Baluchi, Talysh, Turkmen, Arab, Qashqai, Kurd, Guilaki, Lur, Mazandarani, and Persians, which they also described as ethnicity. Although it is not possible to fully accept this map, and especially to speak of the Persians as an ethnicity, the map in its general lines can give us an opportunity to obtain an estimate of the position of Iran.

geographically is not just state, but it covers entire Iranian plateau, highland region between the Anatolia and the Himalayas. And culturally, includes all Iranian languages speakers, those who speak Persian, Guilak, Dari (Tajik and Afghani), Lori, Kurdish, Khorasani, Baluchi, Mazandarani and Azeri. (Mojtahed Zadeh, 2007).

2.2 Brief History of Iran

In view of the archaeological evidences that were discovered in some parts of Iran, this country has a history which covers a period of human life for at least seven thousands years. It has a long history with several different sovereings from different etnic groups. This unified state began in the sixth century B.C. and at the time of the conquest of Cyrus managed to launch the great Empire of Achaemenids (Petersen, 1999).

The Achaemenic Empire was eventually defeated and invaded by Alexander the Great's army in 331 B.C. and following twenty years until the death of Alexander's death in 323 B.C., whithin twenty years, his empire was divided up between Seleucids of Iran, Macedonia and the Ptolemys in Egypt. Seleucids in the beginning held much of the old Achaemenid empire, except of parts of Asia Minor, southern Syria and Egypt. Seleucus, one of Alexander officers who was the founder of the Seleucid dynasty, built Antioch and Seleucia as two capitals, one in Syria (Orontes) and the other in Mesopotamia or today Iraq (Tigris). The Seleucids established the basis of the Achaemenid Empire (Debevoise, 1938). First Persian empire, the Persians, was built in 550 B.C. by one group of Iranian nomads, under the leardership of Medes (Hinnells, 2012).

Seleucids were overthrown by the Sasanians, who dominated the region of modern Iran and Mesopotamia. Subsequently, the Arabs attaked to Iran in the years 630 and 637 A.D. and won the war of Qadisiyyah. In the battle of Nahavand, the defeat of the Sasanians against the Arabs, provided their entry into the country. Finally, in 651 A.D., the last king of Sassanid, Yazdigird, was murdered and their way to Iran was opened, but still many parts of the country was under control of Persian princes. Eventually, Arabs from the cities of Basra and Kufa conquered Iran and made a great contribution to Iran's religion and political matters (Petersen, 1999).

Iranian history has many significance dramatic events, but it could be said that any century passing at least one major upheaval, but most of them didn't change its land. The greatest ones that had profound consequences on Iran's history and culture, were the Mongol invasions, then the conquest of Achaemenid empire by Alexandrian in thirteenth century and the Sasanian empire occupation by Arabs. (Katouzian, 2009).

The Turks were a people from various tribal groupings in Central Asian, apparently origin from Altai Mountains. Between the 4th to 6th centuries A.D. they raided the eastern Sasanian boundries and moved into Transoxiana. In the eleventh century, they began to move into Persia’s interior from Central Asia by crossing the Oxus. This movement eventually created the principalities seljuk empire, Ottoman Empire and later in modern Turkey. First they were chased out of Khorasan by the Ghaznavids, then the way was open for conquering (Lane, 2011). However, the history and culture during the first centuries of Islamic rule is poorly known for the case of Iran as well as Central Asia. As described by Ettinghausen and Grabar, 1987, nominally that vast area consisted of several provinces ruled by governors appointed in Baghdad. From the 9th century, however, dynasties of governors such as the Tahirids (821-73), or the

aristocratic native Iranian Samanids (819-1005) and the more popular Saffarids (867-963), exerted their rule in those areas which are not yet well defined. Except a numner of Iranian cities like to future Isfahan or Qum, that accepted an early holy connection with Shi'ism, the main Islamic centers were mainly located in the province of Khorosan, with its four leading cities, Nishapur, Merv, Hera and Balkh, which formed the frontiers of Transoniana, with Bukhara and Samarqand. The real growth of an Islamic western Iran started with the Buyid dynasty (932-1062 A.D.), which occupied Baghdad itself in 945 A.D. (Ettinghausen & Grabar, 1987).

By the end of the 11th cent. the Seljuks Emperors had been divided into a number of independent principalities. Iran was conquered by the Mongols in the middle of the 13th cent. (Petersen, 1999).

With the advent of Islam, Iran and its neighbors went through various events. The Abbasid Caliphate, in the years 1258-75, created border states in eastern Iran and formed almost entirely from the Sassanid organizations. In the post-Sassanid period, with the spread of Islam, Shi'a Islam was further developed against the Sunnis and revived the cultural and national identity of the country. The concept of justice in Iran, as one of the five basic principles of the Shi'i, took on a new value. Little by little, the resurgence of the concepts of land and government against the Arabs took a fresh start. Eventually, with the advent of the Safavids in northern Iran, in the years 1501 to 1722, the empire and identity of Iran was restored under the Safavid dynasty. At this time, a united Iran was restored and Shia Islam became the official religion of the country. Of course, Arab domination over Iran during twenty centuries separated Iran from its ancient traditions (Mojtahed Zadeh, 2007).

The Safavid ruled Iran for more than 200 years establishing it as unified modern state The Safavids rebuilt the Persian Empire in a form of Shiite Muslim country. Persian society and culture has survived the Arabic war and has never been destroyed, so that Iran's influence even in the culture and government under the Arab sovereignty has been remarkable. Many Iranian languages specially Farsi, have survived the onslaught (Jackson & Lockhart, 2006). As the boundaries of the Safavid grew up, keeping control of the whole county became difficult and by 1730s the Afghans attacks created problems. However, one of the rulers, Nadir Shah, ruler of a north-eastern local dynasty known as Zands managed to stop the Afghan attacks and became dominant in that area, though the Safavids still remained nominally in control until 1779, when the Zans were destroyed by the leader of a Turkish dynasty known as Qajars, who took the control of Iran until 1924 (Petersen, 1999)

The eighteenth century was one of the darkest periods in Iran's history. At that time, due to numerous attacks, the country suffered from a crisis, death and destruction, even more severe than the Mongol invasion of the early fifth century, and the Ottomans and Russians The situation and occupation sectors used the territory of Iran. Hadji Mirza Aghasi, foreign minister, was defeated and his soldiers were devastated. Tehran was among a group of prominent members with the support of Malek Jahan, and the other was opposed to them. The first Qajar leader, Nasir al-Din Shah Qajar, who ruled Iran for 48 years and visited Europe in 1873 and 1879, was murdered by the order of Mirza Reza Kermani in May 1896. The plot was arranged by Seyyed Jamalodin Afghani on his way to the pilgrimage of the holy shrine of Abdullah Azim near Tehran. During the 1921-41 period, Reza Khan Pahlavi took power, established armed forces, stopped chaos, and resulted in internal order and overthrow the Qajars. Subsequently, the

monarchy replaced the Qajar monarchy, advancing the nationalist ideology of Pan-Persia, and pursued modernization policies in line with the ideals of this ideology. As a result, the era of chaos ended while a new era of arbitrary dictatorship began in Iran. Between 1963 and 1978, Shah tried to combine the arbitrary and traditional kingship with the modern revolutionary leaderership. Shah Mohammad Reza Pahlavi so proud of himself and believed in his democratic ruling system, however, he had a mistake to have belief in the support of his citizens as a popular leader who also established closer links to Europe. Eventually, he lost the support of his citizens while he and his close circle became the victim of his propaganda and self prejudice (Katouzian, 2009). Then a new era in Iranian was opened with the upheaval of a religious group who established The Islamic Republic of Iran under the leadership of Imam Khomeini.

Figure 2.4. Iran Political Map
(https://www.nationsonline.org/oneworld/map/iran_map.htm)

2.3 Iranian Architectural Styles in Pre-Islamic and Islamic Eras

Throughout the history of Iran geography, monumental buildings of Iran, such as the ones in Persepolis, Pasargad, Takht-e Solomon and Ctesiphon, formed its significant historical heritage. According to archaeological excavations, Iranian architectural heritage can go back at least to 8,000 B.C. The architectural styles and type of buildings had constantly changed and evolved in relation to various issues, as the most important factors influencing the Iranian architecture, can be mentioned is the adaptation of new religions and regimes as the result of the wars and revolts.

In general, as Pirnia (2001) and Ghobadian (2015) classified, Iranian architecture has seven styles:

1. Parsian (پارسیان) style (Cir. 700 B.C to 300 B.C.): from the time of the Medes to Alexander's attack.
2. Parthian (پارتیان) style (Cir. 247 A.D. to 224 A.D.): After Alexander's attack, began with the establishment of the Parthian dynasty and continues until the end of the Sassanid period.
3. Khorasani (خراسانی) style (Cir. 601 A.D. to 999 A.D.): after Islam (all buildings of Umayyad, Abbasids, Taherians).
4. Razi (رازی) style (Cir. 301 A.D. to 601 A.D.): From the beginning of the fourth century to the Mongol invasion, which included the Samanid, Ghaznavid, and Seljuk practices.
5. Azari (آذری) style (Cir. 601 A.D. to 901 A.D.): From the seventh to the tenth century, starting from the time of Halaku, and continue until his empire in Maragha and the advent of Safavid.

6. Isfahani (اصفهانی) style (Cir. 901 A.D. to 1900 A.D.): In the early 10th century, the Isfahani style flourished and, until the middle of the Qajar period, during periods such as Safavid, Afshariyeh, Zandieh and Qajar.
7. After the Qajar period and with the onset of Pahlavi's, contemporary Iranian architecture has been formed and continues to this day.

Table 2.1. Some Selected Examples of the Iranian Monuments and their Styles

Style	**Monuments**
Parsian Cir. 700 B.C. to 300 B.C.	Chogazanbil Ziggurat Persepolis - Shush - Ekbatan – Pasargadae
Parthian Cir. 247 A.D. to 224 A.D.	The Anahita Temple – Qale Dokhtar - The Arch of Kasra – Bishapur
Khorasani Cir. 601 A.D. to 999 A.D.	Jame Mosque of Isfahan
Razi Cir. 301 A.D. to 601 A.D.	Gonbad Qaboos Tower - Kharghan Towers
Azari Cir. 601 A.D. to 901 A.D.	Arg of Tabriz - Goharshad Mosque – Monarjonban
Isfahani Cir. 901 A.D. to 1900 A.D.	Chehel Sotoun - Shah Mosque - Sheikh Lothfalah Mosque
Contemporary After the Qajar period till present	Saad Abad Green Castel – Marmar Castel

As the focus of this thesis, Islamic urban space, in general, the early hypo-style mosques and other buildings were dating back to Mohammed's time and were mainly developed in the Umayad States. The iwan entraces and four iwan courtyard style was developed in Asian countries, and in Iran introduced by the Seljuks in the 11th century (Petersen, 1999, 122), while centralized dome stuctures adopted from the Byzantine architectecture evolved in Ottoman Empire and its dependencies (Ettinghausen & Grabar, 1987; Hillebrand, 1999).

Still further, Islamic architecture can be divided into several large categories. The Egyptian category is in the Egyptian province, Sudan, Libya, and Habasa, where the traces of ancient architecture of Egypt could also be percieved. Early Islamic States under the Umayads mainly continued early traditions in Maghreb, in North Africa, including Morocco, Algeria and southern Spain, it gained certain monumental and aesthetic values and made remarkably impressive and progressive, and is also blended with the Egyptian and Damascus stylistic trends. On the other hand, almost paralele to the last era of the Umayads in North Africa and Spain, the Abbasids grew in power in such centres as Damascus, and created monuments which reveals the impact of the Byzantine architecture. Palestine and Jordan developed common style with the Egyptian arts in Hejaz. Third one is the Iranian art's category with an influential area of Mesopotamia, current Iran, Transoxiana, Persian Gulf , Sheikhs such as Oman, and in general it could be said that any place where Iranians precipitated the implementation of Islam, such as India, Indonesia to the proximity of Korea, Iran culture had left its impacts on them as well as adopting new ideas for the development of its art and architecture (Pirnia, 2008).

Iranians showed their citizen's strength and ability in art and architecture in the world. Although in different periods of history, there have been many ups and downs on Iran's architecture and art due to regime changes. During the Safavid period, the process reached its peak, and the works that were formed during the Safavid period promoted architecture, art, and even urban and landscape planning and technology to a peak and a completely different time from the past.

Iranian architecture in general has unique features, including highly accurate calculations, special design, suitable façades, technical and scientific issues in building structures, high rise porches, and long columns (Hillebrand, 1999). Apart from these characteristics, the character which is considered to be more worthy in Iranian architecture and is considered to be the gem of Iranian architecture is its mathematical and mystical logic (Ettinghausen & Grabar, 1987). The introversion and tendency of Iranian architects to the courtyards, iwans, garden springs and vestibules, which surrounded the seraglio, have long been part of Iranian logic. Thus Iranian architectural styles have been associated with change and evolution in different periods of history, in accordance with governments, religions and beliefs (Pirnia, 2001; Ghobadian, 2015).

2.3.1 The Origin and Characteristics of Isfahani Style (School of Isfahan)

The emergence of the Isfahan school has not fully occurred in the city development planning, but has been implemented along with traditional Iranian urban planning and design, as well as other urbanization or architecture plans in Iran. There are good researches about the school of Isfahan urban planning, but in the pre-Isfahani style the resources are so few that it is difficult to accurately determine their impact on the formation of this style (Ahari, 2006).

With the extinction of the Mongol rule, the Shiite sect of Islamic religion grew up. Safavid rule, based on mystical concepts and reliance on Shari'a interpretations and this new interpretations, succeeded in gaining a very large social base in a vast area and thus establishing the most central Iranian government of the Islamic period after the Sassanid government. The Safavid government according to the ancient tradition had organized, set up and built infrastructure and equipments, and the growth of these facilities led to the prosperity of urbanization. In the course of this period, the concept of redevelopment of the city was invented and the city was a combination of agricultural, industrial and commercial activities, which at the same time was the headquarters of the court and the government (Nazarian, 2011).

One of the important issues achieved is the creation of an utopia by the School of Isfahan for the Safavid state which included the concepts of administrative power of the rulers on the cities, presenting a beautiful city landscape, bringing attaractions to the spaces reserved for coomercial and financial activity in the bazaars and stregthening the importance of “capital city” as the symbol of political power. The physical characteristics of cities afected by this style which is quoted from Habibi (2008) can be summarized as follows:

- A new and massive urban (Chaharbagh) axis was designed, which until that time had no history in urban planning and urbanization.
- There was a wide and broad field of exploration with clear definition in the city centres that were surrounded by the bathhouse, school, convent, mosque, *ab anbar* (cisterns [*Ab Anbar*: āb anbār]), bazaar, and so on.
- For the first time, urban zoning became meaningful.

- New urban society, along with ancient cities, were used as a guide everywhere, thus introducing the style of Isfahan into existing cities.
- The design of the city complex and not a single architectural monument were founded.
- Urban planning also has other features like space hierarchy, equilibrium and harmony, human space, a lack of breakpoint, unity in the same plurality and plurality while unity.

In the style of Isfahan, the arts and science of Iranian architecture and urban planning reach its peak. In this style, everything is well-suited, nor can the style of Isfahan be distinguished from previous styles, nor can it be regarded as unlike the previous ones. In this style, the art of Iranians are intertwined with the meaning of Islamism and offer the sample of the city of Isfahan. This style, contrary to previous styles, has a metaphorical expansion, so that in most historic cities of Iran, its immense effects are clearly seen. In spite of the time span, the style of Isfahan, despite the encounter with modern European urbanism, maintained its breadth until late Qajar.

2.3.2 Effects of Water Resources on Urban Planning

In the four styles of Khorasani, Razi, Azari and Isfahani, water resources play an important role in organizing the street network, the location of water supply systems, neighborhood size and even neighborhood development (Ziyari, 2000).

2.3.3 Architecture of Urban Spaces in Iran

Among the different styles, the style of Isfahan as the first Islamic Iranian style introduced urban community and the creation of harmonious spaces, that is, henceforth, architecture is not proposed in the form of individual monuments but in the form of urban societies, and urban architecture and the creation of urban spaces is

the main purpose of urban planning in Isfahan style. In this view, urban facilities, water cisterns, bridges, caravansaries and gardens, rivers, rivulets and streams are rather aimed to serve not to individuals but to the public in larger scale.

2.3.4 Transformation of Urban Spaces from Closed to Open Space Plan

Patterns of urbanization, both before and after the arrival of Islam, have always been deployed in closed form, although after the arrival of Islam, these patterns of closure have been developed as one of the characteristics of Iranian Islamic urbanization. For the closure of the spaces of urban and architectural patterns, the prevailing security reason has been that the provision of urban security by the central government, the alteration of residential housing forms from the central courtyard to apartment complexes, and the entry of cars into the streets led to the outsourcing of architecture and urbanization. The new gradually replaces the traditional introvert architecture, and the external and internal patterns are to be abandoned (Soltanzadeh, 1988).

The set of these trends has led to the transformation of urban and livelihoods from closed and traditional form to open forms, and the cities, both in terms of communication with external spaces and with their internal components, take on a new form and create more links between urban neighborhoods (Memarian, 1995).

2.3.5 Varieties of City Shapes in Islamic Iranian Style

The shape of the city has been in two styles commonly called as Khorasani and Razi, in the form of square and rectangular. These urban forms have been consistent with the Sassanian style of urbanization, while the other two styles, Azeri and Isfahani, have a city-like harmonic urban space. It is a fragmented and irregular shape, this can be due to the rapid development of the city, especially in the school of Isfahan (Rahnamaei & Shahhoseini, 2004).

2.4 Safavid Period

The Safavid era, which is the main focus point in this thesis, is the peak of the magnificent Islamic architecture and art of Iran throughout its history. It was founded in early 1500s, in the year 907 AH (1501-1502 A.D.), by Shah Isma'il Safavi in Tabriz. It tooks its name from Shaykh Safi al-Din, its ancestor (Bloom & Blair, 2009). The Safavid dynasty enforced Shiite Islam as their state religion. Their territory and power grew quickly, yet they was prone to Sunni attack in the north by the Uzbeks, and in the east and west by Mughals and Ottomans. Fighting between Safavid and Ottomans was for both territory and religious and it had lasted for over 150 years.

After Shah Isma'il, in 930 A.H. (1524-1576 A.D.), Shah Tahmasb reigned and moved the capital from Tabriz to Qazvin. In Qazvin, the capital of Shah Tahmasb, buildings such as mosques, palaces and caravanserai were created. Before the reign of Shah Abbas in 996 A.H. (1587-1588 A.D.), Shah Isma'il II and Mohammad Khodabandeh governed for short periods.

During the reign of Shah Tahmasb, the Homayoon, the Mongol king of India, was refugee to Iran and spent some time in the Safavid court. His stay in Iran and the support of Safavid Shah, after returning to India, created a relationship between the two rulers, Iran and India, in all aspects including art (Kiani, 2017).

The 42-years period of the reign of Shah Abbas is the era of flourishing of art in Iran. On the one hand, relations between Iran and Europe and, on the other hand, relations between Iran and India also Iran and Ottoman were developed. In the years 1587 to 1629, Shah Abbas led them well by creating political, military and cultural trust among the Safavids. Creating the beautiful city of Isfahan can be considered as a reflection of

this management. He allowed the Ottomans to stay in their occupied territories in order to help him confront the possible assaults of the Uzbeks. He also helped England to victory against the Portuguese in Hormoz, which started trading with England. By creating profitable businesses, he rebuilt his army to regain the captured territories of the country (Aghajari & Moshfeghifar, 2010).

During the reign of Shah Abbas I in the years 1587 to 1629 A.D. capital was moved to Isfahan from Qazvin, and town planning were proposed in the vast open space, in Meydan-e-Shah or Naghsh-e Jahan square. The history of the Isfahan showed that, in a long period of time it was the Sassanid fire temple which was located on top of the hill. Then, during the Seljuk period from 1038 to 1194, the city was the capital of the headquarters of many kings and ministers of that era. At that time, the city was developed around the famous Friday mosque (Porter & Thevenart, 2003).

Figure 2.5. Safavid Persian Empire (https://www.themaparchive.com/Safavid-empire-c-1630.html)

2.5 Safavid Architecture

With the advent of Shah Abbas I (5th Safavid king), reign from first of October 1588 to ninetheenth of January 1629, the golden age of the Safavid architecture began, due to his interest in art, pride and ambition, and with the help of the wealth he provided, began a new era in the urban spaces of Iran. This period of architecture, although not the brightest era of architecture, is the era of elevation of the latest Islamic architecture of Iran. After that, Iran's architecture never flourished and was even neglected. Shah Abbas built many different buildings throughout Iran. And since Isfahan was the capital, there was a great expansion there. In his time, the great central square of Isfahan, Naqsh-e Jahan Maidan (Square) (see figure 2.6), is one of the masterpieces of Iranian and world urban space. In addition to the beautiful monuments built around it, the square has been the venue for the parade and the various parades and festivals on special occasions and special days. School of Isfahani and its teachings are influenced by Shi'a rational wisdom and it is one of the most important factors that have made the development and identity of Safavid art and architecture more than other ages (Haghighatbin et al., 2016). The phenomenas of the Safavid period can be found in various arts in different parts of the country. The paintings in the Chehel Sotoun Palace and Garden (figure 2.7) and the AliQapu Palace (figure 2.8) and other buildings, miniatures, Shahnameh, which were painted during that time, the Quran copies in beautiful calligraphic and illuminated practicees, and other elements that were developed in art in this period, all show that during the Safavid era, not only coherence and political integration in Iran, but also played an significant role in the development of the field of urban planning, architecture and art in the country.

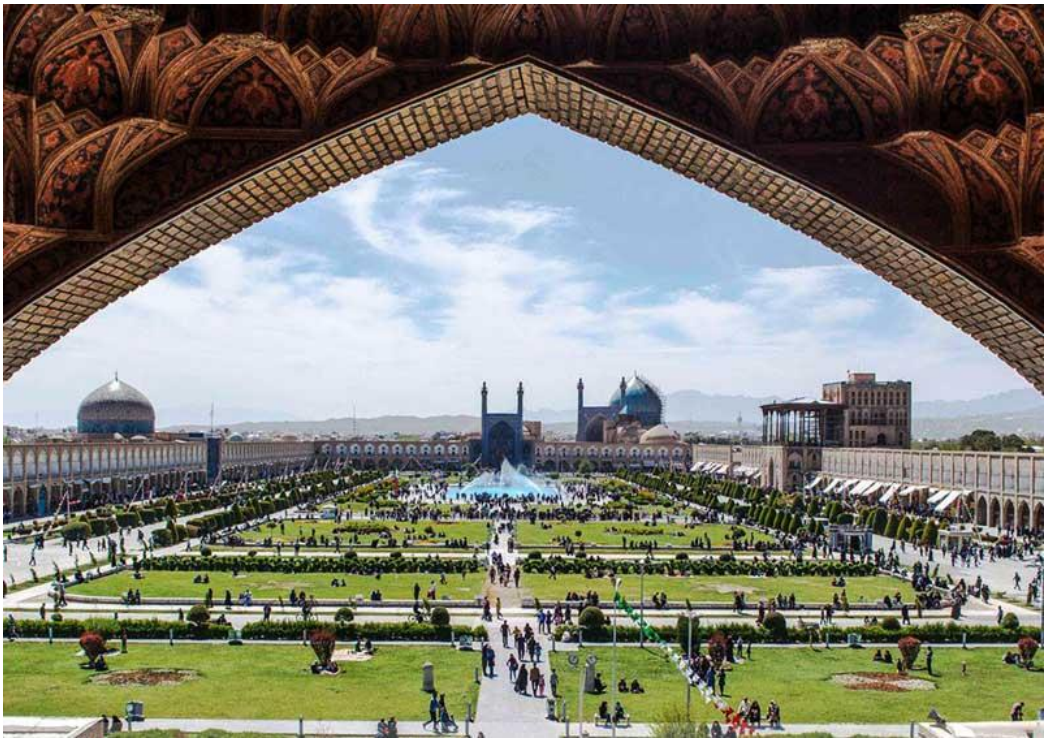

Figure 2.6. Naqsh-e Jahan Square – Created Cir. 1632
(https://www.tappersia.com/naqsh-e-jahan-square/)

Figure 2.7. Chehel Sotoun Palace and Garden – Mid of Seventeenth Century
(www.jamejamonline.ir)

Figure 2.8. AliQapu Palace - Early Seventeenth Century
(https://www.youtube.com/watch?v=k_Rk58n0R4s)

Today, when we look at the manifestation of Safavid era architecture, not only in the city of Isfahan, but throughout Iran, features that show how both urbanization precess and architecture managed to achieve an exceptional opportunity in this period can be seen.

2.6 Summary

Iran is the country in west Asia that its architectural heritage can go back at least to 8,000 B.C. In Iran and in the course of Isfahani style period, the concept of redevelopment of the city was invented and the city was a combination of agricultural, industrial and commercial activities, which at the same time was the headquarters of the court and the government.

In this style water resources play an important role in organizing the street network, the location of water supply systems, neighborhood size and even neighborhood development, also urban facilities, water cisterns, gardens and rivers are rather aimed to serve not to individuals but to the public in larger scale, and also transformation of

urban and livelihoods from closed and traditional form to open forms could be seen. The Safavid era, which is the main focus point in this thesis, is the peak of the magnificent Islamic-Iranian architecture and art, and new era in the urban space of Iran.

Chapter 3

WATER AND URBAN SPACE

" أَفَرَءَيتُم المـاءَ الَّذى تَشرَبونَ - ءَأَنتُم أَنزَلتُموهُ مِنَ المُزنِ أَم نَحنُ المُنزِلونَ."
And have you seen the water that you drink? Is it you who brought it down from the clouds, or is it We who bring it down?(Quran, Surah Al-Waqi'ah: 68-69).

3.1 Water as the Basic Thing for Living

Water can be transformed into the dense substances by continued fermentation. such as vegetables, animals, stones, salts, and various earths. and finally be coagulated into metallic and mineral substances. In fact, all of them are one, an element that has been altered in various forms by nature (Schechner Genuth, 1997).

Water is considered as the Origin of (nature) life and also fountainhead of civilizations. It represents continuity as a flowing substance, shape-shifting and reflection, rivers of time, streams of consciousness, passages, death and the depths, deluges and the unfathomable. From the perspective of purity and panacea. Water could give the symbol of cleanness and sanitation, purity and the sacred, temperance and inebriation (Glasgow, 2009).

3.2 Types of Water Sources

The sublime god created within the earth a static water, which is like blood in the creature's veins. This water, according to the predecessors, does not increase or decrease by increasing or decreasing of precipitation, because its origin is the transformation of air into water, inside the earth. This water fills most cracks in the ground, and each part joins the other, as far as there is no hard obstacle on its way.

According to the above description, water in nature has three types:

1. First one is the main water inside the earth, which does not increase or decrease with precipitation.
2. The second type is the water that originates from the underground in a constant transformation and back to the earth.
3. The third type is the water that originates from clouds that precipitated into rain or snow, and most of the nourishing of living beings on earth depends on this water. Water is found in naturally created lakes, rivers, streams and and human created canals (*kariz*), cisterns, dams and pools, which runs after heavy rains or melting of the snow or through its oushing out of the springs or underground to the surface.

The heterogeneous distribution of rainfall in terms of time and place, and as a result of the particular status of water resources in Iran, has led to a lot of effort from the very far-flung past to make optimal use of these resources. The result of these efforts is the several number of water buildings like aqueducts, dams, cisterns, naturally thermal lakes and ponds, pools and etc. Most of the available resources attribute the *qanat* technology to Iranians. What is certain is that the building type '*qanat'* has been

transported from Iran to other parts of the world to extract underground water. From the Achaemenids to the Sasanians, and then in the Islamic era, you can see the development of *qanat* in other countries. At this time, the Iranians developed the *qanat* system along with other aspects of their culture and civilization not only in their lands, but also in Europe, as they transmitted it from Spain to Morocco and the Southern America (Al-Karaji, 1994) and (Yıldız, 2006).

3.3 Importance of Water in Islamic Iranian Urban Space

As legend says, human beings begun their life after being exited from paradise, as it is dreamed like a green heaven. The nature, like a cradle, contains human beings, among which the Persian garden is a conductor, to the innermost layer of thought, a fictitious wisdom of the Iranian worldview. Through the history of thousands of years, the Iranians have always created an environment with a wide range of amenities alongside the nature of their surroundings to provide their comfort. Therefore, it can be said that the complete structure of the garden represents a close relationship between nature, worldview and Iranian culture. The foundation of all abstract and cosmological traits in Iranian civilization is based on cultural beliefs. Water plays an important role in attracting people, and the river bank is the bedrock of the emergence and growth of many ancient cultures and past civilizations. In Iran, where the river has been flowing, it has been expanding rapidly and accelerating. Also as in ancient ages, available water sources led to the creation of villages, towns and, later on cities that human life enabled to improve the civilization level. With respect and mercy to the great assest obtained through the valuable source ‘water’, temples were erected next to the water sources (Moghtaderi, 2012).

As it stated in Quran: “every living thing is made of water,” *"وجعلنا من الماء كل الشیء"*

this could shows the importance use of water in Islam. Water's role in Islamic urban space is both symbolic and practical. As water used for the purely unadorned manner, it is important symbol of eternal movement, purification, source of life and sustainability, for many cultures especially Islam.

In ancient Iran, water was a very valuable assest and a sign of purity and refreshment. Architects have always tried to make the best use of water out of environmental resources. Being an element of beauty and perfection, water becomes a factor for cleanliness, peace and tranquility (Yurtyapan Salimi, Salimi & Kara Pilehvarian, 2016). Water was the source of light and cleanliness and was of great value. Perhaps due to the fact that Iran was a country with low-water sources, this vital fluid between them has a high status. The water was used not only to satisfy the needs of Iranians, but also to the spiritual and mental impact. Water has different sensibilities in human psyche with its various abilities, such as life, freshness, brilliance, purity, prosperity, and the spread of light, quietness and tranquility and mobility. For this reason, water in various forms has always been stored in places built by human beings (Mansoori, 2005). Water is not only a functional addition but also is an integral part of architecture, and could form the landscape aesthetics, or giving life and breathe to structures. It has abundantly been used in Islamic architecture, all over the world such as Middle East, India and Spain.

Symbolic meaning of water could be seen in Persian gardens, but it also used as a functional element for cooling the air and nourish the shading plants. From the beginning, Iranians saw the garden as a land parable of a spiritual truth, the light and reflection of the universe within another universe. For this reason, the garden design and its artistic face was associated with the sciences of cosmology and wisdom, and

the experience of the garden was not limited to the tangible world, but to a certain extent the high truth of the universe and its direct experience made it possible for those who had the insight and spiritual potential and so was a sacred art. Persian Gardening, like Iranian architecture, is designed to fit the ecosystem of the climate and is best suited to the north and south. Preserving green space in the form of lawns, which is one of the most important principles in landscape design, is under severe sunshine and climatic conditions of Iran, and requires frequent consumption of water (Ebrahimi, Noori & Ghiw, 2016).

Figure 3.1. Iran's Major Water Basins (Fahmi, 2012)

All of the inventions that Iranians performed in their cultural richness in order to make the water look even more beautiful were also reflected in the Iranian handicrafts. Particularly in the most important handicrafts of Iran, mainly the carpet, they have played a role in representing beautiful landscapes, water springs and dams and rivers. It is also, in the lesser case, through the Iranian miniature, the beautiful streams or the ponds where the birds are swimming or plying in the water are commonly represented. As well as the inscriptions and the walls of the palaces, each time they have built a hall (chamber), water, waterfront, steams, ditch, will glorify the long-standing art of Iran into the audience.

3.3.1 Relationship of Water Architecture in Urban Plan and Landscape

As the Quran states, all living things are made of water, and this element highlights the importance of other elements in Islamic life. The central role of water in Islamic architecture is life, refined and used for cleanliness and cooling of the air. One of the other characteristics of this element is its decorative effect. In Islamic buildings, and in Persian gardening, which is an allegory of paradise, water is used to cool the air and a means of transferring the city's noise and irrigation of trees. The basis of this irrigation, which originates from the Quran, is derived from the geometric form of the Chahar Bagh. The central fountain represents life and worship. The centrality of water in Islamic urban space, mainly in the gardens and mosques, reminded the presence of the Quran, and the spirit and power of the God in life (Hunt, 2011).

As Marianna Barrucand described, in her article called the Gardens as a reflection of paradise, that appeared in the large size book about Islamic art and architecture, “There are gardens at both the beginning and the end of mankind’s destiny -The Garden of Eden and Paradise-“, it is believed that this idea is perfectly a true expression not only

for the Muslims, but similarly for the Christians and the Jews (Barrucand, 2004). Bloom and Blair remarked on the same theme as follows: “ The garden has always played an important role in the Islamic lands, not only for agriculture and relaxation, but also as a visual metaphor in poetry and prose.” (Bloom and Blair, 2009).

As Barrucand (2004) described, the widely used term *chahar bagh* (four gardens) or the garden divided into four lanes, is Persian and in reality have not an Arabic equivalent. As she added, literature concerning Islamic garden suggests that this concept of “garden divided into four” derives from the Quran, as it is mentioned in Sureh 55 (Al-Rahman) as two sets of two gardens (Barrucand, 2004).

The Persian Garden with its components, the harmonic division into four sections, springs and reflecting pools, was also used to design the landscape of other countries with different cultures, such as those in Sicily, Morocco, Spain and so on (Hunt, 2011).

The Persian garden known as paradise on earth, is shaped in four sections by waterways (figure 3.2). However, in the principles and geometry of Persian garden, the use of water from the stream of water beside the trees and overflowing basins is used from water and the garden is an image of heaven.

Figure 3.2. Jahan Nama Garden-Shiraz – Eighteenth Century, Iranian Garden- four sections by waterways (http://irantravelexplorer.com/works/jahan-nama-garden/, [18.03.2019])

The four primary elements of Iranian gardens or paradise are used in this building. These four elements represent four seasons, or rivers of milk and honey, water and wine as the symbol of the paradise. This place has been the Palace of King Pedro, in which the coexistence of Islam and Christianity can be clearly and openly seen. Fruit trees, one of the characteristics of Persian gardens, have been planted in deep areas. The reason for the planting of trees and plants in these courtyard gardens is to ease the smell and aroma of plants and flowers, and the convenience of picking fruits (Al-Rhodesly et al., 2018).

It is probabe that English word of ‘paradise’ comes from the word *pairidaēza* (walled garden) which is one old Persian word. Use of water in gardens creates different

effects. From aesthetic point of view, with emphasis on visual axes, water in gardens presents the beautiful reflection of the unique architecture of the surrounding buildings. Dynamic water in fountains shows the effervescence of life (see figure 3.3 and 3.4). Water's abundant presence allows people to listen to the gentle sound of water and look at the moving reflections of flowers and trees, and it succeeds in creating a paradise on arid lands on earth. Water also used in ablution fountains. In practical way it was used for symbolizing external purification, as it is thought to create spiritualy a ritual contact between user and the architecture itself (figure 3.5).

Figure 3.3. Shahzadeh Mahan Garden - 1850 A.D.
(https://www.mehrnews.com/news/1543589/, [19.03.2019])

Figure 3.4. *Haft Awrang* (Seven Thrones) by Jami (d.1492), A Father Advises His Son About Love. Qazvin. 973AH=1556-1565A.D. Safavid Period Watercolor, Ink and Gold (www.Pinterest.com)

Figure 3.5. Jaame Mosque of Zanjan – About 1863 A.D. (Mehr News, https://www.mehrnews.com/news/1400682 [18.03.2019])

The fragrance, the water and the greenery on the ground, and the pond that is circular, symbolizes the sky and pond, which is square, that is symbol of the earth and the combination of the these two shape in the garden, represent the arrival of the earth and the sky to each other.

3.4 Water Supply System to Settlement Sites

Water is considered as one of the natural elements that has an unchanging nature. Wherever it appears, its application should reflect the perception of nature by the designers. Access to water resources has long been considered as one of the most important factors of urban space organization in Iran and other civilizations. The overall geographic survey of Iranian cities well represents the dependency between urban life and access to water resources.

3.4.1 Aqueduct System: *Qanats* and Wells

Because of the climatic variation and landscape of the natural environment, the Iranian plateau has no reliable surface water source. The sea, the river and the lake as the surface waters of the earth, play an important role in the urban space and its creation, in many areas from these water surface sources, the requaired water is obtained from underground resources, supplied through man-made qanats and wells. The river bank is the bedrock of the emergence and growth of the ancient world cultures. In Iran, wherever the river has been flowing, it has rapidly expanded and accelerated, and it has also stabilized itself within the culture. And in the very long past, water has created vital and economic and humanitarian centers (Kobori, 1973; Lightfoot, 1997).

Therefore, water plays a extremely important role in Iranian architecture and landscape design. Persian agricultural experts created the *qanat* system before first water pump, that functionate according to their hydraulic laws, thousands years ago. *Qanat* is one

kind of water management system that it is used to supply water for irrigation of arid and isolated lands. It comprises of a series of deep wells which carry water over long distances, by connected tunnels.

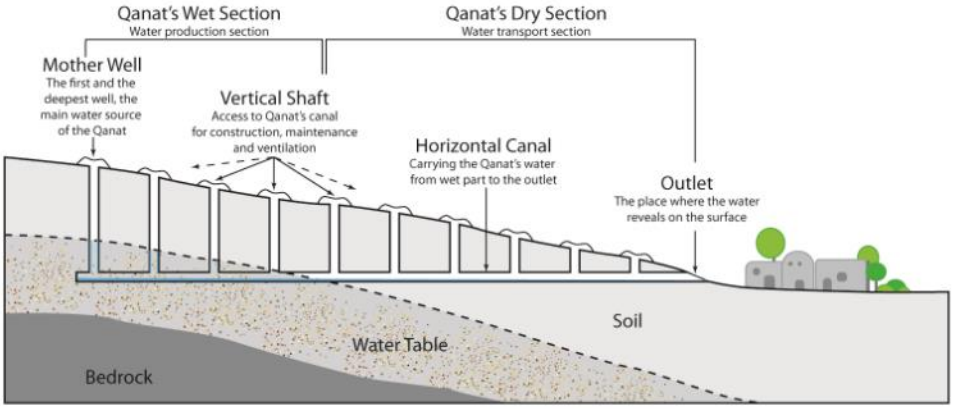

Figure 3.6. *Qanat* section, sketch by Massoud Shamaeezade (Shamaeezade and Zhou, 2015)

Figure 3.7. A Qanat (Aqueduct) Tunnel near Isfahan, Photo by NAEINSUN, (https://en.wikipedia.org/wiki/Qanat#/media/File:Insideqanat.JPG, 21 November 2012, [18.03.2019])

Before the advent of Islam, in Iran, the architecture along with the water and nature, without distorting it, declares its presence, and water is more of an immaterial role. Since the people consider water as a sacred element and give thankfullness to its plentiness, they erected their temples and chapels alongside the water. They even thought that the human passage to enter into another world is similar to the path and fluidity of the water in its pathway. Water has shown its spiritual role in Iranian

architecture, so that water circulation is a demonstration of water in the riverbeds, and all of the water's abstract properties, which clearly have been considered and cited in prayers referring to water. Springs, rivers and lakes that have a religious and belief cannotation, were not formed on their own. The water is flowing out of the mouth of the great mirages from the mountains and inside the caverns, through the rocks creates its flowing bed and then goes to the fields. It then flows on the earth after gushing from small and large springs from the mountains, rocks, gobbles, and then built its own natural bed as it flows out. Thus, in order make more efficient use of it for the use of the living beings, human beings created methods of conveying and preserving this valuable asset by constructing conduits and reservoirs. Here we see that the two factors of water and cliffs are involved in the construction of existing structures. So, as the water plays the role in the flourishing of settlement places, creation of the the water paths plays its part in the creation of the towns and cities. The evolution of cities and the relation between the structure of the garden and the city is such that it can be called the garden from the point of view of the city as a garden, and on the other hand, the garden was considered as a city planning workshop (Aal-e-Ibrahim Dehkordi, 2012).

3.4.2 Water Canals

Water canals in geometric shapes appears in most of the buildings and forms a central architectural unification in water in Iran. Its vigorous movement in religious and artistic concepts flows in Iranian culture. In this way, it is so different in the construction and composition of our structures that it can not be practically made out of the form. Water appears in the center of the palaces, belvedere and the gardens, and so on. In desert areas, scarce water and the life of the sector are responsible for the formation of the water storage system and the floodplains, cisterns [*Ab Anbar*: āb anbār], ligaments and glaciers, and it shows itself in another way (Michell, 1996).

This concept is more favoured in places like parks or gardens. Because the water element is considered as one of the most beautiful contribution to the fields, thus it is one of the most important asses for the growing of the green spaces. Of course, in these places, there is a need for water to clean the area and irrigate trees and flowers or use for hygienic use.

3.4.3 Water Reservoirs and Waterways

Water in gardens and ponds, streams, water fields, waterways, pools and fountains, and each of them represents the domination of man to nature, to show all of this alongside. Water in the architecture of the pools is used as a stagnant water symbol and is based on regular geometric shapes as a complementary factor to building activity. The front pillars of the buildings are complementary to the architecture and reflect them like a mirror. The pools built in the mosques, besides the role of purification, have become symbolic element and water has reflected the images of living beings as while they are thought to bear the symbol of life as well as the death. It removes humans both physically and spiritually, and in general, understanding the concept of water in architecture is the same as the understanding of water architecture. It is necessary to use their reflection in water to be magnificent and pleasing to display the important buildings (Rostami Monjezi & Shahbazi, 2011).

For example, if the (fountain) reflector of the Taj Mahal was covered with grass, then it would have lost a lot of its magical load. In fact, designers, with the use of reflection, expanded the depth and infinity of vast levels of water and personal privacy of individuals, and divert the sense of suffocation in closed spaces. Many of the indigenous buildings built in Iran's climate and geography have been linked to water

and, as a consequence, necessary. Cisterns, glaciers, lagoons, bridges, aqueducts and wind catcher are all within these categories.

On the other hand, cities such as Isfahan and Shushtar are great examples of the symbiosis of the urban and the water, in other words, the water architects designing water related buildings, which would create a great interest in visualizing and relaxing through the use of water.

In the construction of Shushtar's water supplying systems, the main purpose was irrigation, but its creators have been able to achieve other major goals such as architectural, industrial, commercial, defense, and so on. In reality, Shushtar's hydraulic system is dating back to ancient times, Mesopotamia and the Elamites. The Gregar Canal is an artificial river that has been supplying water for the use of Shushtar city, factories, agriculture, transportation and so on for centuries (ICOMOS, 2009).

ICOMOS - International Council on Monuments and Sites - recognizes this historical system, as well as its landscapes, monuments and archaeological sites as unique and worth to be inscribed in the list of World Monuments. The system consists of a vast, yet coherent set of flow control structures and canals, some of which are dug into the rock and make up for countless water uses. It was designed with ancient civil engineering knowledge based on the design of the global water system, and still in use. In the city of Isfahan, Zayanderud River has played an important role in the urbanization of the city. The numerous bridges built on this river are a beautiful and excellent example of water urban space that has functions besides the main function.

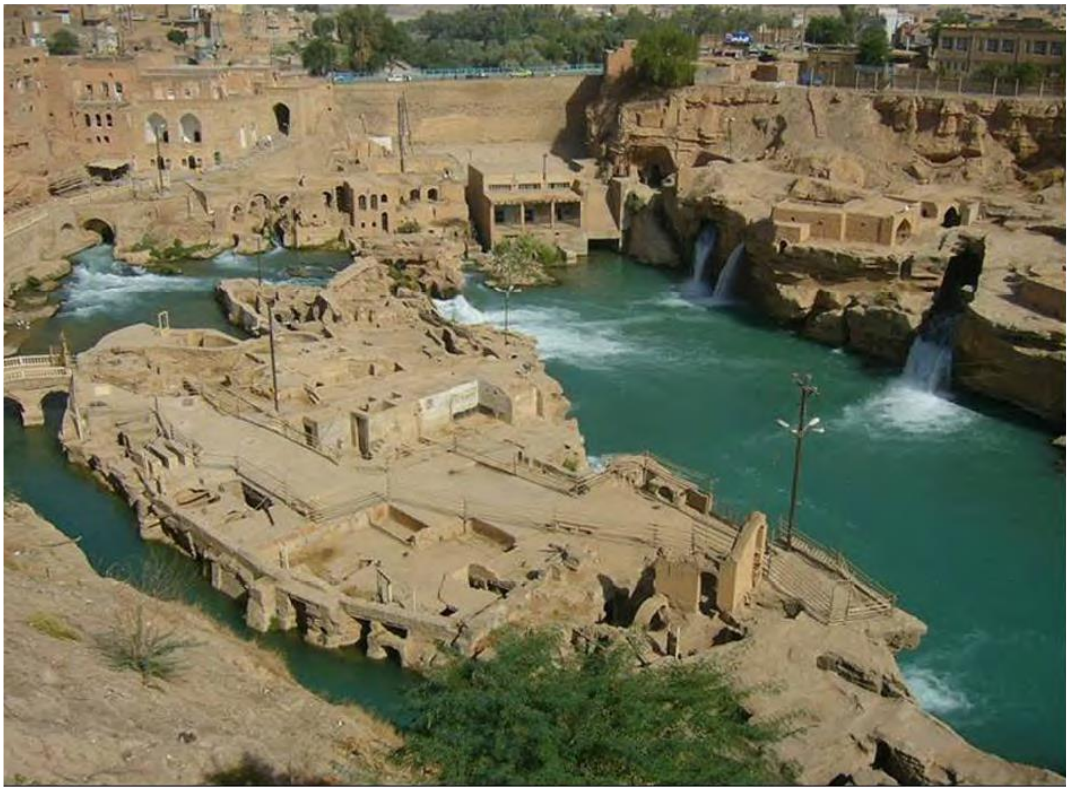

Figure 3.8. Historical Hydraulic System of Shushtar - Sassanian Era /Khuzestan Province/Iran - Gargar Dam and the Areas of Mills (ICHHTO - ICOMOS 2015)

Figure 3.9. Shushtar/Khuzestan Province/Iran - Fisheries and Ponds along the Gargar River (ICHHTO - ICOMOS 2015)

Figure 3.10. Zayanderud River/Isfahan (www.imna.ir) [16.07.2019]

Cistern is another ancient Iranian feature of the urban environment, which is mostly found in arid and semi-arid regions. An example is the cistern of the Safavid era, which in the past was the source of freshwater resources of Bandar Abbas, which have beautiful, unique domes and its materials are sand and rocky mortar. These ponds has four main openings for water use.

3.4.4 Hammams

*Hammam*s or public baths, are essential parts of the social urban life in Islam. Often, they have a rich and inspiring architecture. In Iran and, in particular, in Isfahan–a large and historic city in central of Iran–numerous *hammam*s were built during the Safavid dynasty (1501–1722 A.D.). *Hammam*, 'spreader of warmth' in Arabic, also named '*garmabeh*' in Persian which literally means 'hot water', became synonymous with steam baths and bathing (Kilito, 1992).

Water is the crucial element in *hammam*s in countless ways. It is the central element for human cleanliness and hygiene, a necessity for human health, in the sacred and the sublime (Anderson & Tabb, 2002), and at times in the propagation of diseases (Coppock & Miller, 1998), while it took an important role by providing an environment for socializing of the citizens. Ancient medicine was strongly connected to ideas about water and to the equilibrium it provided to any system, religious or

physical (Kosso & Scott 2009), not only in its function to shape the conduits through which people transform space and construct meaningful place, but also embeded them with specific practices. Major and minor ablutions bring Muslims to *hammam*s at certain times.

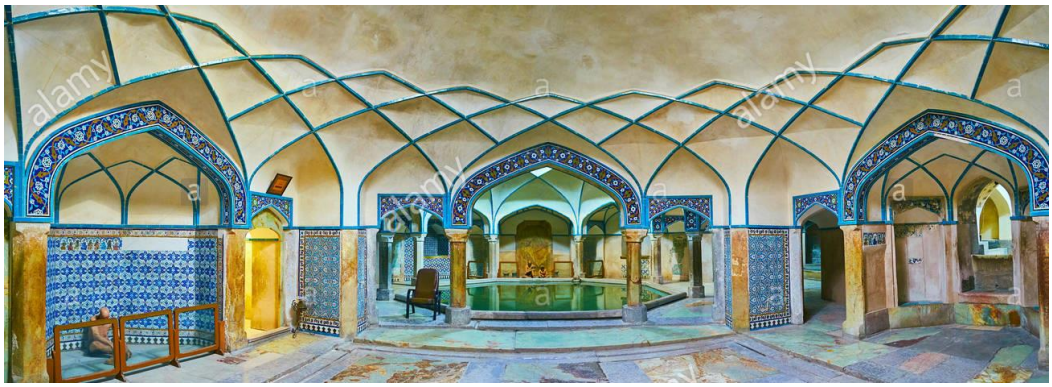

Figure 3.11. Bathing Hall in Hammam-e Ganjali Khan-Kerman – 1611 A.D. (https://www.alamy.com - ID: P8DNGP, [19.03.2019])

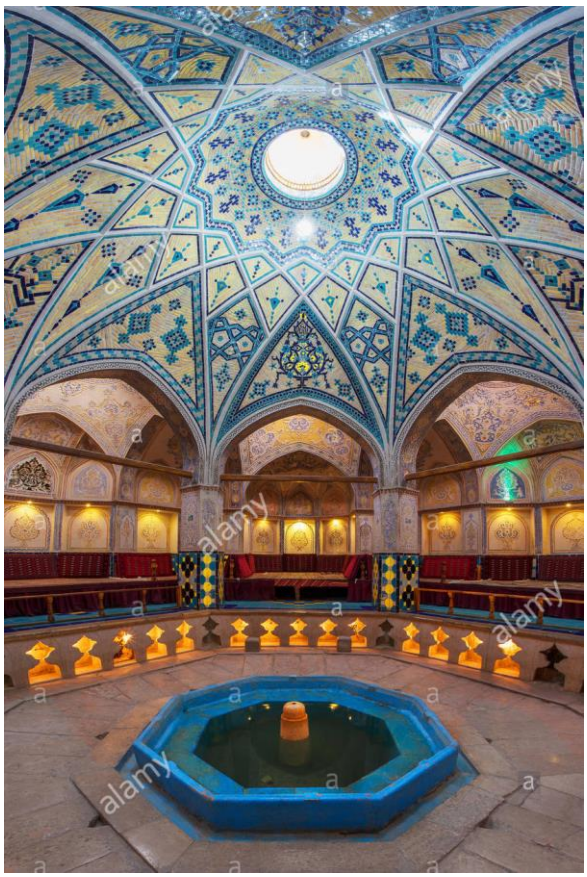

Figure 3.12. Sultan Amir Ahmad Bathhouse-Kashan /16th century, Safavid era (https://www.alamy.com – ID: R2Y1W3, [19.03.2019])

3.4.5 Water Related Architecture in the Mosques: Fountains and Pools

Mosques have emerged as a place of reflection and worship alongside the water, because there was no possibility of making and using them without water. Existence of water in the mosque, in addition to emphasizing this aspect, may also be a reminder of the beauty of Paradise, according to the late Dr. Pirnia (2013). In general, water is used in two situations in the mosque: (a) the symbolic dimension used in this case for the last cleansing before prayer, (b) for other matters of purity. In the spiritual environment of the mosque, the presence of water in the courtyard is more due to its symbolic aspects, but in many cases, especially in Iran, its functional aspects, such as the place for ablution, have been considered. The symbolic significance of water in the culture of the people of the Middle East dates back to the pre-Islamic era. The presence of water in the courtyard of the mosque shows the reflection of the mosque in itself, an indication of purity and reminding that if anyone wants to enter the mosque, he must first purify himself (Seyyed Sattari & Balilan, 2012).

There are also water basins and *sangab* in mosques for ablution, cleaning the courtyard and mosque's space, as well as the belief in life and the cleanliness of the water. Also fountains and moving water (flows) are symbols of the dynamic life. Water is also involved in the transformation of surfaces and architectural space.

Sangab is a large container of unidimited and chopped stone (see figure 3.15). They were used to collect rainwater in the mosque courtyard, Imam Zadeh (graveyard for religious authorities) and public places so that people could use them for ablution or drinking water. The outer and inner surfaces of the Sangab, are decorated with motifs, poems and verses of the Quran. Public people consider this water to have spiritual and

healing qualities. Examples of these dishes are among the Chinese, Indians, Japanese, and other religious followers.

Figure 3.13. Shah Mosque of Isfahan – Safavid era 1641 A.D. – Its Reflection on Water and Sense of Purity and Monumentality
(https://www.kojaro.com/2015/12/17/45283/imam-mosque-isfahan/ , [18.03.2019])

Figure 3.14. Pool in Jaame Mosque of Isfahan Courtyard – Umayyed era 777 A.D.
(https://mosafersalam.com/attraction, [24.03.2019])

Figure 3.15. *Sangab,* in the Courtyard of Seyyed Mosque of Isfahan – Qajar era 1801 A.D. (https://www.flickr.com/photos/saeid1354/5123118511/sizes/l/ , [24.03.2019]).

3.4.6 Bridges

Bridge that enables transportation over the river, is another water related urban space in Iranian architecture. Creating important and beautiful bridges on the rivers, which in fact, will double the beauty effects of the river below it. One of the most beautiful bridges built in the Safavid period by Allah Verdi Khan on the Zayanderud River, Isfahan, is the Bridge of Allah Verdi Khan or Si-o-Se-Pol bridge. Lord Curzon, while watching this bridge, writes: "When traveling to this city, the person does not expect to see the bridge, which may be said to be one of the glorious bridges of the world. It is called as a Si-o-Se-Pol (33 bridge) because it consist of two superimposed rows of thirty three arches. This bridge was made for both function, as a bridge and a dam and specially used for popular recreational gathering place (Curzon, 1892).

Figure 3.16. Allah Verdi Khan or Si-o-Se-Pol Bridge one of Most Important Water Related Urban Space of Safavid era – 1629 A.D. (2015)

3.4.7 Gardens and Courtyards as Spaces to Contain Water

There are several descriptions of the beautiful nature and specially designed gardes, one of which is quoted below:

وَأُدْخِلَ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ جَنَّاتٍ تَجْرِي مِنْ تَحْتِهَا الْأَنْهَارُ خَالِدِينَ فِيهَا بِإِذْنِ رَبِّهِمْ ۖ تَحِيَّتُهُمْ فِيهَا سَلَامٌ.

And those who believed and did righteous deeds will be admitted to gardens beneath which rivers flow, abiding eternally therein by permission of their Lord; and their greeting therein will be, "Peace!" (Quran, Surah Ibrahim: 23).

مُتَّكِئِينَ عَلَىٰ فُرُشٍ بَطَائِنُهَا مِنْ إِسْتَبْرَقٍ ۚ وَجَنَى الْجَنَّتَيْنِ دَانٍ "[They are] reclining on beds whose linings are of silk brocade, and the fruit of the two gardens is hanging low."(Quran, Surah Al-Rahman:54).

Alhambra is a palace in Spain near the city of Granada, which can be considered as one of the most prominent examples of the Islamic Court Gardens and one of the most famous Islamic buildings in the world. Red Fort or Alhambra's name origin from Arabic word, Qal'at al-Hamra, was built in 1232-1492 A.D. by the the last Muslim ruler Nasrid Dynasty of Spain. Muhammad ibn Yusuf ibn Nasr was founder of Nasrid Dynasty in 1237 A.D. He built the Alhambra as an his court complex, on Sabika hill. (Mirmobiny, 2014). The art and architecture of this complex is the legacy of the last great Islamic dynasty in Spain, which represents a style that dates back more than seven hundred years before the official beginning of Islam in the Iberian Peninsula. It located at the city center with seven hundred meters long and two hundred meters wide, at the north was surrounded by Darro river, and hills of Albaicín and Sacro-monte. (Raezer & Raezer, 2015)

Figure 3.17. Alhambra Palace – Morocco - 1232-1492 A.D.
(https://www.kojaro.com/2016/9/27/122244/alhambra-granada/, [24.03.2019])

The Agdal garden built in Morocco with an area of about 400 hectares which is surrounded by a 15-kilometer-long wall that was established in twelfth century by Almohad Caliphate. It was then availed as an orchard and finally renovated in the nineteenth century. The water in the garden is pumped from the Atlantic Mountain and is about 900 years old. Despite the huge shortage of water in Morocco, view of a large reservoir in this garden creates a sense of abundance of water in Morocco. This water is carried through on aqueduct system that runs nearly 20 kilometers. The garden is the site for gathering the army, as well as a vast pool of garden used for the swimming training of them.

Figure 3.18. Agdal Garden - Twelfth Century – Morocco
(https://www.gardenvisit.com/gardens/aguedal_gardens, [24.03.2019])

Throughout the last century, the term "place" has come up with a wide range of meanings in almost all architectural spaces. The construction of the place has embodied human beliefs, and has a profound connection with the existential realms of

human and his relation to his surroundings. Hence, addressing the relationship between human and nature in the context of the landscape and identifying the kind of communication formed is a preliminary step in the study of the concept of place. On the other hand, Iranian garden as a transcendent example from the perspective of Iran, is the image of the Iranian humanistic beliefs in the history, which despite its intricacies, is still considered as a successful model (Medghalchi et al, 2014).

During the Islamic period, the geometric quartered pattern of Persian gardens became more reinforced by the belief of four heaven streams; as it was similar to the image of the heaven in the Quran (Mansouri, 2011). Therefore, the general pattern of most Persian gardens consisted of a rectangular space which is quartered by intersecting streams and pathways. The common irrigation system of the time has been known as another effective factor in the formation of geometric garden structure besides the impact of Persian beliefs and morals (Naghizadeh, 2013).

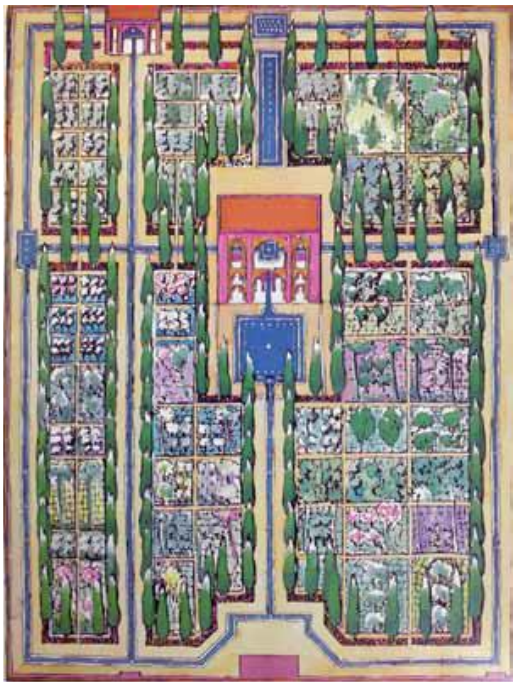

Figure 3.19. Persian Garden Complex, Unity, Hierarchy, Composition and Accomplished Incorporation in Open and Closed Spaces (Pirnia,1994).

The construction of the garden in Iran has a long history and has been of particular interest throughout the Islamic period, and the creation of gardens depends on the flow of water, creating a relaxing environment in summer heat with elements such as trees and grass. Considering that Iran is geographically located in the area that most of its area is desert and suffers from water shortages. In the past water supply systems had been scientifically solved and furthermore using this elaborate and artistic methods of this divine blessing has been used in Persian gardening. In the almost all of the gardens, water has an important presence, and in addition to its functional benefits and aesthetic interest, it has also benefited from the philosophical interest that, from a philosophical point of view, water refers to concepts such as purity, freshness and life. Persian garden is a combination of objective and sensual form. Water is a major element in shaping Iranian gardens with different aspects, as well as the role and relationship between water and human beings in Persian gardens (Karimi, 2017).

The garden has a significant place in Iranian culture and civilization from the ancient times and is one of the fundamental concepts of the social, cultural and natural issues of this land, which today is also present in various forms in the literature, architecture and urbanization of Iranians (Banimasoud, 2004).

In Iran, they refer to the gardens that were paradise (Yahaghi, 1990). Schultz also mentions the garden as a cultural landscape: “in the cultural landscape, natural forces have become romance and nature, and living reality emerges as a systematic process in which man participates” (Norberg-Schulz, 1980).

Figure 3.20. Persian Garden (Inspired by Timurid Miniatures -1,500 A.D.), by Monir & Mehdi Ghanbeigi (https://www.suzannezahr.com/monir-mehdi-ghanbeigi/persian-garden)

Building gardens in Iran, due to specific climatic conditions, is mainly influenced by the construction systems, especially the irrigation system, However, the intuitive and and aesthetic factors in the next steps have played a special role in the process of landscape planning and construction. The specific climatic and morphological characteristics of Iranian have led them to become more active in the field of garden architecture (Pourmand & Keshtkar Ghalati, 2011).

In Iranian garden, like Iranian architecture, there is nothing unnecessary; what is necessary and beautiful is presented and it is a manifestation of perfection. With all this, Persian garden is a beautiful, multifunctional and effective work of art (Abolqasemi, 1374). In conformity with the description of paradise in the Holy Quran, which is a verse of glory and goddess, Muslim architects, by virtue of these descriptions, have constructed gardens in this mortal world in order to bring about the immortality and immortality of the eternal world and paradise gardens (Ansari & Mahmoudinezhad, 2007). In fact, a garden is a combination of vocabulary, components, elements and patterns that help us to create opportunities for combining, integrating and constructing space (Moore & Mitchell, 1983)

In general, the garden is formed by combining factors such as land, water, plants, and so on. The land should be studied in terms of soil, water penetration and fertility. Water in garden, in addition to quality, also should have the character of continuity and permanence. Types of plants are manifestations of nature that depends on human manner and needs, and climatic conditions, organized in the gardens. Architecture is also a factor in the development of the garden and is in direct relation with the human life and thinking. Each component has qualitative and quantitative properties that are used to build and design the garden.

3.4.7.1 Physical Components of Iranian Gardens

ICHHTO - Cultural Heritage, Handicrafts and Tourism Organization of Iran - Provides an Iranian gardening management plan, which includes different sections, to create a general framework and to harmonize the strategies and objectives for the Iranian gardens. Also ICOMOS also offers a number of common points in this regard, which can be finalized and approved by the management plan for Persian Garden and its components. As it mentioned in the ICOMOS 2011 physical components of Iranian garden are categorized as follows:

- Surroundings (land, walls)
- Water and related elements
- Vegitation (plants,trees and shrubs)
- Geometry (chaharbagh, entrances, two axes)
- Architecture (pavilion)

The existence of Iranian gardens has always relied on the existence of a aqueduct systems (*kariz ,qanats*) or springs, which constantly flow in the garden. Typically, the water first enters the gardens, and after full garden irrigation, what is the

surplus, goes out of there for other uses. As a result, the area of the garden is in relation to the amount of water, and its area is always so large that it can irrigate the garden in a dehydration season. Water scarcity increases Iranian interest to watch it more. As a result, Iranian garden designers have always tried with different initiatives to keep the water in the garden as much as possible and by circulating and moving, show it more and more. for this purpose, by the use of waterfronts, pools, steams, waterfalls, and various fountains with deferent designs, sizes and water jumps rate, and the brilliant results have been made to make the garden more beautiful and create a variety of water sounds in the garden and a more vibrant display of water. The sounds of various fountains of Iranian gardens, while their design and volume form the garden's space, is nice. Particularly, in every water flowing and motion in steams, fountains and waterfalls is heard a special whisper of water.

- **Materialist use of water:** irrigation, axis strengthening, direction description, Reflection of space image, etc.

- **Aesthetical use of water:** sight enjoyment, audio enjoyment, sense of peace and comfort, reflection of sky depth on earth (symbol of sky), nostalgic color and image, etc.

In the past centuries, Iranians built gardens more in sloping lands, and by making a staircase in the direction of the water, a narrow stream of water, was quickly and loud. The main factor that always existed in Iran's gardens was the flow of water that is swept through in *chahar bagh* and low slope and spiral streams, and made the garden's air enjoyable and pleasant. In the ornamental gardens that connected to the ponds, the

kerbs were usually made with stone and brick. At the bottom of the fountain and most of the places where water was flowing, often boulders with white lacquer or with different designs, which gave a beautiful effect to the water wave. Iran's old gardens are often built in warm, dry and damp waters, and the reason for their construction in such areas is the existence of natural springs and *kariz.* The size of each garden depends on the volume and amount of water available for irrigation. Gardens of dry and desert cities have always been of great importance due to the hot weather in the summer, including Kashan gardens, such as the Fin Garden of Kashan, which is one of the most famous gardens of Safavid, Zandieh, Qajar, and also our time, has always been one of the most prominent gardens in Iran due to the abundance of Suleimani fountains, pools, numerous fountains and ancient trees, and historical heritage.

In Iranian gardens, to create a calm, cool and preserved environment, there are no options except of watering the entire garden, and these streams usually turned into ponds at intersections. Water from the streams, which often originated from the pond of pavilion, in regular locations, using a natural slope of the earth, with the repetition of the waterfalls, it flowed into the pools. Fountain, which was considered one of the most essential elements of gardening, was mostly constructed in front of the garden pavilion and its main dimension was along the length of the building and in rectangular, square, polygonal and circular shapes. Sometimes, inside the pavilion of the old gardens, there was also a fountain that it called *hozkhaneh* (wind catchers led wind by some special channels over the pond that is full of water and the evaporation happens. In fact water and evaporation used to make the atmosphere cooler. This place that is called *hozkhaneh* or *tabestanneshin,* is cool to live in hot-dry summer.) (Eirajia

& Akbari Namdar, 2011). The residents of the garden relaxed alongside the water in the hot summer days, especially at noon.

Figure 3.21. Fin Garden in Kashan (Dashti, 2013)

3.5 Summary

Water is considered as the Origin of (nature) life and also fountainhead of civilizations. It plays an important role in attracting people, and the river bank is the bedrock of the emergence and growth of many ancient cultures and past civilizations. In Iran, where the river has been flowing, it has been expanding rapidly and accelerating. In ancient Iran, water was a very valuable assest and a sign of purity and refreshment. Water is not only a functional addition but also is an integral part of architecture, and could form the landscape aesthetics, or giving life to structures. Use of water in gardens creates different effects and the existence of Iranian gardens has always relied on the existence of a aqueduct systems. From aesthetic point of view, with emphasis on visual axes, water in gardens presents the beautiful reflection of the unique architecture of the surrounding buildings. In practical way it was used for symbolizing external purification, as it is thought to create spiritualy a ritual contact between user and the architecture itself. The basis of Persian garden irrigation, which originates from the Quran, is derived from the geometric form of the Chahar Bagh. Symbolic meaning of water could be seen in Persian gardens, but it also used as a functional element for

cooling the air and nourish the shading plants, and also the area of the garden is in relation to the amount of water.

As stated, the Iranian garden is a symbol of Iranian architecture, especially a symbol of the urban spaces of the Safavid era, while water is recognized as one of the most influential elements of the Iranian garden.

Now, one has to see how and to what extent this element has influenced urban planning and urban spaces of that era. In the following chapter, we will discuss this issue through selective samples, and analyze one of the most prominent in the Safavid era.

Chapter 4

WATER RELATED URBAN SPACES THAT SHAPED THE URBAN PLANNING OF ISFAHAN DURING THE SAFAVID ERA, AND SOME SELECTED CASES

إِنَّ اللَّهَ يُدْخِلُ الَّذِينَ آمَنُوا وَعَمِلُوا الصَّالِحَاتِ جَنَّاتٍ تَجْرِي مِن تَحْتِهَا الْأَنْهَارُ يُحَلَّوْنَ فِيهَا مِنْ أَسَاوِرَ مِن ذَهَبٍ وَلُؤْلُؤًا ۖ وَلِبَاسُهُمْ فِيهَا حَرِيرٌ

Looking at the garden, refers to Surah Al-Rahman "and in the gardens underneath them are flowing waters." and Surah Al-Hajj: 23, May God bring in those who believe and do good deeds in gardens that flow through their trees. And since the gardens are originally created in the warm environment, existing water in the garden can also be a symbol of the soul.

Belongingness to something is a basic human need. This requires the formation of social groups and activities in which people regard each other as belonging to each other and thus support each other. In this group, people are trying to put the group in their best interests. At this time, group beliefs have grown and the sense of identity changes from "me" to "us." Social identity theory was developed in 1979 by Tajfel and Turner. Symbolism has been used in Safavid architecture of Iran. The symbolic aspect of the architecture of this era, especially in the architecture of public buildings, is often associated with signs of a new nation and identity in the Muslim world. (Mokhtarshahi Sani, 2009).

The search for an ideal community or utopia is one of the exciting topics of literature and art in Iranian culture, which is called the “utopia of Islamic philosophy” and is one

of the pillars of Shi'ite political philosophy and has been of particular interest to Iranian scholars. The Safavids, relying on Shi'i teachings, after centuries of silence, re-raised the flag of a new empire in Iran, and, with the promotion of Shiism, sought to create greater integrity in their realm. Isfahan, the new capital of Shah Abbas the Great, also reflects the teachings of Shia political philosophy through Chahar Bagh's geometry, the eternal format of the atmosphere of art and architecture in Iran. As with the new Isfahan scheme, the utopia, the longtime dream of the great thinkers of this border, was believed to have been realized (Kalhor, 2015).

The study of the geographical and climatic conditions of each region and its impact on the urban spaces of its cities are one of the most important historical issues. As the city of Isfahan has a special architecture due to its location in warm and dry areas, this city was considered by the Safavid rulers more appropriate for administration. Thus they transferred the capital city from Qazvin to Isfahan, and its historical monuments and important buildings were renoavated to suit the climatic conditions of this part of the country. The results of this research indicate that in the study of the condition of the cities of arid regions, including the city of Isfahan, under any circumstances, have their texture, which consists of public streets and public gardens and domestic units, strongly affected by climatic conditions. The urban space of the city of Isfahan during the Safavid period was perfectly in line with the climate and the conditions of their environment, and it was usually used to protect the tissues of houses, markets, mosques, all spaces, in a very compact manner, and prevented the entry of undesirable winds and direct solar radiation. Also, the texture of passages in Isfahan city, as well as other physical elements, was most logically influenced by environmental factors, especially climates (Bayati & Miladi, 2018).

The formation of the Safavid government in the history of Iran is important in several respects. After the advent of Islam, this land lasted for two centuries under the control of the Umayyad and Abbasid Caliphs. After the division of the Abbasid caliphs into the territories of the provinces of Iran, they were subordinated to independent local rulers during the domination of the Seljuk Turks of the Timurid and Majorities of Qara-Qiyonglu (Karakoyunlu). This land has up and downs through its history which of course will result with a variety of culture and cultural heritage. In the nineteenth century, the Ottoman Empire also dominated the Islamic world, including Iran, and apparently did not have a serious impediment to it. But the advent of the Safavid government changed this situation and a national government was established on the basis that not only the territory of the country was placed under a single government, but also because of the recognition of the Shi'a religion during the time of Shah Isma'il Safavi, the national and political unification in Iran was realized. In this period, due to the proximity of Tabriz to the Ottoman border and the threats posed by its expansionism, the capital of the country moved from Tabriz to Qazvin. At this time, Shah Abbas sometimes went to Isfahan to expand, travel, and hunt, and at that time he saw the characteristics of the city. The position of the city which seemed to promise for a more secure to set up his palace and keep the control of his country as well as the beautiful view of the natural flowbed of the water of the Zayanderud River, and its dug canals (*madi*) which were separated from the river and flowing to every side, encourage him to decide to settle into the city of Isfahan (Torkaman, 1971). And eventually Isfahan gave the priviledge position to be the capital city of Safavid State. This event has had an important role in the history and culture of the country as well as in its political fate. Also, the city of Isfahan has been a valuable place in the urban and urban system of the country since then.

Pierre Loti writes in his travelogue: “As Shiraz is the city of Karim Khan, Isfahan should also be considered the city of Shah Abbas. Shah Abbas decided to deploy his court in Isfahan, and this ancient city, that destroyed by the terrible terror of Timur in past, would grew up in such a way that it has been admire the whole world. The new and advanced Isfahan foundation of Shah Abbas was in terms of plan beyond the expectations of the thoughts of that time” (Loti, 2010).

In his travelogue, Uruch Beg considers the geographical location of Isfahan to have been a major factor in the choice as the capital, He also writes that the city's location was more favorable in terms of centrality as a capital city, as it had vast and fertile areas around Isfahan, and was well suited to feed many communities that flowed to capital (Beg, 1926).

In his travelogue, Pietro Della Valle writes: “The city of Isfahan has a greater ability to show about the majestic Shah Abbas, it could give its natural location and environment, which was well-developed and communicative” (Della Valle, 2005). After the move of the capital to the city of Isfahan, it reached a major position. Moving of the capital to Isfahan reflects the progress of art and architecture at that time. The caravanserai, cisterns [*Ab Anbar: āb anbār*], mosques, etc ... are evidents of the artistic spelendor of Iran at those times (Taheri, 2009).

The construction of gardens as a part of urban development plan, and the construction of a symbolic Islamic city based on the allegory of paradise is described in the Quran. Contrary to the past works of Iran in building mansions and palaces of great magnitude, Isfahan architecrural style that is a combination of architecture and gardening, has achieved beauty and grandeur through the expansion of the Chahar Bagh gardens on

the surface along with human-scale proportions. The expansion of the Isfahan Garden City at its level is an allegory of the expansion of paradise in the level of the paradise image that has been mentioned in the Hadith of Hazrat Ali in the commentary of verse 44 of Surah al-Hajr (Naghizadeh, 2008).

Among the other factors that caused Shah's attention to the city of Isfahan was the Zayanderud River. English traveller Chardin writes that: “There are not many gardens in Qazvin like other cities, because the land is dry. Only a small river passes in Qazvin.“ (Chardin, 2010).

According to several references, Safavid era was the golden age for Persian gardens and some of the best gardens were constructed in Isfahan. Gardens have played a significant role in the beauty of this city (Haghighatbin & Bostani, 2016). One can see the example of the garden city in Isfahan, the Chaharbagh and the alleys that extend in different directions, and this was one of the principles of urban design. In ancient Iran, the architecture moves toward the water and relaxes beside it. But in the Islamic era, water is related to architecture, and architects consciously try to dominate the nature and discipline it, and it is the physical laws and behavior of water, and the understanding of the role and the parable and its relation to the human being into the water related architecture. Shah Abbas and Sheikh Bahaei [who was was an arab Shia Islamic philosopher, scholar, architect, astronomer, mathematician and poet who lived in the Safavid Iran (Meisami & Starkey, 1998; Kohlberg, 1988), architectural and engineering designs included the Naqsh-e Jahan Square and Charbagh Avenue in Isfahan are attributed to him (Kheirabadi, 2000)], provided a sustainable agriculture for the new capital, with the creation of full irrigation and communication networks. From this time on, we are witnessing the progress of Isfahan in various fields (Savory,

2007). Isfahan planning after the movement of the Safavid capital, changed and shaped as a *chahar bagh* (persian garden) surrounded the Zayanderud river and its canals and *madies* (water networks / aqueduct system).

Shah Abbas built markets [*bazaar*] and walking paths on the both sides of the Chaharbagh, and in the middle of was a stream, which had a pool at a certain distance. There were fountains in this stream, and along with them, there were trees that threw shadows in summer heat (Jackson & Lockhart, 2006).

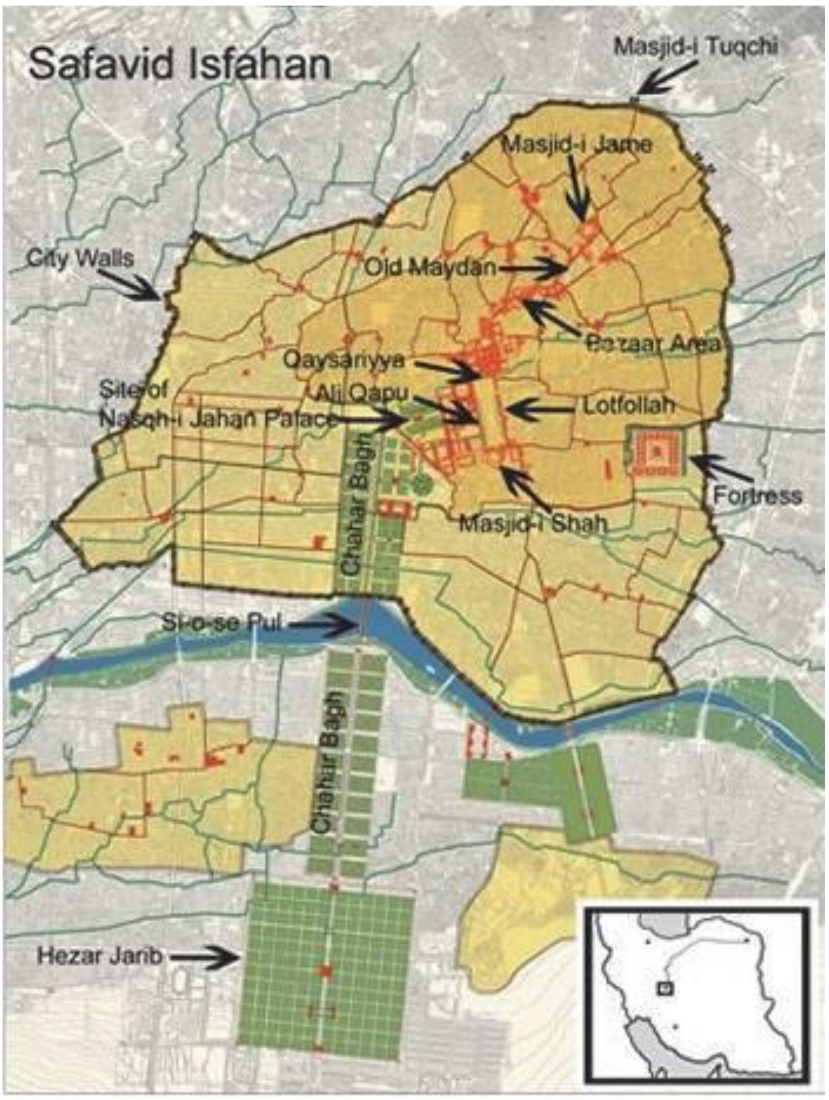

Figure 4.1. Development of Isfahan During Safavid Period into a Garden City (Haghighatbin, 2010)

4.1 A Brief History of Isfahan

Different factors and forces influence the evolution and physical transformation of cities. Both the city's main structure and the city's texture are influenced by factors such as time forces, economic and financial forces, political and managerial forces, and social and cultural forces (Soltani & Namdarian, 2010). In some cities, the geological movements and textures have caused this organic textures. But in Isfahan, the skeletons and texture of the city have an interesting story. It originates near the Zayanderud river and adapts well to the needs of the time. The importance of the role of this river is inseparable in the development of Isfahan, but the discussion is about how this role is shaped. The human wisdom of this area over time has led to the creation of *madies* that helped them to enable a sustainable human life and agriculture, and many scholars have pointed to this issue (Omranipour & Mohammadmoradi, 2011).

In all these respects, the *madies* network was best illustrated in various roles such as facilitating livelihood, facilitating settlement and flourishing urbanization. Research on the role of *madies* in the city of Isfahan has all focused on their impact on the garden construction (Alemi, 2011).

4.1.1 Use of Water Sources in Isfahan Before Safavid

The formation of the primary core of the city of Isfahan before the Islamic period began to interact with agricultural biological points at the Zayanderud border with the biological points located in the north of the region, which were mostly based on craft and trade, and in the early Islamic periods it accelerated and went so far as to be the capital city of the Al-Boya and Seljuk periods, with the main urban structures

consisting of the bazaar, the *maidan* (square), the mosque and other government buildings.

Isfahan originally consisted of three main cores, and the main pattern of activities of the people of Isfahan was gardening or farming for fruits and flowers. They were mostly on the margin of the Zayanderud River. During the last few years, people learned to use Zayandeh rood to irrigate these gardens, and thus *madies* were formed. This residential activity pattern may be an answer to the question of why the primary core of Isfahan have not formed alongside this river and have been created with distance. Providing drinking water through wells has been far easier than providing water for gardens, and has played a key role in livelihood of the residents as refered to by Naser Khosrow Ghobadiyani. Therefore, residents preferred to provide the water for their need and their accommodation, through the well and Zayanderud, which has abundant water to be used for the irrigation of the gardens and agriculture fields. In addition, the river was not permanent and in some seasons it was dry or low (Ghobadiyani, 2003) and (Shafaghi, 2002).

4.1.2 The Origin of the Urban Planning of Isfahan

Because of the gradient of the earth, and the proper soil material, the primary center of Isfahan were formed in the north of Zayanderud, and the construction of *madies* provided the necessary water for agricultural land. In the dry climate of Iran, this river was a unique opportunity, and its adjacent inhabitants were deployed to maximize the use of this river and maximize its livelihoods based on agriculture. One of the reasons for the development of Isfahan to the south has been less pollution of the air and water. From the review of historical texts it can be concluded that the *madies* was not used only for agricultural, but also it was a certain *madies* that had supplied water to the

public buildings of cities and settlements, and Abbasid Caliphs set up their palace next to the Farsan stream (Shafaghi, 2002).

The important monuments remaining from the pre-Safavid periods, as well as the signs of the past centuries, indicate that the life and activity of public buildings has been dependent on the *madies* (water) network. From this we can conclude that for the development of the city of Isfahan, some *madies* have served as guidance, and the construction and location of new public buildings has been based on their path. So the spatial organization of a city, all of which is the site of the public buildings of a city, and the historical routes, have been influenced by the *madies* (water) flows (Hosseini Abari, 2009).

4.1.3 Space Organization of Isfahan in the Safavid Era

Upon the decision of Shah Abbas to set up his government next to the old city's core, the new Safavid palace and government buildings were built at the site of the Naghsh-e Jahan, the old garden, while being in the midst of the historic city of Isfahan, had a great extent that opened the hands of the Shah to create the desired center, also *madies* that provided the water of this complex (Babaie et al., 2011).

With the selection of Isfahan as the capital, the city's population has risen up (Ayatollah Zadeh Shirazi, 2002). Increasing population forces Safavid kings to think about the urgent need for the housing of this population and water regulation and distribution required a strategic look to the future of Isfahan, developments occuring thus inspired the new Safavid master plan. The Shah's awareness of the state of the Zayanderud, and its lack of continuity or lack of water makes them consider how to change the route of the river from its source. In several steps, Shah Tahmasb and Shah

Abbas I decide to transfer a part of the abundant water source that goes to the Karun River to be directed to this river (Torkaman, 1971).

At this time, Shah Abbas takes two important decision to change the fate of Isfahan to this day. First, extending the boundaries for the use of *chaharbagh* in the residential neighborhoods, and the second decision, supplying enough water for these alternative gardens and new neighborhoods through new *madies* and the construction of aqueducts. In this new applications, gardens change from private to public use.

According to Zarei and Soltanmoradi (2015), one of the Safavid measures in the field of water management in Isfahan have been arranged accordingly:

- Zayanderood River Management
- Construction of various structures such as dam, canals, bridges, cisterns and pools.
- Implementing management procedures and scheduling for fair water distribution
- Urban planning to control water level of the rivers against the the risk of floodings

This urban structure, which is undoubtedly one of the glorious examples of Iranian organic Islamic cities, was followed by successive ups and downs until the peak of its flourishing and evolution in the Safavid period, which again became the capital city of Isfahan, in the form of a pre-planned and exquisitely extended form, with the use of a city joint (Naghsh-e Jahan complex and Safavid government office), through the axis of the four Abbasid gardens, an unprecedented expansion on the urban scale of that time to the south of the Zayanderud River and the Garden of Hezar Jerib was caused

and based on this. The basis of an organized city with a balanced, magnificent program, which is undoubtedly brought Isfahan not only as an example for being a brilliant and unparalleled city among Islamic cities of Iran, but in the history of urbanization of the world. Its fame became so high that Isfahan was rightly renowned at least in the half of the world.

The Safavid era brought security, prosperity and support to Iran's arts and architecture and the ambitious urban expansions. Therefore, the city of Isfahan can be considered as an avant-garde event of urban development in its time that creates contemporary values. This city can be considered a masterpiece of Islamic heritage, since the morphological integrity of urban development before the city's design, and its structure, was well tolerated. Its traditional bazaar is an impartible from urban morphology because of architectural and socio-economic values. For instance, in Naghsh-e Jahan Maidan (Square) which has the meaning of its name as “Image of the World”, currently called as Meidan Emam, of Isfahan, due to the special architecture, a sense of place and harmonious urban space have been created (Oliveria et al., 2014).

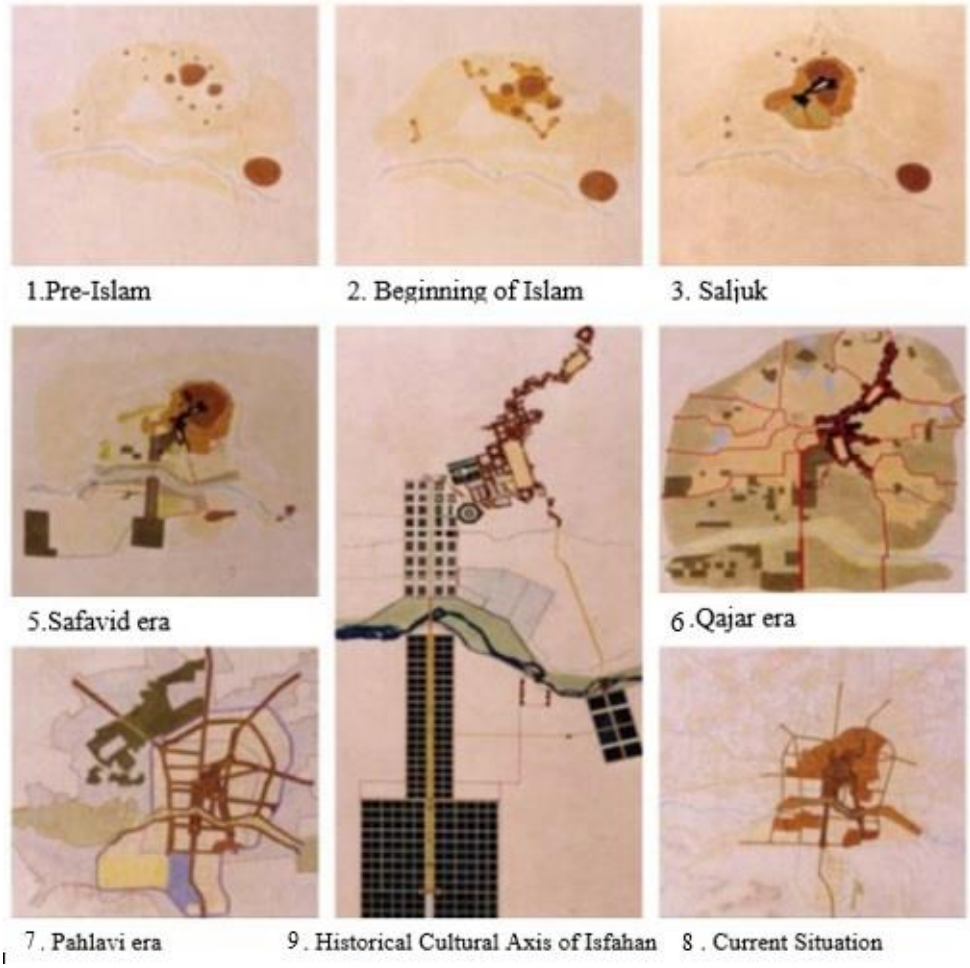

Figure 4.2. The Process of Formation and Development of the City of Isfahan (Mirmiran, 2011)

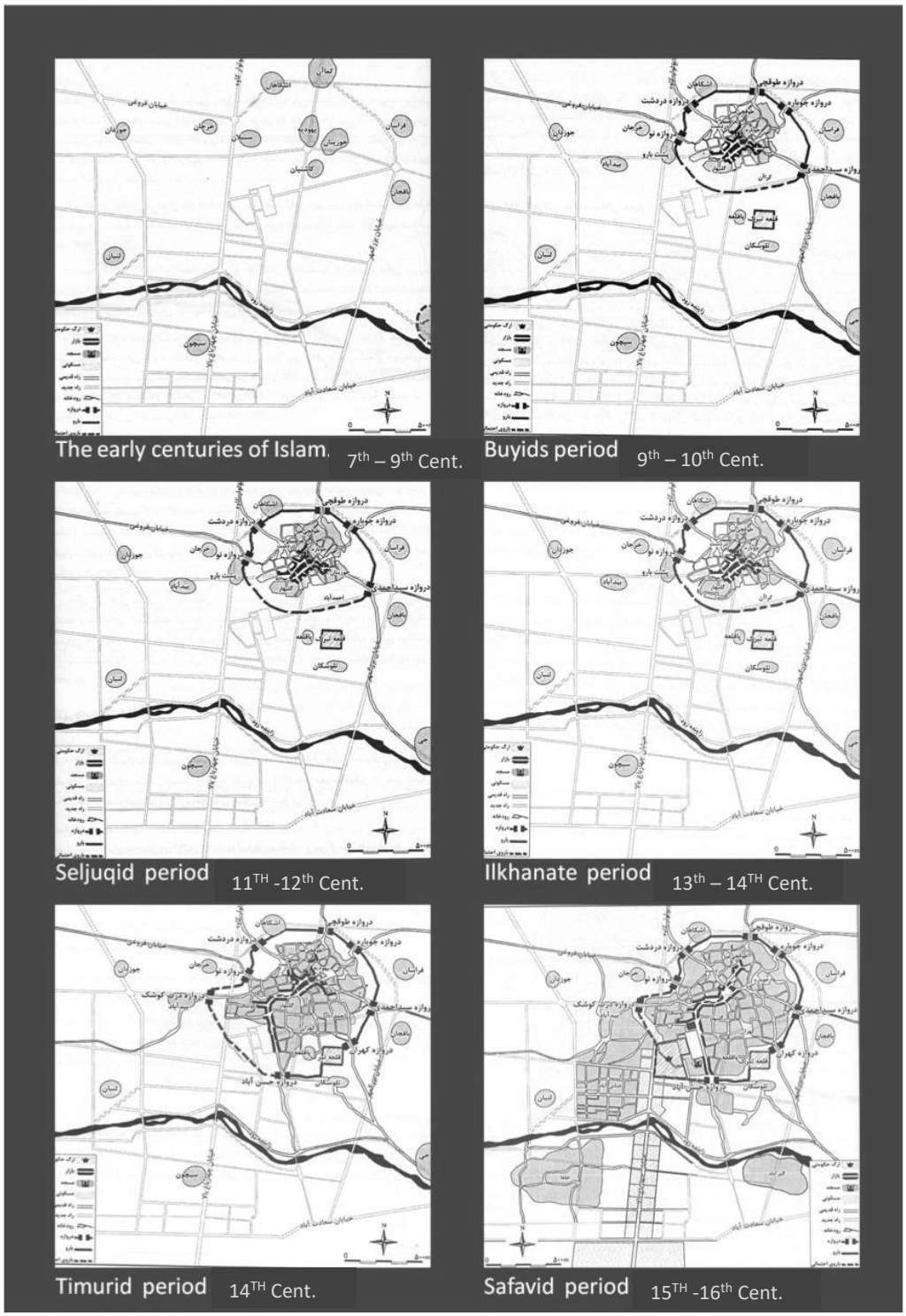

Figure 4.3. Isfahan Urban Development According to current Streets position (Pakzad, 2011)

Figure 4.4. Perspective of the City of Isfahan and Historical Center of the City During the Safavid Period (drown by Jean-Claude Gallowin, architect, archaeologist and researcher at the University of Bordeaux in France)

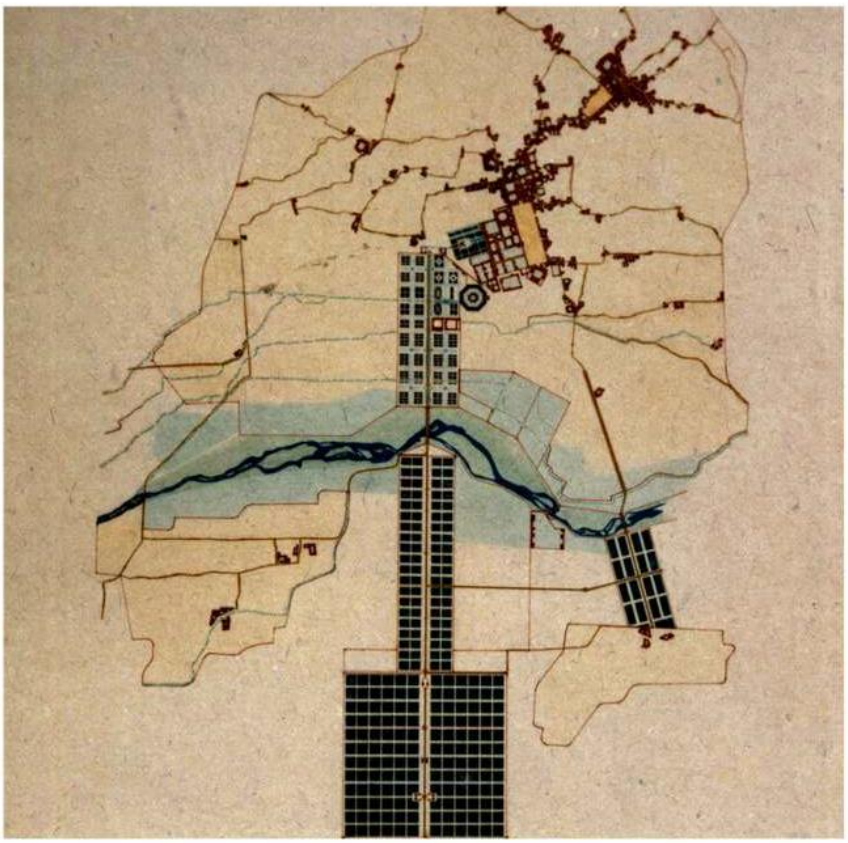

Figure 4.5. The Structure of the City of Isfahan and the Cultural and Historical Axis of the City During the Safavid Period (Mirmiran, 2011)

4.1.3.1 The Role of Water in the Formation of the Urban Planning of Safavid Isfahan

As it was said, water as a spiritual and holy element, as well as its role as a source of life, in the beliefs of the Persians before and after Islam, always had been the main factor in the displacement and shaping of the spaces, and especially the Iranian Safavid gardens. Also as it is mentioned in previous chapters, water as a vital element for life and hygienic purposes in human life as well as in Islamic religion, Iranian architects had an important contirubution for the developments of architectural elements such for the process of storage and supplying water to the settlements, mainly aqueduct systems, hammams, fountains for the mosques and public stuares, bridges, gardens and so on. This important element played its rules as an introverted element.

When Isfahan recognized itself at the height of its welfare during the Safavid era, the market became the connecting point of the old and new city, and ensured the prosperity and survival of the city (Pourjafar, 2014).

Bazaar can be considered as the primary movement system of the city, and the residential areas and *madi* are ranked second and third. Walking paths are like the veins that feed the city's backbone, and schools, baths, cafes, bakeries, warehouses and handicraft stores, like vital organs, are close to each other. (Shea, 1995).

The Chaharbagh boulevard is known as a popular garden, which consists of four pieces divided by waterways or paths with a cruciform plan. The length of the main boulevard is 1650 meters, which consists of four quadrangular gardens located along the north-south axis that extrude to southwards. Each quadrangle consists of two *maidans* (squares) and two rectangles separated by paths, They made a single boulevard with

promenade in center that is flanked by axial garden parts. The gardens have become into roadways, and on either side trees were planted. Water channel with cascades were running along the centre of the promenade, but now there are just small streams, light posts and circular flower beds. The water channel also acts as a natural axis to further expand the city to the south. (Blake, 1999; Blunt, 1966; Pope, 1977; Katouzian, 1986; Alemi, 1986).

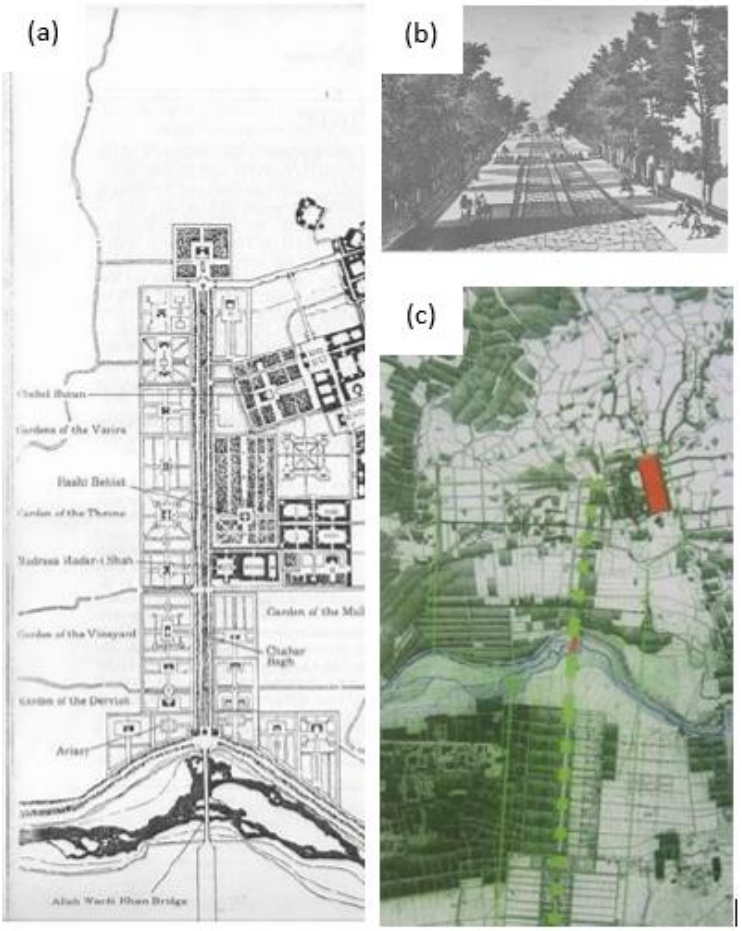

Figure 4.6. (a) Chaharbagh Boulevard at Seventeenth Century (b) Chaharbagh by J. Chardin, 1965 (Irani Behbahani and Khosravi, 2011) (c) Plan of Chaharbagh-Four Hundred Years Ago (Mohamadzadeh Goodini et al., 2015)

The Zayanderud River, the heart of the city of Isfahan, is known as the natural boundary of this city, which guided the natural element of urbanization during the Safavid period (Pourmoghaddas, 2006).

On the way to the southern part of the river, there are several bridges built at different times. The river has always provided the city's sustainable water supply. Although until the Safavid era, the river had not little impact on Isfahan's social-commercial ties, however, during the Safavid period, the Zayanderud River and its bridges played an important role in directing business activities throughout the city and also celebrations were conducted on it (Agha Ebrahimi Samani, Salehi, Irani Behbahani & Jafari 2012).

Combined natural axis was creating by river as main element in the city, which has been driving the urbanization of Isfahan over the past four centuries. This is the axis of the modern expansion of the Isfahan historical framework to the south, which includes Naqsh-e-Jahan *Maidan* (square), Chahar-Bagh Promenade, Si-o-se-pol Bridge, a nd Chahar-Bagh Bala boulevard (Habibi, 2008). This axis of the Zayandeh River and nature connects to the city life and at the end it reaches the beautiful agricultural land and *Gavkhouni* salt marsh.

Safavid ambitious plans set the city of Isfahan forward on the path to urban expansion, changing existing physical patterns and related social and spatial relationship. Although this development was considered a successful urban development plan, in the twentieth century and during Pahlavi era, severe criticisms were made about Isfahan's modernization programs (Sarraf, 2010).

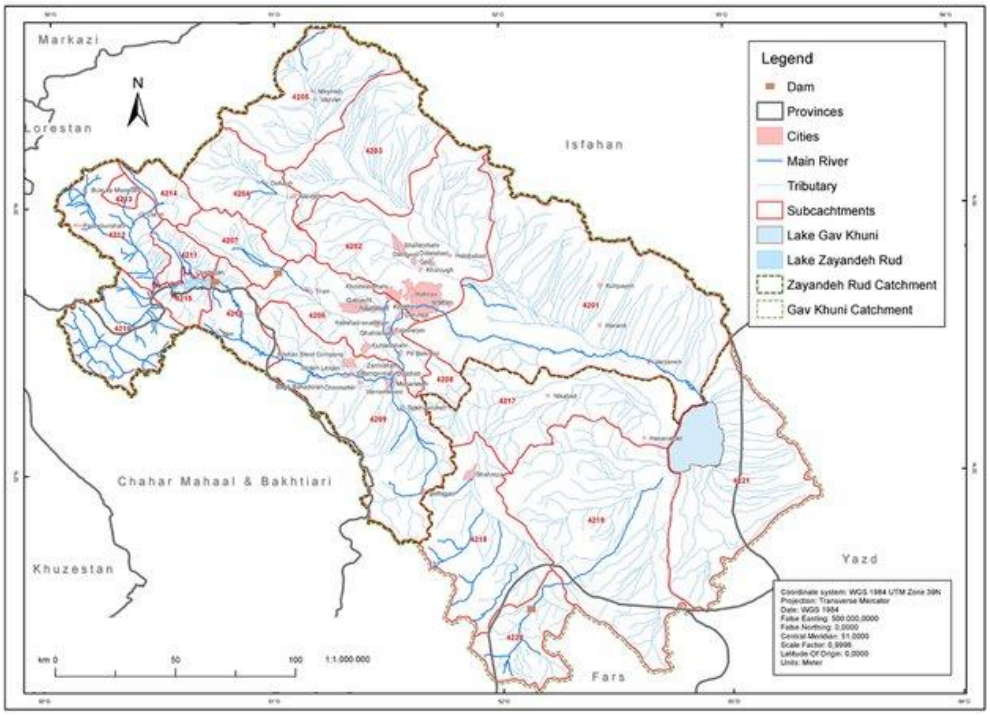

Figure 4.7. Zayanderud Basin and Hydrological Sub Catchments (DHI-WASY)

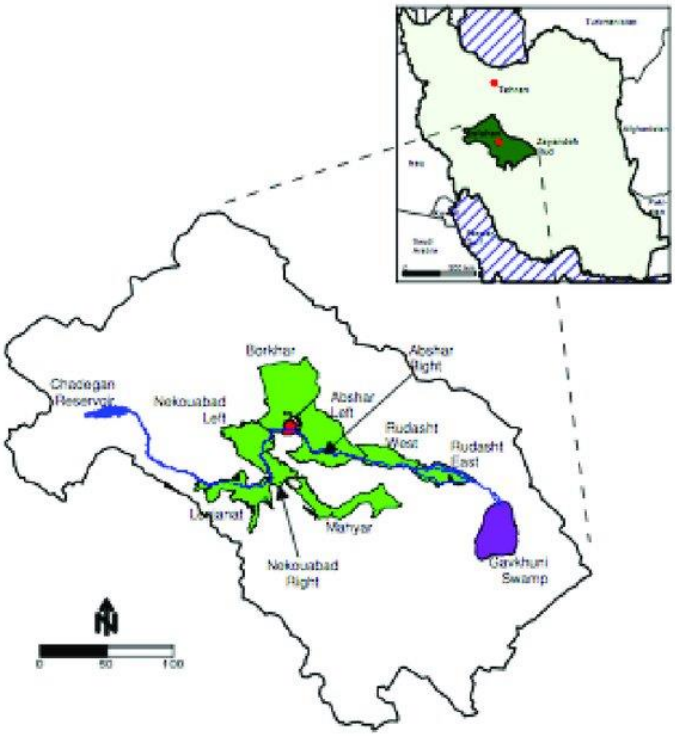

Figure 4.8. Main Irrigation Networks along the Zayanderud (Droogers & Miranzadeh 2000)

4.1.4 School of Isfahan Monuments

Some monuments from School of Isfahan are given below to recall the great contribution of Safavid architecture to the architectural heritage of Iran:

- Chehel Sotoun Palace in Qazvin (created between 1524 to 1576 A.D.)
- Ali Qapu Palace in Qazvin (created between 1524 to 1576 A.D.)
- Safiabad Palace in Behshahr, Mazandaran (created between 1587 to 1629 A.D.)
- Harun Velayat Mosque in Isfahan (created between 1501 to 1524)
- Naqsh-e Jahan Maidan (Square) in Isfahan (created about 1632 A.D.)
- Chehel Sotoun Palace in Isfahan (created between 1587 to 1666 A.D.)
- Hasht Behesht Palace in Isfahan (created between 1666 to 1694)
- Madar Shah or Isfahan Chaharbagh School in Isfahan (created between 1694 to 1722 A.D.)
- Hakim Mosque of Isfahan (created between 1642 to 1666 A.D.)
- Ashraf Hall in Isfahan (created between 1642 to 1694 A.D.)
- Ganjali Khan Complex in Kerman (created between 1596 to 1624 A.D.)
- Allah Verdi Khan or Si-o-se-pol Bridge in Isfahan (created between 1629 to 1632 A.D.)
- Khaju Bridge in Isfahn (created between 1642 to 1666 A.D.)
- Fin Garden of Kashan (renovated between 1587 to 1666 A.D.)

4.1.4.1 Case Study

It has been realized that water has played a significant role in the architecture and urban planning in history, on the other hand, in some religions, cultures and architectural styles, more importance has been given to the role of water in the formation of settlements and buildings.

Considering that the most prominent water-based urban spaces can be found in the Islamic era and in Iran during the reign of the Safavids, the question now comes to mind, about the effect of water on Iranian Islamic architecture and also the meaning and the role of water in identity of Safavid architecture and urban spaces. But unfortunately, based on the searches, the results show that there is still a great deal of gap and flaw to show the significant impact of water element on Islamic urban planning, especially in Iran.

As a result, in this section, by selecting prominent examples of buildings and urban spaces related to water in the Safavid era, particulary in Isfahan, such as Naghsh-e Jahan square, Chehel Sotoun palace and garden and Chaharbagh boulevard, it is attempted to show the impact of the water element on urban spaces more clearly and practically.

Research methodology is qualitative - descriptive method, which after a brief review of case studies, the role of water in shaping the urban space and landscape planning will be analyzed for Chaharbagh boulevard. For this analysis, a comparison is made between features and common components of Iranian gardening and Chahar Bagh Boulevard.

When Shah Abbas transferred the capital to Isfahan, he founded one of the largest cities in the world. The city was enlarged around the great square. Naghsh-e Jahan *Maidan* (Square) in Iran is one example of Iranian garden, it is one of the rare urban spaces that is intact. This place even acted beyond in the scale of the city, and today it is accredit on a global scale (Tavasoli & Bonyadi, 1992; Petersen, 1999). It was built about in 1632 with dimensions of 510 meters length and 165 meters width. Naqsh-e Jahan *Maidan* (square) was designed and implemented as the city centre, in the southwest of the new capital of Iran, Isfahan, in the period of Shah Abbas I. The Naghsh-e Jahan *Maidan* (square) is in fact an enormous infinite garden with an open area in the middle of it, which once played *chovgan* (polo). And the bazaar with trees on both sides of the *maidan* (square) that now have streets and large canals of water around them. Naghsh-e Jahan is assumed to have been one of the largest square in the world. Shah Abbas linked the main components of Iranian culture in this field. The traditional and commercial purpose of the market can still be seen here. A place where people with their professional background and skills are involved in business (buying and selling). Shah Abbas watched the square from his own pavilion which is located in middle of the palace, a place reserved as a sign of the reign's power and rule (Hayati, Fazeli & Alipoor, 2016).

Figure 4.9. Sketch of Old Naghsh-e Jahan *Maidan* (Square) (IASP 2018 ISFAHAN http://iasp2018isfahan.com/about-isfahan/oldisfahan-imamsq2/, [24.03.2019])

Figure 4.10. Iranian Garden Plan of Naghsh-e Jahan *Maidan* (Square) (https://www.irandestination.com/naqsh-e-jahan-square-isfahan/) [10.05.2019]

Also Shah Mosque and Sheikh Lotfollah Mosque, two important and famous water related Safavid mosques, are located in this square garden. Sheikh Lotfollah Mosque was the private residence of the Shah's family. Its name was taken from the name of the father of one of the women of the Shah. It has a fantastic and different tiles. Calligraphic motifs of the panels contains surahs from Quran and Islamic logos the rays of light.

One of Safavid's greatest gardens is in the city center where is not far from the Naghsh-e Jahan Maidan (square). The name of the garden is Chehel Sotoun. This garden was built in the mid-seventeenth century as part of the development of the city of Isfahan. The name of the building is Chehel Sotoun (Forty Colonnades Palace), because the twenty columns in front of it, are reflected in the pond below. The area of the palace 67000 m2 that is built in the center, was constructed during Shah Abbas I era and was completed during Shah Abbas II era. Some historians, believe that this palace has been constructed on the ruins the time of an old building of Sasanian dynasty. Chehel Sotoun have been a gardens for fun since its inception, a place for celebrations and parties. The palace has never been inhabited. It can be thought of as a garden during its peak, with fresh water and fruit trees far away. In a cool place, the observers took away all the pleasures of the world, while at the same time adapting to the spiritual aspirations of Paradise, certainly it has affected guests. It's not only part of heaven's pleasures but also the power of its makers. The design of the palace should have astonished the guests. Its walls and ceilings are covered with magnificent and expensive mirrors from Venice.-As a magical and refreshing place, such greatness, unimaginable and splendor that every world explorer and turists calls it as the greatest buildings of the royal palace. (Ajand, 2008).

According to some historical sources, the main building originally planned with forty pillars that have been destroyed by fire and only twenty pillars are the rest of the material. Still there are traces of fire on the building's facades (Rafiei, 1973). Robert Byrone, the author of a book called *The Road to Oxiana*, an account of his travels to Persia and Afghanistan in 1933-4, remarked about Chehel Sotoun to have been covered with rugs and lit up with pyramids from lamps (Byrone, 1982).

Professor Jawad Rahmati, an expert on gardens in Isfahan, describes the background of the garden, and gives information for the date and purpose of its construction time. The Chehel Sotoun Gardens were built for the purpose of the general garden. The ceremonies and illuminations that King Abbas performed in the Chehel Sotoun mansion on the occasion of the celebrations and victories were performed. According to Shah Abbas's chronicler, when the garden was illuminated, the stars envied it. In the south and behind the garden there are two large ponds that once swam and play water game, but now there are pipes for irrigation. The characteristic of the Iranian garden is that it reduces the heat and humidity of the air and the sunshine of brutality that especially occurs in the summer, which is why along the main passes we see shaded trees and shrubs. On the outside, poplar trees and inside the greenery area, there were fruit trees. It is interesting that the gardens were open to public to celebrate great victories and to enjoy the magnificence of the garden.

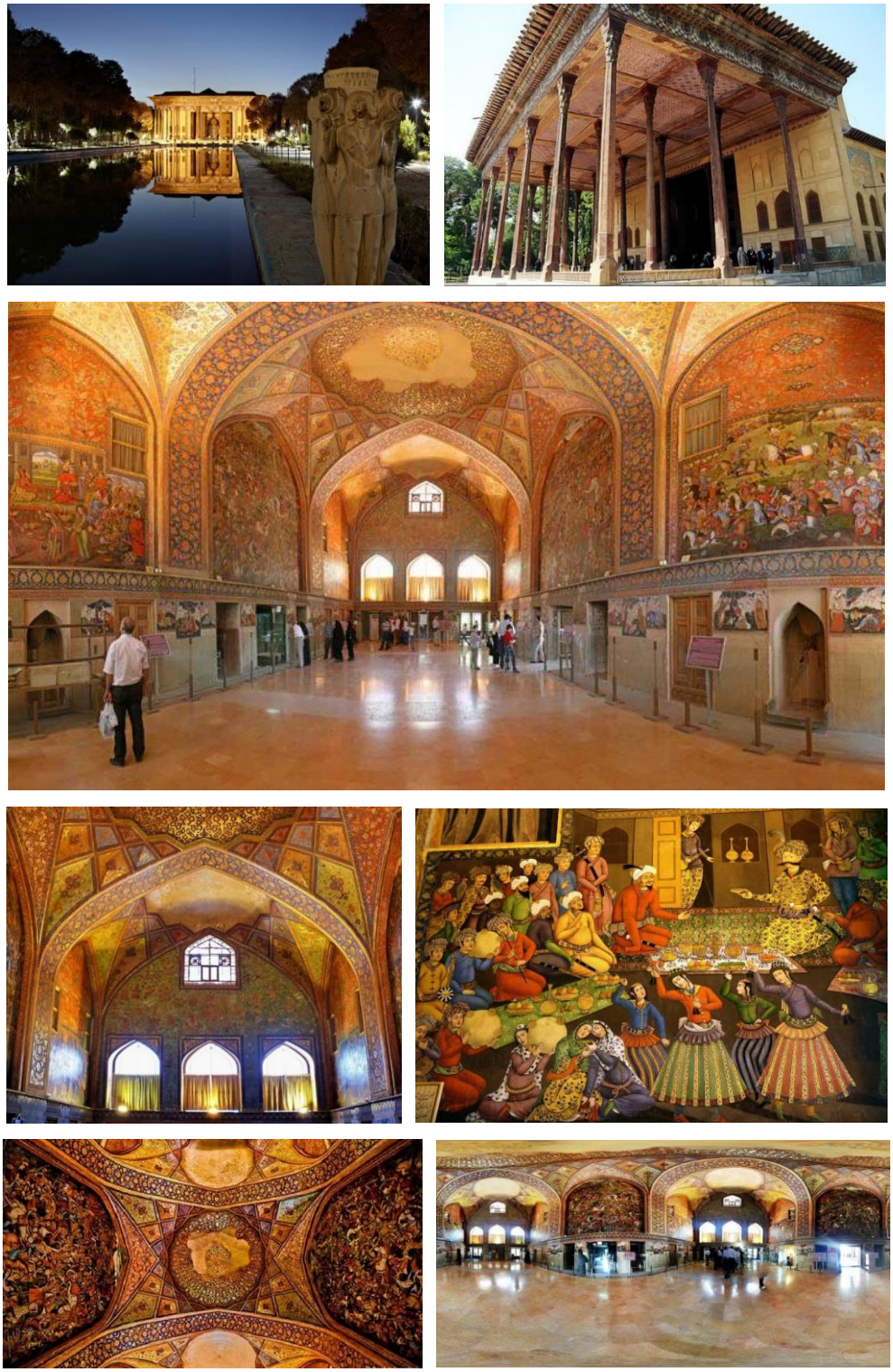

Figure 4.11. Chehel Sotoun Palace and Garden – Isfahan
(https://origiran.com/isfahan-chehel-sotun-palace/)

4.1.4.2 Chaharbagh Boulevard as an Indicator of the Axis of Isfahan Garden City

Garden City or *Baghshahr*, is one of the most favoured patterns of Iranian urban planning during the Safavid period. As it is mentioned before, Isfahan urban plan was according to this pattern. Shah Abbas spent his childhood in the city of Herat, which led him to consider such a design for Isfahan urban planning, based on the pattern of the Iranian garden that he recalled from his childhood memories related to Herat Garden City (Ansari, 2009). In this urban plan, there are some important axis that the formation and expansion of urbanization, as well as social, commercial, educational, tourism, residential, and so on, occur around them (Alemi, 2008) and (Chardin, 2010). One of the most important gardens in Isfahan is the Chaharbagh boulevard. This axis is the main road between the southern part of the Safavid *dolatkhane* (government parliament) and Hezar Jirib garden in the upper part of the city. All of the Iranian garden components have been used in this boulevard planning, such as water, greenery and etc.

According to Chardin, the number of pools on the street were seven. As it was mentioned in the history book of Alam Aray-e- Abbasi, in addition to the middle creek, there is a stream of water on the sides of the street (Torkaman, 1971). Della Valle points out that these pools have very beautiful fountains and are fed through the rocky streams flowing from the main big creek of the streets. Also, in the construction of this street, the mirroring is well visible on the two sides of the street. In brief, among the common features between gardens and main axes, in the two cities of Samarkand and Isfahan, the following can be mentioned (Gholipour & Heydar Nattaj, 2016):

- Garden City
- Garden as a center-point.

- The use of Mashgar Street on the garden path.
- The use of the trans-human scale in the hallways.
- The most recent gardens, the garden with a central slope.
- Creating beautiful watermarks.
- Applying the gardens as a venue for official celebrations.
- The presence of walls around with wings.
- The high degree of some of the *ghaji* in both periods like the Hezar Jarib Garden of Isfahan.
- The presence of water and walking paths lined with sitting elements.
- The existence of various commercial, tourism, government and residential activities in the urban dimension

4.1.4.3 Chaharbagh Boulevard, Isfahan, that Shows all Common Structural Features of the Iranian Gardens

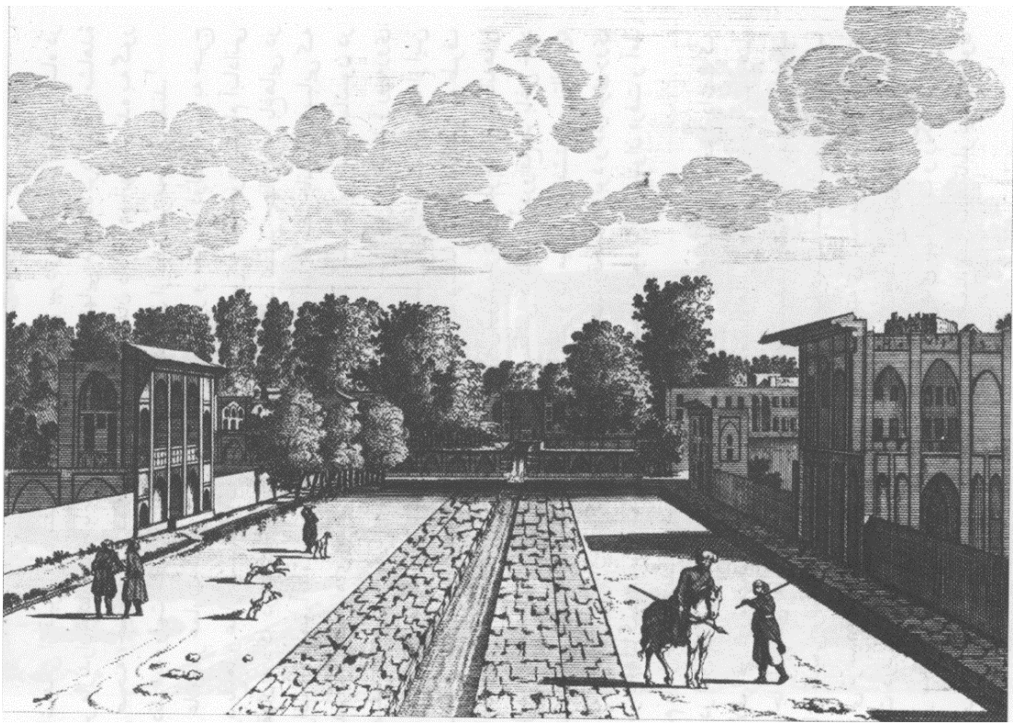

Figure 4.12. Chaharbagh Depicted by Chardin – Seventeenth Cent.

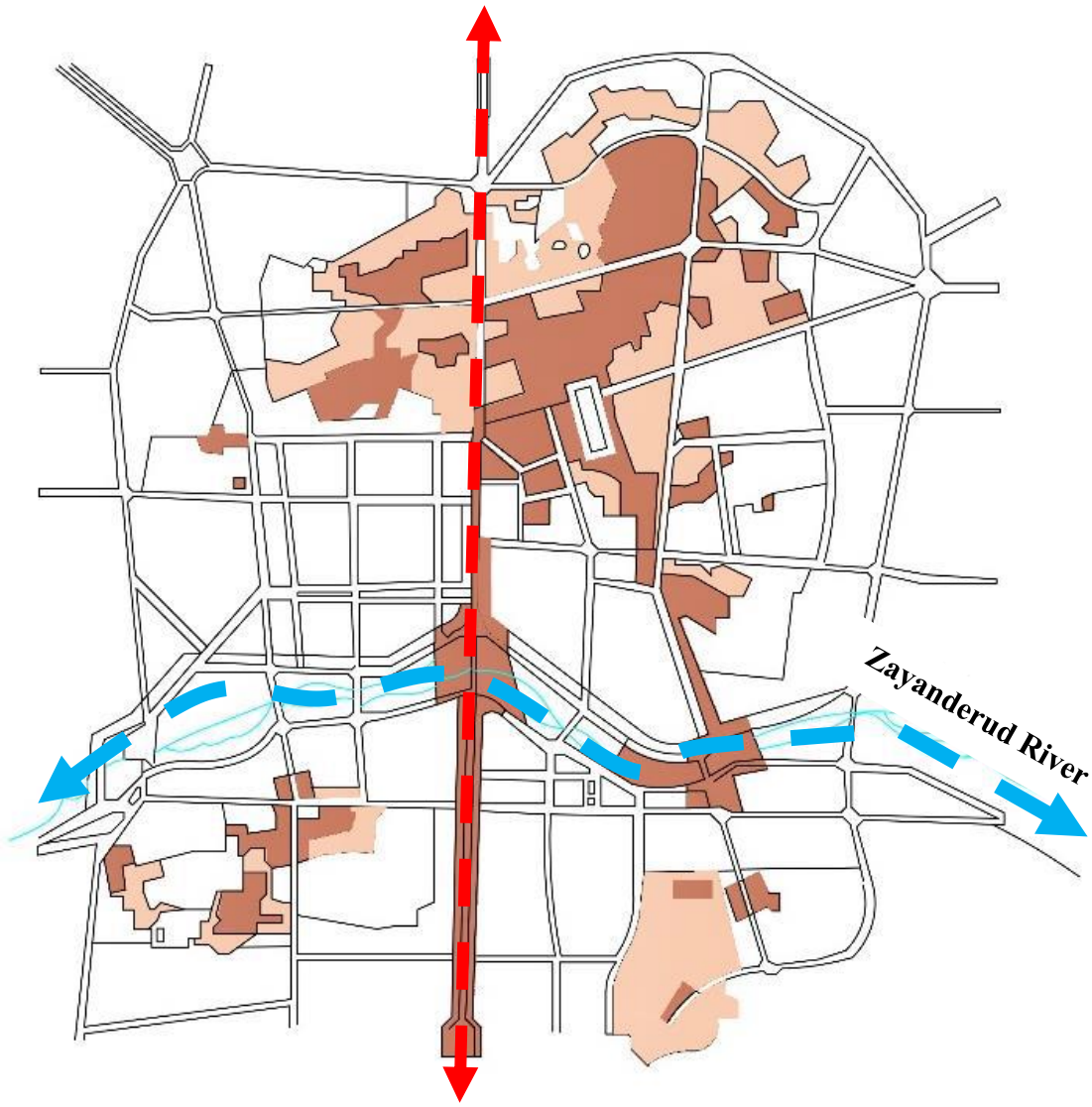

Figure 4.13. Safavid Isfahan Structure Located on Two Main Axes/ 1.Chaharbagh Boulevard 2. Zayanderud Riverer (Ahmadi, 2016)

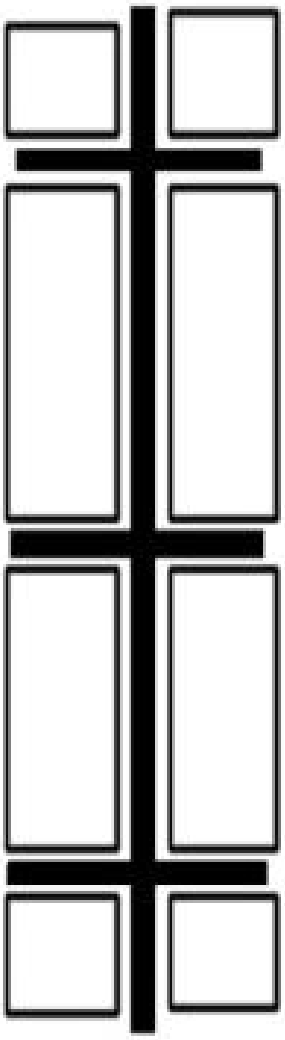

Figure 4.14. The Main Axis of Iranian Gardens (Mohammadzade & Nouri, 2017)

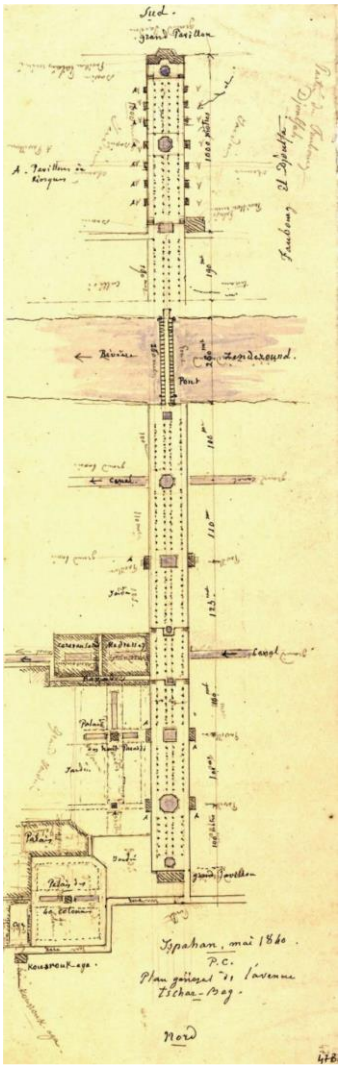

Figure 4.15. Safavid Isfahan – Chaharbagh Boulevard. by Pascal Coste in 1839-1841 (http://www.middleeastgarden.com /garden/english/?page=photo&refe

- Grid system contained straight line in the main axis of the garden, and it is divided into different sections with specific spans.

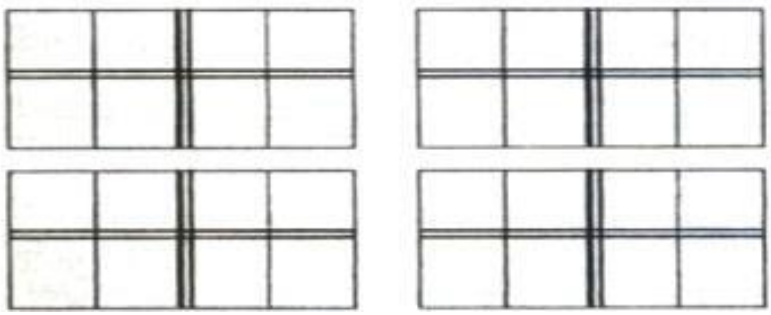

Figure 4.16. Iranian Garden Division (Mohammadzade & Nouri, 2017)

Figure 4.17. Safavid Isfahan – Division of Chaharbagh Boulevard Gardens (Gholipour & Heydar Nattaj, 2016)

- The garden usualy is divided into four main parts, where from each part again a four section lawns will be formed.

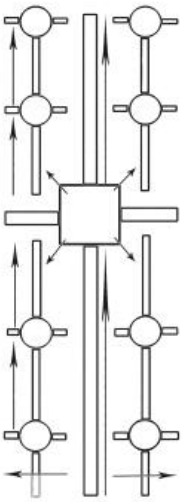

Figure 4.18. Iranian Garden Pools and Creeks (Streams) Positions (Mohammadzade & Nouri, 2017)

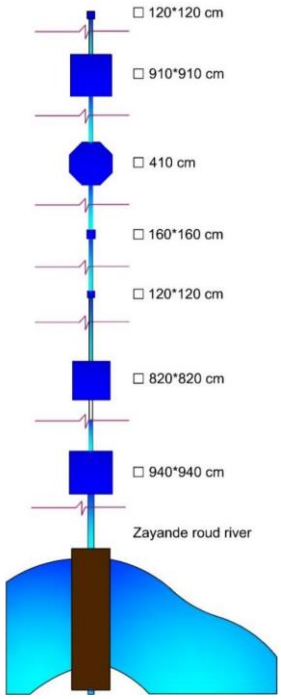

Figure 4.19. Safavid Isfahan – Water Positions in Chaharbagh Boulevard (Ahmadi, 2016)

- In Persian garden as well as Chaharbagh Boulevard in Isfahan, a central pool is storing water from which water flows to different streams. In a natural way these streams are designed on a grid system in the area to create separate divisions.

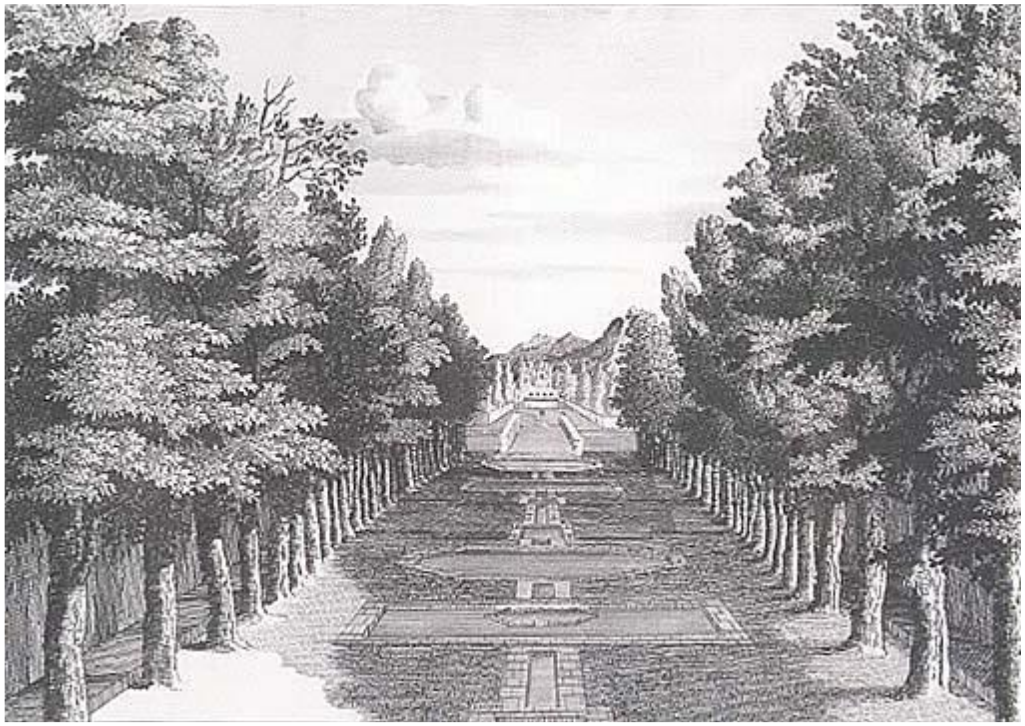

Figure 4.20. Hezar Jerib, One of Several Chaharbagh's Gardens in Iran (Ferrier, 1996)

Figure 4.21. Current Isfahan – Chaharbagh Area and its Greenary

- Combination of urban spaces and nature which they used greenery the most.

4.2 Summary

The construction of gardens as a part of urban development plan, and the construction of a symbolic Islamic city based on the allegory of paradise is described in the Quran. Considering that the most prominent water-based urban spaces can be found in the Islamic era and in Iran during the reign of the Safavids, the question now comes to mind, about the effect of water on Iranian Islamic architecture and also the meaning and the role of water in identity of Safavid architecture and urban spaces. But unfortunately, based on the searches, the results show that there is still a great deal of gap and flaw to show the significant impact of water element on Islamic urban planning, especially in Iran. By selecting prominent examples of buildings and urban spaces related to water in the Safavid era, particulary in Isfahan, such as Naghsh-e Jahan square, Chehel Sotoun palace and garden and Chaharbagh boulevard, it is attempted to show the impact of the water element on urban spaces more clearly and practically. One of the most important gardens in Isfahan is the Chaharbagh boulevard .This axis is the main road between the southern part of the Safavid *dolatkhane* (government parliament) and Hezar Jirib garden in the upper part of the city. All of the Iranian garden components have been used in this boulevard planning, such as water, greenery and etc. After analyzing the urban space of Isfahan's Chahar Bagh Boulevard, which is a very valuable monument of the Safavid dynasty, and one of the most prominent water-related urban spaces, it may be possible to better understand the impact of this valuable element in the design of urban spaces. As it is seen in Isfahan examples, water as an element in Iranian gardens becomes an external and social element from a personal, internal and traditional point of view, and it contributes to the formation of a new urban space, as well as plays a significant role to the gathering and attracting of people and the strengthening of business and economic areas.

Chapter 5

CONCLUSION

Water is not only a functional addition but also is an integral part of urban space, and could form an aesthetic value to landscapes, or giving life and breath to living beings. It has abundantly been used in Islamic architecture, such as Middle East, India and Spain. It could also be assumed that it had some impacts on European architecture, mainly on Renaissance and Baroque architecture.

The analysis of the influence of pre-Islamic and Islamic gardens in the Safavid plan indicates that this type of garden is inspired by the Timurid gardens and Herat's urban plan. Geometry from the Pasargad Gardens by Spanish and Moroccan designers, was reflected in the fifteenth century on the Chahar Bagh Boulevard, which is considered to be the Safavid palace.

According to Kevin Lynch, the urban system and its image must be readable and understood by observers, which leads to the identification of a real structure and identity, with which it is possible to analyze a city pattern (Zamburlini 2010).

The presence of a sprinkler at the intersection of two vertical axes, represents purity in Islamic beliefs. Also, the existence of trees on both sides of the street emphasizes pre-Islamic and Islamic gardens and is a sanctuary to the cultivation of deep-rooted plants.

Water plays a extremely important role in Iranian architecture and landscape design. Symbolic meaning of water could be seen in Persian gardens, but it is also used as a functional element for cooling the air and nourish the shading plants. The Persian garden known as paradise on earth, is shaped in four sections by waterways.

The new Safavid urban development programs tried to complete the existing structures, while modernism, without regard to these programs, injected social and spatial patterns of morphology into the city's structure.

As mentioned in the preceding chapters, Persian Garden is one of the characteristics of Iranian Islamic architecture, and the water element has been considered as one of the most important integral part of urban space by the Iranian architecture.

Also, in Chapter 4, by examining a number of monuments inherited from the architecture of the Safavid era, attention to the role of water in the urban spaces of this era is clearly seen.

The Safavid era is the peak of the magnificent architecture and art of Iran throughout its history. With the advent of Shah Abbas I, the golden age of the Safavid architecture began, due to his interest in art, pride and ambition, and with the help of the wealth he provided, began a new era in the urban spaces of Iran.

This period of architecture, although not the brightest era of architecture, is the era of elevation of the latest Islamic architecture of Iran. After that, Iran's architecture never flourished and was even forgotten. Shah Abbas built many different buildings throughout Iran. And since Isfahan was the capital, there was a great expansion there.

The point that can be considered as a distinction of water-related urban space in this era with other times is to turn the water element into a social element and its use in urbanization and developement, in such a way that the urban design of the city of Isfahan, one of the most important capitals of the Safavid era, based on a geometrically design garden with the water pools and canals designed on a certain geometric plan. Then this city becomes virtually a Garden City.

Considering the characteristics of architecture attributed to Isfahani school as mentioned in the previous sections, and with the case study of Isfahan city, it can be seen that the future urban morphology is a determinant factor for the spatial-social relations of the city.

It can be said that Chaharbagh Street follows the pattern of the Timurid and the Mongol Chaharbagh. The emphasis on the central axis of symmetry along the longitudinal axis in garden geometry was introduced as a dominant feature in the design of Chaharbagh of Isfahan by Shah Abbas. Looking at the garden of Isfahan, we can see the role of water and respect for this element as well as its urbanization changes during the Safavid era.

The creation of a philosophical connection between man and nature in this city, especially the central part that includes the Charbagh street and its constituent parts, is well tolerated. In the city of Isfahan during the Safavid era and in the main body of the city, which includes the Naghsh-e Jahan Square, Chehel Sotoun and Hasht Beheaht Gardens, the Mother Shah complex, the Bazaar, various mosques including the Shah Mosque, the Ali Qapu Palace, Chaharbagh Boulevard and bridges leading to it such as Si-o-Se Pol bridge and dozens of other different buildings, It creates privacy and

publicity, unity, mobility and immobility; dimension and domain, hierarchy, connection and proportion; solitude and togetherness; concentration, simplicity and complexity.

In fact, the element of water, entering the central part of the city, which includes commercial, educational, political, worship, production, sports and recreation, is the idea of unity and the relationship between the main activities of society, as well as the identity of Isfahan and the identity of Islamic civilization exposes Iran. The role of water in the construction of Iranian palaces and gardens, as we see in the Fin garden of Kashan, Shahzadeh Mahan garden, and etc., is not only for gardening and watering, but the movement, quietness, and the sound of water, are used for the mental and spiritual enjoyment. The kings' palaces in some cases are built in gardens, where water plays an important role in their beauty. The Chehel Sotoun palace of Isfahan and Fath Ali Shah's palace are in this area. Whoever does not enjoy the reflection of these palaces in water, as in reflection there is something that shakes the heart.

As it is seen in Isfahan examples, water as an element in Iranian gardens becomes an external and social element from a personal, internal and traditional point of view, and it contributes to the formation of a new urban space, as well as plays a significant role to the gathering and attracting of people and the strengthening of business and economic areas.

And now, after analyzing the urban space of Isfahan's Chahar Bagh Boulevard, which is a very valuable monument of the Safavid dynasty, and one of the most prominent water-related urban spaces, it may be possible to better understand the impact of this valuable element in the design of urban spaces.

This element can influence people, promote social relationships, economic interactions, educational spaces, tourism and more. With this in mind, water can be used to design and upgrade urban spaces. This can not only have a positive impact on the individual lives of the residents, but it can also enhance the process of attracting tourists and thus higher levels of economic development.

Therefore, urban designers, architects, government officials should pay more attention to water management, preservation of the existing cultural heritage and protection of water sources, and also use it to design and upgrade urban spaces.

REFERENCES

[1] Aal-e-Ibrahim Dehkordi, S. (2012). Water in Iranian Culture, Architecture, and Painting (Miniature). *Human Sciences Journal*. Sixth issue. Iran: Payame Noor University of Chaharmahal and Bakhtiari province.

[2] Abolghasemi, L. (1996). The Norm of Iranian Garden in the Mirror of History. *1st Congress of Architecture and Urban Planning*. Tehran: Culture Heritage Organization.

[3] Agha Ebrahimi Samani, F., Salehi, E., Irani Behbahani, H. & Jafari, H. (2012). Urban Landscape Planning and Design for the Interface Conflict between Urban Development and Landscape in Historic Cities – A Case Study: Isfahan City, Iran. *International Journal of Technical and Physical Problems of Engineering (IJTPE)*, 4: 122-127.

[4] Aghajari, S. H., Moshfeghifar, E. (2010). Analysis of Iran's Military Strategy and Its Components in the Age of Shah Abbas the Great (996 to 1038 AH). *Motaleat Tarikhi Farhangi*, Iranian History Association bulletin. 1st year, vol 4: 1-24.

[5] Ahari, Z. (2006). *Style of Isfahan in Urbanism, Grammer of Urban foundation design*. Tehran: Ministry of Culture and Islamic Guidance.

[6] Ahmadi, M. (2016). Chahar Bagh Avenue, Isfahan: Genesis and Demise, Pre-Islamic and Islamic Garden Influences in the Safavid Creation and History of its Subsequent Degeneration. *PHD Thesis*, Nottingham Trent University.

[7] Ajand, Y. (2008). *Iran Painting during Safavid Dynasty*. Tehran. p. 442

[8] Alemi, M. (1986). Chahar Bagh Environmental Design. *Journal of the Islamic Environmental Design Research Centre I.*, 38-45.

[9] Alemi, M. (2008). The Safavid Shrine Gardens - a Scene to Show Royal Ceremonies and Political Legitimacy. Translation: Maryam Rezaeipour and Hamid Reza Jeyhani. *Golestan-e-Honar,* vol 12: 68 - 47.

[10] Alemi, M. (2011). Symbolism in Persian garden (sense of nature in Safavid royal gardens). *Manzar,* vol 17.

[11] Al-Karaji, A. (1994). *Extraction of Underground Waters*. Translated by Xadiv Jam, H., Tehran: Institute for Humanities and Cultural Studies, Iranian National Commission for UNESCO.

[12] Al-Rhodesly, A., Al-Hagla, Kh., Farghaly, T. & El-Gamal, M. (2018). Revisiting the Alhambra architecture: Biophilic Design approach. HERITAGE 2018, *10th Anniversary Edition. Proceedings of the 6th International Conference on Heritage and Sustainable Development*, Vol 1, Granada, Spain. Retrieved from https://www.researchgate.net/publication/326170674_Revisiting_the_ Alhambra_ architecture_Biophilic_Design_approach [05.05.2019]

[13] Anderson, S.C. and Tabb, B.H., eds. (2002). *Water, leisure and culture*. Oxford: Berg.

[14] Ansari, M. and Mahmoudinezhad, H. (2007). Bagh e Irani Tamsili az Behesht (Persian Garden, an Allegory of Paradise, with an Emphasis on the Values of Iranian Garden in Safavid era), *Honarhaye Ziba*, 29: 39-48. Tehran: Tarbiyat Modarres.

[15] Ansari, M. (2009). Landscape Workshop on the topic "History of Iranian Garden". Research Center, *Poldokhtar Institute of Archeology*. Retrieved from http://poledokhtar.blogfa.com/post/141 [15.07.2019]

[16] Ardalan, N. and Bakhtiar, L. (1973). *The Sense of Unity: The Sufi Tradition in Persian Architecture*. University of Chicago Press, Chicago/London.

[17] Ariya, P. *Atlas of Iran and World of Gates*.

[18] Ayatollah Zadeh Shirazi, B. (2002). Iran and the Islamic World from the Perspective of Isfahan, in the Museum City of Naghsh-e Jahan. *Asar Quarterly*, vol 35, 3-22.

[19] Babaie, S. et all. (2011). *Special Slaves: Newborn Elites of Safavid era*. Tehran, Markaz publisher.

[20] Banimasoud, A. (2004). *A history of Western Architecture: From Ancient to Chicago Style*. Isfahan: Nashr e Khak.

[21] Barrucand, M. (2004). *The Garden as a Reflection of Paradise, in: Islam Art and Architecture*. ed. By Markus Hattstein & Peter Delius, Italy: Köneman pp. 490-493.

[22] Bayati, H. and Miladi, h. (2018). The effect of climatic conditions on Iranian-Islamic architecture of Safavid era; Case study of Isfahan city. *Civil, Architectural and Urban Development Conference of Muslim World Countries*, Tabriz University of Tabriz - Shahid Madani University, Azad University - Applied Science University of Tabriz. Retrieved from https://www.civilica.com/Paper-CAUCONF01-CAUCONF01_0951.html [09.06.2019].

[23] Byrone, R. (1982). *The Road to Oxiana*. Oxford University Press, USA.

[24] Beg, U. (1926). *Don Juan of Persia*. Filling and Sons, Ltd., Guildfgrd and Aeashek.

[25] Blake, S. (1999). *Half the World: The Social Architecture of Safavid Isfahan, 1590-1722*. Costa Mesa,CA: Mazda Publishers.

[26] Bloom, J. M. & Blair, SH. S. (2009). *The Grove Encyclopedia of Islamic Art and Architecture*. Vol 2, 3: Delhi to Mosque, Oxford University Press, USA.

[27] Blunt, W. (1966). *Isfahan: Pearl of Asia*. Elek Books, London.

[28] Chardin, S. J. (2010). *Sir John Chardin's Travels in Persia*. Cosimo, Inc. Retrieved from https://books.google.com.cy/books/about/Sir_John_Chardin_s_Travels_in_Persia.html?id=kV67nWAJ0eMC&printsec=frontcover&source=kp_read_button&redir_esc=y#v=onepage&q&f=false [11/12/2018].

[29] Coppock, A. J. and Miller, J. (1998). Transformations of middle eastern natural environments: legacies and lessons. *New Haven, CT*: Yale University Bulletin Series No.103, 206–220.

[30] Curzon, G. N. (1892). *Persia and the Persian Question*. Vol 1. London: Cambridge University Press.

[31] Dashti, K. (2013). Fin Garden, Where History Overtakes Nature. *Iran Daily*, 21 Jan 2013, p: 06. Retrieved from http://old.irandaily.com/1391/11/2/ MainPaper/4428/Page/6/MainPaper_4428_6.pdf [22.05.2019]

[32] Debevoise, N. C. (1938). *A Political History of Parthia*. The University of Chicago Press, Chicago. Retrieved from https://oi.uchicago.edu/sites/oi.uchicago.edu/ files/uploads/shared /docs/political_history_parthia.pdf [21.04.2019].

[33] Della Valle, P. (2005). *Cose e Parole nei Viaggi di Pitro Della Valle*. Translated by shafa, sh. Elmi-Farhangi, Tehran.

[34] Ebrahimi, Gh., Noori, A. and Ghiw, A. (2016). Investigating the Effect of the Principle of Fluidity in Iranian Gardens (Case Study: Fin of Kashan). *The First National Conference on Architecture and Urban Planning (Thought, Theories and Methods)*, Malayer, Islamic Azad University, Malayer Branch. Retrieved from https: //www.civilica .com / Paper-AUITM01-AUITM01_337.html

[35] Eirajia, J. and Akbari Namdar, SH. (2011). Sustainable Systems in Iranian Traditional Architecture. *Procedia Engineering*, Vol 21, pp-553 – 559. Available online at www.sciencedirect.com

[36] Ettinghausen, R. & Grabar, O. (1987). *The Art and Architecture of Islam 650-125.*, New Haven & London: Yale University Press, The Pelican History of Art.

[37] Fahmi, H. (2012) *An Overview of Water Resources Management in the IR of Iran*. Ministry of Energy of Iran.

[38] Farahani, L., Mahmoudi, B., Motamed, B., & Jamei, E. (2016). Persian Gardens: Meanings, Symbolism, and Design, Landscape. *Online Official Journal of the International Association for Landscape Ecology* – Regional Chapter Germany (IALE-D) 46:1-19

[39] Felmeden, J., Schramm, E., Sattary, E. and Davoudi, A. (2014). Agriculture in the Zayandeh Rud Catchment. *ISOE – Institute for Social-Ecological Research*, Frankfurt, Germany. Retrieved from https://www.researchgate.net/publication/278686018_ Agriculture_in_the_Zayandeh_Rud_Catchment/figures?lo=1 [07.07.2019]

[40] Ferrier, R.W., (1996). *Isfahan. A Journey to Persia*. London: I. B. Tauris and co ltd, pp. 44-65.

[41] Ghobadian, V. (2015). Sabk Shenasi Va Memari Nazari Dar Memari Moaser *(Styles and Concepts in Iranian Contemporary Architecture*). Tehran: Elm e memar.

[42] Gholipour, S. & Heydar Nattaj, V. (2016). Effects of Timurid Gardens in Samarkand on Safavid Gardens in Isfahn (Chaharbagh Avenue). *Bagh Nazar*, 13:40, 5-18.

[43] Glasgow, R.D.V. (2009). *The Concept of Water*. United Kingdom: R. Glasgow Books.

[44] Habibi, S. M. (1995). Isfahan School, Exaltation and Promotion of government Concept. *First Iran Architecture and Urban Building History Congress*. Ark-Bam. Kerman Cultural Heritage Organization of Iran. Tehran.

[45] Habibi, M. (2008). *From Flood to City, A Historical Analysis of the Concept of the City and Its Physical Impression*. Tehran: Tehran University Press.

[46] Haghighatbin, M. (2010). Study of Design and Aesthetic Principals of Persian Garden in Major City Axis` (Safavid) and Its Influence Outside of Iran (Sub-Continent of India and europe). *PhD Thesis in Architecture*, Tarbiat Modares University, Tehran.

[47] Haghighatbin, M. and Bostani, S. (2016). Silk Road and Isfahan's Garden City Sustainability During Safavid Period. *4th International Conference, Mukogawa Women's Univ.*, Nishinomiya, Japan, July 16-18,2016.

[48] Haghighatbin, M., Ansari, M. Bemanian, M.R. and Bostani, S. (2016). A Study of Effective Elements on Safavid Garden-Cities Configuration with Emphasis on Shia Teachings. *Hoviat Shahr*, Vol. 10 No. 25.

[49] Hasani Miyanroudi, S. (2016). Effect of Water Exposition on Iranian-Islamic Architecture (Case Study: Behshahr Mansion Garden). *4th International Congress on Civil, Architectural and Urban Development*. Tehran. Retrieved from https://www.civilica.com/Paper-ICSAU04-ICSAU04_2362.html

[50] Hayati, H., Fazeli, Z. and Alipoor, N. (2016). A Review on the Identity in Iranian Architectue (Case Study: Naqsh-e Jahan Square in Isfahan). *The Turkish Online Journal of Design, Art and Communication –TOJDAC*. Special Edition, PP- 1518-1532.

[51] Hillebrand, R. (1999). *Islamic Art and Architecture* (World of Art [Paperback]), Thames & Hudson.

[52] Hinnells, J. R. (2012). Iran IV. Myths and Legends. *Encyclopædia Iranica*, XIII/3, Retrieved from http://www.iranicaonline.org/articles/iran-iv-myths-and-legends [21.04.2019].

[53] Hosseini Abari, S. H. (2009). The Relation Between Sheikh Baha'i Petition and the Traditional Division of Zayanderud Water. *Journal of Geography and Environmental Studies*, Department of Geography, Iran. vol 1:2, 5-14.

[54] Hunt, P. (2011). *History of the Movement of the Persian Garden to Other Cultures, Gift of Persia: Exotic Garden for California*, 15/7/2011 2011, The Gardens at Heather Farm, Walnut Creek, CA, pp. 2-16.

[55] *ICOMOS*. (2009). Evaluation for the 33th World Heritage Committee Session.

[56] *ICOMOS*. (2011). The Persian Garden (Iran). No 172. ICOMOS report, pp-171.

[57] *ICOMOS*. (2015). Cultural Heritages of Water, The Cultural Heritages of Water in the Middle East and Maghreb.

[58] Irani Behbahani, H. and Khosravi, F. (2011). Persian Garden between Permanent and Innovation from Edison to Contemporary. *TÜBA-KED*, 9/2011.

[59] Jackson, P. and Lockhart, L. (2006). *The Timurid and Safavid Periods, in The Cambridge History of Iran in Seven Volume.* Volume 6, pp. 188-232, Cambridge: Cambridge University Press.

[60] Kalhor, M. (2015). Chahar Baghshahr: Isfahan Safavi The Realization of Shiite Mine. *Third International Civil, Architecture and Urban Development Congress*, Tehran, Shahid Beheshti University. Retrieved from https://www.civilica.com/Paper-ICSAU03-ICSAU03_1867.html [09.06.2019].

[61] Karimi, M. (2017). The role of Water in Iranian Garden (Case study: Shazdeh Mahan Garden). *The First Sustainable Development Conference in Civil Engineering, Architecture and Urban Planning*, Kish, Hamandishan Noavar Elm

Company. Retrieved from https://www.civilica.com/Paper-ACUCONF01-ACUCONF01_008.html [09.06.2019].

[62] Katouzian, S. (1986). The Sense of Place in Persian Gardens. In Environmental Design. *Journal of the Islamic Environmental Design Research Centre II*, 42-47.

[63] Katouzian, H. (2009). *The Persians: Ancient, Mediaeval and Modern Iran*. Yale University Press. Retrieved from http://www.jstor.org/stable/j.ctt1nq9d0 [21.04.2019].

[64] Kiani, M.Y. (2017). *History of Iranian Architectural Art in the Islamic Period*. Samt, Tehran.

[65] Kilito, A. (1992). *Architecture and the sacred: a season in the hammam. Research in African Literatures*. Vol. 23, No. 2, North African Literature, pp. 203-208, Indiana University Press.

[66] Kheirabadi, M. (2000). *Iranian Cities: Formation and Development*. Syracuse University Press. pp. 47

[67] Kobori, I. (1973). Some notes on Diffusion of Qanats. *Orient*, Vol. 9, pp. 43–66.

[68] Kohlberg, E. (1988). BAHĀʾ-AL-DĪN ʿĀMELĪ. *Encyclopaedia Iranica*. Vol. 3, Fasc. 4, 429-430. Retrieved from http://www.iranicaonline.org/articles/baha-al-din-ameli-shaikh-mohammad-b [26.08.2018].

[69] Kosso, C. and Scott, A. (2009). *The Nature and Function of Water, Baths, Bathing and Hygiene from Antiquity through the Renaissance*. Leiden: Brill.

[70] Lane, G. E. (2011). *The Mongols in Iran, in The Oxford Handbook of Iranian History*. Chapter 10, pp. 243-270. Retrieved from https://eprints.soas.ac.uk/13395/3/ Mongols_in_Iran.pdf [21.04.2019].

[71] Lightfoot, D. R. (1997). Qanats in the Levant: Hydraulic Technology at the Periphery of Early Empires. *Technology and Culture*, Vol. 38, No. 2, pp. 432–451.

[72] Loti, P. (2010). *Vers Ispahan*. Gutenberg Retrieved from http://www.gutenberg .org/files/32138/32138-h/32138-h.htm#TROISIEME_PARTIE [9/12/2018]

[73] Mansoori, S. A. (2005). *Investigation of Role of Sofhe in Iranian Architecture Research Project*. College of Fine Arts, University of Tehran

[74] Mansouri, S.A.N. (2011). Chahar Bagh. A Study of the Origin of the Chahar bagh Concept as a Model, *Manzar*, 14, 16-23

[75] Medghalchi, L., Ansari, M. and Bemanian, M. R. (2014). Spirit of Place in Persian Garden. *Bagh- e Nazar*: The Scientific Journal of Nazar Research Center, for Art, Architecture & Urbanism. Article 3, Volume 11, Issue 28: 25-38.

[76] Meisami, J. S. & Starkey, P. (Ed.). (1998) *Encyclopedia of Arabic Literature*. New York: (Routledge – Taylor & Francis Group); Vol 1: p. 85.

https://books.google.com.cy/books?id=sx1bqgibKhQC&pg=PA85&redir_esc=y#v=onepage&q&f=false [26.08.201]

[77] Memarian, GH. (1995). *Residential Architecture of Iran, Introverted Typology*. Tehran: Elm o Sanat University.

[78] Michell, G. (1996). *Architecture of the Islamic World: Its History and Social Meaning*. London: Thames and Hudson.

[79] Mirmiran, H. (2011). Historical and Cultural Center of Isfahan. *Third Conference of Isfahan (Isfahan of Today, Opportunities and Challenges)*, Islamic Azad University-Khorasgan Branch, Isfahan. Retrieved from http://www.memarnet.com/sites/default/files/pdf/Isfahan%20%20web%20quality.pdf [09.06.2019]

[80] Mirmobiny, Sh. (2014). *The Alhambra. Khan Academy*. Retrieved from https://www.khanacademy.org/humanities/ap-art-history/early-europe-and-colonial-americas/ap-art-islamic-world-medieval/a/the-alhambra 09.06.2019.

[81] Moghtaderi, S. (2012). Water Identity in the Formation of Iranian Garden, Case Study of Shahzade Mahan Kerman Garden. *First National Conference on New Thoughts and Technologies in Architecture*, Tabriz, Tabriz Architects Society. Retrieved from https://www.civilica.com/Paper-NTA01-NTA01_480.html [09.06.2019].

[82] Mohammadzade, M. and Nouri, S. (2017). Study of Structure and Viewing Angles of Persian Garden in Persian Garden Paintings and Garden Carpets in Safavid Period. *Bagh Nazar*, Vol 14 (52), 27-36.

[83] Mohamadzadeh Goodini, Y., Miri, S., Kharrazi Qadim, F. & Pakbaz, H. (2015). Survey on the Development of Articulation with the Axis of Chahar Bagh in Isfahan: from Safavid to Contemporary, *International Journal of Review in Life Sciences*, 5(10), 1303-1310

[84] Mojtahed Zadeh, P. (2007). *Iran: An Old Civilization and a New Nation State. Part I. The Iranian Tradition of Statehood. Focus on Geography*. Volume 49, Number 4.

[85] Mokhtarshahi Sani, R. (2009). An Inquiry into Iranian ArchitectureManifestation of Identity, Symbolism, and Power in the Safavid's Public Buildings. *PHD Thesis*. Eastern Mediterranean University, Architecture Department, Gazimağusa, North Cyprus.

[86] Moore, C.W & Mitchell, W. (1983). *On Gardens, Mimar & Architecture in Development, Concept*. Singapore: Media, LTD,

[87] Naghizadeh, M. (2008). Origins of the idea to create a paradise on earth. *Mah-e-Honar*, Tehran: Department of Art and Architecture, Olum Tahghighat University, 40-62.

[88] Naghizadeh, M. (2013). Representations of Beauty in Persian Gardens. *Manzar*: The Iranian Scientific Journal of Landscape 5, 6-9.

[89] Norberg-Schulz, C. (1980). *Genius Loci: Towards a Phenomenology of Architecture*. Minnesota: University of Minnesota.

[90] Nazarian, A. (2011). *Urban Scenarios in Iran*. Tehran: Mobtakeran Publication.

[91] Oliveira, V., Pinho, P., Batista, L., Patatas, T. & Monteiro, C. (eds.) (2014). *Our Common Future in Urban Morphology*. FEUP, Porto.

[92] Omranipour, A. and Mohammadmoradi, A. (2011). The Evolution of the Greenery Environment and its Interaction with the Historic City of Isfahan. *Sofhe Magazine*, vol 55, 172-184.

[93] Pakzad, J. (2011). *History of Iranian City, from Begin to Qajar Dynasty*, Tehran, Armanshahr.

[94] Petersen, A. (1999) *Dictionary of Islamic Architecture*. Routledge. London & New York.

[95] Pirnia, M. K. (1994). Baghha- ye Irani [Persian Gardens]. *Abadi* (15): 4-9.

[96] Pirnia, M. K. (2001). *Iranian Architecture's Styles*. Collected by Me'marian, Gh. Tehran: Soroush-e-Danesh.

[97] Pirnia, M. k. (2008). *Sabk Shenasiye Memari Iran* (Stylistics of Iranian Architecture), Tehran: Soroush Danesh.

[98] Pirnia, M. k. (2013). *Introduction to Islamic Architecture of Iran*. Tehran: Soroush Danesh.

[99] Pope, A. (ed.) (1977). *A Survey of Persian Art from Prehistoric Times to the Present. Vol. 3, Architecture, Its Ornament, City Plans, Gardens*. Tehran: Soroush. 1407-1410.

[100] Porter, Y. and Thevenart, A. (2003). *Palaces and Gardens of Persia*, Paris: Flammarion.

[101] Pourjafar, M., Amini, M., Hatami Varzaneh, E. & Mahdavinejad, M. (2014). Role of Bazaars as a Unifying Factor in Traditional Cities of Iran: The Isfahan Bazaar. *Frontiers of Architectural Research*: 3, 10 -19.

[102] Pourmand, H. and Keshtkar Ghalati, A. R. (2011). The Analysis of Essence Causes in Persian Garden. *Honarhaye ziba-Memari va Shahrsazi*, Vol 3: No 47: 51-62. Retrieved from https://jfaup.ut.ac.ir/article_28930_325ac3cf21fcb6790b744843b0fb7547.pdf [30/10/2018].

[103] Pourmoghaddas, H. (2006). Water Quality and Health Issues in the Zayanderud Basin. Research Report. *International Water Management Institute*, Iran.

[104] Ghobadiyani, N. KH. (2003) *Naser Khosrow Travelogue*. Tehran, Qoqnous.

[105] *Quran*, Surah Al-Anbia:30.

[106] *Quran*, Surah Al-Hajj:23.

[107] *Quran*, Surah Al-Rahman:54.

[108] *Quran*, Surah Al-Waqi'ah: 68-69.

[109] *Quran*, Surah Ibrahim:23.

[110] Raezer, D. and Raezer, J. (2015). *Spain Revealed: Granada's Alhambra. Version 1.0. Approach Guides*, New York, USA.

[111] Rafiei, A. (1973). *Athare Melli-ye Isfahan* [National Monuments of Isfahan), Tehran.

[112] Rahnamaei, R. and Shahhoseini, F. (2004). *Urban Planning Process in Iran*. Samt, Tehran.

[113] Rostami Monjezi, A. & Shahbazi, M. (2011). The Role of Water Effect on the Identity of Iranian Garden Architecture. *Third National Conference on Civil Engineering*, Islamic Azad University, Khomeini Shahr Branch.

[114] Saffari, H. and Abbasian, N. (2015). Sacred Water Role in Iranian Garden's Architecture: Case Study, Shahzadeh Mahan Garden. *International Conference on Architecture, Urbanism, Civil, Art and the Environment: Future Horizons, Looking*

Back. Tehran. Retrieved from https://www.civilica.com/Paper-ICAUCAE01-ICAUCAE01_1684.html

[115] Sarraf, M. Jawad (2010). Vestiges of Urban Spirit: Isfahan's Urban Fabric Through Socio-spatial Transformations. Stockholm : *KTH Royal Institute of Technology, School of Architecture & the Built Environmen*, Thesis.

[116] Savory, R. (2007). *Iran Under the Safavids*. Cambridg University Press. Retrieved from https://books.google.com.cy/books?id=v4Yr4foWFFgC&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false [11/12/2018].

[117] Schechner Genuth, S. (1997). *Comets, Popular Culture, and the Birth of Modern Cosmology*. Princeton: Princeton University Press. 144.

[118] Seyyed Sattari, R. and Balilan, L. (2012). Analysis of the Role of Water Presence in the Architecture of Mosques in Iran. *1st National Symposium of Ideas and Technologies in Architecture*, Tabriz: Tabriz Architects' Society. Retrieved from https://www.civilica.com/Paper-NTA01-NTA01_432.html

[119] Shafaghi, S. (2002). *Geography of Isfahan*. Isfahan: Isfahan University Press.

[120] Shamaeezade, M. and Zhou, H. (2015). *Cumulus Mumbai 2015: In a Planet of our own -A Vision of Sustainability with Focus on Water*. Retrieved from http://www.inaplanetofourown.net/assets/papers/Massoud%20Shamaeezadeh-%20Cumulus%20Mumbai%202015.pdf, [18.03.2019]

[121] Shea, C. (1995). *Culture, Symbol and Time: The Revitalisation of Samarkand*. University of Massachusetts Insitute of Technology, Cambridge.

[122] Sheykhi, M. and Kolaei, A. (2016). Investigating the Role of Water and Plant in the Architecture of Iranian Gardens Case Study of Bushehr Mansion, Safavid era. *The First National Conference on Islamic Architecture, Urban Heritage and Sustainable Development*. Tehran: International Institute of Iranians, Directorate of Cultural Heritage, Handicrafts and Tourism of Tehran Province. Retrieved from https://www.civilica.com/Paper-IUSD01-IUSD01_092.html

[123] Soltani, A. and Namdarian, A. A. (2010). Review of the Impact of Different Ways on the Formation of Urban Space. *Hoviyat e Shahr*, vol 7, 123-130.

[124] Soltanzadeh, H. (1988). *Introduction to Urban History in Iran*. Amir Kabir Publisher, Tehran.

[125] Taheri, A. (2009). Political and Social History of Iran. *Elmi-Farhangi*, Tehran.

[126] Tavassoli, M. and Bonyadi, N. (1992). Urban Space Design 1. *Urban Planning and Architectural Research Center of Iran*.

[127] Torkaman, I. B. (1971). *Alam Aray-e- Abbasi, History*. Volum 1, Tehran: Amir Kabir.

[128] Yahaghi, M. J. (1990). *Farhang- e Asatir va Esharat- e Dastani Dar Adabiate Farsi* [Culture of Mythology and Stories, Symbols in Farsi Literature]. Tehran: Nashre-Soroush.

[129] Yıldız, Netice (2006). *"Aqueduct" in: Medieval Islamic Civilization: An Encyclopaedia, Medieval Islamic Civilization, Medieval Islamic History, Medieval Islam, Medieval Islamic Culture, Daily Life, Rituals*, (Routledge Encyclopaedias of the Middle Ages). ed. Josef W. Meri et al., 2 Volumes, New York: (Rout ledge – Taylor & Francis Group). Vol. I, pp. 51-53. (Routledge Reference Books ISBN 0415966906).

[130] Salimi, A. Yurtyapan; Salimi, A. & Pilehvarian, N. Kara (2016). Position of Light and Water in Architecture and Philosophy of Art. *The Turkish Online Journal of Design, Art and Communication -TOJDAC* April 2016 Special Edition, 58-67

[131] Zarei, M. I. and Soltanmoradi, Z. (2015). Investigating the Relationship between Political Stability and Water Management in Safavid Isfahan. *Quarterly Journal of Islamic and Iranian History of Alzahra University*. Vol 31, 121.

[132] Zamburlini, G.I.C. (2016). Modernist Heritage Conservation:An Evaluation of Theories and Current Practice. *PHD Thesis*, School of the Built Environment College of Science and Technology University of Salford - UK

[133] Ziyari, K. (2000). Detachment of the Qanat and its Role in the Formation and Initial Development of Iranian Settlements. *Daneshvar Quarterly*, Seventh Year, Number 28, 90-81

[134] https://www.ontheworldmap.com, [29.07.2019]

[135] http://anthropology.ir/article/611.html, [18.03.2019]

[136] A Qanat Tunnel near Isfahan. Photo by Naeinsun. At 21 November 2012 https://en.wikipedia.org/wiki/Qanat#/media/File:Insideqanat.JPG, [18.03.2019]

[137] http://irantravelexplorer.com/works/jahan-nama-garden/, [18.03.2019]

[138] https://www.mehrnews.com/news/1543589/, [19.03.2019]

[139] https://www.mehrnews.com/news/1400682 [18.03.2019]

[140] https://www.alamy.com - ID: P8DNGP, [19.03.2019]

[141] https://www.alamy.com – ID: R2Y1W3, [19.03.2019]

[142]https://www.kojaro.com/2015/12/17/45283/imam-mosque-isfahan,[18.03.2019]

[143] https://www.flickr.com/photos/saeid1354/5123118511/sizes/l/ , [24.03.2019]

[144] https://mosafersalam.com/attraction, [24.03.2019]

[145] https://www.flickr.com/photos/saeid1354/5123118511/sizes/l/ , [24.03.2019]

[146] https://www.kojaro.com/2016/9/27/122244/alhambra-granada/, [24.03.2019]

[147] https://www.gardenvisit.com/gardens/aguedal_gardens, [24.03.2019]

[148] IASP 2018 ISFAHAN - 35th World Conference on Science Parks and Areas of Innovation,http://iasp2018isfahan.com/about-isfahan/oldisfahan-imamsq2/, [24.03.2019]

[149] https://www.themaparchive.com/Safavid-empire-c-1630.html

[150] https://www.tappersia.com/naqsh-e-jahan-square/

[151] www.jamejamonline.ir

[152] https://www.youtube.com/watch?v=k_Rk58n0R4s

[153] https://origiran.com/isfahan-chehel-sotun-palace/

[154] https://www.suzannezahr.com/monir-mehdi-ghanbeigi/persian-garden

[155] http://www.mantouristam.com

[156] https://www.nationsonline.org/oneworld/map/iran_map.htm

[157] http://Isfahanemrooz.ir/?newsid=1773

[158] http://en.farsnews.com/newstext.aspx?nn=13931027000233

[159] (https://www.irandestination.com/naqsh-e-jahan-square-isfahan/)